

*See Nature 7 Oct 1875*

**REPORT**  
**OF THE**  
**METEOROLOGICAL COMMITTEE OF THE**  
**ROYAL SOCIETY,**

**For the Year ending 31st December 1873.**

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

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**LONDON:**  
**PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,**  
**PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.**  
**FOR HER MAJESTY'S STATIONERY OFFICE.**

**1874.**

[C.—1103.] *Price 4d.*

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## P R E F A C E .

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THE Meteorological Committee consists of Fellows of the Royal Society who have been 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 services of the Committee are *entirely gratuitous*.

The Meetings of the Committee are held regularly 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.

### MEMBERS OF THE COMMITTEE :—

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

Mr. DE LA RUE.

Captain F. J. O. EVANS, C.B., Hydrographer to the Admiralty.

Mr. FRANCIS GALTON.

Mr. GASSIOT.

Rear-Admiral G. H. RICHARDS, C.B.

The EARL of ROSSE.

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

Major-General R. STRACHEY, R.F., C.S.I.

Sir CHARLES WHEATSTONE.

May, 1874.



# R E P O R T

For the year ending December 31st, 1873.

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## PART I.

AT the end of this, the seventh year of their administration of the Office, the Committee have to report that it continues under the same management as heretofore, namely, that of Mr. Robert H. Scott, as Director, assisted by Captain Henry Toynbee, as Marine Superintendent. Introduction.

In their own body there have been considerable changes. To their great regret, Mr. Spottiswoode has found himself unable to devote as much time to the work of the Committee as he had previously done, and has handed in his resignation. His place has been filled by Major-General R. Strachey, while the name of the Earl of Rosse has been added to the list. Furthermore, the resignation by Rear-Admiral Richards of the post of Hydrographer, rendered it necessary to have Captain Evans, his successor in that office, nominated on the Committee. At the same time Admiral Richards has consented to continue to afford his colleagues the benefit of his assistance. The Committee accordingly (April 1874) consists of ten instead of eight members. Changes on Committee.

The most important circumstance during the year has been the nomination of Mr. Scott by Her Majesty's Government, at the recommendation of the Committee, as one of the two Delegates\* to represent this country at the International Meteorological Congress at Vienna in the month of September. An English translation of the Report of Proceedings at the Congress has been published.† Mr. Scott has been elected a member of the Permanent Committee for carrying out the resolutions of the Congress. A summary of the resolutions adopted, and of the action taken at the Congress in question, as well as at the Conference at Leipzig in 1872, of which a notice appeared in the last Report of the Committee, will be found in Part II., which will thus contain, in a reasonably concise form, most of the rules now generally adopted for the prosecution of Meteorological Science. Vienna Congress.

The operations of the Office will, it is hoped, exhibit a steady advance along the various lines of investigation which have from the first been marked out by the Committee for the employment of their staff.

These lines are three in number, and it is unnecessary to do

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\* The other being Mr. Alexander Buchan, Secretary of the Scottish Meteorological Society.

† Report of the Proceedings of the Meteorological Congress at Vienna. Stanford 1874 Price 1s.

Sub-division of  
objects of  
inquiry.

more than allude to their names, as the character of each has been fully given in previous Reports. Their names are—

- I. Ocean Meteorology, including the supply of instruments to the Royal Navy.
- II. Weather Telegraphy.
- III. Land Meteorology of the British Islands.

These several branches will now be discussed seriatim.

#### I.—OCEAN METEOROLOGY.

Issue of instru-  
ments.

The principle of operations as to the collection of observations in this branch is to supply on loan to Captains a set of instruments properly verified at Kew, which are returned to the Office for recomparison with standards as soon as the voyage is over. The loan is granted on condition of observations being taken with the instruments, and entered in a register supplied for the purpose, which is sent into the Office when filled. 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.

Supply to the  
Royal Navy.

The foregoing remarks apply to the Merchant Service. As regards the Royal Navy, the Office is entrusted by the Admiralty with the duty of supplying all ships in commission with all the meteorological instruments required in the service. The case of such issue is on a totally different footing from that to a merchant ship, inasmuch as there is no condition annexed as to the return of observations to the Office, the keeping of a special register besides the ship's log being entirely voluntary. However, some very valuable registers have been from time to time received from Her Majesty's ships, among which may be specially noticed H.M.S. "Pearl," Commodore J. G. Goodenough, and H.M.S. "Challenger," Captain G. Nares, in the year 1873.

Collection of  
observations,  
&c.

The Committee need only refer to their former Reports for a full account of the care exercised in the selection of observers and in the examination of their registers when sent in, so as to ensure that all the particulars as to the position of the instruments, &c., should be ascertained from the observer while they are fresh in his memory, and recorded for future reference.

In addition to the supply of instruments direct from the Office in London, a stock is kept at some of the more important seaports, the Agents in charge of them receiving a fee for each case of issue and return, and a further fee for each observer obtained through him who furnishes first-class observations. The names of all applicants for instruments are submitted to Captain Toynbee for approval prior to the supply.

Presentation of  
Pilot Charts.

To each observer who has obtained the mark "excellent" a copy of the Atlantic Pilot Charts, or of the Wind and Weather

Charts of the Atlantic, Pacific, and Indian Oceans is presented. 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." They also get such publications of the Office as are likely to be of interest to them. 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 Admiralty Charts.*

Captain's name.	-	-	-	Ship.
Balderston, James William	-	-	-	"Rajmahal."
Freeman, Thomas William	-	-	-	S.S. "Wisconsin."
*Goodenough, James George	-	-	-	H.M.S. "Pearl."
†Hosken, Henry	-	-	-	Do.
Johnson, Charles	-	-	-	"St. Lawrence."
Kerr, Alexander	-	-	-	"Ardgowan."
Mackie, Thomas	-	-	-	S.S. "Mazinthien."
Newton, James William	-	-	-	S.S. "Grenadier."
Sutherland, James Taylor	-	-	-	"Maggie."
Tully, Thomas	-	-	-	"Baroda."
Wadham, Thomas Littleford	-	-	-	"Vere."

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 Admiralty 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.

The geographical distribution of the vessels in which observations were being taken at the close of the year 1873 was as follows:— Localities whence observations are being derived.

Voyages.	-	-	-	-	Ships.
To Baffin's Bay or Greenland	-	-	-	-	5
„ East Coast, North America	-	-	-	-	9
On East Coast, North America	-	-	-	-	3
„ West Coast, North America	-	-	-	-	3
To West Indies	-	-	-	-	5
„ East Coast, South America	-	-	-	-	3
„ West Coast, South America	-	-	-	-	5
„ West Coast, Africa	-	-	-	-	3
On East Coast, Africa	-	-	-	-	1
To Australia and New Zealand	-	-	-	-	8
„ India, viâ the Cape	-	-	-	-	19
„ India, viâ Suez	-	-	-	-	1
In Indian Seas	-	-	-	-	2
To China Seas, viâ the Cape	-	-	-	-	2
„ China Seas, viâ Suez	-	-	-	-	3
„ Mediterranean Ports	-	-	-	-	1
„ Home Ports	-	-	-	-	2

75

\* Commodore.

† Navigating Lieutenant.

Appendix No. III. contains a list of the documents received during the year in this department, of which 105 are ships' registers.

Charts of  
Equatorial  
Region of  
Atlantic Ocean.

In the last Report it was announced that the Committee had decided to issue Monthly Charts for two degree squares for the district of the Atlantic Doldrums, known as Square 3, and the reasons for selecting this small area were fully detailed.

These charts are now completed, and the explanatory letter-press is in a forward stage of preparation, so that the whole work will be published in the course of the summer.

In an Appendix, a selection of the best quality logs has been made from the mass of observations used in the general discussion of Square 3, and of those only the registers in which the observations have been entered regularly at intervals of every four hours. The four-hourly means of Barometer, and Air and Sea Temperature have been deduced for each month, and for the year, in the northern and southern halves of the square; and from these means have been calculated the constants in the periodical expression for the diurnal variations, and therefrom the most probable values for each hour of the day, as well as the various maxima and minima.

The results obtained are very interesting and satisfactory, and show not only a remarkable regularity of diurnal changes but also the extremely small variation in Pressure or Temperature throughout the year in those latitudes.

This work is a continuance, on a much greater scale, of the investigation made under the superintendence of Admiral FitzRoy, in the year 1861, (Seventh Number of Meteorological Papers,) and as there stated, "a value or correction may be obtained for barometrical observations made on board any ship crossing the Equator" from the tables, with a near approximation to truth. It also serves the purpose of a test as to the accuracy of the observations returned to the Office by captains who have crossed the district in question.

Having thus finished the work for Square 3, which may fairly be termed a monograph for the district, the circumjacent squares 38, 39, 40, 2, 4, 301, 302, and 303 have next been taken up, but inasmuch as Square 3 contains as much as 59% of the information in existence in the Office for the entire area of the Atlantic, between 10° S. and 20° N., occupying fully 15 times the space of its central square, it is obvious that the materials for any other square will not bear as minute a sifting as that to which the observations for Square 3 have been subjected.

The results for each month as regards each strip of three squares will be published on one chart, but for areas of 5° of longitude by 2° of latitude, instead of for 2° Squares.

The information obtained from ships' logs for Square 301 will be rendered materially more complete by the observations taken at Ascension by the late Lieut. Rokeby, R.M., for the space of two years, comprising regular anemometrical records as well as the ordinary contents of a meteorological register.

The Committee may now confidently expect that by the end of the year their staff will have completed the examination of the nine squares above referred to with the utmost extent of minute-

ness and accuracy justified by the amount of materials at command, which, as will have been perceived, are far from enough to allow of the preparation of satisfactory charts for the entire area.

The Committee would here observe that it has been often remarked that their chief attention should be directed to the utilization of the more recent materials, and that the store of old logs should be considered as of more secondary importance. Such an opinion as this is affected by a serious misconception of the mode of dealing with the subject of Ocean Meteorology enforced by the nature of the materials at hand for discussion.

Relative value of old and new materials.

It is perfectly impossible to obtain means of any value from the observations say of the last six years. The table of the distribution of observing ships is a sufficient proof of this. The only immediate use to which recent logs can be put is to the preparation of synoptic charts of weather, while mean meteorological results, to be of value, must depend on the comparison of all the good observations available for the district from all the logs accessible to the Office.

With reference to the subject of Synoptic Charts mention was made in the last Report of the investigation into the weather of the Atlantic in February 1870, at the time of the loss of the steamer "City of Boston." In the month of August last another storm of exceptional severity visited the coast of Nova Scotia and wrought much damage. An account of this storm has already been prepared by the Chief Signal Office of the United States, and published in the Report of that Office for 1873. The Committee have, however, requested Captain Toynbee, at his own suggestion, to collect as much information for the weather over the Atlantic during the entire month of August as is possible, in order to throw light on the conditions which preceded and succeeded the disturbance, as well as into the character and course of the storm itself. Accordingly invitations have been issued to all British shipowners to lend to the Office all logs of ships in the Atlantic during any portion of the month.

Weather of August 1873 in the Atlantic.

Of minor investigations the Committee would notice the completion of the discussion of the anemometrical returns from Bermuda for four years, which was noticed in the last Report. It will be remembered that these results have been the long-delayed outcome of a recommendation of the British Association at their meeting in Dublin in 1857, to the effect that two anemometers should be erected on selected stations in the Atlantic. One of these instruments was sent to Bermuda, and has remained there ever since, though the records are only available for four years, as explained in the introduction to the discussion. The other was first placed at Halifax, and then removed to Sandwick Manse in the Orkneys.

Bermuda Anemometry.

The information as to wind has been supplemented by such data for the barometer, &c., as were obtainable for the islands during the years over which the investigations extended. The observations from which these have been deduced were taken at the station of the Royal Engineers, and for copies of them the Office is indebted to the kindness of General Sir H. James, F.R.S.

Results of  
Sir J. Ross's  
Antarctic  
Expedition.

The discussion of the observations taken during Sir J. Ross's Antarctic expedition has been completed and published.\*

The materials for this paper have been the observations taken south of the latitude  $60^{\circ}$  S., on board H.M.S. "Erebus" and "Terror" in the years 1840-3, and H.M.S. "Pagoda" in 1845. It is hoped that this investigation may be of use in connexion with any expedition sent to the southern seas for observing the transit of Venus in 1874, or any future expedition to these regions, inasmuch as several Arctic voyagers and physical geographers have expressed wishes for any information which the Office could furnish on the subject of Antarctic Meteorology. It has also been already consulted by captains proposing to follow whaling in the Southern Seas.

Six sets of observations made during the civil day have been kept together in order that the mean results may fairly represent daily values. These means are given for areas measuring  $5^{\circ}$  in longitude and  $2\frac{1}{2}$  in latitude. This proportion was taken to suit the convergence of the meridians, from which it results that in latitude  $60^{\circ}$  S. one degree of longitude has just half the length of one degree of a great circle, while of course as the latitude increases the degrees of longitude become of less length, so that in reality more importance has been given to longitude than to latitude. Notes are appended to the tables of meteorological results, containing information as to currents, ice conditions, and observations relating to the fauna &c., such as the appearance of whales and birds. Sir J. C. Ross in his narrative "Voyage to the Southern Seas," has remarked "the cause of the atmospheric pressure being so very much less in the southern than in the northern hemisphere remains to be determined, and I trust that the very extensive series of observations made on board the 'Erebus' and 'Terror' will be of material assistance in this important inquiry." This latter consideration has led to the computation of the mean pressure and mean temperature in zones of latitude, and to the investigation of the diurnal range of pressure and temperature from the whole of the observations for January and February. It is only the months December to March that are represented; as for the winter season no observations are available for the region.

It may here be added that the mean heights of the barometer from the aggregate of the observations is as follows:—

Latitudes.	No. of Observations.	Mean Pressure.
		Inches.
$60^{\circ}$ to $67^{\circ}$	1,650	29·122
$65^{\circ}$ - $71^{\circ}$	852	29·030
$70^{\circ}$ - $75^{\circ}$	456	28·898
$75^{\circ}$ - $78^{\circ}$	408	28·970
$60^{\circ}$ - $78^{\circ}$	3,366	29·055

\* "Contributions to our Knowledge of the Meteorology of the Antarctic Regions." Stanford. Price 2s. 6d.

These results indicate that the lowest pressure lies between lat. 70° and 75° S., and confirm the remark of Sir J. C. Ross that “ in the highest southern latitudes the barometer at 29 inches, “ we learnt to consider to indicate fine weather although in “ England such a depression would be regarded very differently.”

In direct connexion with the transit of Venus and the selection of Kerguelen Island as an observing station the Committee received in the month of October a request from the Astronomer Royal for any information contained in the Office for the region in question and for the month of December. Instructions were at once given for the extraction of the information from the logs, and the data required by the Astronomer Royal were furnished to him. At the same time a much fuller discussion of the climate of the island has been prepared in case of its being called for, and an abstract of this paper has been supplied to the Admiralty for publication.

Meteorology of Kerguelen Island.

The subject of Ocean Meteorology did not receive a much fuller treatment at the Congress of Vienna than at the Leipzig Conference in the previous year, owing to the fact that it had not been given sufficient prominence in the official invitations to the Congress. The only question debated was,—

International Maritime Meteorology.

“ In what way can Maritime Meteorology be best introduced “ into the system of general meteorology.”

And while the resolutions of the Leipzig Conference were confirmed it was finally decided to take steps for the assemblage of a Maritime Conference to re-consider the decisions of the Brussels Conference in 1853. This subject has been ultimately referred to a sub-committee composed of the following members: Professor Buys Ballot (Holland), Professor Mohn (Norway), Capt. Mouchez (France), Dr. Neumayer (Germany), and Mr. Scott, the Director of the Office (for this country).

Appendix IV. contains a list of the contents of the publications issued by the Office during the year in continuation of that given in the Report for 1872, p. 59.

In Appendix V. 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 1873. This latter statement is prepared from the latest returns furnished by the storekeepers at the respective dockyards, &c.

Stock of instruments.

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

## II.—WEATHER TELEGRAPHY.

The number of stations remains the same as it was at the date of the last Report, and with few exceptions the service has been performed in a very satisfactory manner throughout the year.

Stations.

The only station whence the reports have not been received with almost perfect regularity has been Sumburgh Head, and that

outpost has been nearly useless to the Office for the purposes of daily weather intelligence, inasmuch as the cable connecting the Shetland with the Orkney Islands, has not been in working order for more than 15 weeks out of the year, and even then the reports were usually very late in arriving. These circumstances are especially unfortunate as the post of observation is a very good one, and the reports are not replaceable by any others, while the intelligence is of even higher importance to the eastern shores of the North Sea than to our own coasts. The reports have, however, been received by post regularly.

Changes of  
observers.

The only changes of observers during the year 1873 have been as follows:—At Leith, where the former reporter Mr. Bolton has removed his residence to Edinburgh, his duties were handed over to another telegraph clerk, Mr. Turnbull, whom he had previously trained to the duty.

Change of  
station from  
Portsmouth to  
Hurst Castle.

At the close of the year the observer at Portsmouth resigned, and as a substitute could not readily be found at that place, it was decided to transfer the instruments to Hurst Castle, at the entrance to the Solent, a situation which affords much better exposure both to wind and sea than could be obtained at Portsmouth. The Post Office authorities have kindly granted permission to their clerk at Hurst Castle to undertake the duty of reporting.

The stations were, as usual, inspected during the year, excepting a few whose uniform regularity of service showed that the duty might be safely waived. The exceptions were Bidston Observatory, Nottingham, Radcliffe Observatory, Oxford, Roche's Point, Scarborough, and Sumburgh Head.

Continental  
communica-  
tions.

The communications with the Continent have been, on the whole, satisfactory during the year, the only exceptions having been those from the Observatoire de Paris and from Corunna, which have not been so regular as might be wished, especially in regard of those from Corunna, which have hardly ever arrived in time to be of service.

Proposition for  
reports from  
the Azores.

In the Reports for 1861 and 1862 allusion was made to a proposal, made in the first instance by Professor Buys Ballot, and supported by some British meteorologists, that measures should be taken to ensure the daily receipt of intelligence from the Azores. With reference to this suggestion it has been asserted that there is no country which would benefit so much by this intelligence (that from the Azores) as Great Britain.

A most careful comparison between the daily observations from Valencia in Ireland and Angra do Heroismo in the Azores, for the space of  $2\frac{1}{2}$  years, has been instituted in the Office, and the result has shown beyond the possibility of a doubt that there is but little, if any, connexion traceable between the phenomena recorded at the two stations, and that the reports from a station situated at the Azores would be practically useless to us in giving early intimation to us of approaching storms, so that the opinion above quoted is unsupported by any proof.

The Committee, however, must not be understood to imply that the establishment of such a communication as that to the Azores

would not be of great importance to the Science of Meteorology, but they think that it has been shown sufficiently that their own attention can be more profitably directed to our own west coasts.

In connexion with the last-named district the Committee had at one time some hopes that they would have been able to have established a station at Mullaghmore, a low-lying point on the south side of Donegal Bay, near the town of Sligo. Unfortunately, however, the Post Office authorities have declined to extend the wires to the coast at this point, so that the Office is still without daily information from stations along the important and extended line of coast from Valencia to Lough Foyle. It is most desirable that this break should no longer exist.

New station on West Coast of Ireland desirable.

The only change in the arrangements with the Continent has been the commencement in the month of April of the regular receipts of reports from the Scaw in Denmark, and from four stations in Sweden; Haparanda, Hernosand, Stockholm, and Wisby, in return for which last the Swedish Office receives the same reports as are sent to Copenhagen and Christiania, viz., those from Yarmouth, Valencia, and Thurso, the last-named twice a day. This information is transmitted free of charge over the lines of the Great Northern Telegraph Co. The daily reports sent to Copenhagen are forwarded thence to Hamburgh in time for publication in the afternoon papers.

Exchange of information with the Continent.

In addition, the Office supplies to the offices at Copenhagen and Utrecht, a telegram containing the most important barometrical readings and wind observations whenever the total amount of difference in barometrical readings over the area covered by the network of the British system, exclusive of the extreme stations, such as Corunna, Toulon, Haparanda, Christiansund, &c. exceeds 0·7 in.

It will thus be seen that the Office is directly responsible for all the Meteorological information transmitted by telegraph to the Continent, excepting the regular supply of reports to Holland, which has been organized by Professor Buys Ballot, independently of the Office.

The Office receives, or would receive, were the Continental telegraphic communications and that with the Shetlands perfect, 51 reports every morning, and 9 every afternoon, except on Sundays, being an increase of 5 on the number reporting last year. The stations are situated along the entire coast of the Continent, from Christiansund, in lat. 63° N., to Corunna, in lat. 43°, as well as along the western shore of the Baltic.

The daily observations are taken at 8 a.m., Greenwich time, and most of the telegrams arrive in London about 9 o'clock, when the Intelligence Department of the Post Office extracts from them the portions required for its wind and weather reports. They are then at once transmitted to the Office by the private wire. About two hours are required for their reduction, discussion, and the preparation of the Daily Weather Report, copies of which are ready by about 11 a.m., and are at once supplied for the afternoon issue of several of the London papers. A wind chart for the day

Preparation of Daily Weather Report.

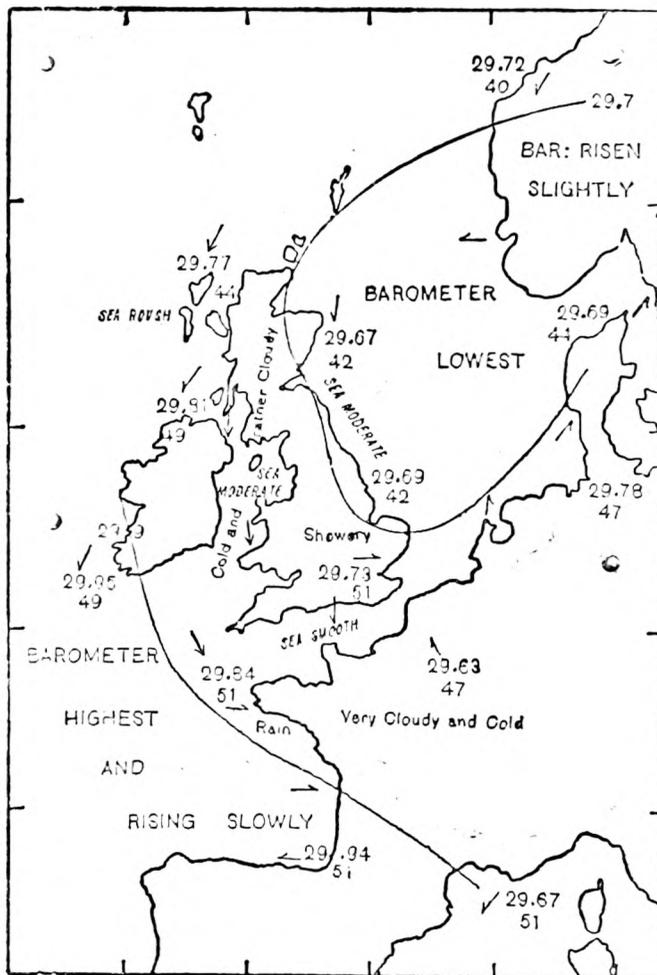
Preparation of Daily Weather Report.

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. The Daily Weather Charts are drawn by noon, and forwarded to the lithographers to be printed. The copies for postal distribution are received at the Office at about 3.30 p.m. The total number of copies issued every day is about 530.

The list of institutions and persons who receive the Charts free will be found at Appendix VIII.

Proposed Daily Chart for the newspapers.

The idea has been often entertained that it would be desirable to prepare daily charts capable of reproduction in the daily press. This has at last been rendered feasible by the efforts of Mr. F.



May 7th-8 a.m.

The most important readings of the Barometer and Thermometer are given in figures thus, 30.12 and 50.0. The curves are those of equal barometrical pressure, and where they are broken the course is uncertain. The direction of the wind is shown by arrows flying before it, and the force (*Beaufort Scale*) is indicated thus, ○ for calm and force 1, — for forces 2 to 4, —→ 5 to 7, —→ 8 to 10, —→ 10 to 12.

and the Committee here subjoin a specimen of the result obtained.

Exchange of information with the Chief Signal Office, Washington.

The Office has entered cordially into the proposal made by Brigadier-General Albert J. Myer, chief signal officer, Washington, for the introduction of a system of really synchronous

Galton, to whom his brother members of the Committee are indebted for so many of the special mechanical appliances used in the Office. At his suggestion Messrs. Shanks and Johnson, of the Patent Type-Founding Co., have devised a form of drill pantagraph for copying such charts, and furthermore have invented a composition which will bear to be used as a mould for a type metal cast immediately after it is engraved. The method is now so far perfect that a cast mounted for printing in a newspaper can be prepared within less than an hour from the time the pattern chart reaches the works,

observations at a definite epoch daily all over the earth's surface.

The time selected is 12.43 p.m. Greenwich time, and invitations have been issued to private observers to co-operate with the Office and supply schedules of observations taken according to the directions. More than sixty promises of returns have been received. Synchronous observations.

Copies of the observations are sent to Washington, duplicates being retained in the Office, and the Chief Signal Office supplies in return copies of its Monthly Review, through this Office, to any gentlemen who may join in the scheme.

The plan has been adopted by most European nations, and it is hoped to extend it to Asia. It was set in operation at the beginning of the year 1874.

The Committee would point out that some such plan as the above has long been requisite, in order to render it possible to prepare correct synchronous weather charts for a large area of the earth's surface, and that if it be persistently carried out a great advance in our knowledge of weather must necessarily result from it.

The Committee are glad to say that a movement, originating with their representative, Mr. Scott, at the Vienna Congress, in favour of the adoption of an international code for weather telegraphy has met with approval, and that the matter was referred to him and Professor Wild, of St. Petersburg, for further consideration. Proposal for an uniform telegraphic code.

The intelligence of storms which is sent out from the Office varies in character, according to the requirements of the place which receives it. In Appendix IX. will be found a list of the stations which are furnished with signals, 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, 129 in number, situated, 64 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 under, 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 signal, accompanied by a brief explanation of the reasons why it is to be hoisted. The message is posted up for the information of the public as soon as it is received. It continues in force for 48 hours, *and no longer*, from the time of its issue from London, 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.

In addition to the foregoing, a telegram consisting of reports of the atmospherical pressure and the wind at the most impor-

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\* This circular has been entirely modified by a subsequent circular, No. 717 of 1874.

Telegraphic weather intelligence.

tant stations, is sent daily to the Underwriters' Rooms, Liverpool, the entire expense of the transmission being borne by that Association.

All intelligence sent 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 of storms sent to foreign countries, so that the previous reports of the Office give full information on this head.

Comparison of warnings with weather in 1873.

The comparison has been instituted between the warnings issued and the weather experienced on our coasts, as was the case in the three previous years. The method of testing the warnings has been fully explained in the Report for 1872, p. 17. It is only necessary to repeat a few words explanatory of the subjoined table.

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

All telegrams which have been late, owing to the intervention of a Sunday, or owing to telegraphic errors, are marked with an *s*.

RETURN of the Result of the Comparison between the Warnings issued and the Weather experienced in 1873.

Coasts.	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.
1871.								
Ireland, South -	29	7	11	3	3	4	1	Jan. 13 <sub>p</sub> , Jan. 18, Mar. 10 <sub>p</sub> , Mar. 15 <sub>p</sub> .
„ East -	35	12	17	6	—	—	—	Jan. 18 <sub>p</sub> , Mar. 10 <sub>p</sub> .
Scotland, East -	24	8	13	3	—	—	—	Jan. 18, Jan. 28 <sub>p</sub> , Oct. 6, Oct. 20 <sub>s</sub> , Oct. 31 <sub>p</sub> , Dec. 16, Dec. 22 <sub>s</sub> .
„ West (Clyde)	32	12	11	9	—	—	—	Jan. 13 <sub>p</sub> , Jan. 18, Sept. 18 <sub>p</sub> , Oct. 20 <sub>s</sub> , Oct. 31, Dec. 16, Dec. 22 <sub>s</sub> .
England, North-west	33	18	8	6	—	1	—	Jan. 13 <sub>p</sub> , Jan. 18 <sub>p</sub> , Mar. 15 <sub>p</sub> , Oct. 20 <sub>s</sub> , Oct. 31 <sub>p</sub> .
„ West -	28	14	9	5	—	—	—	Jan. 18, Mar. 10 <sub>p</sub> , Oct 31 <sub>p</sub> .
„ South -	31	19	7	4	—	1	—	—
„ „ (Devon and Cornwall only).	—	—	—	—	—	—	—	Mar. 10 <sub>p</sub> , Mar. 15, May 7, Sept. 15 <sub>s</sub> .
England, South-east -	17	13	1	3	—	—	—	Mar. 15 <sub>p</sub> .
„ East -	21	10	8	3	—	—	—	Nov. 22, Dec. 16.
„ „ (N. of Hull).	—	—	—	—	—	—	—	Oct. 10, Oct. 31 <sub>p</sub> , Dec. 22 <sub>s</sub> .
Totals -	250	113	85	44	3	6	1	
Per-centages -	- -	45·2	34·0	16·8	1·2	2·4	0·4	

If these figures be compared with those for the previous years in which the system has been checked, we arrive at the following result :

Comparison of warnings with weather in 1873.

—	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Success of Warnings.	Warnings not justified by subsequent Weather.
1870	46·7	21·7	<b>68·4</b>	22·4
1871	46	17·7	<b>63·7</b>	22
1872	61	19·5	<b>80·5</b>	11·9
1873	45·2	34·0	<b>79·2</b>	16·8

It will be noticed that while the total percentage of success for 1873 is nearly identical with that for 1872, and far higher than those for 1870 and 1871, there is a serious difference between the years 1872 and 1873, as regards the way in which the percentage of circa 80, of successful warnings, is distributed between those justified by *gales* and those only justified by *strong winds*.

The explanation of this is to be found in the peculiar character of the weather during the greater part of the year 1873, the paths of the storm centres lying to the northward of the British Isles, so that our stations felt the barometrical and other meteorological disturbances, but were not exposed to the full force of the wind.

The Office has necessarily to issue its warnings on the first signs of approach of a storm, and before its character and course have fully declared themselves, and so in several cases has only to show winds of forces 6 and 7 as justifications of its cautionary telegrams. The warnings may therefore be considered as right in principle, though hardly necessary for large ships, as distinguished from smaller craft.

The remark that the storms in 1873 took a more northern course, is corroborated by the fact that the number of storms reported on the coast of Scotland in the year showed a decided increase on those reported in 1872, while on other coasts there was a falling off in the number of storms reported.

In the cases of two very serious gales, those of January 18 and December 16, the storms came on so rapidly during the night-time, subsequent to the receipt of the afternoon reports of the previous day, that no warnings could be issued by the Office. It does not seem that the funds at present at the disposal of the Committee will enable the Office to give timely warning of such gales as the two in question, as for that purpose much more frequent telegrams—in fact an almost constant service on the coast and at the Office—would be required, and such an arrangement would involve a materially increased expenditure.

Before the close of the year, the Committee received a Report from the Director of the Office to the effect that he was prepared to recommend to them the practical restoration of Admiral FitzRoy's system of warnings, in so far as to announce in the warning message the probable direction of the apprehended storm,

Partial restoration of Admiral Fitz Roy's system of warnings.

Partial restoration of Admiral Fitz Roy's system of warnings.

and they accordingly informed the Board of Trade of their readiness to sanction this advance on the system which had been for six years in operation, and the change was finally announced to take effect from the 15th of March 1874.

The only additional signal shape to be used besides the drum is the cone as originally devised by Admiral FitzRoy.

“ The signals to be used will consist of—

“ 1°. Cone, point downwards for Southerly gales; S.E. round  
“ by S. to N.W.

“ 2°. Cone, point upwards for Northerly gales: N.W. round  
“ by N. to S.E.

“ 3°. Drum *with cone*, to indicate the probable approach of a  
“ *very heavy gale* from the direction indicated by the  
“ cone.

“ The drum will not be used without the cone.”

The reason that the drum is not used alone is that its original signification was “ dangerous winds from nearly opposite quarters successively,” and as such a signal gave no indication of the direction of the wind which was likely to come first, and furthermore, as experience has shown that unless in small whirlwinds there is rarely a chance in these islands of a shift of wind through anything like 16 points within the space of a few hours, it was judged advisable to employ the drum simply to emphasize the warning given by the cone. This decision is still further justified by the fact that there is much greater certainty as to the *direction* than as to the *force* of a coming wind.

Degree of probability assigned to the warnings.

By the following statement an attempt is also made to assign the degree of probability to a storm which is announced by signal: “ Hitherto it has been found that at least *three* out of *five* signals of approaching storms (force upwards of 8 Beaufort scale, a ‘ fresh gale ’), and *four* out of *five* signals of approaching strong winds (Force upwards of 6 Beaufort scale, a ‘ Strong Breeze ’), have been fully justified.”

Another alteration in the warning system as previously practised is that the Meteorological Office now, with the sanction of the Board of Trade, undertakes to replace signals and gear when worn out or carried away by the force of the wind. The circular of the Board of Trade announcing the new system will be found at Appendix IX.

Report on weather telegraphy, Vienna Congress.

In the last Report it was stated that a sub-committee, composed of Prof. Buys Ballot, Dr. Neumayer, and Mr. Scott had been appointed at the Leipzig Conference to prepare a report on Weather Telegraphy for the Vienna Congress, and that they had prepared a circular which was issued extensively. A considerable number of replies were received, but these must be considered as mainly the expression of English opinion on the subject, as the total number of replies from individuals was thus apportioned: United Kingdom, 8; Denmark, 1; Germany, 2; Hungary, 2; Italy, 1; Norway, 1; Sweden, 1; Russia, 2; British Colonies, 6. Three replies were received from bodies of a more

or less corporate character which therefore merit more special attention than those emanating from private parties. These are respectively:—the Commission for Storm Warnings (German Empire), the Meteorological Society (of London), and the Scottish Meteorological Society. Report on weather telegraphy, Vienna Congress.

The report which was adopted by the Congress is in the press, and will be published in full with the more important replies to the circular.

The propositions contained in the Report are accordingly to be carried out wherever possible. Some of them, such as those relating to the necessity of a continuous service, day and night, and without interruption on Sundays, are at present impracticable for this Office on the ground of expense; others have already been introduced into the British system.

One of these latter has been the practice of requiring the observers to reduce their own barometer readings to 32° and sea level. The experience of other systems, notably of the Norwegian, has shown that the number of errors to be apprehended is not great, while the advantages of the new method are twofold, viz., economy in telegraphy, as the reading of the attached thermometer is not required, and great saving of time in the utilization of the reports, as the figures can be entered on the charts as read off from the wires. Telegraphy of reduced readings.

Another suggestion has been already carried into effect by the restoration of the use of the cone as above described.

It was moreover suggested in the Report that forecasts of probable weather should be issued. The Committee have directed that tentative forecasts should be daily prepared in the Office, and compared with the facts experienced subsequently, and they hope ere very long to be able to afford the public the benefit of the information. Probabilities of weather.

The number of Fishery Barometers issued on loan to small ports and fishing stations has been increased by one, and there are now 119 stations on our coasts supplied by the Office with barometers for public use. They are situated, 49 in England, 4 in Wales, 41 in Scotland, 23 in Ireland, and 2 in the Isle of Man. See Appendix X. Fishery barometers.

#### LAND METEOROLOGY OF THE BRITISH ISLES.

The observatories have all continued in perfect working order, with the single exception of Falmouth, where the accidental breakage of a thermograph thermometer in the month of April caused a few days' interruption in the continuity of the photographic record. The establishments were all visited by Mr. Scott as usual. Observatories.

The publication of the Quarterly Weather Report has been continued, and the arrears have now nearly all been cleared off. The only back parts which will remain unpublished at the date of appearance of this Report will be those for the latter half of 1873, and it is hoped that these will be issued in August. Quarterly Weather Report.

Bermuda anemometry.

The only Appendix of consequence which has been printed in the recent numbers has been that relating to the anemometry at Bermuda, which has already been noticed at p. 9.

Reduction to French units.

The usual tables of mean values have been given, and the Committee, in accordance with the resolution adopted at the Leipzig Conference, have decided to give these figures in the metric and centigrade scales in addition to their original British measures.

Issue of hourly tabulations.

At the close of the year the Committee received a memorial signed by several gentlemen interested in physical science, requesting them to issue copies of the hourly tabulated values for each instrument at their observatories. They have resolved to comply with this request, and to issue a limited number of copies of the readings to such gentlemen as should agree to pay a small subscription towards the expense of copying the figures.

Extra self-recording stations.

The list of the seven self-recording observatories, with their geographical positions &c., has been given in previous Reports. In addition anemograms are received from the following stations, which are all provided with anemographs similar to those erected at the observatories. In the case of Halifax, Mr. Crossley supplies also barograms and thermograms, in addition to most liberally lending to the Committee the anemometer which has been erected at Seaham, free of charge, by the kindness of Mr. Eminson, and with the sanction of the Marquis of Londonderry.

Station.	Supplied by	Superintended by
Alnwick Castle	- Duke of Northumberland.	F. Holland, Esq.
Halifax	- L. J. Crossley, Esq.	-
Holyhead	- Meteorological Committee.	Harbour Authorities.
Orkney	- Ditto.	Rev. C. Clouston, LL.D.
Seaham	- L. J. Crossley, Esq.	G. H. Aird, Esq.
Yarmouth	- Meteorological Committee.	Secretary Sailors' Home.

Volunteer observers.

The list of volunteer observers shows a slight increase. It now consists of 43 names. These gentlemen supply information of various degrees of completeness. Those who furnish the fullest monthly register (Form 19) receive a copy of the Daily Weather Charts.

#### VOLUNTEER OBSERVERS.

Name.	No. of Form.	Place.
Aird, G. H.	19	Seaham Harbour.
Amy, A. P.	19	St. Helier's, Jersey.
* Baxendell, J., F.R.A.S.	—	Fernley Observatory, Southport.
Bellingham, J. G.	14	Saffron Walden.
Byron, Rev. J., F.M.S.	—	Killingholme, Lincolnshire.
Campbell, J., M.D.	19	Chigwell Row, Essex.
Clouston, Rev. C., LL.D.	12	Sandwick Manse, Orkneys.
Cooper, W. F., F.M.S.	19	Sheffield.
Curtis, Professor A. H.	19	Queen's College, Galway.

\* Printed Weekly Register.

Name.	No. of Form.	Place.
Delap, Rev. A. - -	12	Dungloe, Co. Donegal.
Dunlop, W. H., F.M.S. - -	19	Annan Hill, Kilmarnock.
Dun, F. - -	12	Moreton-in-the-Marsh.
Fiesser, H. - -	19	Royal Horticultural Society, Chiswick.
Harrison, W. J. - -	19	Leicester.
Hartnup, J., jun. - -	13	Liverpool Observatory.
* Hoskins, S. E., M.D., F.R.S. - -	—	Guernsey.
Jones, G. I. - -	19	Lymington.
Lucas, J. - -	13	Radcliffe Observatory, Oxford.
Mackay, Rev. W. P., D.D. - -	19	Hull.
McLeod, H. - -	19	Indian C. E. College, near Staines.
Mackrell, T. - -	19	Barnstaple.
Moore, J. W., M.D. - -	19	Dublin.
Morris, E. E. - -	19	Bedford Middle-class School.
Moyle, M. P., F.R.C.S. - -	12	Helston (Cornwall).
* Plummer, J., M.A. - -	—	Durham Observatory.
Prince, C. L., F.R.C.S., F.M.S. - -	12	Crowborough Beacon, Tunbridge Wells.
Quinton, J., jun. - -	19	Norwich Meteorological Committee.
† Redford, Rev. F., F.R.S.E. - -	—	Silloth, Carlisle.
† Richards, W. H. - -	—	Penzance.
Richardson, Rev. G. - -	19	Winchester College.
Rosse, Earl of, V.P.R.S. - -	19	Birr Castle, Parsonstown.
† Ryves, Rev. G. T. - -	—	Ironbridge, Salop.
Sawyer, F. E., F.M.S. - -	19	Brighton.
Stanford, W. - -	—	Gorleston, Gt. Yarmouth.
Stow, Rev. F. W., F.M.S. - -	19	Hestholm, Bedale.
Style, Rev. G. - -	19	Giggleswick Grammar School, nr. Settle.
Todd, H. - -	13	Cambridge Observatory.
Torrens, Mrs. (rainfall only) - -	—	Dromore, Coleraine.
Wakefield, C. - -	13	York Philosophical Society.
Wheeler, Rev. R. F. - -	19	Newcastle-on-Tyne.
Whitty, Rev. S. - -	19	Oscott, near Birmingham.
Wilson, J. M., F.R.A.S. - -	19	Rugby School Natural History Society.
Woollett, G. C. - -	19	Acrise, Canterbury.

\* Complete Monthly Register.

† Printed Weekly Register.

DESCRIPTION OF FORMS.

12. Monthly Tables, two Observations daily. 13. Monthly Tables, three Observations daily. 15. Monthly Table and Diagram, one Observation daily. 19. Complete Monthly Register.

Form No. 13 is also kept by the Telegraphic Reporters (Appendix VII.)

No further action has been taken by the Government during the year with reference to the question of the possible preparation by the Office of meteorological tables for the General Register Office, to which allusion was made in the last Report.

Meanwhile the idea of commencing the publication of results from some of the stations mentioned in the foregoing list has been before the Committee, and recently they have received a communication from the Board of Trade, stating that the Meteorological Society had expressed a wish that some plan of conjoint action should be devised between the Society and the Office with reference to the publication of results from stations of the second order

Proposal for conjoint action with the Meteorological Society.

(*vide*, p. 31). It is hardly necessary to observe that the Committee at once promised to give their best attention to any plan which might be submitted to them.

Sea temperature and migration of fish.

In the month of June a communication was received from the Harbour Department of the Board of Trade, requesting the Committee to direct their attention to the subject of sea temperature on the coasts of the British Islands, with especial reference to the migrations of fish, such as herrings, mackerel, &c. The Committee at once signified their readiness to conform to the wishes expressed, and have entered into correspondence with the three Lighthouse Boards on the subject with the following result. The Trinity House and the Commissioners of Irish Lights have agreed to have observations of sea temperature taken at any of their lightships which might be selected, and it is hoped that to these a few lighthouse stations may be added. The Board of Northern Lights have stated their inability to assist in the investigation, as they consider lighthouses unsuited for such observations. Recently the same subject of inquiry into the physical condition of the sea on our coasts has been brought before the notice of the Committee by a communication from the Commission for the examination of the German Seas, which has for some time been working at Kiel, and which is now extending its operations to the North Sea. The Committee have at once replied that they will be prepared, within reasonable limits, to aid in furthering the objects of the Commission, by observations of the temperature and specific gravity of the sea on our coasts.

Resolutions of Vienna Congress.

The resolutions of the Vienna Congress in respect of land meteorology can be adopted without affecting seriously the work of the Office, and will, so far as practicable, be carried out. The most important change has been that it has been resolved to employ civil time, commencing at midnight, instead of astronomical time, commencing at noon. This change has been introduced into the calculations for the year 1873.

The five day means, 73 in the year, and the calendar monthly means will be maintained, while the annual mean is to be the mean of the 12 months, not of the 365 days.

The idea of a general publication of an international character, and of a uniform type, has been brought forward by several European Meteorologists of eminence, but as the plan has not yet met with an acceptance which is nearly universal, it appears premature for the Committee to think of modifying their tables so as to be in accordance therewith.

Issue of "Instructions."

The Committee have given directions to Mr. Scott to prepare a set of "Instructions in the use of Meteorological Instruments," which shall be an amplification and extension of the portion of the Barometer Manual (1870), which refers to instruments. The work is at present in the press, but it will be submitted in proof to several gentlemen versed in the science, in order to render it a fair representation of the present condition of Meteorology in the United Kingdom as regards instruments and observations.

### LIBRARY.

Appendix XI. 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 fallen short of that during the preceding year by the amount of 488*l.* 13*s.* 1*d.* The financial statement will be found at Appendix I. The following table shows the general distribution of the expenditure under the several heads :—

—	1872-73.			1873-74.			Increase.			Decrease.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Office, salaries, &c. -	1,255	12	2	1,275	12	3	20	0	1	—	—	—
„ rent, attendance, and contingencies -	880	16	1	817	3	1	-	-	-	63	13	0
Observatories -	3,463	9	6	3,506	6	3	42	16	9	—	—	—
Telegraphy -	2,762	16	10	2,184	9	4	-	-	-	578	7	6
Ocean Meteorology -	2,121	19	9	2,212	10	4	90	10	7	—	—	—
<b>Totals</b> £	<b>10,484</b>	<b>14</b>	<b>4</b>	<b>9,996</b>	<b>1</b>	<b>3</b>	<b>153</b>	<b>7</b>	<b>5</b>	<b>642</b>	<b>0</b>	<b>6</b>

Net decrease, 488*l.* 13*s.* 1*d.*

This decrease is almost entirely due to the fact of the payments to the Post Office for Telegraphy being in arrear, no account having been furnished for more than six months. The amount estimated by the Office to be payable on this head is about 750*l.*, so that the abstract just given hardly affords a fair representation of the financial state of the Office.

The increase under the head of Marine Meteorology has been due to the extra efforts to complete the discussions for Square 3.

The statement of accounts at Appendix I. shows that the balance to the credit of the Committee on March 31, is 2,290*l.* 12*s.* 2*d.*, being an increase of 646*l.* 19*s.* 9*d.* on that with

Expenditure.  
Available  
balance.

which they commenced the year. Against this sum must, however, be set off liabilities then due.

The estimated available balance in their hands at that time was 1,165*l.* 12*s.* 8*d.*, as shown by the balance sheet in Appendix I.

At the date of the last Report, the total balance amounted to 1,643*l.* 12*s.* 5*d.*, with estimated liabilities of 727*l.*, showing an available balance of 916*l.* 12*s.* 5*d.*

These figures, therefore, show that the expenditure of the year has been within the income to the extent of about 250*l.*

Transactions  
for foreign  
correspon-  
dents.

It will be seen from the left-hand side of the statement of receipts and payments, that the amount of money passing through the Committee's accounts is materially increased by transactions for foreign and colonial institutions, &c., such as the purchase of instruments, from which the Office derives no profit whatever, the work being undertaken for the sake of furthering the cause of Meteorological Science in general.

### SUMMARY.

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

Mr. Scott, the director, attended the Meteorological Congress at Vienna in September, where he, in conjunction with Mr. Alexander Buchan, had the honour of representing the Government, and he has been elected a member of the Permanent Committee appointed at that meeting. The Committee have published an English translation of the Report of Proceedings of the Congress prepared by him.

**I. Ocean Meteorology.**—The number of barometers afloat on the 1st January 1874 was 82, as compared with 98 in the preceding year. In addition, all ships in commission in the Royal Navy have as usual received all their meteorological instruments from the Office.

Fifty-one gentlemen have sent in registers which have received the mark of "excellent."

The 12 monthly charts in 2° squares for Square III. in the equatorial region of the Atlantic have been completed, and will be published early in the year, with explanatory letter-press, containing, with other matter, a discussion of the daily range of the barometer, &c. over the square under discussion.

The eight squares surrounding Square III. are now being treated, and it is hoped that the results for the entire district from 10° to 40° W. longitude, and from 10° S. to 20° N. latitude, will be ready for issue to the public by the end of the year.

With this work will appear also the results of the observations carried on at Ascension for two years by the late Lieut. Rokeby, R.M.

The Discussion of the Bermuda Anemometry has been completed and published in the Quarterly Weather Report. Summary.

The Discussion of the Results of Sir J. Ross's Antarctic Voyage has been completed and published.

At the request of the Astronomer Royal, the materials in the Office bearing on the meteorology of Kerguelen Island for the month of December have been extracted from the registers, and the results furnished to the gentlemen who are to be stationed on that island to observe the transit of Venus.

Capt. Toynbee has been requested to endeavour to procure information from British ships relative to the weather over the Atlantic in August 1873, so as to throw light on the severe storms which were felt on the coast of Nova Scotia in that month.

It having been resolved at the Vienna Congress that it was desirable to summon a new Maritime Conference to reconsider the decisions of the Brussels Conference in 1853, it has been decided that any meeting held in the present year should be merely preliminary and of an unofficial nature, and it is intended to hold such a meeting in London at the end of August.

The cost of this department has been 2,212*l.* 10*s.* 4*d.*

II. *Weather Telegraphy.*—There has been no change in the number of reporting stations during the year. These are now 51 in number, 29 being situated in these islands and 22 abroad.

There is a regular exchange of information with all the adjacent coasts of the continent, except Belgium.

Storm warnings are issued to our own coasts, as well as to those of Norway, Denmark, Germany, Holland, and France.

Signals are hoisted at 64 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.

The results of total success of the warnings issued has been 79·2 per cent., as compared with 80·5 in 1872.

It has been resolved to reintroduce the use of the cone to indicate the direction of the storm which is apprehended, the circular of the Board of Trade explanatory of the method will be found at App. IX p. 53.

The number of copies of the Daily Weather Chart, which are regularly issued by the Office, amounts to 530. A method has been devised for publishing daily charts in the newspapers, and it is hoped that this plan may be brought into practice.

The Office has entered into co-operation with the Chief Signal Office, Washington, with regard to the scheme for synchronous observations over the globe, proposed at Vienna by Brigadier-General Myer, and upwards of 60 observers have volunteered to

send in their observations, taken at the appointed hour, regularly every fortnight.

The number of stations to which fishery barometers have been lent is 119, situated, 49 in England, 4 in Wales, 41 in Scotland, 23 in Ireland, and 2 in the Isle of Man.

The cost of this department has been 2,184*l.* 9*s.* 4*d.*, but there is an account of upwards of 750*l.* due to the Post Office, for which the account has not yet been presented.

III. *Land Meteorology of the British Islands.*—Good progress has been made in clearing off the arrears of the Quarterly Weather Report.

It has been resolved to issue sheets of the hourly tabulated readings of the several instruments to subscribers.

It has been determined to use civil, instead of astronomical, time for the calculation of means.

The list of volunteer observers has shown a satisfactory increase.

The cost of this department has been 3,506*l.* 6*s.* 3*d.*

*Office.*—The expenses of management, in salaries and wages, have been 1,275*l.* 12*s.* 3*d.*

The other charges incident on the Office, for rent, furniture, postage, &c. have amounted to 817*l.* 3*s.* 1*d.*

## PART II.

### SUMMARY of the GENERAL COURSE of ACTION taken at the METEOROLOGICAL CONGRESS at VIENNA in 1873.

An English translation of the Report of the Vienna Congress has been published (p. 5), and it may be useful to give here a brief summary of the more important resolutions adopted at the meeting, with reference to the several subjects which were taken into consideration, with some remarks on the present and future practice of the Meteorological Office in regard of these resolutions, wherever such seem requisite.

#### INSTRUMENTAL.

*Barometer.*—The decision as to the best form of barometer for general adoption was postponed to a future congress. Meanwhile the several directors of meteorological establishments are to be requested to communicate to the Permanent Committee (see p. 5), the results of their experience.

Aneroids are allowed to be used alongside of mercurial barometers, but not as independent instruments.

*Thermometers.*—No recommendation was made as to the best method of exposure of thermometers for the observation of air temperature, owing to the inherent difficulty of the question. It is simply impracticable to enforce everywhere the condition of a uniform height of 4 feet above the ground.

Further experiments on the influence of height and exposure on the readings are required.

No special remarks about *Maximum Thermometers* were made, so that both Negretti's and Phillips' may be considered to be recognised.

As to *Minimum Thermometers*, Casella's mercurial minimum did not meet with approbation, owing to its liability to derangement. It was recommended to use amyl alcohol, instead of ordinary spirit, for minimum thermometers, owing to its possessing a higher boiling point and consequently less volatility.

The readings of both maximum and minimum thermometers are to be taken at the latest observing hour of the day, and put down to the day on which they are taken.

*Hygrometers.*—The wet and dry bulb thermometer is recognised as the best form of hygrometer, but the desirability of an instrument which shall perform under all conditions, especially during frost, was expressed. This quality is particularly desirable for a continuously self-recording hygrometer.

The hair hygrometer was recommended to be used in cold climates, but with the precaution of checking it from time to time by comparison with the wet and dry bulb.

The desire was expressed that further comparisons between the wet and dry bulb and Regnault's hygrometers should be instituted in hot and dry climates.

*Radiation.*—Reference was made to Mr. Stow's experiments, with solar radiation thermometers, but it was decided that the subject was not yet ripe for adoption into the regular scope of observations.

*Earth Temperature.*—Lamont's method of observation by means of thermometers attached to laths and plunged in stationary wooden tubes, sunk in the ground, was preferred to the use of thermometers with long metal scales. Further experiments in different countries and in various kinds of soil are called for, especially with regard to the depths at which the observations should be taken.

*Wind.*—In order to avoid the confusion arising from the use of the initial O, for "Ost" (East), in Germany, and for "Ouest" (West), in France, it was resolved to employ the English initials for the directions, and to give 16 points instead of 32. The intermediate points to be reckoned alternately to one side or the other.

It is recommended not to use Lambert's formula for determining the mean direction of the wind.

The frequency and the mean force of the wind is to be given

for each point. (This is what has been done in the charts for Square III., p. 8.)

It is recommended to employ Wild's pressure wind gauges, which are already used in Switzerland, Baden, and Russia, at all stations where the force of the wind is given by simple estimation.

The instrument consists of a plate hung like a signboard on a horizontal axis, of which the degree of divergence from a vertical position is read off on a quadrantal arc. The plate is kept facing the wind by a vane.

The following scale has been proposed by Mr. Scott in a paper recently read before the Meteorological Society, for the conversion of velocities in miles, per hour, or in metres per second, to the figures of Beaufort scale, and is the scale now used in the office. It has been based on direct experiments, conducted at Holyhead and Yarmouth, with anemographs of the pattern described in the Report of the Meteorological Committee for 1867:—

Figures, Beaufort Scale.	Approximate Velocity. Miles per Hour.	Approximate Velocity. Metres per Second..
0. Calm - -	3	1.5
1. Light air - -	8	3.5
2. Light breeze - -	13	6
3. Gentle „ - -	18	8
4. Moderate „ - -	23	10
5. Fresh „ - -	28	12.5
6. Strong „ - -	34	15
7. Moderate gale - -	40	18
8. Fresh „ - -	48	21
9. Strong „ - -	56	25
10. Whole gale - -	65	29
11. Storm - -	75	33.5
12. Hurricane - -	90	40

*Rain, Hail, &c.*—It was recommended to employ gauges of circular aperture, and of 14 inches diameter ( $\frac{1}{10}$ th square metre area), erected at a height of from 3 to  $4\frac{1}{2}$  feet above the ground. At all events the height of the rim of the gauge above the ground and above mean sea level is to be stated in publications.

The fall is to be measured in the morning and the amount entered to the previous day.

The duration of the fall in hours is to be given, if possible, and in the case of heavy falls the measurement should take place immediately after the rain ceases.

(With respect to the question of the size of the gauge, this Office will maintain its 8-inch gauges, which have been proved to work admirably.)

The days of rain and snow to be given separately in the resumé.

A separate column to be given for the depth of unmelted snow on the ground.

(It seems unnecessary to observe this regulation in the British Isles.)

Hail is to be only entered when the stones are large enough to do damage to crops.

(This resolution was adopted with reference to a question as to the entry of "graupel," and it is evident that it, as well as the preceding regulation, is more applicable to continental than to English meteorology. The English language has no word for "graupel" ("grésil" in French,) small balls of snow, such as often fall in spring; while conversely, Denmark is apparently the only nation besides ourselves which has a special term "slud" for sleet, snow mixed with rain.)

*Thunderstorms.*—The days of thunderstorms are to be regularly noted, not the storms themselves, unless the observer chooses to do so in his remark column.

*Clouds.*—The proportion of cloud in the sky is to be given by the scale 0–10, *i.e.*, in tenths of the apparent sky surface.

Howard's cloud nomenclature is declared to require amendment.

*Hydrometeors, &c.*—The following symbols are proposed for general adoption for the respective phenomena, and are to be entered in the "remark" column:—

Rain - - - ●	Hoar-frost - - - □	Solar Corona - - - ⊕
Snow - - - ✱	Dew - - - ∩	Solar Halo - - - ○
Thunderstorm - - - ⚡	*Silver-thaw ("Rauh-frost," "Duft"). } V	Lunar Corona - - - ⊕
Lightning without Thunder, or Sheet Lightning } <	Glazed Frost ("Glatteis") } ~	Lunar Halo - - - ⊖
Hail - - - ▲	Snow-drift - - - ↗	Rainbow - - - (
Soft Hail ("Graupel") - - - △	Ice crystals - - - ↑	Aurora - - - ≡
Mist, Fog - - - ≡	Strong wind - - - ↘	Dust Haze ("Höhenrauch"). } ∞

In respect of their intensity, the individual phenomena are to be distinguished by the figures 0 and 2, which should be used as exponents of the symbols, in such a way that 0 should indicate very slight, 2 strong.

*e.g.* ●<sup>0</sup> slight Rain.

●<sup>2</sup> heavy Rain.

It is further to be remarked that Fog (mist) is only to be entered when the observer is quite enveloped in it.

*Evaporation* to be measured only at stations of the first order.

As to other elements, such as *ozone, atmospheric electricity, &c.* experiments are to be made wherever possible, so as to obtain further information on the various subjects.

*Measures.*—It was recommended by a large majority that the Metric and Centigrade system should be adopted everywhere, and at all events that the use of Paris lines and Reaumur degrees should be discontinued.

\* "Rauh-frost" or "Duft-anhang" is the phenomenon of the deposition of a large quantity of frozen moisture on trees when the weather suddenly becomes warm after great cold, sometimes called, as above, "Silver-thaw."

All important mean results, if not originally published in the Metric and Centigrade scales, are at least to be given in those scales as well as in their original scales.

(Here it must be noted that there seems no present prospect of the introduction of the Metric and Centigrade systems in this country.)

#### OBSERVATIONS.

*Hours of Observation.*—Certain combinations of hours, a list of which will be found in the Report of the Congress, were recommended as giving a good approximation to the true mean of the day for temperature.

Observations at inland stations in extra European countries are declared to be specially desirable, in order to aid in the discovery of the true law of march of atmospherical phenomena, and thereby the necessary corrections for observations at any hours selected.

The periods for which mean values are to be calculated are :—

*Day.*—The solar day of the place, midnight to midnight.

*Month.*—The calendar month.

*Year.*—The calendar year, beginning with January 1, the mean being that of the monthly means.

*Five-day Means,* (to be calculated at least for temperature). 73 in the year.

*Lustral Means* to be calculated for periods of five years, beginning with January 1, 1871, or 1876.

#### WEATHER TELEGRAPHY.

The recommendations of the Congress are in very close accordance with the practice of the Meteorological Office already described in Part I. of this Report ; the most important points of difference being—

I. That it is not within the power of the Office, on financial grounds, to institute a continuous service of weather reports from the coast.

II. Even if such an idea could be actually carried out, which is more than doubtful, the Office is not yet prepared to announce *probabilities of weather.*

#### MARITIME METEOROLOGY.

It is recommended that this subject be referred to a special Conference (which will be held in London in the year 1874).

#### ORGANIZATION.

It is declared to be desirable that at least one, but in case of necessity more than one, central institution should be established in each country for the management, &c. of the meteorological system of the country.

It is decided that none but verified instruments should be used, and that all stations should be inspected if possible yearly, but at least every five years.

The Permanent Committee (see p. 5) is entrusted with the duty of preparing a general set of Instructions for the taking of meteorological observations.

The special resolutions as regards standard instruments, &c. will be found in the Report of the Congress.

The following classification of stations was adopted :—

*Stations of the First Order.*—Where either hourly readings or continuous records of the principal elements are obtained.

*Stations of the Second Order* are those where complete and regular observations on the usual meteorological phenomena are made.

*Stations of the Third Order* are those where the observations are more or less incomplete.

#### PUBLICATION OF OBSERVATIONS.

The publication of results from stations of the first order is to be kept distinct from that of results from stations of the second order.

The Permanent Committee is to propose a form for the uniform publication of results bearing on International Meteorology.

*Carrying out the decisions of the Congress*, a Permanent Committee consisting of seven members, M.M. Bruhn, Buys Ballot, Cantoni, Jelinek, Mohn, Scott, and Wild, was appointed, with power to increase their number by two if deemed advisable.

M. Buys Ballot is appointed President, and the Committee is to meet annually and publish annual reports. The first meeting is to take place at Utrecht in September 1874.

A fresh Congress is to be summoned in 1876.

It was referred to the Permanent Committee to consider the possibility of organizing an international institution for meteorological investigations, the existence of which was considered by the majority of the Congress to be really useful and desirable.

Various other questions as to the extension of meteorological stations, &c. &c., which will all be found in the Report, were also referred to the Permanent Committee.

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# APPENDIX.

## APPENDIX I.

### METEOROLOGICAL OFFICE : ACCOUNT OF RECEIPTS and PAYMENTS for the year ending 31st March 1874.

RECEIPTS.	PAYMENTS.
Balance from year 1872-3 - £1,643 12 5	<b>OFFICE:</b>
Parliamentary Vote - 10,000 0 0	Salary of Director - 800 0 0
Gen. J. H. Lefroy 14 9 0	„ Two Clerks - 314 14 6
Powell Bros. - 3 6 8	Office-keeper and Mes- senger - - 160 17 9
Rev. G. Style - 8 0 0	<u>£1,275 12 3</u>
Bishop of Rupert's land - - 8 15 0	Rent of Office - - 534 12 0
Dr. J. Campbell - 8 1 0	Fuel and gas - - 46 1 6
Dr. C. Smallwood 0 17 0	Furniture and fittings - 64 16 4
W. D. Penny - 2 3 0	<u>645 9 10</u>
H. Tarry - 0 6 8	Postage - - 61 7 6
Capt. W. Syming- ton - - 15 0 0	Printing, &c. - - 25 13 8
S. Jeffery - 1 13 9	Attendance, and other Contingencies - 84 12 1
H. Lee and Sons - 2 10 0	<u>171 13 3</u>
Dornbusch & Co. 10 0 0	<b>LAND METEOROLOGY:</b>
F. H. Dancaster - 4 10 0	Expenses at Observa- tories - - 2,722 9 10
G. T. Kingston - 69 7 9	Computations - - 783 16 5
G. Meek - 4 5 0	<u>3,506 6 3</u>
Mrs. Torrens - 6 1 0	Telegraphy - - 1,182 4 2
H. Mohn - 9 4 0	Inspections, issue of D.W. Charts, &c. - 479 6 10
Freshfield & Co. - 1 0 0	Computations - - 522 18 4
Dr. B. Stewart - 12 10 6	<u>2,184 9 4</u>
D. J. Rowan - 15 0 0	<b>OCEAN METEOROLOGY:</b>
R. M. Barrington 1 1 0	Marine Superintendent 400 0 0
W. v. Freeden - 2 5 6	Supply and Return of Instruments, &c. :
Sale of old Instru- ments, &c. - 6 19 9	Admiralty - 338 5 7
Subscriptions to D.W. Charts - 243 2 11	Mercantile Marine 419 0 7
Subscriptions to Hourly Obsns. 6 0 0	Computations and Care of Instruments - 1,055 4 2
<u>456 9 6</u>	<u>2,212 10 4</u>
Interest on deposit account - 186 11 6	<u>9,996 1 3</u>
<u>£12,286 13 5</u>	Cash in hand - - 11 19 5
	Advance to Valencia Observatory - 50 0 0
	Bank of England account 187 11 5
	London and Westmin- ster Bank - - 2,041 1 4
	<u>2,290 12 2</u>
	<u>£12,286 13 5</u>

Examined and compared with the vouchers and found correct.

June 2, 1874.

(Signed) } Rosse,  
R. STRACHEY, } Auditors.

#### Balance Sheet 31st March 1874.

Subscriptions paid in advance - - 66 15 6	Balance of cash ac- count - - 2,290 12 2
Accounts unpaid (esti- mated) - - 1,104 0 0	Sundry debtors - 45 16 0
Balance, probable net surplus - - 1,165 12 8	
<u>2,336 8 2</u>	<u>2,336 8 2</u>

## APPENDIX II.

LIST of CAPTAINS (and Officers) who have received from the Committee a Copy of the Admiralty Charts, to 31st March 1874 (see Report, p. 6). 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, F.R.A.S.	1	"Decapolis."
Angel, John Fry - -	—	"Twilight."
Balderston, Richard James -	—	"Rajmahal."
Banner, Frederick William -	3	"Lady of the Lake," and "Kenilworth."
Barwood, William Richford -	1	"Fugitive."
Blake, Edwin John - -	3	"Gilbert Thompson," and "Gitana."
Bouchette, Francis Baines -	1	S.S. "European."
Brooks, Samuel - - -	2	S.S. "City of Brooklyn."
Brown, Robert - - -	1	S.S. "Moravian."
Bruce, John - - -	2	"City of Adelaide," and S.S. "Australian."
*Bythesea, John (V. C.), R.N. -	2	H.M.S. "Phœbe."
Campbell, Archibald - -	4	S.S. "Britannia" and S.S. "Europa."
Capper, Edward Hall - -	1	"Palm Tree."
<i>Carruthers, Forrest Priest</i> -	2	"Minero."
<i>Davidson, Charles</i> - -	—	"Perseverance."
<i>Donkin, Thomas, R.N.R.</i> -	2	"Inverness."
Ellery, William - - -	2	"Bowfell."
Fernie, Alexander Durwood -	—	"Sir John Lawrence."
Finlay, James - - -	2	"Duncairn."
Fry, Alfred - - -	1	"Foam."
Gaye, Gerrard - - -	1	"Eliza Shaw."
*Goodenough, James G., R.N. -	—	H.M.S. "Pearl."
†Hosken, Henry, R.N. - -	—	Do.
Grange, James - - -	—	S.S. "Acantha."
Gray, David - - -	—	S.S. "Eclipse."
Gray, John - - -	—	S.S. "Mazinthien."
Gray, John McDonald - -	3	"Speranza."
Greenwood, William - -	3	S.S. "Scotia" and "Assaye."
Grigs, George, R.N.R. - -	2	S.S. "Helvetia," and S.S. "France."
<i>Harris, David</i> - - -	1	S.S. "Medway."
Hassell, Thomas Edward - -	2	"Mervyn."
Hayes, James - - -	5	S.S. "Ptolemy" and S.S. "Camoens."
Hayward, George Olive - -	2	S.S. "Durley."
Heggum, Edward Carl V. - -	5	"Czar."
Henderson, Henry - - -	5	"Hope," and S.S. "Cleveland."
†Hodding, Samuel White - -	—	"Indus."

\* Pilot charts not presented.

† Chief Officer.

‡ Second Officer.

Names of Officers, deceased, *in italics*.

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Captain's Name.	Letters of Thanks.	Ship.
Holdich, John Peach - -	—	"Agra."
*Hopkins, John O., R.N. - -	—	H.M.S. "Liverpool."
Hunter, David - -	4	S.S. "Alpha" and S.S. "Delta."
Johnson, Charles - -	—	"St. Lawrence."
Jones, Arthur Arundel - -	2	"Victoria Nyanza," and "Chevy-chase."
Jones, George Henry - -	3	S.S. "Nile," and S.S. "Niger."
Kennedy, Charles William - -	1	S.S. "Scotia," and S.S. "Baltic."
Kennedy, James Branch, R.N.R. - -	—	S.S. "Blue Cross."
Kerr, Alexander - -	—	"Ardgowan."
Kerr, Thomas Coulter, R.N.R. - -	1	"Durham."
Lecky, Squire Thornton Stratford, R.N.R., F.R.G.S.	2	S.S. "Uruguay" and S.S. "Halley."
Leportier, Theodore - -	1	"Kate."
Lewis, John Thomas, R.N.R. - -	1	S.S. "Scotia," and S.S. "Chaldea."
Lindsay, Henry Kay - -	1	"Valparaiso."
Lunham, Robert Dowe - -	3	S.S. "Berar," S.S. "Durley" and "Charles Howard."
*MacDonald, John - -	—	S.S. "Europa."
McKechnie, Duncan Ferguson - -	1	"Cottica."
Mackellar, D. E. - -	—	Observations at Rapa Island.
Mackie, Thomas - -	—	S.S. "Mazinthien."
Maddison, John, R.N.R. - -	—	"Anglesey."
Manning, Henry - -	—	S.S. "Kangaroo."
Martyn, John Artis - -	9	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."
*Mouland, John Elsey - -	—	S.S. "Batavia."
Murphy, Michael - -	—	S.S. "Tarifa."
Newton James William - -	—	S.S. "Grenadier."
†Paterson, James Forrest - -	2	S.S. "Moravian."
Pearson, Charles William - -	4	"S.S. "Strathclyde."
*Perry, John L., R.N. - -	2	H.M.S. "Orontes."
†*Petch, John A. R., R.N. - -	2	H.M.S. "Phebe."
Petrie, Peter Conrad - -	1	S.S. "Patagonia."
Potts, Thomas Crosby - -	3	"Tenasserim."
Price, James John - -	3	"Sorata."
Rawle, Charles, R.N.R. - -	1	"Star of the North."
Raymond, Charles Tenzer - -	3	"British India" and "British Consul."
Reid, Carson William - -	1	"Lord Strathnairn."
Renaut, Charles Henry - -	2	"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. - -	—	H.M.S. "Hydra."

\* Pilot Charts not presented.

† Chief Officer.

‡ Navigating Lieutenant.

Names of Officers, deceased, *in italics*.

Captain's Name.	Letters of Thanks.	Ship.
Simpson, Alexander - -	3	"Traveller."
<i>Smith, David, F.R.A.S.</i> - -	—	"Wiltshire."
Smith, William Henry, R.N.R. - -	4	S.S. "Hibernian," S.S. "Peruvian," and S.S. "Scandinavian."
Stanhope, John - - -	—	"Decision."
Steele, John - - -	1	S.S. "Erl King."
Stephen, John George - - -	1	S.S. "Moravian" and S.S. "St. Patrick."
Stuart, George Rennie - - -	1	"Otago."
Stuart, William Henry - - -	3	"Richmond."
Sutherland, James Taylor - - -	—	"Maggie."
Symington, William - - -	5	"Northfleet," "Flying Venus," and S.S. "Hong Kong."
*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."
<i>Tucker, John Worth</i> - - -	—	"John Temperley."
Tully, Thomas - - -	—	"Baroda."
*†Vine, William W., R.N. - - -	2	H.M.S. "Orontes."
Vowell, Michael - - -	1	"Kelso" and "Undine."
Wadham, Thomas Littleford - - -	1	"Vere."
Walker, John Burnett - - -	—	S.S. "Erik."
Watkins, Thomas - - -	—	"Emulation."
Watson, William - - -	9	S.S. "Palmyra" and S.S. "Parthia."
Wherland, Frederick, R.N.R. - - -	4	"Galatea."
Wight, Henry Potts - - -	2	"Gosforth."
Wilcox, Henry George, R.N.R. - - -	—	"St. Lawrence."
Williams, James Agnew - - -	—	S.S. "Wisconsin."
Wylie, James - - -	1	S.S. "Austrian" and S.S. "Sarmat- ian."

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.

Names of officers, deceased, *in italics*.

## APPENDIX III.—SHIPS supplied and DOCUMENTS returned during the year 1873.

The number of ships supplied with standard instruments and meteorological registers during the year 1873 was 78. This number does not include ships in the Royal Navy, all of which are supplied with instruments by the Meteorological office, but in which the keeping of a special meteorological register is optional.

The number of meteorological registers and documents received during the year 1873, and registered in the office, amounted altogether to 227, of which 122 were returned from ships, and 105 from land stations generally outside the British Isles.

## LIST of DOCUMENTS received from LAND STATIONS.

Place.	Observer.	No. of Documents.	Nature of Observations.
Aden*	John Peter Malcolmson, C.S.	1	Observations for October 1846, and March to May 1847.
Alten (Norway)*	J. H. Grewe	1	Three observations daily. January 1846 to December 1847, October 1848 to March 1849.
Angra do Heroismo (Azores)	-	13	One observation daily. October 1872 to October 1873.
Bermuda	Dockyard Authorities	11	Anemometrical Records, December 1872 to October 1873.
"	Officers of the R. Engineers	1	Monthly means of barometer, and dry and wet bulb thermometers, April 1859 to March 1862.
"	-	1	Observations of barometer and thermometer for 1862-3.
Cardington	S. C. Whitbread, F.R.S.	1	Graphical register from 1846-1870.
Cay Sul (Bahamas)	Lightkeeper	2	"Lighthouse" Register, from January 1872 to March 1873.
Christiania*	-	1	Five observations daily, January 1847 to December 1848.
Chusan*	-	1	Six " " for August and September 1840.
Colombo*	James Stewart, master attendant	1	Two " " August 1849 to June 1852.
Durham	J. J. Plummer	1	Summary of meteorological results for 1872.
Falkland Islands (Cape Pembroke)	Lightkeeper	2	"Lighthouse" Register from July 1872 to June 1873.
Funchal (Madeira)	-	13	One observation daily, October 1872 to October 1873.

List of DOCUMENTS—continued.

Place.	Observer.	No. of Documents.	Nature of Observations.
Gibraltar - - -	Serjeant J. Brewster - -	12	Two observations daily and monthly means, December 1872 to November 1873.
Halifax (N.S.) - -	F. Allison - -	1	Monthly abstract of observations for April 1871 and July to December 1872.
Heligoland - - -	Lightkeeper - -	11	Eight observations daily, January to November 1873.
Kaafjord (Norway)* -	J. H. Grewe - -	1	Three " " January to September 1848.
" - - -	" - -	1	Results of 11 years observations, 1837-1848.
London (Charing Cross)* -	W. Bone - -	1	Eight observations daily from November 5 to December 2, 1843.
" (Whitehall) - -	J. C. Haile - -	1	Monthly rainfall, 1854-1873.
" ( " ) - -	" - -	1	Two observations daily, 1856-1873.
" ( " ) - -	" - -	1	Yearly diagram of ditto, 1858-1873.
Patras (Greece) - -	Rev. H. A. Boys - -	7	One observation daily, January to July 1873.
Reykjavik (Iceland) - -	" - -	1	Three " " October 1872 to March 1873.
St. John's (Newfoundland) -	J. Delany - -	8	Three " " April to November 1873.
San Borja (River Uruguay)* -	Monsieur Bonpland - -	1	Observations at various hours daily from 5 April 1847 to 23 March 1848.
Selkirk (Manitoba) - -	Wm. R. Flett - -	2	One observation daily, January to August 1873.
Sombroso - - -	Lightkeeper - -	3	" " " Register from May 1872 to October 1873.
Toronto* - - -	" - -	1	Diurnal and Annual Oscillation of various Meteorological elements.
Trincomalee* - - -	James Higgs, master attendant -	1	Seven observations daily, September 1844 to December 1853.
Van Diemen's Land (Ross Bank)* -	" - -	1	Uncorrected meteorological observations from January to December 1843.
		105	

\* These documents were received from Lieutenant-General Sir E. Sabine, in August 1873.

## LIST of DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Adair, James -	Queen of the South	376	J. Buxton, Lyttelton, N. Z.	To Mauritius and Otago	5
Adams, G. E. -	Velocity	491	— Todd, London	To Yokohama, San Francisco, and home	11
Adams, Joseph	Soukar	1,304	Savill & Temple, London	To Calcutta, Mauritius, Point de Galle, Calcutta, Demerara, and home.	11
Almond, T. M.	Decapolis	632	T. B. Walker, London	Sydney, Yokohama	9
<sup>1</sup> Balderston, R. J.	Rajmahal	1,302	T. Brocklebank, Liverpool	Calcutta	8
"	"	"	"	"	6
Banner, F. W.	Kenilworth	979	C. Hill, Bristol	West Coast of South America	8
Becher, A. B., R.N.*	Mastiff	-	H.M.S.	At the Orkneys	2
Becket, Alexander	City of Perth	1,189	G. Smith & Sons, Glasgow	To Calcutta and home via New York	8
Bennett, E. C.	Medea	1,066	J. H. Carmichael, Greenock	To Buenos Ayres, Mauritius, Point de Galle, Calcutta, and home.	9
Bisset, W. H., R.N.R.	Dilharree	1,293	G. Lidgett, London	To Melbourne, Colombo, Calcutta, Trinidad, New Orleans and home.	9
Blake, E. J.	Gitana	1,367	E. Bates, Liverpool	To Bombay, Calcutta, and home	11
Brett, E. E.	Aylestone	442	T. Harrison, Liverpool	Old Calabar	4
<sup>2</sup> Bruce, H. W., R.N.*	Queen	-	H.M.S.	At Lisbon and Malta	12
Bruce, John	South Australian	1,040	Devitt & Moore, London	Adelaide	6
Burton, F. C.	Palmyra	639	J. H. Allan, London	India	9
Campbell, Archibald-	S.S. Europa	1,840	T. & J. Henderson, Glasgow	New York, four voyages to, and three from.	4
Carruthers, F. P.	Rosalind	547	C. C. Lewis, Brentwood, Essex	To Chile	6
Carruthers, George	Minero	478	H.M.S.	Coquimbo, &c.	7
<sup>3</sup> Chimmo, William, R.N.	Nassau	695	"	Surveying in China Seas and to Bombay	12
"	"	"	"	From Bombay to Malta, via Suez	3
Christie, Alexander	Alibi	283	A. Robertson, Peterhead	Greenland	1
Clavering, D.C., R.N.*	Pheasant	-	H.M.S.	In West Indies	2

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Clarke, Lieut., R.N.*	Pagoda	-	H.M.S.	In High Southern Latitudes	5
<sup>4</sup> Collinson, —, R.N.*	Plover	-	"	Off the Coast of China	10
Crozier, R. M., R.N.*	Terror	340	"	At Madeira	2 days
"	"	"	"	In High Southern Latitudes	15
"	"	"	"	"	11
"	"	"	"	"	5
"	"	"	"	"	31
Dennehy, John	Callixene	1,337	W. & R. Wright, Liverpool	Bombay, Rangoon	9
Ellery, William	Bowfell	1,002	T. & R. Brocklebank, Liverpool	Calcutta	7
Freeman, T. W.	S.S. Wisconsin	3,700	Liverpool and Gt. Western Steam Co., Lim., Liverpool.	New York, five voyages	4
<sup>5</sup> Goddard, William	La Hogue	1,331	J. Moore, London	To Sydney	3
Graham, John	S.S. Moravian	2,481	J. & A. Allan, Glasgow	Portland, 4 voyages; Quebec, 2 voyages; Baltimore, via Halifax, 2 voyages.	6
Gray, David	S.S. Eclipse	435	J. Arbuthnot, Peterhead	Greenland	4
Gray, John	S.S. Hope	452	R. Kidd, Peterhead	"	1
"	Unknown	-	"	Iceland	14 days
Gray, J. McD.	Speranza	455	W. Nicholson, Sunderland	Valparaiso, &c.	6
<sup>6</sup> Grigs, George, R.N.R.	S.S. France	3,572	National S.S. Co., Lim., Liverpool	New York, two voyages	2
"	S.S. Helvetia	3,975	"	" three	4
"	S.S. Italy	4,303	"	"	1
Gun, A. F.	Martaban	781	J. H. Carmichael, Greenock	Brisbane	8
<sup>8</sup> Hall, J. V.	S.S. Cordillera	2,860	Pacific S. N. Co., Liverpool	From Lisbon to Rio Janeiro, Monte Video, Valparaiso, and Bordeaux.	3

*List of DOCUMENTS, &c.—continued.*

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Hamlyn, J. T.	Fedalma	478	Scrutton, Sons, & Co., London	To Coquimbo, Callao, Guanape Islands, Barbados, and home.	8
Harland, Charles	Nelly	407	J. C. Brooks, Newfoundland	To Callao, Barbados, and home	8
Harris, David	S.S. Medway	1,846	J. Temperley, London	Quebec, three voyages	3
Hassell, T. E.	Mervyn	288	R. J. & W. Poole King, Bristol	Cape Palmas	4
Hayes, James	S.S. Camoens	1,053	Brazil and R. Plate S. N. Co.	On south-east coast of America	4
Heggum, E. C. V.	Rozelle	1,286	R. Cuthbert, Greenock	To Calcutta, New York, and home	8
Henderson, Henry	S.S. Cleveland	1,067	H. Nelson, Westoe, Durham	Ports in Mediterranean, four voyages	4
Horne, James	John Allan	734	J. H. Allen, London	Madras, Trinidad, and New York	7
Hunter, David	S.S. Alpha	653	W. Cunard, Halifax, N.S.	From Halifax to St. Thomas and back, via Bermuda, six voyages.	4
Johnson, Chas., R.N.R.	St. Lawrence	1,094	J. Lawrence, London	Madras	7
Jones, A. A.	Chevy Chase	678	J. Ravenscroft, Oxton	San Francisco	11
Jones, Edward, R.N.R.	Superb	1,451	H. Green, Blackwall	Melbourne	5
Jones, G. H.	S.S. Niger	1,125	C. M. Norwood, London	Odessa, one voyage; Quebec, one voyage; Cronstadt, one voyage.	4
"	"	"	"	Halifax, New York	2
"	"	"	"	Cronstadt, two voyages	1
Jones, T. M., R.N.	Glasgow	3,037	H.M.S.	From Seychelles to Ceylon and Zanzibar	4
"	"	"	"	Cruising between Zanzibar and Bombay	4
"	"	"	"	" various ports in Bay of Bengal, and from Trincomalee to Bombay, Aden, Suez, and back to Trincomalee.	8
"	"	"	"	From Bombay to Seychelles, Zanzibar, Comoro Islands, and Seychelles.	4
Kennedy, J.B., R.N.R.	S.S. Yorkshire	2,273	W. H. Tindall, London	Calcutta, via Suez	3

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Kennedy, J. B., R.N.R.	S.S. Yorkshire	2,273	W. H. Tindall, London	To Calcutta, viâ Suez, New York, and home.	4
Kerr, Alexander	Ardgowan	1,283	G. Adam, Greenock	Calcutta	7
Knowles, Charles G. F.	Lapwing	774	H.M.S.	On East coast of North America and in West Indies.	21
<sup>14</sup> Leeke, Sir J. H.*	Queen	-	"	At Plymouth	6
<sup>15</sup> Lecky, S. T. S., R.N.R.	S.S. Araucania	2,877	Pacific S. N. Co., Lim., London	From Callao	1
Lewis, J. T., R.N.R.	S.S. Chaldea	1,434	The British India S. N. Co., Lim., London.	To Colombo, viâ Suez, and in Indian Ocean.	4
Lindsay, H. K.	Valparaiso	730	S. Williamson, Liverpool	Iquique, &c.	8
McInnis, A. A.	Duke of Edinburgh	1,117	T. H. Holderness, Liverpool	To Sydney	3
McKechnie, D. F.	Cottica	319	A. Pearson, Glasgow	Surinam, two voyages to, and one from.	4
<sup>16</sup> McRitchie, D.	Assaye	1,281	J. Stewart, Greenock	To Calcutta, New York, and home	8
<sup>17</sup> Mackie, Thomas	S.S. Mazinthien	397	R. Kidd, Peterhead	Greenland	6
Maples, Charles	Genii	975	L. H. Macintyre & Co., Liverpool	Rangoon	7
Martyn, J. A.	S.S. Java	2,696	J. Burns, Glasgow	New York, six voyages	4
"	"	"	"	five "	4
Mends, Sir R., R.N.*	Iphigenia	-	H.M.S.	To West Coast of Africa, St. Thomas, Ascension, and Bahia.	3
Morton, J. D.	Henry Bath	490	H. Bath & Son, Swansea	Coquimbo	7
Mouland, J. E.	S.S. Batavia	2,553	J. Burns, Glasgow	New York, five voyages	4
Murdoch, Henry	Andromeda	1,876	W. H. Jones, Liverpool	Bombay	8
<sup>18</sup> Nares, G. S., R.N.	Challenger	2,306	H.M.S.	To Gibraltar, St. Thomas, and Bermuda	4
Newton, James	S.S. Admiral	608	Tyne Steam Shipping Co., Newcastle-on-Tyne.	Trading between Newcastle-on-Tyne and London.	2

## LIST OF DOCUMENTS, &amp;c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Newton James	S.S. C. M. Palmer	818	Tyne Steam Shipping Co., Newcastle-upon-Tyne.	Trading between Newcastle-on-Tyne and London.	14 days.
"	S.S. Grenadier	737	"	"	16 "
"	S.S. Sentinel	551	"	"	2 "
Parsell, Henry	S.S. Tropic	2,123	T. Jackson, Liverpool	Rio Janeiro, Valparaiso, &c.	4
Pasley, Sir T. S., R.N.*	Curaçoa	1,571	H.M.S.	Off Monte Video	6
<sup>19</sup> Paterson, J. C., R.N.	Princess Charlotte	4,122	"	Off Hong Kong	2
Pearson, C. W.	S.S. Strathclyde	1,951	Burrell & McLaren, Glasgow	Bombay, viâ Suez, one voyage; Quebec, one voyage.	4
"	"	"	"	Calcutta, viâ Suez	4
<sup>20</sup> Perry, J. L., R.N.	Orontes	2,812	H.M.S.	Cruizing between Portsmouth and Queenstown; one voyage to Madeira, West Indies, and home.	4
Phillips, E.	Ivanhoe	1,064	T. R. Miller, Newcastle-on-Tyne	Yokohama, Sandwich Islands, &c.	12
Pirie, William	Carn Tual	498	J. Thompson, Liverpool	Adelaide	8
Potts, T. C.	Tenasserim	1,419	T. & R. Brocklebank, Liverpool	Calcutta	6
"	"	"	"	"	6
Price, J. J.	Sorata	332	C. C. Dawson, London	Jamaica	3
"	"	"	"	"	3
Raymond, C. T.	British Consul	1,267	British Shipowners Co., Liverpool.	Sydney, San Francisco	11
Reid, C. W.	Haddon Hall	1,416	R. Alexander, Liverpool	Calcutta, thence to New York	7
Renaut, C. H.	Celaeno	702	T. Rhoades & Son, London	Wellington, N. Z.	6
Roberts, P. B., R.N.*	Alfred	-	H.M.S.	Off Monte Video	6
Ross, J. C., R.N.*	Erebus	370	"	At Madeira	2 days.
"	"	"	"	In high Southern Latitudes	5

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Ross, J. C.* -	Erebus -	370	H.M.S. -	In high Southern Latitudes -	15
" " -	" -	"	" -	" -	11
<sup>21</sup> St. John, H. C., R.N.	Sylvia -	695	" -	In Japan Sea, Indian Ocean, and voyage home.	15
Shaw, Gilbert	S.S. Alpha -	653	W. Cunard, Halifax	From Halifax to Bermuda and back, viâ St. Thomas.	20 days.
" "	S.S. Delta -	644	" "	From Halifax to St. Thomas and back, viâ Bermuda, 12 voyages.	7
<sup>22</sup> Shortt, F. H., R.N.	Princess Charlotte -	4,122	H.M.S. -	Off Hong Kong -	3
<sup>23</sup> Smith, —	Worcester -	-	H.M. Training Ship	Off Greenhithe -	4
Stanley, O., R.N.* -	Rattlesnake -	-	H.M.S. -	From New Zealand, Falkland Islands, and home.	5
Stopford, G. J., R.N.	Amazon -	-	" -	To Mediterranean ports -	9
Stuart, G. R.	Otago -	993	J. Galbraith, Glasgow	Otago, N. Z. -	7
Sutherland, J. T.	Maggie -	100	D. R. Simpson, Wick	Lisbon, the Baltic, &c., two voyages	4
Symington, William	S.S. Hong Kong -	1,881	E. H. Watts, London	China and Japan, viâ Suez -	7
Tannock, R. S.	Lake Leman -	1,035	W. Ross, Glasgow	Singapore -	7
Thompson, R. C.	British American -	1,207	C. Hill, Bristol	Payta -	4
Thompson, T.S., R.N.*	Comus -	-	H.M.S. -	Off Monte Video -	6
Thompson, W. H., R.N.R.	S.S. Baltic -	3,707	The Oceanic Steam Navigation Co., Lim., London.	New York, eight voyages	5
" "	S.S. Oceanic -	"	" "	" two -	1
<sup>25</sup> Tisseyman, Isaac	Lockett -	616	J. H. Lockett, Liverpool -	San Francisco -	11
Toynbee, Henry	Gloriana -	1,056	T. & W. Smith & Sons, London -	India several voyages -	-
" "	Hotspur -	1,042	" "	" -	-
" "	Marlboro' -	1,292	" "	" -	-
Tully, Thomas	Baroda -	1,364	T. Brocklebank, Liverpool	Calcutta -	8

## LIST OF DOCUMENTS, &amp;c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
<sup>26</sup> Unknown* -	Oriental Queen	-	-	Mauritius -	6
Vowell, Michael	Undine	796	J. R. Kelso, North Shields	China -	10
Wadham, T. L.	Vere	396	J. Anderson, London	Jamaica -	3
"	"	"	"	"	3
Walker, J. B.	S.S. Erik	412	G. L. M. Gibbs, London	To Davis Straits	4
Watson, William	S.S. Parthia	3,167	J. Burns, Glasgow	New York, four voyages	3
"	"	"	"	" four voyages to and three from.	3
Wilcox, H. G., R.N.R.	S.S. Walamo	1,833	C. H. & A. Wilson, Hull	India, via Suez -	3
Williams, J. A., R.N.R.	S.S. Wisconsin	3,700	Liverpool & Great Western Steam Co., Lim., Liverpool.	New York, three voyages	2

\* These documents were received from Lieutenant General Sir E. Sabine, in August 1873.

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

- |    |  |    |   |
|----|--|----|---|
| 1  | Richard Coulson and William Porter.          | 16 | William Greenwood, Chief Officer.                   |
| 2  | Major D. McAdam, R.M.                        | 17 | John Walker, Mate.                                  |
| 3  | Officers.                                    | 18 | { Thomas H. Tizard, Navigating Lieutenant.          |
| 4  | A. J. Greene.                                | 18 | { Arthur Haverall, Navigating Sub-Lieutenant.       |
| 5  | C. P. Trevenan, Chief Officer.               | 19 | 22 Thomas W. Webster, Navigating Lieutenant.        |
| 6  | Assisted by George Attree.                   | 20 | William Wallis Vine, Navigating Lieutenant.         |
| 7  | Assisted by R. P. Williams.                  | 21 | Francis S. Wheeler, Navigating Lieutenant.          |
| 8  | Robert Graham Fowler, 2nd Officer.           | 23 | Boys under superintendence of Rev. W. T. Read, M.A. |
| 9  | Francis A. Harvey, Chief Mate.               | 24 | Charles W. Kennedy, Chief Officer.                  |
| 10 | 11 12 Robert Jackson, Navigating Lieutenant. | 25 | Charles Sharp.                                      |
| 15 | Walter C. Hart.                              | 26 | G. H. Harrington, Chief Officer.                    |

## APPENDIX No. IV.

## CONTENTS of the PRINCIPAL PUBLICATIONS issued.

*Continued from Report for 1872.*

Official No.

14. QUARTERLY WEATHER REPORT for 1871. 77 pp. 73 Plates.

This contains the usual continuous traces of the self-recording instruments at the seven British and Irish Observatories, with a chronicle of the weather. The report also contains tables showing:—I. The Mean Monthly Results of the Records of the Seven Observatories for the Year. II. Five-day Means of the same. III. Rainfall Observations at about 35 Stations, and Mean Monthly Results at about 23 Stations. IV. Discussion of the Anemometrical Results furnished by the Anemometer at Sandwick Manse, Orkney, 1863–68. The observations of Direction and Force have been resolved into their rectangular components, and treated on the plan recommended by the Rev. T. R. Robinson, D.D. V. Constants arising from the solution of Bessel's Interpolation Equations for Barometer, Dry Bulb Thermometer, and for Vapour Tension for 1869 and 1870 for the seven Self-recording Observatories. VI. Tabular Results referred to in No. I., converted to the Metric and Centigrade Scales, in accordance with the general desire expressed by the Meteorological Conference at Leipzig in August 1872.

16. QUARTERLY WEATHER REPORT for 1872. 4to. 110 pp. 73 Plates.

The information given in this Report corresponds to that in No. 14. The mean results from the seven Observatories have been, as before, given in English and French scales. It contains only one special Appendix, giving the results of the discussion of Anemometrical Observations at Bermuda for four years ending 31st March 1859. This work is referred to at p. 9 of the present Report.

18. CONTRIBUTIONS to our KNOWLEDGE of the METEOROLOGY of the ANTARCTIC REGIONS. 1873. 4to. 47 pp. Two Plates.

This paper contains the results of Meteorological Observations taken on board H.M. ships "Erebus," "Terror," and "Pagoda," during portions of the years 1840–43 and 1845. The constants of Bessel's formula for periodicity have been calculated, and from these the diurnal range for the months of January and February. This information is the most complete now available for the region in question.

19. QUARTERLY WEATHER REPORT, 1873.

20. MONTHLY WIND CHARTS of SQUARE III., with Explanatory Text.

22. INSTRUCTIONS for taking METEOROLOGICAL OBSERVATIONS.

} In the  
press.

## APPENDIX V.

## INSTRUMENTS supplied, &amp;c. to the Royal Navy.

Per Account.	Baro- meters.	Ane- roids.	Thermometers.			Hydro- meters.
			Ordinary.	Max.	Min.	
January 1st, 1873, afloat - - -	167	376	863	25	45	134
Issued in 1873 - - -	63	106	242	31	35	64
	230	482	1,105	56	80	198
Returned in 1873 - - -	51	91	225	25	24	44
January 1st, 1874, afloat - - -	179	391	880	31	56	154

## INSTRUMENTS supplied, &amp;c. for use at Naval Stations.

January 1st, 1873, in use - - -	51	72	71	10	12	10
Issued in 1873 - - -	—	10	16	8	5	4
	51	82	87	18	17	14
Returned in 1873 - - -	6	7	23	5	5	4
January 1st, 1874, in use - - -	45	75	64	13	12	10

## DISPOSITION of ADMIRALTY INSTRUMENTS on January 1st, 1873.

Afloat in Royal Navy - - -	179	391	880	31	56	154
In use at stations - - -	45	75	64	13	12	10
In store at M.O. - - -	154	94	118	34	34	82
" Chatham - - -	5	10	48	6	6	24
" Sheerness - - -	7	6	25	6	6	18
" Portsmouth - - -	2	5	35	3	5	24
" Devonport - - -	8	8	36	7	6	17
" Queenstown* - - -	—	3	6	1	1	8
" Gibraltar - - -	4	5	—	—	—	4
" Malta - - -	3	5	23	—	1	28
" Halifax - - -	5	7	6	4	5	13
" Bermuda - - -	5	10	38	3	—	16
" Jamaica - - -	4	6	19	3	3	8
" Cape of Good Hope - - -	6	11	44	1	1	31
" Trincomalee - - -	2	2	12	—	—	—
" Hong Kong - - -	6	22	34	4	3	21
" Valparaiso† - - -	4	1	23	2	2	16
Under repair - - -	—	10	8	—	—	—
Total, January 1st 1874 - - -	439	671	1,419	118	141	474
Destroyed and lost during 1873 - - -	2	6	136	16	12	18

\* No return has been made since 1873, April 1st.

† No return has been made since 1869, July 1st.

APPENDIX VI.

INSTRUMENTS, &c. supplied to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.			Hydro- meters.
			Ordinary.	Max.	Min.	
January 1st, 1873, afloat -	98	2	595	1	1	371
Issued in 1873 - -	59	—	407	—	—	233
Returned in 1873 -	157	2	1,002	1	1	604
	75	2	492	1	1	290
January 1st, 1874, afloat -	82	—	510	—	—	314

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

January 1st, 1873, in use	102	3	217	50	51	54
Issued in 1873 - -	8	—	16	8	11	1
Returned in 1873 -	110	3	233	58	62	55
	10	—	22	9	5	—
January 1st, 1874, in use	100	3	211	49	57	55

DISPOSITION of Board of Trade Instruments, on Jan. 1, 1873.

In merchant ships -	82	—	510	—	—	314
In use at stations -	100	3	211	49	57	55
In store at M.O. -	54	46	87	15	8	32
At Liverpool agency -	8	8	64	—	—	36
„ Aberdeen „ -	9	—	69	—	—	31
„ Glasgow „ -	6	—	31	—	—	20
Under repair -	1	—	15	1	—	—
Total, Jan. 1st, 1874	260	57	987	65	65	488
Lost, &c. during 1873	22	—	206	17	15	81

## APPENDIX VII.

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

†Sumburgh Head -	W. Lawrence - - - -	Schoolmaster.
Stornoway - - -	J. Smith - - - -	Gardener.
*Thurso - - - -	J. Trotter - - - -	_____
Wick - - - -	J. Sinclair - - - -	Watchmaker.
Nairn - - - -	W. D. Penny - - - -	Schoolmaster.
Aberdeen - - -	J. McCormack - - - -	Telegraph Clerk.
Leith - - - -	J. Turnbull - - - -	Do.
Shields - - - -	J. Irvine - - - -	Do.
*Scarborough - -	E. Shaw - - - -	Do.
York - - - -	C. Wakefield - - - -	Curator of Museum.
Nottingham - - -	E. J. Lowe, F.R.S. - - - -	Highfield Ho. Observatory.
Ardrossan - - -	W. McNeil - - - -	Telegraph Clerk.
*Greencastle(Moville)	J. McGladery - - - -	Do.
Donaghadee - - -	J. MacGowan, jr. - - - -	Do.
Kingstown - - -	G. Mitchell - - - -	Keeper of Sailor's Home.
*Holyhead - - -	J. Tilston - - - -	Do.
Liverpool - - -	J. Hartnup, junr. - - - -	Bidston Observatory.
*Valencia - - -	E. O'Sullivan - - - -	Telegraph Clerk.
Roche's Point - -	W. Kennedy - - - -	Do.
Pembroke - - -	J. C. Walker - - - -	Do.
Portishead - - -	W. Sandford - - - -	Station master.
*Scilly - - - -	W. Thomas - - - -	Signalman.
Plymouth - - -	J. Merrifield, LL.D., F.R.A.S.	Teacher of Navigation.
†Portsmouth - - -	J. Hoar - - - -	_____
Dover - - - -	J. Costello - - - -	Telegraph Clerk.
*London - - - -	F. Gaster, F.M.S. - - - -	_____
Oxford - - - -	J. Lucas - - - -	Radcliffe Observatory.
Cambridge - - -	H. Todd - - - -	Observatory.
Yarmouth - - -	G. T. Watson - - - -	Secretary, Sailor's Home.

## Summary :

England and Wales - - -	- 16
Scotland - - - -	- 8
Ireland - - - -	- 5

Those marked with an asterisk, report twice daily. The office also receives daily reports from 22 places on the Continent.

† Communication interrupted since September 1873.

‡ Replaced by Hurst Castle, 28th March 1874; Observer, T. Jobbins, Telegraph Clerk.

APPENDIX VIII.

LIST of PERSONS, PLACES, &c. to which the Daily Weather Report has been supplied, free of cost, to 31st December.

*Newspapers :*

Daily News.  
 Echo.  
 Express.  
 Globe.  
 Hour.  
 Imperial Beacon.  
 Lloyds' Shipping List.  
 Mark Lane Express.  
 Mechanics' Magazine.  
 Morning Advertiser.  
 Observer.  
 Pall Mall Gazette.  
 Shipping and Mercantile Gazette (with special daily chart).  
 Standard (Morning and Evening).  
 Times (1st and 2nd editions).

*For Exhibition at following Seaports :*

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 Barnes, R. H.  
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 Clouston, Rev. C., Sandwick, Orkney.



*Government Offices, Societies, &c.—cont :*

International Exhibition.  
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Royal Society.  
Royal United Service Institution.  
Scottish Meteorological Society.  
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*Foreign Places :*

Christiania, Meteorological Institute.  
Constantinople, Imperial Meteorological Observatory.  
Copenhagen, Meteorological Institute.  
Emden, Dr. Prestel.  
Hamburg, German Ocean Observatory.  
Lisbon, Observatory.  
Madrid, Royal Observatory.  
Paris, Meteorological Observatory, Montsouris.  
„ Meteorological Society.  
„ Ministry of Marine.  
„ Observatory.  
„ M. Harold Tarry.  
Rome, Ministry of Agriculture.  
St. Petersburg, Central Physical Observatory.  
Stockholm, Meteorological Institute.  
Upsala, University Observatory.  
Utrecht, Royal Meteorological Institute.  
Vienna, Imperial Meteorological Institute.  
Washington, Smithsonian Institution.  
„ United States Naval Observatory.  
„ Chief Signal Officer, War Office.

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APPENDIX IX.

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 signal shapes 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, 78 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.	ENGLAND, N.W.	ENGLAND, S.W.	ENGLAND, E.
Kirkwall.	Silloth.	Ilfracombe.	Tynemouth.
Inverness.	Maryport.	Barnstaple.	S. Shields.
Nairn.	Workington.	Port Isaac.	Sunderland.
Burghead.	Whitehaven.	Boscastle.	Middlesborough.
Lossiemouth.	Ramsey.	Newquay.	Redcar.
Buckie.	Douglas.	Hayle.	Whitby.
Portsoy.	Castletown.	Pendennis.	Filey.
Banff.	Barrow.	Scilly.	Withernsea.
Fraserburgh.	Morecambe.	Penzance.	Hull.
Peterhead.	Fleetwood.	Falmouth.	Goole.
Aberdeen.	Blackpool.	Plymouth, four stations.	Grimsby.
Stonehaven.	Lytham.	Teignmouth.	Boston.
Montrose.	Runcorn.	Exeter.	Sutton Bridge.
Broughty Ferry.	Southport.	Exmouth.	Lynn.
St. Andrews.	Liverpool.		Cromer.
Dundee.	Queensferry.		
Anstruther.	Hawarden.	ENGLAND, S.	ENGLAND, S.E.
St. Monance.	Mostyn.	Guernsey.	Yarmouth.
Burntisland.		St. Helier, Jersey.	Southwold.
Alloa.	ENGLAND, W.	Gorey, Jersey.	Ipswich.
Grangemouth.	Port Penrhyn.	Weymouth.	Harwich.
Bo'ness.	Holyhead.	Poole.	Chatham.
Granton.	Carnarvon.	Cowes.	Sheerness.
Leith.	Port Dinorwic.	Ventnor.	Faversham.
Fisherrow.	Aberystwith.	Portsmouth.	
Dunbar.	Milford.	Littlehampton.	
Eyemouth.	Pembrey.	Brighton.	
	Llanelly.	Newhaven.	
	Swansea.	Hastings.	
	Briton Ferry.	Rye.	
	Porthcawl.	Dover.	
	Penarth.		
	Cardiff.		
	Newport.		
	Weston-super- Mare.		
	Burnham.		
FIRTH OF CLYDE.	IRELAND, E.		
Glasgow.	Belfast.		
Greenock.	Howth.		
Rothesay.	Kingstown.		
Campbeltown.			
Girvan.	IRELAND, S. and W.		
	New Ross.		
	Dunmore, East.		
	Dungarvan.		
	Youghal.		
	Queenstown.		
	Passage.		
	Cork.		
	Tralee.		
	Limerick.		
	Galway.		

\* This arrangement was modified by the following Board of Trade Circular.

Circular No. 717.

TELEGRAPHIC WEATHER INTELLIGENCE.

Board of Trade, February 14, 1874.

THE Board of Trade have been informed by the Meteorological Committee that they are now prepared to re-introduce the use of Admiral FitzRoy's signals (cones and drum) with slightly modified significations, and that the change will take effect on and after 15th March 1874.

The signals to be used will consist of:—

- 1°. Cone, point downwards for Southerly gales ; S.E. round by S. to N.W.
- 2°. Cone, point upwards for Northerly gales ; N.W. round by N. to S.E.
- 3°. Drum, *with cone*, to indicate the probable approach of a *very heavy gale* from the direction indicated by the cone.

The drum will not be used without the cone.

The signals are to be kept hoisted *during the daylight only*, until 48 hours have elapsed from the time *the telegram was despatched*, unless countermanded. At night lanterns may be used wherever the local authorities deem it desirable to do so, as pointed out in the explanatory pamphlet sent herewith, copies of which are supplied for gratuitous distribution.

It will be seen from the pamphlet in question that the meaning of the signals is that an atmospherical disturbance exists (which will be explained in the telegram), and will probably, but not *necessarily*, cause a gale at the place warned *from the direction* indicated by the signal.

The Meteorological Office will supply the canvas shapes and lanterns to such places as require them, on loan, but in all cases the local authorities must undertake the charges incidental to the hoisting of the signal, such as flagstaff and gear, oil, &c., and also to the keeping of the apparatus in repair, painting, &c., as directed by the Circular No. 278, dated 30th November 1867.

THOMAS GRAY.

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APPENDIX X.

FISHERY BAROMETERS.

LIST of PLACES supplied with FISHERY BAROMETERS.

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Those supplied during the years 1867–73 are distinguished by an asterisk.

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*Shetland Isles*.—Sandsair, Lerwick.

*Orkney Isles*.—Burray. Kirkwall.\*

*Scotland, east coast*.—Stroma, Staxigoe, Wick, Sarclet, Lybster, Portmahomack, Cromarty, Avoch, Nairn, Burchhead, Portessie, Port Knockie,

Portsoy,\* Whitehills, Gardenstown, Rosehearty, 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\*(2) (Isle of Wight), Gorey (Jersey), Poole, Weymouth, Portland, Budleigh-Salterton, Cawsand, Mevagissey, Gorranhaven, Devoran, Penryn, Falmouth, Newlyn, Mousehole.

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

*Wales.*—Briton Ferry,\* Swansea, Angle,\* 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.*—Portrush,\* Cushendall,\* 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.*—Burton Port, Bunbeg, Dunfanaghy, Rathmullen.

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

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

#### SUMMARY of INSTRUMENTS ON SERVICE.

England and Wales	-	-	-	-	56
Scotland	-	-	-	-	41
Ireland	-	-	-	-	24
					<hr/>
					121
					<hr/>

APPENDIX XI.

DONATIONS RECEIVED DURING THE YEAR 1873.

Presented by Societies, Institutions, &c.

Aschaffenburg -	K. Forst-Akademie	-	Beobachtungs- Ergebnisse der im K. Bayern errichteten meteor. Beobachtungen, July to Dec. 1872. By Dr. E. Ebermayer.
Berlin -	K. Hydrographisches Bureau.	-	Hydrographische Mittheilungen. I. Jahrgang. Nos. 1-26.
	" "	-	Nachrichten für Seefahrer, IV. Jahrgang. Nos. 1-52.
	" "	-	Protocolle der Commission zur Berathung eines verbesserten Sturm-Signal-Systems für die deutsche Küste. By Dr. G. Neumayer.
Bombay -	Colaba Observatory	-	Report on Proceedings for the year ending 30th June 1873. General Remarks on the Climate of Bombay. By. C. Chambers, F.R.S., Supt.
Bournemouth -	Meteorological Society	-	Report for 1870-71. By W. H. Blenkinsop, M.D.
Brussels -	Observatoire Royal	-	Annales. Tome XXI.
	"	-	Observations des Phénomènes Périodiques, 1870 ; and three excerpt papers. By A. Quetelet, Director.
Calcutta -	Meteorological Office	-	Meteorological Report for 1872.
	"	-	Abstract of Observations, July to Sept. 1873.
	"	-	Administration Report, 1872-3.
	"	-	Weekly Report of Rainfall, July to Novr. 1873.
	"	-	Telegraphic Reports, Aug. to Nov. 1873.
	"	-	The Cyclone in the Bay of Bengal, June 1872. The Winds of Northern India, in relation to Temperature, &c. By H. F. Blanford, Government Meteorological Reporter.
	St. Xavier's College	-	Meteorological Register, July 1872 to June 1873. By the Rev. E. Lafont, S.J.
	Surveyor General's Office	-	Abstracts of the Results of Hourly Observations, Oct. 1872 to Sept. 1873. By Col. Thuillier, F.R.S.
Carlsruhe -	Meteorologische Central-Station.	-	Beobachtungen der badischen Stationen, Oct. 1872 to Sept. 1873. Berichte, 1869-71. By Dr. F. Sohncke.
Chiswick -	R. Horticultural Society	-	Journal, Vols. I.—III. and Vol. IV., part 13. By W. Thiselton Dyer, F.L.S.
Christiania -	Norske Meteorologiske Institut.	-	Meteorologiske Jagttagelser i Norge, 1872, pp. 113-144. 1873, pp. 1-120.
	" "	-	Aarsberetning, 1871.
	" "	-	Tordenvejr i Norge, 1871.
	" "	-	Klimatologie Norwegens.
	" "	-	Om Wind og Vejr. Vejledning til Udførelse af meteor. Dagttagelser, &c. By Professor H. Mohn, Director, and by the University.

Colombo (Ceylon).	Surveyor General's Office	Monthly Results of Meteorological Observations (36 stations), October 1872 to October 1874. Rainfall returns, 1870-72. By Major A. B. Fyers, R.E.
Constantinople-	Observatoire Impérial Météorologique.	Résumé des Observations Météorologiques, Jan. to Aug. 1872. By A. Coumbary, Director.
Copenhagen -	Danske Meteorologiske Institut.	Observations at Danish Stations pp. 1-104.
	„ „ -	Vejledning til Benyttelsen af det Met. Inst. daglige Vejrmeddelelser. Forhandling, No. 2, 1872. By J. Steenstrup, Secretary.
	K. Danske Videnskabernes Selskab.	Aarsberetning, Nov. 1872 to June 1873.
	K. Landhus- holdnings - selskab	By H. J. Fjord and J. C. La Cour.
Cracow - -	K. K. Sternwarte - -	Meteorologische Beobachtungen, November 1872 to October 1873.
	„ - -	Materyaly do Klimatografü Galicyi. Rok 1872. By Dr. F. Karlinski, Director.
Dublin - -	R. Dublin Society - -	Journal, Vol. VI. No. 2.
Edinburgh -	Royal Society - -	Proceedings, Session 1871-2.
Fiume - -	I. R. Academia di Marina	Meteorological Observations, July 1872 to September 1873.
Geneva - -	Bibliothèque Universelle	Results for 1872.
	Société Géographique -	Archives des Sciences, Vols. VII.—XLVIII. Le Globe. Vol. XI., Nos. 4-6. Vol. XII., Nos. 1-3.
Greenwich -	Royal Observatory - -	Report of the Astronomer Royal to the Board of Visitors, 1836-54, 1858, 1873.
	„ - -	Magnetical and Meteorological Observations, 1836-39, 1871.
	„ - -	Daily Weather Reports for the year.
	„ - -	Weekly Returns to Registrar-General, Vol. XXXIV. By Sir G. B. Airy, K.C.B., Astronomer Royal.
Gorizia - -	- - - -	Osservazioni delle Stazione meteorologica, May 1872 to June 1873.
Hamburgh -	„ Deutsche Seewarte - -	Results for 1872. Jahresbericht, 1872. "Hansa" 1872. Wetterberichte for 1872. By W. H. v. Freeden, Director.
Havanna -	R. Colegio de Belen - -	Observaciones magneticas y meteorologicas, Jan. 1862 to Nov. 1869 and Nov. 1870 to Nov. 1871.
	„ - -	Marcha regular o periodica e irregular del Barometre en la Habana, 1858-71.
	„ - -	Observaciones correspondientes ol mes de Octubre de 1870, &c. By R. P. A. Viñes, Director.
Helsingfors -	Observatoire - - - -	Observations Météorologiques, Vol. V. 1848-56. By N. K. Nordenskiöld.
Hobarton -	R. Society of Tasmania -	Monthly Notices of Papers and Proceedings for 1871.
	„ - -	Result of five years Observations at Hobarton. By F. Abbott, F.R.A.S.

Hong Kong	-	Government Civil Hospital	Meteorological Observations taken at Victoria, Nov. 1872 to Sept. 1873. By R. Young, M.D.
	-	Harbour Office	Meteorological Observations taken at Praya West and Victoria Peak, Sept. 1872 to Sept. 1873. By Captain H. Thomsett, R.N. China Coast Meteorological Register, August to Nov. 1873. By A. Lister.
Kew	-	Observatory	Report of the Kew Committee for 15 months, ending October 1872.
Kiel	-	Commission zur Untersuchung der deutschen Meere.	Jahresbericht, 1871. By Dr. G. Karsten.
Kremsmünster-	-	Sternwarte	Resultate aus den im Jahre 1867 angestellten meteorologischen Beobachtungen.
	-	„	Geschichte der Sternwarte, by P. S. Fellöcker. By Dr. A. Reslhuber.
Lahore	-	Meteorological Department for the Punjab.	Meteorological Report for 1866 and 1872. By Dr. A. Neil, Government Meteorological Reporter.
Leipzig	-	Sternwarte	Übersicht der Resultate aus den meteor. Beobachtungen angestellt auf den K. sächsischen Stationen, August 1872 to August 1873. Resultate aus den meteor. Beobachtungen, 1870. Meteorologische Beobachtungen angestellt auf der Leipziger Universitäts- Sternwarte, 1871 and 1872. By Dr. C. Bruhns, Director.
Lisbon	-	Observatorio do Infante D. Luiz.	Boletim Meteorologico for the year 1873. Le Portugal par A. de Figueiredo.
	-	„	L'Observatoire de l'Infant D. Luiz, par J. Graindorge. By Sr. Fradesso da Silveira, Director.
Liverpool	-	Observatory	Report of the Astronomer to the Marine Committee, 1872. By J. Hartnup, F.R.A.S.
London	-	Admiralty	Tide Tables for 1874. Vancouver Island Pilot. By the Hydrographer.
	-	Army Medical Department.	Report for the year 1871.
	-	Board of Trade	Report of Wrecks, Casualties, &c. for 1872. By Thos. Gray, Assistant Secretary.
	-	British Association	Report for 1872.
	-	Colonial Office	Returns from various Colonies and Settlements.
	-	India Office	Returns from various Observers in India.
	-	London Institution	Journal, Vol. III., Nos. 18-22.
	-	Medical Department of the Navy.	Statistical Reports of the Health of the Navy, 1867-71.
	-	Meteorological Society	Quarterly Journal, Vol. I., Parts 5-8.
	-	Royal Astronomical Society	Monthly Notices, Vol. XXXIII., Nos. 3-9. Vol. XXXIV., Nos. 1 and 2.

London	-	Royal Geographical Society	-	Proceedings, Vol. XVI., No. 5; Vol. XVII., Nos. 1-5.
		"	-	Journal, Vol. XLII.
		Royal Institution of Great Britain.	-	Proceedings, Vol. VI., No. 57; Vol. VII., No. 58.
		Royal National Lifeboat Institution.	-	Journal, Nos. 87-90.
		Royal Society	-	Proceedings, Vol. XXI., No. 140-8.
		Royal United Service Institution.	-	Journal, Vol. XVI., No. 69 and App. XVII., Nos. 70-74.
		Society of Arts	-	Journal, Nos. 1,052-1,103.
		Standards' Department	-	Reports of the Warden of Standards, 1866-73. Reports 1-5 of the Commissioners appointed to enquire into the Condition of Exchequer Standards.
		"	-	General Index to do., and other Papers. By H. W. Chisholm, Warden of the Standards.
Lyons	-	Commission Météorologique.	-	Reports for 1870. By M. E. Lafon, President.
Madrid	-	R. Observatorio	-	Daily Weather Reports 1873. By Sr. Aguilar, Director.
Manchester	-	Literary and Philosophical Society.	-	Proceedings, Vol. XI., Nos. 15. " XII. " 5-12. " XIII. " 1-5.
Mauritius	-	Meteorological Society	-	Monthly Notices.
		"	-	Results of Observations taken in 1871-2. By C. Meldrum, M.A.
Melbourne	-	Flagstaff Observatory	-	Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism, &c., October 1872 to May 1873.
		"	-	Notes on the Climate of Victoria. By R. J. Ellery, F.R.S., Government Observer.
Modena	-	R. Observatorio	-	Lettere Meteorologiche: — " L'Umidità." Relazione tra le Variazioni diurne della Elettricità atmosferica a ciel sereno e quelle del Barometro. Sulle Piogge di Ottobre 1872. Coefficiente termometrico, &c. By Sr. D. Ragona, Director.
Moncalieri	-	Osservatorio del R. Collegio Carlo Alberto.	-	Bullettino Meteorologico, Vol. VI., No. 12; Vol. VII., 1-4; Vol. VIII., Nos. 1-7.
		" "	-	Observations météorologiques faites dans les stations des Alpes Italiennes, January 1872 to November 1873. Sulle possibile Connessione tra le Eclisse di Sole ed ie magnetismo terrestre. L'Aurore boréale du 4 Février observée en Italie. Osservazioni meteorologiche con speciali istruzioni interno a quelle pluviometriche. Grande Pioggia di Stelle cadenti:—la sera del 27 Nov. 1872. By Sr. F. Denza, Director.
Munich	-	K. Sternwarte	-	Meteorologische und magnetische Beobachtungen, July 1872 to June 1873.
		"	-	Beilage, Nos. 12-16. By Dr. J. v. Lamont, Director.
Naples	-	Specola Reale	-	Osservazioni meteoriche, December 1872 to October 1873.

Naples	-	-	Specola Reale	-	-	Osservazioni barografiche e termografiche, December 1872 to October 1873. By Sr. Brioschi, Director.
New York	-	-	Central Park Observatory			Report for 1872. By Prof. D. Draper.
Oxford	-	-	Radcliffe Observatory	-	-	Results of Meteorological Observations, 1870. By Rev. R. Main, F.R.S., Radcliffe Obsr.
Palermo	-	-	R. Osservatorio	-	-	Bullettino Meteorologico:— Vol. VIII., Nos. 5-12. Vol. IX., Nos. 1-6. The following parts are missing:— Vol. IV., Nos. 1-7. Vol. V., Nos. 1-3. By Sr. G. Cacciatore, Director.
Paris	-	-	Académie des Sciences	-	-	Comptes-Rendus Hebdomadaires, Vols. LXXVI. and LXXVII. Except No. 1 of Vol. LXXVI. and Index to Vol. LXXVII.
			Association Scientifique de France.			Bulletin Hebdomadaire, Nos. 271-323.
			Dépôt des Cartes et Plans			Annales Hydrographiques, 1872, and Parts 1-3 of 1873.
			„	-	-	Phares des Côtes.
			„	-	-	Rio de la Plata, Description.
			„	-	-	Des Vents et des Coups-de-Vent observés dans l'Atlantique Nord. By Captain A. Le Gras.
			Ministère de la Marine	-	-	Revue Maritime et Coloniale. Vols. XXXVI.-XXXIX.
			Observatoire Météorologique de Montsouris.			Bulletin mensuel, Nos. 12-22.
			„	„	-	Congrès de Bordeaux.
			„	„	-	Annuaire Météorologique, 1873. By H. Marié-Davy, Director.
			Observatoire de Paris	-	-	Bulletin International, 1873. By U. J. Le Verrier, Director.
			Service Hydrométrique	-	-	La Seine: Études Hydrologiques, with an Atlas. By E. Belgrand.
			Société Météorologique de France.			Annuaire, Vol. XVI. Vol. XVIII., Bulletin des Séances, feuilles 1-14.
			„	„	-	Tableaux Météorologiques, feuilles 1-6.
			„	„	-	Vol. XIX., Bulletin des Séances, feuilles 1-9.
			„	„	-	(Missing—Tableaux Météor. for Vol. XVII.).
Philadelphia	-	-	Franklin Institute	-	-	Journal, Vols. LXV. and LXVI.
Pola	-	-	K.K. Hydrographisches Amt.			Meteorologische Beobachtungen, November 1872 to November 1873.
			„	„	-	Mittheilungen aus dem Gebiete des Seewesens, Vol. I., Nos. 1-11. By Dr. R. Müller, Director.
Porto Rico	-	-	Department of Public Works.			Meteorological Observations, April 1872 to September 1873.
Rome	-	-	Ministero d' Agricoltura, Industria, e Commercio.			Meteorologia Italiana,— 1872, pp. 101-237. 1873, pp. 1-140.
			„	„	-	Climatologia Italica, June to Nov. 1872. By Sr. L. Bodio.
			Osservatorio del Collegio Romano.			Bullettino Meteorologico, Vol. XI., No. 12. Vol. XII., Nos. 1-11.
			„	„	-	Ricerca-fisico-astronomiche, by G. S. Ferrari. Note spettroscopiche sul sole e gli altri Corpi Celesti. Le Stelle cadenti, del 27 Nov. 1872. By Padre A. Secchi, Director.

Roorkee -	-	Meteorological Department of N.W. Provinces of India.	Meteorological Observations, 1868, 1869, 1870, and 1872. By Murray Thompson, M.D., Government Meteorological Reporter.
Rugby -	-	Natural History Society -	Report 1872. By F. E. Kitchener, F.L.S., President.
St. Petersburg -	-	Central Physical Observatory.	Annales de l'Observatoire, 1871. Jahresbericht, 1872. Meteorological Bulletins, 1873. Five-day Means of Barometer and Thermometer, January to June. Über die Bestimmung des Temperatur- Coefficienten von Stahlmagneten. Correspondance Météorologique, 1852. Meteorologische Beobachtungen in St. Petersburg nach graphischen Instrumenten, 1871. By Dr. H. Wild, Director.
San Fernando -	-	Observatorio de Marina -	Annales, 1870-71. By Don Cecilio Pujazon, Director.
Singapore -	-	Convict Jail Hospital	Meteorological Observations, October 1872 to October 1873.
		”	- Abstracts, 1872.
		”	- Comparative Annual Abstract, 1869-72. By H. L. Randell, M.D.
Southport -	-	Fernley Observatory	Weekly Abstracts of Observations and Results, 1872. By J. Baxendell, F.R.A.S.
Stonyhurst -	-	Observatory - - -	Results of Magnetical and Meteorological Observations, 1872. By the Rev. S. J. Perry, S.J.
Strassburg -	-	K. Universitäts Sternwarte	Bestimmung der Parallaxe des zweiten Argelander'schen Sternes, &c., der Sternwarte zu Bonn, 1857-58. By Dr. F. A. T. Winnecke, Director.
Stuttgart -	-	Polytechnische Schule	Uebersicht über die meteorologischen Verhältnisse Württembergs nach den Resultaten der württembergischen Stationen, October 1872 to July 1873. Die Witterungsverhältnisse des Jahres 1871. Normale Wärmemittel. By Dr. H. Schoder.
Toronto -	-	Education Office - - -	Journal of Education, Vol. XXVI. Annual Report of Schools, 1870-71. By the Rev. E. Ryerson, D.D.
		”	- Monthly Meteorological Register, July to December 1872.
		Magnetical Observatory -	- General Meteorological Register, 1872.
		”	- Second Report of the Meteorological Office of the Dominion of Canada. By G. T. Kingston, M.A., Director.
		”	
Trieste -	-	R.Accademia di Commercio e Nautica.	Osservazioni Meteorologiche, November 1872 to October 1873. Results, 1872. By Prof. V. Farolfi.
Upsala -	-	Observatoire - - -	Bulletin Météorologique Mensuel: Vol. IV., Nos. 8-12. Vol. V., Nos. 1-10.
		”	- Om Askvädren i Sverige. 1871.
		”	- Om Uppkomsten of ett barometriskt Depressions- Centrum, &c., 11 Maj 1873. By Dr. R. Rubenson and Dr. H. H. Hildebrandsson.

Utrecht -	-	K. Nederlandsch Meteor. Institut.	Jaarboek, 1872.
		” ”	- A Sequel to the Suggestions on a Uniform System of Meteorological Observations. By Prof. Buys Ballot.
Vienna -	-	K. K. Centralanstalt für Meteorologie und Erdmagnetismus.	Beobachtungen, November 1872 to November 1873.
		” ”	- Jahrbücher, Bd. VII. 1870.
		” ”	- Telegraphische Witterungsberichte, December 1872 to December 1873.
		” ”	- Bericht über die Verhandlungen der Meteorologen- Versammlung zu Leipzig, 1872.
		” ”	- Bericht über die Verhandlungen des internationalen Meteorologen- Congresses zu Wien, 1873. By Dr. C. Jelinek, Director.
		K. K. Sternwarte	- Planeten und Cometen- Beobachtungen am Refractor von 6 Zoll Öffnung: 30 September 1867 to 9 June 1869. By Dr. C. v. Littrow, Director.
		Oesterreichische Gesellschaft für Meteorologie.	Zeitschrift, Bd. VIII. By Dr. C. Jelinek.
Washington -	-	Department of Agriculture	Report for 1871. Monthly Reports for 1872.
		Hydrographic Office	- Second and Third Supplements to Papers on the Gulf Stream. By Capt. R. N. Wyman, U.S.N.
		U. S. Naval Observatory	- Papers on the Transit of Venus in 1874, Part II. On the Right Ascensions of the Equatorial Fundamental Stars. By S. Newcombe.
		”	- Memoir on the Founding and Progress of the Observatory. By J. E. Nourse.
		”	- On the Difference of Longitude between Washington and St. Louis. By W. Harkness.
		”	- Astronomical and Meteorological Observations, 1870. Results of Washington Observations, 1853-60. Catalogue of Stars, 1845-71. By Admiral Sands, Superintendent.
		War Office	- Daily Weather Reports and Maps, for 1873. Annual Report for year 1872. Instructions to Observer-Sergeants. By Brigadier-General Myer, U.S.A.
Wellington, N.Z.	-	Observatory	- Meteorological Observations at various Stations, June to December 1872. By J. Hector, M.D., F.R.S., Government Meteorological Reporter.
Zürich	-	Meteor. Centralanstalt der schweizerischen naturforschenden Gesellschaft.	Meteorologische Beobachtungen, December 1872 to July 1873. Psychrometer oder Haarhygrometer. Über die Wärmevertheilungen in der Schweiz, by A. Weilenmann. By Dr. R. Wolf.

## Presented by the Authors.

Abbe, C., M. A. -	-	Historical Notes on the Systems of Weather Telegraphy. Observations on the Total Eclipse of the Sun in 1869.
Abbott, F., F.R.A.S.	-	See Hobarton.
Allison, F., M.A. -	-	Synopsis of Climatological Statistics, Canada, April 1872 to November 1873. Meteorological Observations at Halifax, December 1872 to October 1873.
Airy, Sir G. B., K.C.B. -	-	Address at Anniversary Meeting of the Royal Society, December 1, 1873. See also Greenwich.
Babbage, B. H. -	-	Description of Babbage's Calculating Machine, or Difference Engine.
Baxendell, J., F.R.A.S.	-	See Southport.
Belavenetz, Capt., R.I.N. -	-	Russian Nautical Magazine, No. 12 for 1872 ; Nos. 1-9 for 1873.
Belgrand, E. -	-	See Paris.
Beverley, Rev. A. -	-	Rainfall at Aberdeen, 1856-71.
Blanford, H. F. -	-	See Calcutta.
Blenkinsop, W. H., M.D. -	-	„ Bournemouth.
Bodio, L. -	-	„ Rome.
Boileau, Maj.-Gen. -	-	Meteorological Observations made at Simla, 1841-45.
Brioschi, Sr. -	-	See Naples.
Bruhns, Dr. C. -	-	„ Leipzig.
Buys Ballot, Dr. -	-	„ Utrecht.
Cacciatore, Sr. -	-	„ Palermo.
Cantoni, Sr. G. -	-	Su alcuni principj d' Idrastatica. Su alcuni principj d' Elettrostatica. Su alcuni punti Controversi di Elettrostatica. Sperimenti e Considerazioni su alcuni punti di Elettro-chimica e di Elettro-fisiologia. Opinioni del Belli sui condensatori elettrici. Il Galvanometro nell' Elettrostatica. Nuova Analogia tra la Polarizzazione e la Magnetica. Importanti Osservazioni di G. B. Beccaria sui Condensatori Elettrici. Sui Condensatori Elettrici. Su le Calorie di Combinazione dei Corpi. Gl' intenti della Meteorologia. Sulla Paragonabilità delle Osservazioni Ozonoscopiche. Ancora su le Macchine a Strofinio.
Carl, Dr. P. -	-	Repertorium für Physik, vols. I.-VIII ; vol. IX., Nos. 1-5, with an Atlas.
Chambers, C., F.R.S.	-	See Bombay.
Chase, P. E. -	-	On Cosmical and Molecular Harmonies (two papers).
Chisholm, H. W. -	-	See London.
Cora, Guido -	-	Cosmos (Turin), 1873, Nos. 1-5.
Coumbary, A. -	-	See Constantinople.
Delany, J. -	-	General Meteorological Register for St. John's, Newfoundland, 1873.
Denza, F. -	-	See Moncalieri.
Donati, G. B. -	-	Le Thermométrographe à maxima et à minima imaginé et construit par Ulysse Marchi. Raccolta di Documenti e di Nozioni scientifiche concernenti l'Istituzioni di un Servizio Meteorologico (by C. Matteucci). Guida degli impiegati telegrafici Servizio semaforico. Memorie del R. Osservatorio di Firenze.
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Fjord, H. J.	-	-	„ Copenhagen.
Fradesso da Silveira, Sr.	-	-	„ Lisbon.
Freeden, W. H. von	-	-	„ Hamburg.
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Le Verrier, U. J.	-	-	See Paris.
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Petermann, Dr. A.	-	-	Mittheilungen. Vol. XVIII. No. 12. Vol. XIX. Ergänzungsheft. Nos. 32-34.
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Preston, Rev. T. A.	-	-	Seventeenth half-yearly Report of the Marlborough College Natural History Society, for half year ending Midsummer, 1873.
Prettner, Dr. J.	-	-	Das Klima von Kärnten. Meteorologische Beobachtungen zu Klagenfurt, November 1872 to November 1873.
Pujazon, Don C.	-	-	See San Fernando.
Quetelet, E.	-	-	Le Congrès International Météorologique de Vienne, 1873.
Ragona, D.	-	-	See Modena.
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Rawson, Govr. R. W., C.B.	-	-	Monthly Returns of Rainfall and Meteorological Observations in Barbados, December 1872 to October 1873. On the Rainfall of Barbados. Map of Daily Rainfall, January 7 to October 1873.
Reye, Dr. H.	-	-	Über die Abnahme des Luftdruckes bei der Wolkenbildung.
Richards, W. H.	-	-	Abstract of the Weather at Penzance and Neighbourhood, 1872.
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Sands, Admiral	-	-	See Washington.
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Sohncke, Dr. C.	-	-	See Carlsruhe.
Steenstrup, J.	-	-	See Copenhagen.
Stewart, B., F.R.S.	-	-	Report of Committee on Science Lectures.
Symons, G. J., F.M.S.	-	-	Monthly Meteorological Magazine, 1873. British Rainfall, 1872.
Stow, Rev. F. W., F.R.S.	-	-	Raingauge Experiments at Hawsker, near Whitby, 1870-71.
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Wheeler, Rev. R. F.	-	-	Meteorological Reports of the Tyneside Naturalists' Field Club, 1872.
Wild, Prof. H.	-	-	See St. Petersburg.
Winnecke, F. A. T.	-	-	„ Strassburg.
Wolf, R.	-	-	„ Zürich.
Wyman, Capt. R. H. (U.S.N.)	-	-	„ Washington.
Young, R., M.D.	-	-	„ Hong Kong.
Zurcher, F.	-	-	Téléscope et Microscope. La Prévission du Temps.

## APPENDIX XII.

LIST of PERSONS in the EMPLOYMENT of the METEOROLOGICAL COMMITTEE on December 31st, 1873, with their Occupations and Amount of Salary.

Name.	Duties.	Salary						
		Yearly.			Weekly.			
		£	s.	d.	£	s.	d.	
<i>Office.</i>								
Robert H. Scott -	Director of the office - - - -	800	0	0	—			
J. S. Harding, jun. -	Correspondence, Accounts, Library -	200	0	0	—			
J. S. Harding, sen.	} Copying, accounts of stores, registry of documents, &c. }	—			1	18	6	
T. D. Bell - - -			—			1	5	0
<i>Land Meteorology (Observatories).</i>								
R. H. Curtis - - -	} Reproduction of observatory curves by pantagraphs, and preparation for publication. }	140	0	0	—			
*F. C. Steventon -			130	0	0	—		
C. Stodart - - -			—			2	2	0
*H. W. Woodward -			—			1	2	0
J. A. Curtis - - -	} Discussion of returns and compu- tations. }	—			1	14	6	
G. G. Francis - - -			—			1	5	0
C. H. Thompson - -			—			1	0	0
<i>Land Meteorology (Telegraphy).</i>								
F. Gaster - - - -	} Preparation of weather reports, and computations. }	160	0	0	—			
W. L. Dallas - - -			—			1	12	6
F. Brodie - - - -			—			1	5	0
R. Sargeant - - -			—			0	17	0
<i>Ocean Meteorology.</i>								
Capt. H. Toynebee -	Marine Superintendent - - - -	400	0	0	—			
*W. Salmon - - - -	Discussion of data - - - -	250	0	0	—			
R. Strachan - - - -	Care of instruments and reduction of meteorological returns.	230	0	0	—			
C. Harding - - - -	Discussion of data - - - -	150	0	0	—			
W. G. James - - - -	} Computations - - - - }	—			1	14	6	
T. E. Allen - - - -			—			1	14	6
J. W. McVeagh - - -			—			1	0	0
<i>Commissionaire</i> -	Messenger - - - -	—			1	1	0	
Rev. Thos. Kerr -	Director of Valencia Observatory -	250	0	0	—			

\* These gentlemen having resigned since the 31st December several changes have been made in the organization of the Office. The following names have also been added since that date:—A. J. Rigby, H. N. Cobley, V. Sandiford, and H. Chivers.

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of the Meteorological Committee.**

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  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. each. [Stanford.]
  10. Report for 1870. Presented to Parliament. 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, with Book of Charts, 5s. [Stanford.]
  14. Quarterly Weather Report for 1871.— Parts I. to IV. Price 5s. each. [Stanford.]
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  17. Report for 1872. Presented to Parliament. 1s.
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  19. Quarterly Weather Report, 1873.—Parts I., II. Jan.—June. Price 5s. each. [Stanford.]
  20. Charts of Meteorological Data for Square 3. Lat. 0° - 10° N. Long. 20° - 30° W., and Remarks to accompany the Monthly Charts. (In the Press.)
  21. Report of the Proceedings of the Meteorological Congress at Vienna. Price 1s. [Stanford.]
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