

**REPORT**  
OF THE  
**METEOROLOGICAL COUNCIL**

TO THE  
**ROYAL SOCIETY,**

**For the Period of Ten Months, ending  
31st of March 1878.**

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

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THE METEOROLOGICAL COUNCIL

1877.

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R E P O R T  
OF THE  
METEOROLOGICAL COUNCIL  
TO THE  
ROYAL SOCIETY.

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IN the last Annual Report of the Office, embracing the period of 17 months from January 1st, 1876, to May 31st, 1877, the late Meteorological Committee announced that they had rendered up to the President and Council of the Royal Society the trust undertaken by them in the year 1867, and that they merely retained their position until the new arrangements for the management of the Office had been completed. On the 9th of July, 1877, in accordance with instructions received from the Royal Society, they transferred their charge to the Meteorological Council, in whose hands the direction of the Office is now placed.

The Council is a paid body, and consists of a chairman and four members nominated by the President and Council of the Royal Society, and approved by the Lords Commissioners of the Treasury, with the Hydrographer of the Admiralty as an official member.

The executive department of the Office remains in the hands of Mr. R. H. Scott, F.R.S., who has been appointed Secretary to the Council. Captain Henry Toynbee has also been retained as Marine Superintendent.

The vote for the Office for the financial year 1877-78 was increased to the extent of 2,000*l*.

Before proceeding to give an account of their action during the year, the Council cannot but take this opportunity of expressing their sense of the great loss which the Office has sustained in the death of Mr. Gassiot, who had been one of the most active members of the Meteorological Committee from its first constitution. By his high scientific knowledge, business habits, and energy the early organisation of their system was greatly facilitated. Notwithstanding the many and pressing calls on his time, Mr. Gassiot, while his health permitted, rarely missed a meeting, and never failed to attend whenever his advice and experience were especially in request.

The present Report embraces the period of ten months, from

June 1, 1877, to March 31, 1878, and, so far as it relates to the scientific work of the Office, is arranged under three headings:—

Ocean Meteorology.  
Weather Telegraphy.  
Land Meteorology of the British Isles.

An account, by Professor J. D. Everett, of the experiments on Atmospheric Electricity, conducted at Kew Observatory, forms a special Appendix to the Report.

Collection of  
information.

#### OCEAN METEOROLOGY.

The course pursued by the Office in the collection and discussion of observations relating to the various subjects coming under the head of Ocean Meteorology has been described in the several reports of the Meteorological Committee, and a concise account of the procedure will be found in Appendix I.

It is only necessary in this place to state that the logs when received are classified according to their quality into five grades, and that each observer whose observations are classed in the highest grade as "excellent" receives a presentation copy of the work lately published by the Office on the Meteorology of the Equatorial Region of the Atlantic.

In Appendix II. will be found a list of the observers whose logs have been classed as "excellent," since the beginning of the year 1869; some of the names being those of observers who have regularly supplied information to the Office for many years. The names which appear in the list for the first time are as follows:—

Captain's Name.	Ship.
Barlow, Arthur Edward	S.S. "Nizam."
Barron, William	S.S. "Sultan."
Caborn, Warren Frederick	Ship "Waitara."
Cato, Wilson Robert	S.S. "Hibernia."
Gray, Samuel B.	Barque "Letterewe."
*Hepworth, Campbell M. W.	S.S. "Hibernia."
Mesnard, Thomas	Ship "Mistley Hall."
Morrish, Samuel	Ship "Pendragon."
Parry, Moses	Ship "Queen of Cambria."
Randall, William	Ship "Iron Cross."
Scott, William	Brig "Alliance."
Waring, William	S.S. "Atalanta."

The Council have here to express their sincere regret at the death of Captain Price, one of their most careful observers, who was lost in the barque "Sorata," which foundered in the Downs in the storm of November 16, 1877. He had observed regularly for seven years and a half, and had sent in 11 logs, all of which had been marked "excellent."

\* Second officer.

The following figures show the total number of logs, and the number of first-class logs, marked "excellent," which have been received each year from the Mercantile Marine since the management of the Office has been under the Meteorological Committee:—

Collection of Information.

Year.	Total No. of Logs received.	No. of Excellent Logs.	% of Excellent Logs.	Year.	Total No. of Logs received.	No. of Excellent Logs.	% of Excellent Logs.
1867	21	7	33	1873	92	52	57
1868	50	10	20	1874	88	56	64
1869	67	21	31	1875	78	56	72
1870	81	41	51	1876	92	67	73
1871	150	72	48	1877	112	77	69
1872	110	64	58				

These figures show the maintenance of a high standard in the quality of the information received by the Office; and the Council take this opportunity of expressing their thanks to the gentlemen who have co-operated with them during the past year.

The geographical distribution of the voyages on which observations were being taken at the close of each of the years 1870-5, on May 16, 1877, and on March 31, 1878, was as follows:

Districts from which observations are obtained.

	Dec. 31 1870.	Dec. 31 1871.	Dec. 31 1872.	Dec. 31 1873.	Dec. 31 1874.	Dec. 31 1875.	May 16 1877.	Mar. 31 1878.	Totals.
To Baffin's Bay or Greenland	5	3	7	5	3	6	3	7	39
„ East Coast, North America	22	17	10	9	10	9	14	9	100
On East „ „	3	3	3	3	4	2	4	2	24
To West „ „	—	—	5	3	4	3	3	1	19
To West Indies	5	8	4	5	4	3	3	5	37
„ East Coast, South America	4	3	1	3	2	—	4	7	24
„ West „ „	11	10	10	5	7	8	7	4	62
„ West Coast of Africa	2	3	3	3	—	—	—	1	12
On East „ „	—	—	—	1	1	—	—	—	2
To Australia and New Zealand	15	7	10	8	17	18	21	24	120
„ India, viâ the Cape	29	26	24	19	16	25	37	38	214
„ „ Suez	4	3	3	1	3	2	6	2	24
In Indian Seas	2	2	3	2	1	—	—	1	11
To China Seas, viâ the Cape	11	6	3	2	—	—	—	3	25
„ „ Suez	2	1	1	3	3	3	4	6	23
To Mediterranean Ports	—	2	2	1	1	3	3	2	14
„ Home Ports	—	3	4	2	2	3	4	2	20
„ the White Sea, or Kara Sea	—	—	—	—	1	—	1	—	2
„ the Baltic	—	—	—	—	—	1	3	1	5
	115	97	93	75	79	86	117	115	777

This table shows that the Office is able to collect information from merchant ships only for certain routes, and that in particular the observers in the Pacific are very few in number. The Council have lately forwarded a complete outfit of instruments to Norfolk Island, with the view of establishing a station in that part of the Pacific.

Material  
existing in  
Office.

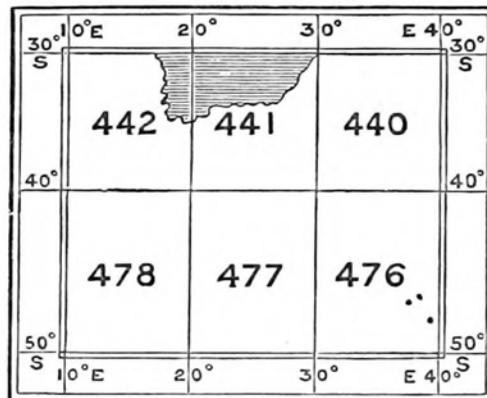
Appendix III. gives a list of all the logs and other documents received at the Office during the year, and in the Report for 1876 will be found a complete analysis of the information existing in the Office for each district of the ocean, and for each month. The charts in Part II. of that Report show the number of days' observations existing for each 10-degree square and for each month in the first 4,000 documents in the Office. These charts give an idea of the amount of material in the Office available for the discussion of Ocean Meteorology, and show that it is already too great to be dealt with, in any reasonable time, by the present staff of the Office, and with the methods hitherto in use.

Information  
supplied to  
India Office.

The India Office has undertaken the discussion of the meteorology of the Northern Indian Ocean, and of the Bay of Bengal; and a copy of the information for that region existing in the Office for the month of January was sent to Mr. Blanford in July 1876. The number of observations copied was about 11,400, the expense of copying, exclusive of the cost of data books, &c., was 94*l.* 8*s.* 4*d.*, and was borne by the India Office. The Council have reason to expect that the information for the remaining months of the year will also be required by the India Office.

District near  
Cape of Good  
Hope.

As regards the progress of the discussions during the year, it was stated in the last Report that in 1875 the investigation of the Meteorology of the district adjacent to the Cape of Good Hope had been undertaken, and that the preliminary correction and extraction of the observations into data books would probably be completed by about August 1878; and it may be anticipated, from the progress hitherto made, that this estimate will prove to have been correct. The actual district under discussion is shown in the subjoined chart:—



The degree of minuteness to which the inquiry is to be carried and the precise shape in which the results will be published is as yet undecided. The question of the most advantageous form for the representation of Meteorological results, in order as far as possible to meet the requirements, on the one hand, of the seaman, and on the other, of the scientific meteorologist, is one to which the Council are at present giving their close and careful attention.

In addition to the regular work of the Office in Maritime Meteorology the staff of the Marine Branch have also been partially engaged on an investigation into the weather of the North

Atlantic during the month of August 1873, which had been undertaken with the sanction of the Meteorological Committee, as explained in previous reports. All British shipowners were invited to send in materials, and the result has been that 280 logs were collected, containing, as the Council believe, a larger number of synchronous observations than has ever before been available for any similar discussion.

Synoptic charts for Atlantic in August 1873.

The object of the inquiry has been to illustrate the rise and progress of a very severe hurricane which wrought an immense amount of damage in the neighbourhood of Nova Scotia, Newfoundland, and Labrador, in the last week of the month.

Daily synoptic charts have been drawn for the entire month for 0h. 43m. Greenwich time, being the epoch of the synchronous observations taken at the suggestion of the Chief Signal Office at Washington. These charts have been lithographed, and the explanatory letter-press is nearly complete, so that the work will appear in the course of the ensuing autumn.

In Appendix IV. will be found a list of all the instruments supplied to ships in the Royal Navy during the year, with a statement of the entire stock and distribution of instruments standing on the books to the account of the Admiralty on the 31st March 1877. This latter statement is prepared from the latest returns furnished by the storekeepers at the respective dockyards, &c.

Stock of instruments.

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

#### WEATHER TELEGRAPHY.

The Council have to express their obligations to the Postal authorities for the endeavours which have been made to overcome the difficulties of correct transmission of the Meteorological Code Messages. In several of the recent Reports of the Office, the frequency of telegraphic mistakes has been mentioned, and, as a necessary consequence, a serious uncertainty in the issue of warning telegrams. This inconvenience has arisen from the known liability to error in the transmission of figures. In the month of December last instructions were issued from the General Post Office to spell out each figure as a word instead of transmitting the usual symbols for the figures, and the result has been a material improvement in the accuracy of the telegraphic reports.

Telegraphic communications.

The communication with all the stations excepting Sumburgh Head and Scilly has been maintained regularly throughout the year. As regards the former of these stations, the cable, which had parted in November 1876, was not repaired until June 18th, 1877. As for Scilly, the communication was interrupted by a storm early in January 1877, and was not restored at the close of March 1878.\* This defect in the system has been of serious

\* The cable was repaired in April 1878, and the first message received on the 20th of that month.

Telegraphic  
communi-  
cations.

moment to the telegraphic service, for, owing to the comparatively sheltered positions of Falmouth and Plymouth, the Office has been without sufficient intelligence of the weather at the entrance of the Channel.

The re-establishment of the communication with Jersey has been a measure from which the Office has derived considerable benefit, as regards information of weather prevailing on the French side of the Channel. In the year 1862, a station was organised by the late Admiral FitzRoy at St. Heliers, but in 1864, owing to the great cost of telegraphic communication, the regular reports were discontinued. As soon, however, as Jersey was included in the British Postal Telegraph System, the expense of communication was greatly reduced, and accordingly, as intimated in the last Report, the service was reorganised at the end of July 1877.

New station at  
Mullaghmore.

The Council have not been forgetful of the often expressed wish of their predecessors to have an additional station on the Atlantic coast; and Mullaghmore, a low-lying point on the southern shore of Donegal Bay, somewhat to the eastward of Sligo, has been mentioned as suitable for this purpose. The Post Office have expressed their readiness to extend their wires to Cliffony, a village situated close to Mullaghmore, provided a regular transmission of reports can be guaranteed, and the Council have every hope that this station will be in operation before the end of the ensuing summer.

Inspection of  
stations.

The stations were all inspected by Mr. Scott in the course of the year, with the exception of Nottingham, Sumburgh Head, and Roche's Point, which were not inspected, and of Cambridge and Yarmouth, which were inspected by Mr. Gaster. The interruption of the telegraphic communication with Sumburgh Head made the necessity for the inspection of that station less urgent.

Among the recommendations for the future operations of the Office, which were made by the President and Council of the Royal Society, in reply to an inquiry addressed to them by the late Treasury Committee,\* was one to the effect that two inspectors, one for Scotland and one for Ireland, should be appointed to visit from time to time the self-recording observatories and eye-observing stations.

The Council at an early date carried out this recommendation as regards Scotland by appointing Mr. Alexander Buchan, F.R.S.E., Secretary of the Scottish Meteorological Society, to the Scotch inspectorship.

No appointment has hitherto been made for Ireland, and in fact Mr. Buchan has not as yet been called upon to make a tour of inspection in Scotland, as that duty was discharged by Mr. Scott as usual in 1877.

Telegraphic  
reporters.

All of the telegraphic reporters are distinctly and immediately responsible to the Office. A list of their names will be found in Appendix VI. The only change among them which has taken

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\* Appendix IV. to the Report of the Treasury Committee.

place during the year has been that, at Hurst Castle, by permission of the Trinity House, the principal light-keeper has been appointed reporter in the place of the telegraphic signalman at the Fort.

At present, Stevenson's thermometer screens have been supplied to all the stations at which a suitable site for the erection of such a screen was obtainable. These stations number 18, leaving 12 where, for various reasons, the thermometric exposure cannot at present be improved. Thermometric exposure.

The arrangements with the "Times" for extra attendance in the Office, which have been described in the last Report, have been continued during the year 1877, and the expense thereby incurred, which has not been far short of 500*l.*, has been as before borne by that journal. Special arrangements with the "Times."

The advantage of these arrangements to the telegraphic system of the Office has been very great, and the Council must again express their warm recognition of the liberality which has allowed the Office the free use for scientific purposes of the 6 p.m. reports of which the entire cost has been borne by the "Times."

In accordance with a recommendation of the Treasury Committee, the Council have re-instituted the Sunday service of telegraphy which, as stated in the last Report, had been commenced on a temporary and tentative footing by the Committee in the winter of 1876-7, and suspended by the order of the Government in the month of April 1877. Sunday service of telegraphy.

The practice of the Office in the collection, discussion, and dissemination of the meteorological information received by telegraph has proceeded in 1877 as in previous years. A description of this practice will be found in Appendix VII., while the list of institutions and persons who received the daily weather charts free of cost in 1877 forms Appendix VIII. Storm warnings.

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 717 of the Board of Trade, issued in February 1874.

These stations were, at the end of March 1878, 129 in number, situated:

- 66 in England,
- 13 in Wales,
- 31 in Scotland,
- 13 in Ireland,
- 3 in the Isle of Man,
- 3 in the Channel Islands.

The usual comparison has been instituted between the warnings issued in 1877 and the weather experienced on our coasts. The results are shown in the following tables. The method of testing the warnings is fully explained in the last Report and will be found in Appendix VII. Results of storm warnings

RETURN of the Result of the Comparison between the Warnings issued and the Weather experienced in 1877.

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 Weather.	Warnings late, Force 9 reached at two Stations before issue.	Warnings partially late, Force 9 reached at one Station before issue.	Warnings in Error owing to Telegraphic mistakes.	Storms for which no Warning was issued.
Ireland, South -	55	31	13	6	1	3	1	Jan. 18, Jan. 28, Jan. 30.
„ East -	62	23	23	12	—	3	1	Jan. 28 <sub>p</sub> , Jan. 30.
Scotland, East -	48	26	10	11	—	1	—	Jan. 18 <sub>p</sub> , Jan. 25, Jan. 28, Jan. 30, Dec. 6, Dec. 24.
„ West (Clyde)	53	26	13	13	—	1	—	Jan. 18 <sub>p</sub> , Jan. 28, Jan. 30, Oct. 31 <sub>p</sub> , Dec. 26.
England, North-west	61	38	12	8	—	3	—	Jan. 18 <sub>p</sub> , Jan. 28, Mar. 7 <sub>p</sub> , Apl. 27 <sub>p</sub> , June 5 <sub>p</sub> , Nov. 20 <sub>p</sub> , Dec. 24, Dec. 26.
„ West -	52	33	13	5	—	—	1	Jan. 28, Jan. 30, Mar. 7 <sub>p</sub> , Apl. 27.
„ South -	60	34	13	9	—	4	—	Jan. 18 <sub>p</sub> ,* Feb. 22 <sub>p</sub> ,* Apl. 27 <sub>p</sub> ,* Aug. 25,* Oct. 15 <sub>p</sub> , Nov. 20,* Nov. 22, Nov. 24.
„ South-east -	28	14	11	3	—	—	—	Jan. 11, Nov. 22.
„ East -	56	28	15	11	—	2	—	Nov. 22.
Totals -	475	253	123	78	1	17	3	
Per-centages -	—	53·3	25·9	16·4	0·2	3·6	0·6	

\* p in the last column indicates that the storm was only partially felt.

\* Storms on the S. Coast marked thus were only felt at the entrance to the Channel.

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

If these figures be compared with those for the previous years in which the system has been checked, we arrive at the following results in per-centages:—

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
1870	349	46·7	21·7	<b>68·4</b>	22·4
1871	299	46	17·7	<b>63·7</b>	22·0
1872	379	61	19·5	<b>80·5</b>	11·9
1873	250	45·2	34·0	<b>79·2</b>	16·8
1874	317	45·4	32·8	<b>78·2</b>	16·4
1875	248	41·1	35·1	<b>76·2</b>	21·0
1876	265	61·1	21·5	<b>82·6</b>	11·7
1877	475	53·3	25·9	<b>79·2</b>	16·4

These results show that while the general proportion of success is maintained at about 80 per cent. as in the last five years, the per-centage of warnings justified by subsequent gales has been reduced by 7·8 per cent. as compared with its value in 1876, while the per-centage of warnings justified by “strong winds” has been increased in the year 1877 by 4·4.

It must be remembered in connexion with this table that as the Office has to issue its warnings on the appearance of the first premonitory symptoms of a gale, it frequently has only winds of forces 6 and 7 to show in justification of its warnings. These winds are, however, quite as much as ordinary yachts and coasting craft can easily face, especially if they come suddenly and with a considerable change in the direction of the wind. Results of storm warnings.

It will be seen that the year 1877 formed no exception to its predecessors as regards the inability of the Office, with the means at its disposal, to issue timely warnings for every storm which visits our coasts. The last column of the Return shows that the East coast of Scotland, the Irish Sea, and the entrance to the Channel have been the districts where these unforeseen gales have most frequently occurred during 1877. As regards the last-named district this circumstance is doubtless in some degree attributable to the absence of reports from Scilly during the entire year.

The Council would here express their appreciation of the public spirit evinced by Mr. James Gordon Bennett, of the "New York Herald," in his attempt to supplement the European storm-warning system by means of warning telegrams from America. These warnings have been prepared by Mr. Jerome J. Collins,\* and have been telegraphed to the London office of the "New York Herald." Transatlantic telegrams.

The Council are fully aware of the great importance attaching to any new source of information as to weather coming from the west; but, so far as the experiment has as yet been tried, they have not found that a combination of the telegraphic intelligence received from America, with that derived from the sources ordinarily available, would have enabled the Office to issue warnings in any of the cases in which it did not actually do so.

The Office has continued its active co-operation in the system of synchronous observations, at 0h. 43m. p.m. Greenwich time, which was organised in 1873 by the Chief Signal Office at Washington. Synchronous observations.

The list of observers who have supplied these returns during 1877 will be found in Appendix X. It will be found to comprise the names of about 40 observers resident in the United Kingdom, while most valuable information has been supplied by the Army Medical Department, and by colonial observers, from extra-European stations which serve to extend the network of observation over the entire globe.

The Office has inserted in its new form of log a sheet for the entry of such special synchronous observations at sea, and this sheet has been filled by seventeen of the captains.

The Office has continued its co-operation with Captain Hoffmeyer in his issue of Synoptic Charts for 1875, and has not

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\* The principles on which these warnings are issued have been explained by Mr. Collins in papers published in "Nature" for May 2, 9, and 16, 1878. Two articles on the results of the warnings in 1877 have appeared in the "New York Herald," of February 22 and April 5, 1878. A comparison of the warnings with the weather recorded at the Meteorological Office has been published by Mr. Scott, in the "Nautical Magazine" for March 1878.

only subscribed for a certain number of copies of the work, but has also supplied him, free of charge, with a copy of all observations in the logs which had been made during the year at the hour of 8 a.m., over the area covered by his charts.

New Weekly  
Weather  
Report.

It was one of the recommendations of the Treasury Committee that the Office should endeavour to publish Meteorological Returns available for sanitary and agricultural purposes. The Council addressed themselves to several gentlemen, recognized as authorities upon these subjects; and ultimately the form shown in Appendix XI. was adopted, and is now issued under the title of the "Weekly Weather Report." This Report is published by Mr. Potter (Poultry), and Mr. Stanford (Charing Cross), at an annual subscription of 12s. 6d., post free, and is not issued by the Office to subscribers like the lithographed Daily Weather Report.

The object of the Weekly Weather Report is to show the temperature and the rainfall of the several districts of the United Kingdom. Of these districts ten are represented on the form published in the newspapers, embracing in a general way the surface of the British Isles with the exception of the Highlands of Scotland. The stations in each district which furnish the returns are shown in the index map on page 1 of the Report, and it will be seen that they are pretty uniformly distributed over England and part of Scotland, but that from Ireland additional information would be most desirable. The Council have to express their sincere thanks to the Meteorological Society (of London) for supplying, at a nominal cost, weekly returns from six of its stations for the purpose of this Report.

The first page of the Weekly Weather Report is intended for re-publication in the newspapers, and only aims at an accuracy of whole degrees for the temperature and of tenths of an inch for rain. This appears to be amply sufficient, considering the small number of stations taken to represent each district. On page 2, detailed tables for the individual stations give the average temperature to tenths of a degree, and the rainfall to hundredths of an inch. Pages 3 and 4 contain a short report of the weather for each day, illustrated by charts drawn on a small scale, of pressure, temperature, wind, state of the sky, and rain.

Barometer  
Manual and  
Weather  
Guide.

The Board of Trade Barometer Manual (Edition 1871) having been for several years out of print, the Meteorological Committee had in the commencement of 1877 instructed Mr. Scott to prepare a draft of a new edition. The Council have since been fortunate enough to secure the services of the Rev. W. Clement Ley to co-operate with the Secretary in the production of this Manual, and they hope that with his assistance and that of the Hon. Ralph Abercromby, who also consented to join in the work, the Manual may be made a fair representation of the present condition of scientific weather knowledge in these Islands.

Fishery  
barometers.

Public Barometers have as usual been issued on loan to small ports and fishing stations,—and up to the end of the year 143 stations on our coasts had been supplied by the Office with

barometers for public use. They were situated, 55 in England, 5 in Wales, 48 in Scotland; 33 in Ireland, and 2 in the Isle of Man. See Appendix XII.

#### LAND METEOROLOGY OF THE BRITISH ISLANDS.

The seven observatories, Aberdeen, Glasgow, Armagh, Valencia, Stonyhurst, Falmouth, and Kew, have been maintained in regular action since the date of last Report. They were all inspected during the year by Mr. Whipple, Superintendent of Kew Observatory, when the instrumental arrangements were thoroughly examined, and, if found in any way defective after their nine years' service, were set right. The observatories.

New scale values for the barographs at several of the observatories have been prepared during the year, the thermographs having been dealt with in 1876, as explained in last Report.

The necessary measurements of the curves have all been effected in the Office, and the unavoidable consequence has been a delay in the production of the plates for the Quarterly Weather Report. Another interruption to the work of preparing the plates for 1876 has been occasioned by the engraving of the entire series of automatic records for Greenwich for the year 1875, as hereafter described in this Report. Experiments in the reproduction of electrograms from Kew have also occupied some part of the time of the staff.

The volume of the Quarterly Weather Report for 1875 is nearly complete. It contains, in addition to the usual information, mean results for all the observatories for the *lustrum*\* 1871-5, and also Means for Pressure, Temperature, and Rainfall for the Telegraphic Reporting Stations. Quarterly Weather Report.

As has just been stated, the plates for the Quarterly Weather Report for 1876 have not yet been engraved, but the Hourly Tabulations for 1877, including the results for Vapour Tension which have been specially calculated for each hour, are in the lithographer's hands, and the numbers for the first nine months of the year have been issued.

As regards the numerical discussions, the calculations of Daily, Five-Day, and Monthly Means for Temperature, (Dry and Wet,) and for Pressure are complete up to the end of 1877.

The Council have to express their thanks to Sir W. Thomson for lending them the working model of his Harmonic Analyser, described in the Proceedings of the Royal Society, vol. xxvii., p. 371. The preliminary trials which they have already made with this model give them ground for hoping that the instrument, when in a completed form, may serve to relieve the staff from the labour of much numerical calculation. Thomson's Harmonic Analyser.

The registering sun-dial, devised by Mr. J. F. Campbell, of Islay, has been employed at Kew during the whole year. Two forms of this instrument are in use. One furnishes a rough measure of the total effect of the heating power of the sun for the Registration of solar heat.

\* The term *lustrum* is conventionally understood to imply a period of five years, ending with a year, of which the number is a multiple of five, as above.

interval between two solstices by the amount of wood burnt out of a hemispherical bowl of mahogany, turned to the exact focal length of a glass sphere placed concentrically with the bowl. The other gives a record of the time during which the sun has shone during the day, and has emitted sufficient heat to burn a hole in a strip of millboard, which is placed in a curved clip, at the proper focal distance. The daily results obtained with this instrument are published in the "Times," every week, by the Kew Committee.

Anemometers  
at high levels.

The Council have had under consideration the desirability of obtaining information as to the wind prevailing at various heights above the surface of the ground; and as a first step, they are making arrangements for the erection, on some elevated building in London, of an anemometer connected telegraphically with the Office, so as to secure more accurate information of the wind blowing over London than is obtainable at a lower level.

Observations of  
cloud motion.

The Council have also engaged, in an attempt to determine the height of clouds, and the direction and velocity of the wind at that height from time to time, by simultaneous photographs taken at two stations a known distance apart, followed by a second photograph taken at one at least of the two stations, after a short interval of time. They hope that it may prove to be possible in this way to measure direction and velocity of the wind at considerable elevations, where it is less liable to be affected by the character of the ground as to the presence of hills, trees, houses, &c. than it is at places where anemometers can be erected.

Mr. Malloch has recently applied photography to a determination of the heights of clouds.\* The method which the Council contemplate, embracing direction and velocity as well, is different in several respects from that employed by Mr. Malloch. As the attempt has not as yet advanced beyond preliminary trials, it is unnecessary to dwell longer upon it in the present Report.

Von Oettingen's Wind  
Component  
Integrator.

The Office has obtained the Wind Component Integrator, of Prof. Arthur von Oettingen, from the guarantors of the Loan Exhibition at South Kensington. This instrument has been erected at Kew, and is now being tested there.

Comparison of  
records at Kew  
and Greenwich.

The question of the number and distribution of the continuously self-recording stations, which ought to be permanently maintained in the British Islands, is one which must engage the serious attention of the Council. At present data are wanting by which to ascertain the necessary degree of vicinity of such stations, in order to afford a meteorological knowledge of the country, to any specified degree of exactness. It may be found that most of the numerous small and rapid changes exhibited by the curves depend upon causes of a purely local character, or, on the other hand, that these phenomena are constant over a considerable area, and are not to be disregarded even in a compendious examination of the weather.

For the purpose of obtaining some of the required data, the Council applied to the Astronomer Royal for the loan of a series of the Greenwich curves, with permission to reduce and adapt

\* "Nature," Vol. xv., p. 313.



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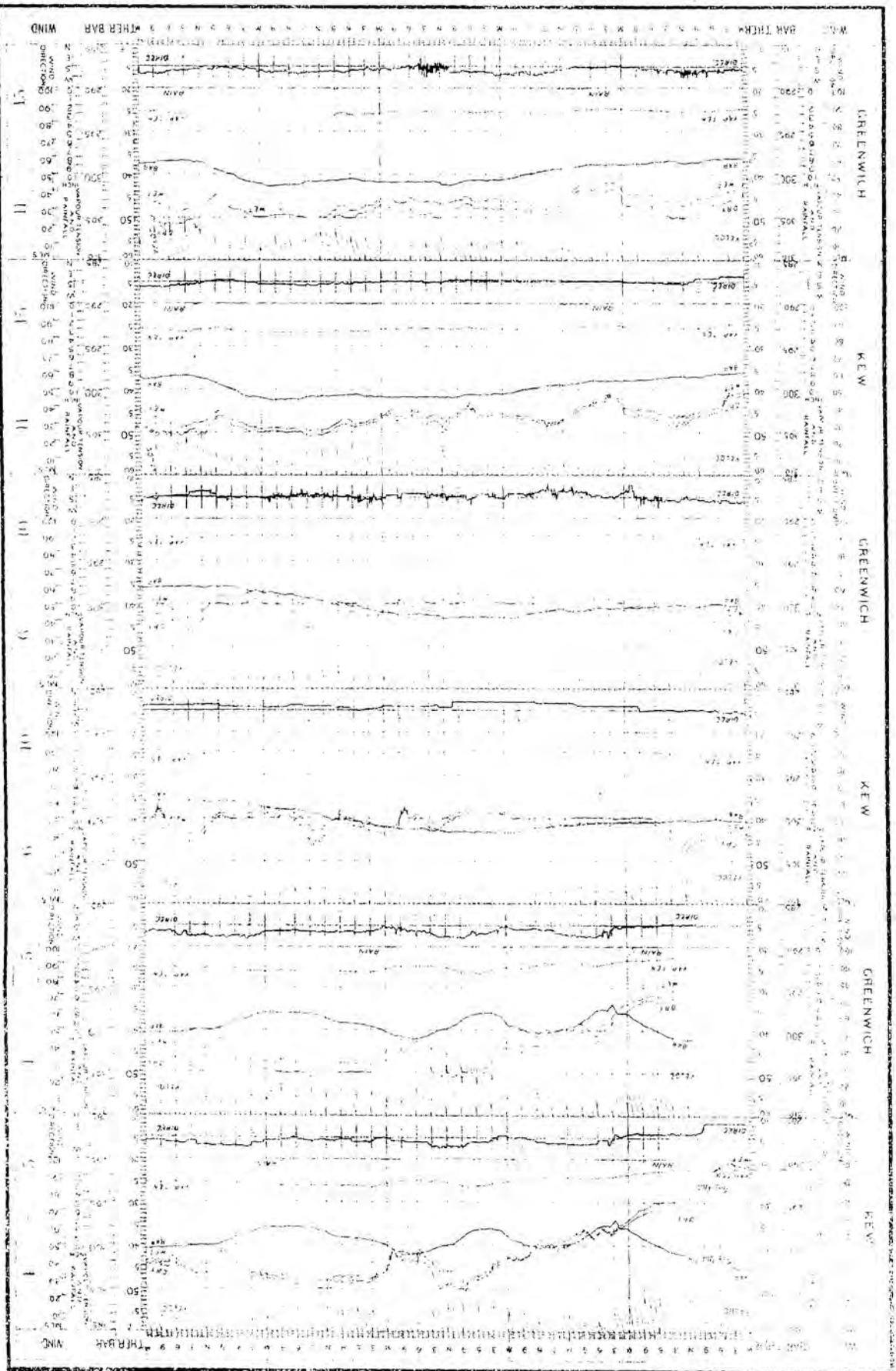
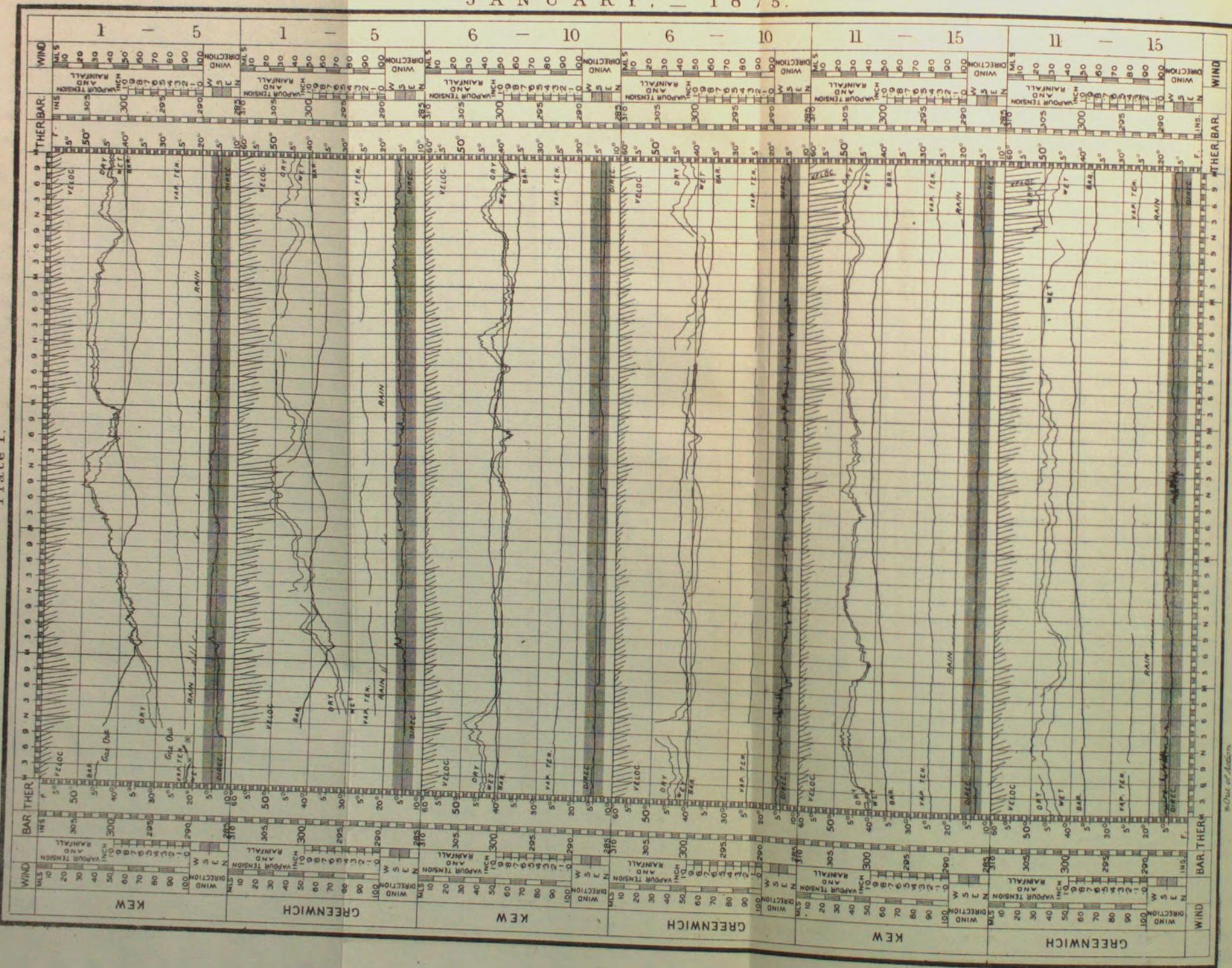


Plate I

Plate I.

To face p. 17.



them to the same scale as those in the Quarterly Weather Report of the Meteorological Office, and to publish selections from them side by side with those of Kew, the distance between the two observatories being only 14 miles. The curves of the year 1875 have been treated on this principle; the plates, of which Plate I. is a specimen, are already engraved, and it is expected that the results will before long be ready for publication.

The Council have devoted some attention to the discussion of the records of atmospheric electricity, furnished by Sir W. Thomson's self-registering electrograph, which the Office has maintained in action at Kew Observatory for the last four years. They have been favoured by Prof. J. D. Everett with a notice of the experiments hitherto conducted at Kew in this direction, which they reproduce as a special Appendix to this Report.

Atmospheric electricity.

In addition to the information derived from the seven observatories, continuous records of the wind are received from the following stations, which are all provided with anemographs similar to those erected at the observatories.

Information from anemometers.

Station.	Supplied by	Superintended by
Alnwick Castle	- Duke of Northumberland, K.G.	Major F. Holland,
Holyhead	- Meteorological Office	- The Harbour authorities.
Orkney	- "	- Rev. C. Clouston, LL.D.
Seaham	- L. J. Crossley, Esq.	- G. H. Aird.
Yarmouth	- Meteorological Office	- Secretary, Sailors' Home.

Applications are frequently made to the Office for information as to wind and weather in the case of legal proceedings arising from wrecks, collisions, &c. Owing to the continuity of action of the anemographs their records have become of considerable importance to public interests.

In previous annual Reports it has been explained that in 1874 the Permanent Committee of the Vienna Meteorological Congress proposed a scheme for the publication of returns from different countries on a uniform plan, and fixed an inferior limit for the number of stations in each country which might reasonably be expected to furnish returns. The Council have agreed to continue their co-operation of the Office in this plan of combined action.

International scheme for publication.

The number of stations suggested for the British Islands was fifteen; but as it appeared desirable that returns should be received from a larger number of stations, arrangements have been entered into between the Office and the Meteorological Society (of London), as explained in the Report for 1874, in virtue of which the Society supplies certain returns for publication on the international form, the cost of copying being defrayed by the Meteorological Office.

Arrangements with the Meteorological Society.

The following is the list of stations (33 in number), from which returns for the year 1877 are being published on this international plan, either in full or as monthly summaries of mean results:—

Names of Stations.	Observers.
<b>ENGLAND AND WALES.</b>	
A* Audley End, Essex - - - - -	Mr. J. Bryan.
A* Babbicombe - - - - -	E. E. Glyde, F.M.S.
A* Buxton, Derbyshire - - - - -	E. J. Sykes, F.R.A.S., F.M.S.
A* Carmarthen - - - - -	G. J. Hearder, M.D.
Chatham, Kent - - - - -	Lieut.-Col. C. M. Martin, R.E.
* Cheadle, Cheshire - - - - -	J. C. Philips, Esq.
Chigwell Row, Essex - - - - -	J. Campbell, Staff Surgeon, R.N.
A* Churchstoke, Montgomery - - - - -	Philip Wright, F.C.S., F.M.S.
A* Dartmoor Prison, Devonshire - - - - -	R. E. Power, L.R.C.P., F.M.S.
A Durham - - - - -	G. A. Goldney, Esq.
Folkestone - - - - -	A. Henry Taylor, Esq.
A Hastings, Sussex - - - - -	Alex. E. Murray, F.M.S.
A* Hawes, Yorkshire - - - - -	Rev. J. Dunne Parker, LL.D., F.M.S.
A* Hereford - - - - -	T. Algernon Chapman, Esq.
A* Hillington, Norfolk - - - - -	Rev. H. Ffolkes, F.M.S.
Hull, Yorkshire - - - - -	Rev. W. P. Mackay, M.A., M.D.
A* Kelstern, Lincolnshire - - - - -	D. G. Briggs, F.M.S.
Leicester - - - - -	W. J. Harrison, F.G.S.
* Llanludno - - - - -	J. Nicoll, M.D., F.M.S.
A* Marlborough, Wilts - - - - -	Rev. T. A. Preston, M.A., F.M.S.
A Oscott, Warwickshire - - - - -	Rev. S. J. Whitty, B.A.
Prestwich, Lancashire - - - - -	T. R. H. Clunn, M.D.
A* Ramsgate - - - - -	Rev. A. E. O'Gara, O.S.B., F.M.S.
A St. Aubin's, Jersey - - - - -	J. E. Vibert, M.A.
Seaham, Durham - - - - -	Mr. G. H. Aird.
A* Strathfield Turgiss, Hants - - - - -	Rev. C. H. Griffith, F.M.S.
A Uppingham, Rutlandshire - - - - -	Rev. G. H. Mullins, M.A.
A* Wakefield - - - - -	H. Clarke, F.M.S.
<b>SCOTLAND.</b>	
A Glenalmond, Perthshire - - - - -	Rev. W. P. Robinson, D.D.
Sandwick Mause, Orkneys - - - - -	Rev. C. Clouston, LL.D.
<b>IRELAND.</b>	
A Dublin - - - - -	J. W. Moore, M.D.
A Markree Castle, Sligo - - - - -	E. Salles, for Col. Cooper, F.R.A.S.
A Parsonstown (Birr Castle), King's Co. - - - - -	J. Dreyer, M.A., for the Earl of Rosse, F.R.S.

The stations marked A in the preceding list are those for which the observations are being published for 1877 *in extenso*. Those marked with an asterisk are stations in connexion with the Meteorological Society (of London) from which returns are received, as already explained.

It has been usual to publish these returns in the form of Appendices to the Quarterly Weather Reports, but for 1877 they will be issued as a separate publication.

Returns from  
extra stations.

In addition to the above, returns of various degrees of completeness are received from the following observers, besides monthly copies of the observations taken at all the telegraphic stations:—

Names of Stations.	Observers.
<b>ENGLAND.</b>	
Alnwick Castle, Northumberland - - - - -	Major F. Holland, for the Duke of Northumberland, K.G.
Barnstaple, Devonshire - - - - -	W. Knull.
Chiswick (Royal Horticultural Society), Middlesex - - - - -	Thomas R. Sim.

Names of Stations.	Observers.
<b>ENGLAND.</b>	
Cooper's Hill (Indian Civil Engineering College)	
Surrey - - - - -	Prof. H. McLeod, F.C.S.
Harpenden, Hertfordshire - - - - -	T. Wilson, F.M.S.
Helston, Cornwall - - - - -	M. P. Moyle, M.D.
Killingholme, Lincolnshire - - - - -	Rev. J. Byron, F.M.S.
Norwich - - - - -	J. Quinton, junr.
Rugby, Warwickshire - - - - -	J. M. Wilson, F.R.A.S.
Saffron Walden, Essex - - - - -	J. G. Bellingham, Esq.
Sheffield, Yorkshire - - - - -	W. F. Cooper, F.M.S.
Silloth, Cumberland - - - - -	Rev. F. Redford, F.R.S.E.
Southport, Lancashire - - - - -	J. Baxendell, F.R.A.S.
Stockbridge, Hampshire - - - - -	C. B. Scott.
Winchester, Hampshire - - - - -	Rev. G. Richardson, M.A.
<b>SCOTLAND.</b>	
Annanhill, Ayr - - - - -	W. H. Dunlop, F.M.S.
Fair Isle - - - - -	W. Lawrence.
Laudale - - - - -	T. H. G. Newton.
<b>IRELAND.</b>	
Ennis, Co. Clare - - - - -	J. Hill, C.E.

It will be seen from these lists of stations that the climate of England and Wales is already well represented, but as regards Ireland and Scotland very few stations are available. The Council, however, hope to effect gradually an improvement in this respect.

The Registrar General for Ireland, having commenced with the year 1877 the publication of Meteorological Tables in his Returns, has made application to the Council to supply him with the requisite information, and accordingly reports from the stations connected with the Office have been furnished to him regularly, viz., from four stations for his Weekly, and from five for his Quarterly Returns. For the year 1878 the numbers will be five for the Weekly and six for the Quarterly Returns.

Information supplied to the General Register Office, Ireland.

#### LIBRARY.

In consequence of the constant reference which is made to the Office for information on meteorological questions, a small library has been formed, containing the standard works on Meteorology, and allied subjects.

The library at present consists of nearly 3,000 volumes, with above 2,500 pamphlets, exclusive of charts and MS. records of observations. The pamphlets are bound in convenient volumes for reference. The books, &c. are accessible to the staff of the Office, and to other scientific men, under the necessary restrictions.

Appendix XIII. 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.

#### REVENUE AND EXPENDITURE.

Appendix XIV. shows the receipts and payments during the year ending 31st March 1878. The statement shows a con-

siderable contrast to those of preceding years, owing to the change in the constitution and arrangements of the Office which has taken place. The receipts during the year, exclusive of a balance of 645*l.* 19*s.* 6*d.* at the commencement, amounted to 13,935*l.* 17*s.* 6*d.*, and the payments amounted to 14,072*l.* 14*s.* 0*d.*, leaving a balance of 509*l.* 3*s.* 0*d.* on the 31st March 1878.

The following abstract of the revenue account shows the true charge for the year, and its distribution under the various heads of expense, together with the increase or decrease in the year 1877-8.

	1876-77.			1877-78.			Increase.			Decrease.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
INCOME - -	10,945	0	8	12,146	1	7	1,201	0	11	-	-	-
Payment of Council -	-	-	-	749	19	10	749	19	10	-	-	-
Secretary - -	800	0	0	800	0	0	-	-	-	-	-	-
Researches, &c. -	-	-	-	52	0	6	52	0	6	-	-	-
Office salaries, &c. -	586	15	9	621	6	5	34	10	8	-	-	-
Rent, attendance, and contingencies -	936	19	10	903	9	0	-	-	-	33	10	10
Land Meteorology -	3,646	6	1	3,542	15	9	-	-	-	103	10	4
Telegraphy - -	2,862	10	2	3,194	13	1	332	2	11	-	-	-
Ocean Meteorology -	2,045	1	2	2,325	13	1	280	11	11	-	-	-
EXPENDITURE -	10,877	13	0	12,189	17	8	1,449	5	10	137	1	2

In this abstract, the figures shown under income and expenditure are the net amounts for the year; all items of expense for which the Office would be reimbursed being first deducted. These figures show that although, as stated on p. 5, the increase to the vote was 2,000*l.*, the real increase of income as compared with the previous year was only about 1,200*l.*, owing to there being a larger available balance at the commencement of 1876-7. The expenditure under the head "Payment of Council," is for nine months only. The increase under the head "Telegraphy" is partially due to the maintenance of Sunday Telegraphy for the greater portion of the latter year; besides this, the salary of the Inspector for Scotland became first chargeable in October 1877. The increase under Ocean Meteorology is chiefly due to the replenishing of the stock of instruments.

Appendix XV. gives a list of the staff of the Office together with their salaries and occupations. These salaries are calculated for a day of six hours, but the hours of work have been increased by the Council to eight and in a few cases to nine daily, with a proportional increase of pay, in lieu of the system of overtime which had previously existed in the Office.

HENRY J. S. SMITH,  
Chairman of the Council.

## APPENDIX.

### APPENDIX A.

#### ACCOUNT OF THE EXPERIMENTS ON ATMOSPHERIC ELECTRICITY, CONDUCTED AT KEW OBSERVATORY.—BY PROF. J. D. EVERETT.

Apparatus for obtaining a continuous record of atmospheric electricity by a method devised by Sir William Thomson, was first erected at Kew Observatory in 1861, and continued in operation till the middle of 1864. From this date to the beginning of 1874, although attempts were made to continue the observations with a more modern form of Sir W. Thomson's electrometer, and with a gas-burner for collector instead of a water-dropper, these attempts were unsuccessful.

In the year 1867 the Meteorological Committee ordered one of Sir W. Thomson's self-recording electrometers, but the instrument was not delivered for a long time, and it was not until the beginning of 1874 that the apparatus now in use was erected. Accidental derangements, the causes of which could not be detected, have introduced breaks, one lasting for about a month, and another for six months. The apparatus is now working regularly, and it is believed that the experience which has been gained will prevent the recurrence of such interruptions.

The present apparatus consists of the following parts:—

I. A water-dropping collector; that is to say, an insulated metallic vessel, from which water flows through a discharge pipe in a fine stream into the open air. The nozzle of the pipe is 1.75 metre distant from the wall of the building, and 3.2 metres above the ground. Previous to May of the present year (1878) it was 3.5 metres above the ground; the discharge pipe having in that month been bent downwards in order to increase the rate of flow.

In such an arrangement every drop, as it breaks away from the continuous stream, carries away (in general) electricity, either positive or negative, and this process of electric convection continually tends to bring about electric equilibrium; but this equilibrium is never, except for an instant, attained, by reason of the continual variation of the potential at a given point in the air. When equilibrium is attained there is no charge of electricity residing on that part of the continuous stream at which the drop breaks away, and hence there is no difference of potential between the stream and the air at this point. The continuous stream, and the insulated conductor connected with it, are therefore at the same potential as that point in the air at which the stream breaks into drops. The actual potential of the conductor, at any instant, differs very little from the potential at this point, except when

extremely sudden changes of potential are taking place in the air. Something less than a minute would suffice to establish sensible equilibrium, even with a very large initial difference of potential, if the potential of the air were stationary.

II. A Thomson's quadrant electrometer, having one of its electrodes connected with the insulated conductor above mentioned, and the other with the earth, so that the instrument indicates the difference between the potential of the insulated conductor and that of the earth.

The electrometer contains a "replenisher," by means of which the charge of its Leyden jar can be very gradually increased or diminished at pleasure, so as to keep it nearly constant, in spite of the inevitable loss by leakage. It also contains a gauge which shows at a glance whether the charge is below or above the standard amount.

Quite recently, from observations made in Mr. De La Rue's laboratory, by means of a thousand of his silver-chloride cells, the indications of the electrometer have been reduced to volts.

III. The apparatus for photographic registration. The needle of the electrometer carries a mirror, which throws an image of a lamp flame upon photographic paper slowly drawn upwards by clockwork, and the movements of the mirror to left and right are thus recorded in the shape of a curve traced on the paper. A fixed mirror at the same time throws upon the paper an image in the position corresponding to zero, thus tracing on the paper a zero line. The curve lies on one or the other side of this line, according as the potential of the insulated conductor is greater or less than that of the earth.

In the earlier observations above mentioned, the apparatus was nearly similar to that now employed, except as regards the electrometer. This was the "divided ring" instrument, in which, instead of a box divided into four quadrants with a symmetrical needle inside it, there was a flat ring cut in halves along a diameter, the needle being suspended so that one of its ends, in the position of equilibrium, was over one extremity of this diameter, and the other, about which it turned, over the centre. The connections of the two half rings were the same as the connections of two adjacent quadrants in the present instrument. There was no replenisher for keeping the charge of the jar constant, but this charge was directly measured every day at about 10h. 30m. a.m., and if it was then found to be below a certain minimum a fresh charge was given. The maximum charge exceeded the minimum by about 30 per cent. of the latter.

The curves for the two years commencing with June, 1862, and ending with May, 1864, were sent to Sir William Thomson, at whose request they were reduced by Professor Everett. The results, along with the results of eye observations of atmospheric electricity at a station in Nova Scotia, are given in a paper by him in the *Philosophical Transactions* for 1868 (pp. 347-361). The following table (Table II. in the original) exhibits the most important of these results. The unit employed is purely arbitrary.

	23 <sup>h</sup> .	0 <sup>h</sup> .	1 <sup>h</sup> .	2 <sup>h</sup> .	3 <sup>h</sup> .	4 <sup>h</sup> .	5 <sup>h</sup> .	6 <sup>h</sup> .	7 <sup>h</sup> .	8 <sup>h</sup> .	9 <sup>h</sup> .	10 <sup>h</sup> .	11 <sup>h</sup> .	12 <sup>h</sup> .	13 <sup>h</sup> .	14 <sup>h</sup> .	15 <sup>h</sup> .	16 <sup>h</sup> .	17 <sup>h</sup> .	18 <sup>h</sup> .	19 <sup>h</sup> .	20 <sup>h</sup> .	21 <sup>h</sup> .	22 <sup>h</sup> .	Mean.	
1862.																										
June	1.41	1.43	1.44	1.49	1.63	1.72	1.80	1.79	1.84	1.90	2.22	2.32	1.91	1.74	1.64	1.46	1.42	1.27	1.31	1.35	1.59	1.96	1.73	1.42	1.64	1.64
July	1.60	1.60	1.54	1.41	1.11	1.05	1.06	1.06	1.08	1.02	2.18	2.17	2.07	1.65	1.37	1.26	1.10	1.08	1.04	1.21	1.70	2.04	1.94	1.67	1.54	1.54
August	1.66	1.60	1.46	1.35	1.30	1.12	1.30	1.57	1.89	2.31	2.39	2.22	2.14	1.80	1.69	1.60	1.34	1.33	1.44	1.58	1.88	2.44	2.57	2.28	1.78	1.80
September	1.60	1.40	1.30	1.49	1.31	1.48	1.69	2.31	2.68	2.90	2.84	2.38	2.31	2.06	1.66	1.49	1.38	1.39	1.28	1.10	1.18	1.79	2.08	1.97	1.70	1.80
October	1.68	1.81	2.03	2.16	2.17	2.55	2.73	3.18	3.17	3.41	2.97	2.70	2.07	1.81	1.70	1.48	1.26	1.40	1.39	1.21	1.41	1.78	1.92	1.90	1.90	2.09
November	3.00	3.08	3.03	3.23	3.28	3.33	3.61	3.91	4.09	4.13	4.10	3.83	3.71	3.61	3.61	3.17	3.21	3.19	2.94	2.98	2.98	3.01	3.38	3.46	3.41	3.41
December	2.55	2.74	2.61	2.29	2.30	2.44	3.01	3.49	3.80	3.88	3.78	3.12	2.64	2.34	1.97	1.61	1.63	1.59	1.66	1.71	1.75	2.23	2.73	2.71	2.53	2.53
1863.																										
January	2.16	2.50	2.20	2.50	2.42	2.61	2.86	3.25	3.62	3.73	3.50	3.10	2.52	1.97	1.56	1.29	1.13	1.09	1.03	1.11	1.25	1.66	1.93	1.99	1.99	2.20
February	3.00	2.82	2.67	2.65	2.61	2.78	3.12	3.77	4.01	3.81	3.84	3.64	3.23	2.82	2.30	2.09	1.92	1.88	1.90	1.90	1.92	2.26	2.78	2.90	2.84	2.84
March	2.17	2.12	1.90	1.91	1.98	2.17	2.14	2.65	2.93	3.08	3.02	2.80	2.45	2.21	2.21	2.26	2.21	2.03	2.12	2.28	2.90	3.26	3.15	2.72	2.47	2.47
April	1.36	1.43	1.28	1.44	1.54	1.88	1.71	1.98	2.47	2.76	2.71	2.88	2.59	2.22	1.88	1.68	1.71	1.70	1.65	1.90	2.61	2.49	2.17	1.70	1.96	1.96
May	1.07	1.05	1.16	1.10	1.01	1.07	1.13	1.26	1.51	1.81	2.08	2.16	1.97	1.59	1.48	1.32	1.14	1.18	1.33	1.62	1.79	1.74	1.38	1.23	1.43	1.43
June	1.11	1.10	1.20	1.12	1.13	1.24	1.30	1.45	1.85	2.01	2.02	2.04	1.87	1.63	1.33	1.10	1.08	1.21	1.30	1.40	1.40	1.74	1.83	1.39	1.20	1.45
July	1.08	1.06	1.02	1.07	1.05	1.06	1.07	1.18	1.38	1.63	1.83	1.91	1.88	1.67	1.40	1.31	1.24	1.13	1.05	1.20	1.71	1.95	1.74	1.38	1.37	1.37
August	1.30	1.34	1.42	1.44	1.49	1.44	1.56	1.66	1.78	1.90	1.95	1.92	1.69	1.50	1.28	1.13	1.00	0.98	1.02	1.27	1.71	1.68	1.48	1.29	1.46	1.46
September	1.41	1.51	1.41	1.44	1.49	1.44	1.95	2.36	2.76	2.71	2.63	2.62	2.27	1.87	1.63	1.49	1.24	1.40	1.26	1.52	1.68	1.91	1.90	1.76	1.82	1.82
October	1.85	2.23	2.56	2.60	2.41	2.36	2.72	2.71	2.86	2.92	2.79	2.38	1.90	1.62	1.60	1.55	1.42	1.36	1.13	1.22	1.74	2.24	2.77	2.43	2.13	2.13
November	2.80	2.88	2.72	2.77	2.98	3.35	3.56	3.88	3.63	3.51	3.55	3.20	3.03	2.83	2.49	2.30	2.22	2.14	2.26	2.37	2.74	3.24	3.24	3.18	2.98	2.98
December	3.14	3.55	3.32	3.18	3.48	3.51	3.95	4.16	4.36	4.17	3.89	3.53	3.15	2.64	2.28	2.11	1.95	1.85	1.75	1.85	2.20	2.82	3.31	3.41	3.11	3.11
1864.																										
January	3.32	2.92	2.90	2.98	3.29	3.74	3.91	4.31	4.20	3.92	3.52	2.97	2.31	2.28	1.85	1.52	1.42	1.31	1.06	1.18	1.75	1.96	2.33	2.72	2.61	2.61
February	2.40	2.48	2.31	2.50	2.47	2.61	3.19	3.46	3.85	4.00	3.91	3.55	2.86	2.57	1.97	1.91	1.91	1.97	2.01	2.15	2.37	2.90	2.75	2.62	2.69	2.69
March	2.51	2.53	2.60	2.57	2.57	2.87	3.01	3.26	3.76	4.07	4.14	3.90	3.25	2.91	2.64	2.31	2.32	2.20	2.33	2.54	2.85	3.20	3.15	2.84	2.93	2.93
April	1.38	1.22	1.22	1.35	1.61	1.68	1.62	2.06	2.56	2.60	2.70	2.58	2.21	1.96	1.72	1.46	1.28	1.24	1.23	1.52	1.97	2.15	1.84	1.34	1.77	1.77
May	1.92	1.82	1.72	1.77	1.81	1.91	1.91	1.97	1.88	1.60	1.72	1.68	1.76	1.56	1.39	1.42	1.36	1.13	0.91	1.01	1.24	1.20	1.10	0.93	1.17	1.17
Sums	45.81	47.12	46.08	46.34	46.91	49.91	55.00	62.02	68.73	71.09	70.43	63.69	58.01	50.89	44.68	40.39	37.91	37.05	36.45	39.58	46.97	54.29	54.76	51.05	51.16	51.16
Means	1.91	1.96	1.92	1.93	1.95	2.08	2.20	2.58	2.86	2.96	2.93	2.74	2.42	2.12	1.86	1.68	1.58	1.54	1.52	1.64	1.96	2.26	2.28	2.13	2.13	2.13

The values given in this table are derived from all available observations. Observations during times of great electric disturbance were not available, owing to the spot of light having passed off the photographic paper, or having failed to leave a distinct trace.

The "diurnal curves," Plate II., Fig. 1, are obtained by plotting the numbers in the body of this table; and the "annual curves," Fig. 2, by plotting the numbers in the last column.

By applying harmonic analysis to the numbers in the last line and last column respectively, the following values were obtained for the coefficients  $A_1$ ,  $E_1$ ,  $A_2$ ,  $E_2$  in the formula

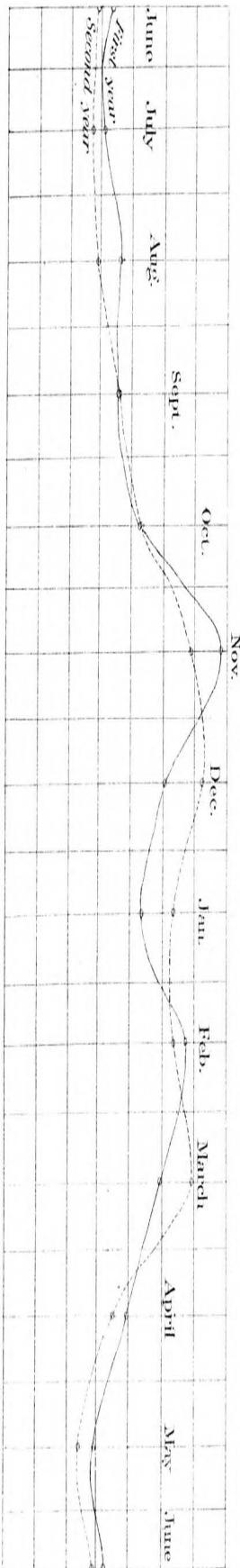
$$A_0 + A_1 \sin \left( \frac{t}{T} 360^\circ + E_1 \right) + A_2 \sin \left( \frac{2t}{T} 360 + E_2 \right)$$

$T$  denoting 24 hours in the case of diurnal, and a year in the case of annual variations, and  $t$  denoting the time reckoned from noon in the former case, and from the middle of January in the latter.

## DIURNAL VARIATIONS.

				First Year.			
				$A_1$ .	$E_1$ .	$A_2$ .	$E_2$ .
					° /		° /
June	-	-	-	·232	-36 53	·241	+179 24
July	-	-	-	·073	-43 26	·484	160 15
August	-	-	-	·084	-97 46	·508	176 45
September	-	-	-	·498	-34 47	·490	180 17
October	-	-	-	·837	- 3 33	·382	214 21
November	-	-	-	·466	-34 26	·218	189 39
December	-	-	-	·768	+ 2 4	·566	185 55
January	-	-	-	1·060	+ 0 8	·457	184 39
February	-	-	-	·743	- 1 38	·583	183 14
March	-	-	-	·119	-87 53	·536	195 37
April	-	-	-	·406	-82 6	·553	194 45
May	-	-	-	·279	-88 48	·323	184 30
Year	-	-	-	·400	-20 36	·435	185 28
<i>continued—</i>							
				Second Year.			
				$A_1$ .	$E_1$ .	$A_2$ .	$E_2$ .
					° /		° /
June	-	-	-	·246	- 62 28	·343	+196 45
July	-	-	-	·240	-105 53	·364	177 46
August	-	-	-	·205	- 8 5	·299	181 45
September	-	-	-	·456	- 34 2	·481	193 50
October	-	-	-	·651	+ 25 53	·313	187 46
November	-	-	-	·521	+ 12 3	·407	204 9
December	-	-	-	1·003	+ 17 15	·450	182 8
January	-	-	-	1·303	+ 12 43	·337	208 19
February	-	-	-	·636	- 8 1	·609	202 51
March	-	-	-	·489	- 25 36	·580	192 41
April	-	-	-	·435	- 44 19	·462	197 46
May	-	-	-	·384	- 83 29	·201	166 36
Year	-	-	-	·452	- 7 50	·395	192 50

Diurnal Curves of Atmospheric Electricity at Kew for each month from June 1862 to May 1864 inclusive.  
The continuous lines belong to the first year, dotted lines to second year.



The numbers written between the names of the months indicate the amounts by which the origin of co-ordinates has been lowered in passing from each curve to the next below it.

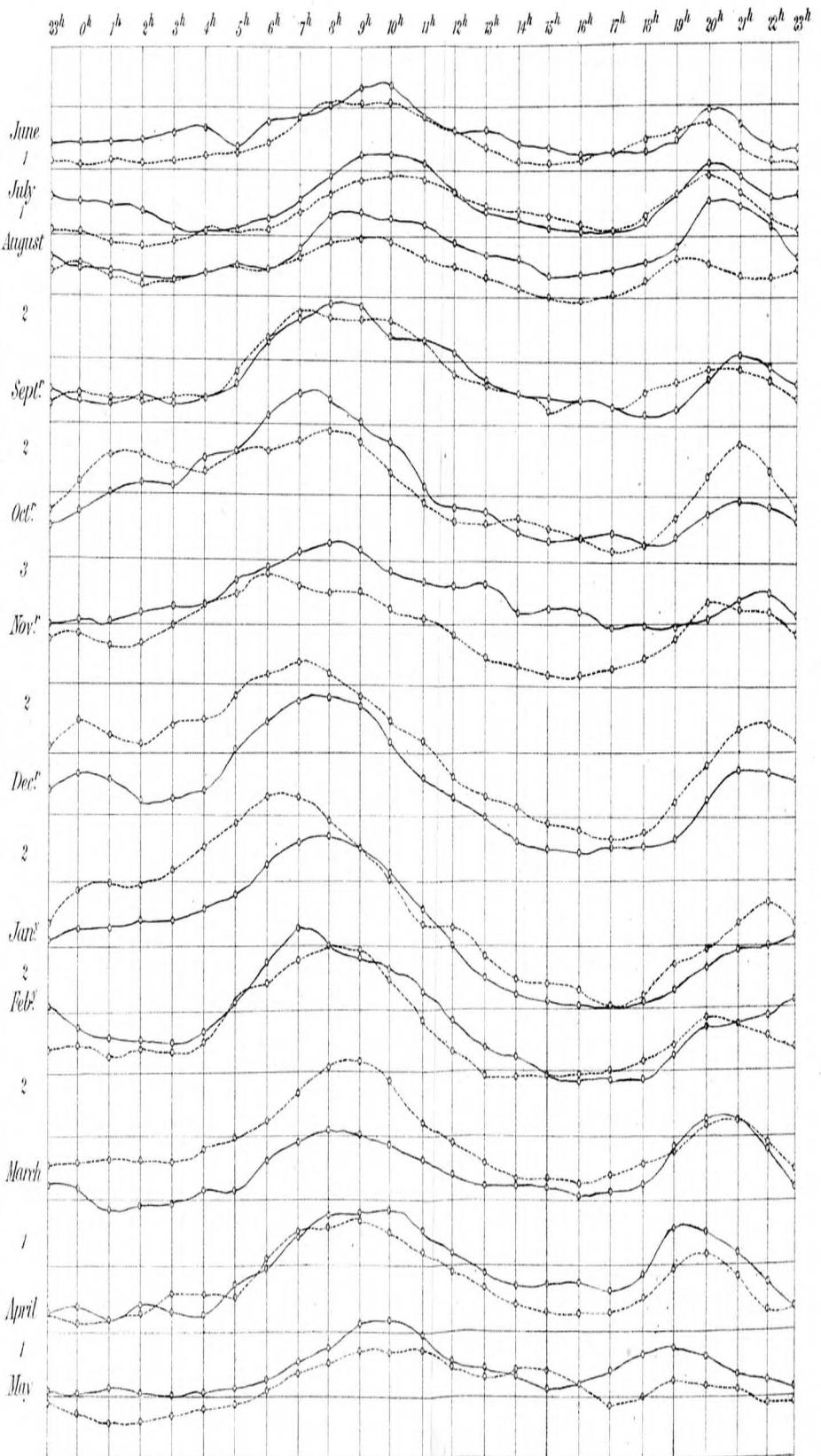
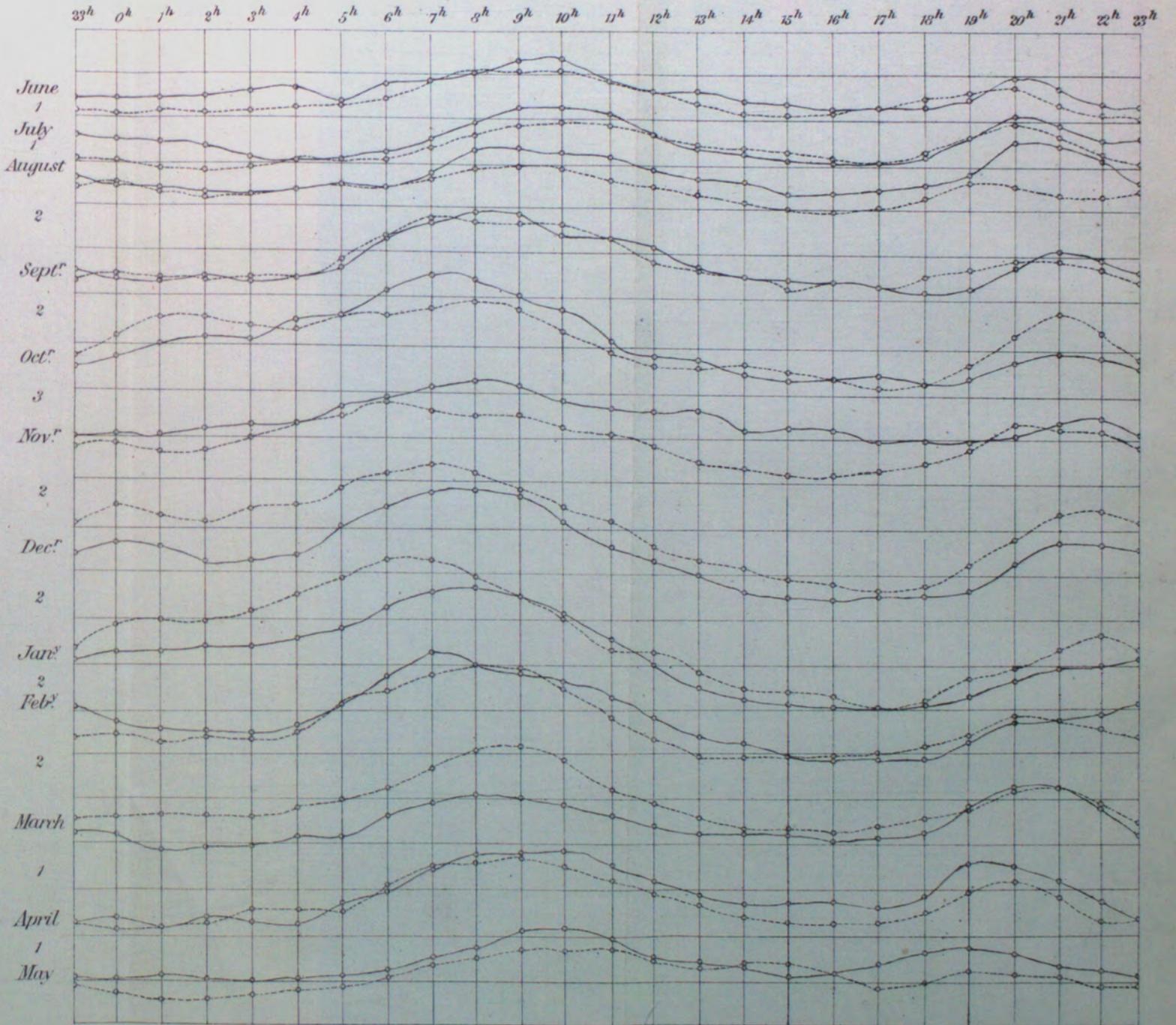


Fig. 1.

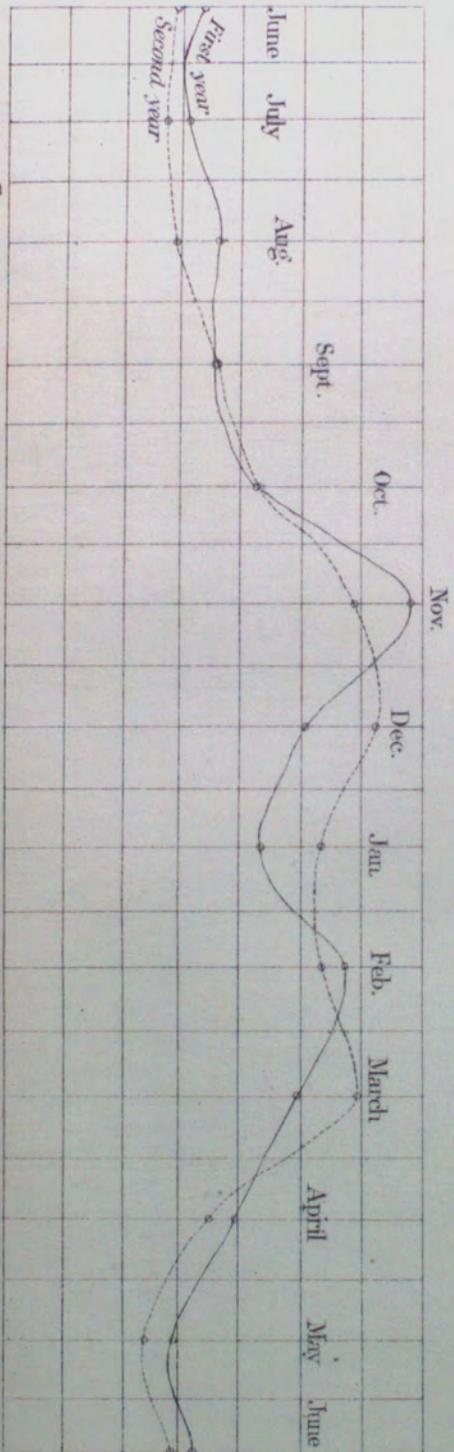
Diurnal Curves of Atmospheric Electricity at Kew for each month from June 1862 to May 1864 inclusive.  
The continuous lines belong to the first year, dotted lines to second year.



The numbers written between the names of the months indicate the amounts by which the origin of coordinates has been lowered in passing from each curve to the next below it.

Fig. II.

Electricity at Kew  
each year separately.





It will be observed that the values of  $A_2$  and  $E_2$  are more regular than those of  $A_1$  and  $E_1$ .

## ANNUAL VARIATIONS.

	$A_0$ .	$A_1$ .	$E_1$ .	$A_2$ .	$E_2$ .
First year - -	2·14	·643	107 56	·080	257 31
Second year - -	2·12	·688	102 38	·030	358 26

The "first year" begins with June 1862 and ends with May 1863. The "second year" begins with June 1863 and ends with May 1864.

## APPENDIX I.

The method which has been followed by the Office, since its first establishment in 1854 up to the present date, in the collection of information on Ocean Meteorology, has been to supply observers with a complete outfit of verified instruments, on the condition of their returning the instruments, and the log of observations made with them, to the Office at the completion of the voyage.

Every instrument supplied has been originally verified at Kew Observatory, and on the completion of the voyage it is compared with standard instruments by a duly authorised observer. Under ordinary circumstances it is not requisite to send the instruments to Kew for re-verification after every voyage, as the changes in their errors are generally slight.

The regular outfit of a ship consists of :—

- 1 Barometer (Kew pattern).
- 6 Thermometers, with a thermometer screen.
- 4 Hydrometers.

The observations are entered in a regular Form of Log, which is supplied together with the instruments, while for the first record of the observations a rough book is supplied, which is retained by the captain.

As regards the Royal Navy, Her Majesty's ships have been supplied by the Office since its foundation in 1854, with the meteorological instruments used in the service, and for this provision is annually made in the estimates furnished by the Office to the Treasury upon which the vote for the Meteorological Council is based. The records of observations made by naval officer- are in due course deposited at the Admiralty, where they are available. It is optional with the observers to keep the Meteorological Log of the Office in addition to the regular record of observations required by the rules of the service. The Council are glad to say that they receive from time to time Meteorological Logs of high value from Her Majesty's ships.

In order to facilitate the communications between the Office and the observers agencies are established at some of the principal ports, and instruments are supplied directly from such agencies to the ships.

The following is a list of the agents at present in connexion with the Office :—

Aberdeen	-	J. R. Jones	-	-	-	Navigation School.
Cardiff	-	H. Thatcher	-	-	-	Bute Docks.
Dundee	-	P. A. Feathers	-	-	-	40, Dock St.
Glasgow	-	Messrs. D. McGregor & Co.	-	-	-	44, Clyde Place.
Greenock	-	Do.	do.	-	-	32, Cathcart St.
Hull	-	Z. Seaping	-	-	-	Trinity House.
Liverpool	-	J. Gill	-	-	-	Sailor's Home.
Southampton	-	Messrs. King, Seymour, & Co.	-	-	-	South-western Terminus.

A set of instruments is kept in working order at the Office in London and at each Agency. A notice to captains is inserted as a standing advertisement in the "Nautical Magazine," and copies of it are supplied to each agent. When a captain expresses himself willing to observe he is invited to inspect the instruments and learn what will be required of him. If this takes place at one of the agencies, and the captain decides to undertake the work, his name is submitted to the Marine Superintendent, who, if the owners of the ship are British subjects, and she is

likely to return to some port in the United Kingdom, sanctions the supply, having due regard to the nature of the proposed voyage and giving preference to captains intending to visit the districts whence the information existing in the Office is scanty.

In a few exceptional cases captains are supplied at ports where there are no agencies, and in these cases the instruments are sent from the Office in London.

Agents receive a fee of 1*l.* 5*s.* for each case of supply and return of instruments, and an additional fee of 1*l.* for the first "excellent" log sent in by any observer whom they may have invited to begin keeping a log.

Captains are requested to give notice of their return to any port in the United Kingdom to the agent at the port, if there be one, or else to the Office in London, and steps are then taken to send for the instruments and log. The latter is sent up to London, and the instruments are at once compared with a standard set, and if received at an agency, the results of such comparison are duly forwarded to London.

The log is tested according to a definite form, (the "test sheet," which has been published in the Report of the Maritime Conference of London, 1874, p. 35), and the observations are classified according to their quality.

As soon as this first testing has been effected, a letter is written to the captain, and if any questions arise to which he can probably give an answer, he is requested to do so while the incidents are fresh in his memory. When his reply is received it is noted in the log for future reference when the observations come for discussion.

The first step in the process of discussion is the extraction of the observations, (which in the original documents are of course in chronological order, and follow the tracks of the ships for the time being,) into forms in which they are grouped for the different months of the year and for definite areas of the sea-surface. These forms are called Data Books, and the actual process of transference of the observations into them is mainly clerical, but the operations "examination" and "preparation," which are preliminary to the transference, are of a different character, and of these the former demands the higher degree of experience in the person to whom it is entrusted.

The examination of a log requires a careful reading of the test sheet, and of any correspondence which may have been conducted with the observer. The hours for which the observations are to be used must be selected. The instrumental corrections must be considered so as to decide whether they shall be applied or not. The observations are then looked over so as to detect by inspection obvious errors (such as of half-an-inch or an inch in the barometer, or of 5° or 10° in the thermometer); evidence of accidental exposure of the thermometers to the sun is also carefully sought for, and indications of mismanagement of the wet-bulb thermometer. These are all precautionary measures, not peculiar to sea records, but it must not be forgotten that as regards the thermometric observations the instruments at sea are placed under different conditions from those which can be obtained on land, for it is impossible on board ships to have the screen always in the shade and yet freely exposed to the air, so that any instances of undue heating of the thermometers in the daytime must be noted. The compass entries must be considered in order to see if they are sufficiently exact for extraction. The ship's positions must be examined, and corrected for current when requisite, and the number of the next subsquare into which the ship moves on the direction of the ship's head for every observation entered for subsequent use as a record of the ship's course when the observation is isolated in the Data Book.

The wind observations are examined in order to ascertain the method employed by each observer, to decide what correction for compass error is to be applied, and to see that the records have been consistently entered.

Finally, the "Remarks" column is to be read, and portions of its contents are to be marked for extraction.

The results of the examination are entered in the log in red ink.

When the examination is complete, the work of preparation begins. This consists in carrying out the instructions entered in red ink in the log, and is always done in pencil. It may be classified under the following heads:—

1. Interpolation of the ship's position at each hour for which the observations are extracted, and notation of the ten-degree square and one-degree subsquare to which each observation belongs.
2. Transference of the current observations, which are given at intervals of 24 hours, to their midway position.
3. Application of instrumental corrections to each reading.
4. Correction of the observations of wind, sea, and cloud motion for compass error.

When the preparation has been completed the copying into data books is undertaken.

The Meteorological Committee having decided in 1867 to sift the data into one degree squares for each month, the following method was devised for carrying out that object. Monthly books are prepared for each ten-degree square for the part of the ocean under discussion from time to time. These books are paged so as to represent the *unit* figures of the *degrees* of latitude and longitude of the position in which a given observation was taken. For instance, an observation recorded in  $8^{\circ} 45'$  N. or S. and  $0^{\circ} 18'$  E. or W. would be entered on page 80 of the Data Book for the month, and for the ten-degree square in which it had been taken, and 80 would be considered to be the number of the subsquare to which it belonged. The same page receives all observations taken between  $8^{\circ}$  and  $9^{\circ}$  N. or S. lat. and between  $0^{\circ}$  and  $1^{\circ}$  E. or W. long. The same number 80 would equally represent all observations recorded between  $18^{\circ}$  and  $19^{\circ}$  lat. and  $10^{\circ}$  and  $11^{\circ}$  long., each ten-degree square having its one-degree subsquares numbered similarly, but every Data Book bears the number of the ten-degree square to which it refers.

The ten-degree squares are numbered on the following system. Square 1 commences with lat.  $0^{\circ}$  N. and longitude  $0^{\circ}$  W., and the numbering is carried on with increasing W. longitude until the circuit of the globe is completed with Square 36. The first number in the southern hemisphere is 300 and the last in the zone nearest the equator is 335.

The following diagram shows the way in which the pages in the Data Books are numbered.

All pages having a number *commencing* with the same digit have the same unit figure for their degree of *latitude*, whilst all *ending* with the same digit have the same unit figure for their degree of longitude.

By using the numbers of the subsquares in quoting extracts from a log, the locality of an observation is shown to a degree, but in the Data Book itself the minutes of latitude and longitude are given with each entry.

10 W.		Square 1.									Square 36.										10 E.	
10 N.	9	8	7	6	5	4	3	2	1	0	0	1	2	3	4	5	6	7	8	9	10 N	
9	99	98	97	96	95	94	93	92	91	90	90	91	92	93	94	95	96	97	98	99	9	
8	89	88	87	86	85	84	83	82	81	80	80	81	82	83	84	85	86	87	88	89	8	
7	79	78	77	76	75	74	73	72	71	70	70	71	72	73	74	75	76	77	78	79	7	
6	69	68	67	66	65	64	63	62	61	60	60	61	62	63	64	65	66	67	68	69	6	
5	59	58	57	56	55	54	53	52	51	50	50	51	52	53	54	55	56	57	58	59	5	
4	49	48	47	46	45	44	43	42	41	40	40	41	42	43	44	45	46	47	48	49	4	
3	39	38	37	36	35	34	33	32	31	30	30	31	32	33	34	35	36	37	38	39	3	
2	29	28	27	26	25	24	23	22	21	20	20	21	22	23	24	25	26	27	28	29	2	
1	19	18	17	16	15	14	13	12	11	10	10	11	12	13	14	15	16	17	18	19	1	
0	09	08	07	06	05	04	03	02	01	00	00	01	02	03	04	05	06	07	08	09	0	
Equator.	09	08	07	06	05	04	03	02	01	00	00	01	02	03	04	05	06	07	08	09	Equator	
1	19	18	17	16	15	14	13	12	11	10	10	11	12	13	14	15	16	17	18	19	1	
2	29	28	27	26	25	24	23	22	21	20	20	21	22	23	24	25	26	27	28	29	2	
3	39	38	37	36	35	34	33	32	31	30	30	31	32	33	34	35	36	37	38	39	3	
4	49	48	47	46	45	44	43	42	41	40	40	41	42	43	44	45	46	47	48	49	4	
5	59	58	57	56	55	54	53	52	51	50	50	51	52	53	54	55	56	57	58	59	5	
6	69	68	67	66	65	64	63	62	61	60	60	61	62	63	64	65	66	67	68	69	6	
7	79	78	77	76	75	74	73	72	71	70	70	71	72	73	74	75	76	77	78	79	7	
8	89	88	87	86	85	84	83	82	81	80	80	81	82	83	84	85	86	87	88	89	8	
9	90	98	97	96	95	94	93	92	91	90	90	91	92	93	94	95	96	97	98	99	9	
10 S.	9	8	7	6	5	4	3	2	1	0	0	1	2	3	4	5	6	7	8	9	10 S.	
10 W.	Square 300.									Square 335.										10 E.		

The further discussion of the observations after they have been transferred to data books involves questions which, as has been stated in the body of the report, at present engage the attention of the Council, and with regard to which they have not as yet arrived at a decision.

Besides the treatment of the observations in order to deduce mean and climatological results, it is also possible to utilize observations made at sea for the production of synoptic charts.

Two publications of this nature have been prepared in the Office, No. 13, on the weather over the Atlantic in February 1870, when the SS. "City of Boston" was lost, and the work now in the press, No. 32, on the weather over the Atlantic in August 1873.

It, must, however, be remembered that for the construction of synoptic charts the materials existing in the Office are, in a great measure, unavailable, and it is therefore necessary to make special efforts in order to obtain a sufficiency of synchronous observations.

## APPENDIX II.

LIST of CAPTAINS (and Officers) who have received a Presentation Copy of Charts (*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 returned to the Office.

Captain's Name.	Letters of Thanks.	Shp.
*Aird, A. D. - - -	1	S.S. "Prussian."
†Allen, Frederick W. - - -	1	"Collingwood."
Almond, Thomas Michael, F.R.A.S.	5	"Decapolis."
Angel, John Fry - - -	1	"Twilight."
Balderston, Richard James - - -	3	"Rajmahal" and "Tenasserim."
<i>Banner, Frederick William</i> - - -	4	"Lady of the Lake," and "Kenilworth."
*Baker, Thomas - - -	1	"Zoroaster"
Barlow, Arthur Edward - - -	1	S.S. "Nizam."
Barron, William - - -	2	S.S. "Sultan."
Barwood, William Richford - - -	2	"Fugitive."
Becket, Alexander - - -	3	"City of Perth."
Bennett, Edwin Charles - - -	4	"Thessalus."
Blackie, Alexander Hamilton, R.N.R.	2	"Melpomene."
Blair, John - - -	2	"Arouca."
Blake, Edwin John - - -	5	"Gilbert Thompson," "Gitana," and "Sydney Dacres."
Blomfield, Harry - - -	1	"Thomas Stephens."
Bouchette, Francis Baines - - -	2	S.S. "European."
Broad, George A., Nav. Lt., R.N.	1	H.M.S. "Valorous."
Brooks, Samuel - - -	3	S.S. "City of Brooklyn."
Brown, Alfred John - - -	3	"Maroon."
Brown, Robert - - -	2	S.S. "Moravian."
Bruce, John - - -	5	"City of Adelaide," and S.S. "Australian."
Buchan, James - - -	3	"Commewyne."
Bythesea, John (V. C.), R.N.	2	H.M.S. "Phœbe."
Caborne, Warren Frederick, F.M.S.	1	"Waitara."
Campbell, Archibald - - -	5	S.S. "Britannia," and S.S. "Europa."
Campbell, Hugh - - -	3	"Burdwan" and "Rajmahal."
Capper, Edward Hall - - -	2	"Palm Tree."
Carpenter, Lieut. Alfred, R.N.	2	H.M.S. "Nassau."
<i>Carruthers, Forrest Priest</i> - - -	3	"Minero."
Cato, Wilson Robert - - -	2	S.S. "Hibernia."
Churchill, Orford, Lt., R.N.	1	H.M.S. "Ariel."
Comley, William Guise, R.N.R.	2	S.S. "Hong Kong."
<i>Cruckshank, William</i> - - -	1	"Richard Wright."
<i>Davidson, Charles</i> - - -	1	"Perseverance."
Dobson, Charles Meadows - - -	5	S.S. "Beta."
<i>Doukin, Thomas, R.N.R.</i> - - -	3	"Inverness."
Ellery, William - - -	7	"Bowfell" and "Baroda."
Faithfull, Henry - - -	1	"Haddon Hall."
Fernie, Alexander Durward - - -	1	"Sir John Lawrence."
Finlay, James - - -	3	"Duncairn."
Frederick, George C., Sub. Lt., RN	3	H.M.S. "Fawn."

\* Charts not presented.

† Chief Officer.

Names of Officers, deceased, in italics.

Captain's Name.	Letters of Thanks.	Ship.
Freeman, Thomas W. - -	5	S.S. "Wisconsin" and S.S. "Nes- tor."
Fry, Alfred - - -	3	"Foam."
Gales, Isaac Chapman - -	1	"Flechero."
Gaye, Gerrard - - -	5	"Eliza Shaw" and "Ænone."
* <i>Goodeough, Commodore James G., R.N.</i>	1	H.M.S. "Pearl."
*†Goodsall, Walter - - -	1	S.S. "Kangaroo."
Gordon, James - - -	2	"City of Oxford."
Grange, James - - -	1	S.S. "Acantha."
Gray, David - - -	5	S.S. "Eclipse."
* <i>Gray, F. J., R.N.</i>	1	H.M.S. "Nassau."
Gray, John - - -	5	S.S. "Mazinthien" and S.S. "Hope."
Gray, John McDonald - -	8	"Speranza" and "Melpomene."
Gray, Samuel B. - - -	1	"Letterewe."
Greenwood, William - - -	7	S.S. "Scotia," "Assaye," and "Gareloch."
<i>Grigs, George, R.N.R.</i> - -	3	S.S. "Helvetia," and S.S. "France."
Haran, Dr. T. J., R.N. - -	1	H.M.S. "Agincourt."
<i>Harris, David</i> - - -	2	S.S. "Medway."
<i>Hassell, Thomas Edward</i> - -	3	"Mervyn."
Hayes, James - - -	7	S.S. "Ptolemy" and S.S. "Camoens."
Hayward, George Olive - -	2	S.S. "Durley."
Hayward, J. J., Paymaster, R.N.	1	H.M.S. "Hydra."
Heggum, Edward Carl V. - -	10	"Czar" and "Rozelle."
Henderson, Henry - - -	5	"Hope," and S.S. "Cleveland."
†Hepworth, Campbell, M. W. - -	1	S.S. "Hibernia."
†Hodding, Samuel White - -	3	"Indus."
Holdich, John Peach, R.N.R. - -	4	"Agra" and "Behington."
Hopkins, John O., R.N. - -	1	H.M.S. "Liverpool."
Horner, Mr. A. C., M.R.C.S. - -	1	S.S. "Pandora."
Hosken, Henry, Staff Com., R.N.	1	H.M.S. "Pearl."
*†Hunt, J. - - -	1	"Avonside."
Hunter, David - - -	5	S.S. "Alpha" and S.S. "Delta."
Innes, George - - -	2	"Silistria" and "Agnes Rose."
Jackson, John Nugent - - -	2	"Knowsley Hall."
Jackson, Robert, Staff Com., R.N.	1	H.M.S. "Glasgow."
Johnson, Charles, R.N.R. - -	4	"St. Lawrence."
Jones, Arthur Arundel - - -	3	"Victoria Nyauza," and "Chevy- chase."
Jones, George Henry - - -	8	S.S. "Nile," "S.S. "Quang-se," and S.S. "Niger."
Jones, Loftus Francis, R.N. - -	1	H.M.S. "Valorous."
Jones, Theodore Morton, R.N. - -	3	H.M.S. "Glasgow."
Kennedy, Charles William - -	3	S.S. "Scotia," and S.S. "Baltic."
Kennedy, James Branch, R.N.R. - -	1	S.S. "Blue Cross."
Kerr, Alexander - - -	4	"Ardgowan."
Kerr, Thomas Coulter, R.N.R. - -	2	"Durham."
Latham, Frederick W. - - -	1	"Sumatra."
Lecky, Squire Thornton Stratford, R.N.R., F.R.G.S.	3	S.S. "Uruguay" and S.S. "Halley."
Leportier, Theodore - - -	2	"Kate."
Lewis, John Thomas, R.N.R. - -	2	S.S. "Scotia," and S.S. "Chaldea."
Lindsay, Henry Kay - - -	2	"Valparaiso" and "Rokeby Hall."

\* Charts not presented.

† Chief Officer.

‡ Second Officer.

Names of Officers, deceased, in italics.

Captain's Name.	Letters of Thanks.	Ship.
Longley, Herbert - -	5	S.S. "Yorkshire."
Lunham, Robert Dowe - -	7	S.S. "Berar," S.S. "Durley" "Charles Howard" and "Sumatra."
*MacDonald, John - -	1	S.S. "Europa."
McKechnie, Duncan Ferguson - -	5	"Cottica."
Mackellar, D. E. - -	1	Observations at Rapa Island.
Mackie, Thomas - -	1	S.S. "Mazinthien."
Maddison, John, R.N.R. - -	1	"Anglesey."
Manning, Henry - -	1	S.S. "Kangaroo."
Maples, Charles - -	3	"Genii" and "Riversdale."
Marshall, David - -	2	"Ardgowan" and "Lady Octavia."
Martyn, John Artis - -	14	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."
Mesnard, Thomas - -	1	"Mistley Hall."
Miller, A. John - -	1	"Camperdown."
Moore, Thomas - -	1	"W. E. Gladstone."
Morrish, Samuel - -	1	"Pendragon."
Morton, John D'Arcy - -	1	"Henry Bath."
Mossop, Clement - -	3	"Candahar."
Mouland, John Elsey - -	5	S.S. "Batavia."
Murdoch, Henry - -	2	"Denbighshire."
Murphy, Michael - -	1	S.S. "Tarifa."
Napier, Richard Henry, R.N. - -	6	H.M.S. "Nassau."
Nares, Sir George Strong, R.N., F.R.S. - -	2	H.M.S. "Challenger."
Newton, James William - -	1	S.S. "Grenadier."
North, William George - -	1	S.S. "West Riding."
Owen, John - -	2	"W. G. Russell."
Owen, Robert - -	1	"Victoria Cross."
Parry, Moses - -	1	"Queen of Cambria."
†Paterson, James Forrest - -	2	S.S. "Moravian."
Pearson, Charles William - -	10	S.S. "Strathclyde" and S.S. "Strathleven."
Pechles, Robert - -	2	"Margaret Galbraith" and "Otago."
Perry, John L., R.N. - -	2	H.M.S. "Orontes."
Petel, John A. R., Staff Com., R.N. - -	2	H.M.S. "Phœbe."
Petrie, Peter Conrad - -	2	S.S. "Patagonia."
Pollard, Lt. G. N. A., R.N. - -	4	H.M.S. "Nassau."
Potts, Thomas Crosby - -	8	"Tenasserim."
Prehn, Carl Christian - -	3	"Eleanor" and "Mikado."
Price, James John - -	10	"Sorata."
‡Pritchard, Charles E., R.N. - -	1	H.M.S. "Ariel."
Racham, John, R.N.R. - -	1	"Airlie."
Randall, William - -	1	"Iron Cross."
Rawle, Charles, R.N.R. - -	1	"Star of the North."
Raymond, Charles Tenzer - -	6	"British India," "British Consul," and "Cicero."
Reid, Carson William - -	2	"Lord Strathnairn."
Renaut, Charles Henry - -	7	"Celaeno," "Glenlora," and "Plei-one."
Ruthven, Jocelyn Fitzgerald, R.N.R. - -	1	"Whittington."

\* Charts not presented.

† Chief Officer.

‡ Navigating Sub-Lieutenant.

Names of officers deceased, *in italics*.

Captain's Name.	Letters of Thanks.	Ship.
St. John, Henry Craven, R.N.	2	H.M.S. "Sylvia."
†Scott, Fergus	1	S.S. "Hotspur."
†Scott, George Alexander Brown	1	S.S. "Nestorian."
Scott, William	1	"Alliance."
Sharp, William H., Staff Com., R.N.	1	H.M.S. "Liverpool."
Shaw, Gilbert	4	S.S. "Beta."
Shearer, George	1	"Early Morn."
Shortland, R. Adm. P. F., R.N.	1	H.M.S. "Hydra."
Simpson, Alexander	8	"Traveller."
<i>Smith, David, F.R.A.S.</i>	1	"Wiltshire."
Smith, William Charles	4	"Kingdom of Saxony" and "Kingdom of Sweden."
Smith, William Henry, R.N.R.	11	S.S. "Hibernian," S.S. "Peruvian," and S.S. "Scandinavian."
Stanhope, John	1	"Decision."
Steele, John	2	S.S. "Erl King."
Stephen, John George	2	S.S. "Moravian" and S.S. "St. Patrick."
Stuart, George Rennie	6	"Otago," "Oamaru," and S.S. "Nemesis."
Stuart, William Henry	5	"Richmond."
Sutherland, James Taylor	3	"Maggie" and "Glensesk."
Symington, William	12	"Northfleet," "Flying Venus," S.S. "Hong Kong," and S.S. "Hankow."
*Tandy, Comr. Dashwood G., R.N.	1	H.M.S. "Nassau."
Thomson, Frank Tourle, R.N.	3	H.M.S. "Challenger."
Tilmouth, Robert J. C.	1	"Peeress."
Tizard, Thomas H., Staff-Com. R.N.	1	H.M.S. "Challenger."
Townsend, William Henry	1	"Valentine and Helene."
Trench, Chas. E. Le Poer	5	"Newcastle."
<i>Tucker, John Worth</i>	1	"John Temperley."
Tully, Thomas	2	"Baroda."
Turner, Edward Wrake	3	"Mertola."
Vine, William W., Staff Com., R.N.	3	H.M.S. "Orontes."
Vowell, Michael	2	"Kelso" and "Undine."
Wadham, Thomas Littleford	5	"Vere" and "The Murray."
Walker, John Burnett	1	S.S. "Erik."
Warden, William	4	S.S. "Alpha."
Waring, William	2	S.S. "Atakuta."
Watkins, Thomas	1	"Emulation."
Watson, William, F.M.S.	16	S.S. "Palmyra," S.S. "Parthia," and S.S. "Algeria."
Wharton, William J. L., R.N.	3	H.M.S. "Fawn."
†Wheeler, Francis S., R.N.	2	H.M.S. "Sylvia."
Wherland, Frederick, R.N.R.	6	"Galatea."
Wight, Henry Potts	6	"Gosforth," "Dunalistair," and "Taranaki."
Wilcox, Henry George, R.N.R.	4	"St. Lawrence" and S.S. "Glenfinlas."
Williams, James Agnew	1	S.S. "Wisconsin."
Wylie, James	2	S.S. "Austrian" and S.S. "Sarmatian."
Young, Sir Allen, R.N.R.	2	S.S. "Pandora."

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.

\* Charts not presented.

† Chief Officer.

‡ Navigating Sub-Lieutenant.

Names of officers deceased, *in italics*.



## LIST of DOCUMENTS—continued.

Place.	Observer.	No. of Documents.	Nature of Observations.
Heligoland	Lightkeepers	11	Eight observations daily, March 1877 to February 1878.
Levuka (Fiji)	H. G. C. Emberson, Registrar General.	1	Comparative Table of Climate during 1876.
Malta (Palace Tower)	G. Calamattio, Pilot	1	Three observations daily, January 22 to 28, 1878.
Manitoba	R. Bourne, M.A. and R. E. Machray.	12	Two observations daily, January 1874 to December 1875 and January 1877 to January 1878.
New York (Central Park)	Professor D. Draper	3	Observations from S.R. instruments, April to December 1874 and January 1876 to December 1877.
Norfolk Island	T. Rossiter, Schoolmaster	1	Three observations daily, August 1859 to September 1864.
Point King (King George's Sound)	S. Mitchell, Lightkeeper	1	"Lighthouse" Register, January to June 1877.
Port Arthur (Van Dieman's Land).	Assist. Commissary General T. J. Lempriere.	1	Three observations daily, May 1837 to June 1846, with two observations daily of tides, January 1841 to April 1848.
Sombbrero	J. A. Richardson, Lightkeeper	1	"Lighthouse" Register, June to November 1876.
		71	

List of DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Almond, T. M.	-	632	T. B. Walker, London	Brisbane	7
F.R.A.S.	Decapolis	3,357	Arthur Wilson, Hull	Calcutta, via Suez, two voyages	6
Avery, B. J.	S.S. Navarino	-	-	-	-
† Calderston, R. J.	Tenassum	1,419	T. & R. Brocklebank, Liverpool	Calcutta	7
† Lartow, A. E.	S.S. Nizam	2,725	The P. & O. Steam Navigation Co., London.	To Bombay, and between Bombay and Venice, via Suez.	5
3 " "	"	"	"	One voyage (via Suez), from Venice to Bombay and back, thence to Bombay, Singapore, Hong-kong, &c.	4
Barron, William	S.S. Sultan	1,025	W. Liddell, Hull	Between Hull and Hamburg	7
" "	"	"	"	"	4
" "	"	"	"	"	4
Beckett, Alexander	Amana	1,209	J. Smith, Glasgow	Calcutta	7
Beunck, E. C.	Thessalus	1,782	J. H. Carmichael, Greenock	"	6
Bley, Otto	Wasdale	1,220	J. D. Newton, Liverpool	"	8
Blomfield, Harry	Baron Aberdare	1,630	J. MacCunn, Greenock	San Francisco	7
Bowman, H.	Caubay	1,000	R. Brocklebank, Liverpool	Calcutta	4
† Boys, H. H., R.N.	Philomel	774	H.M.S.	To Calcutta	5
† Brine, Lindsay, R.N.	Pearl	2,817	"	In Indian Ocean, and home via Suez	4
Bristow, R. J. W.	S.S. Othello	2,478	Arthur Wilson, Hull	From Sydney to Auckland, Rio Janeiro and home.	3
Brown, A. J.	Matoon	362	Anderson, Anderson & Co., London	New Zealand, three voyages	3
Brouse, W. R.	St. Enoch	1,854	W. S. Croudace, Dundee	Jamaica	7
Buchan, James	Commeuwyne	315	J. Grierson, Glasgow	Calcutta	3
" "	"	"	"	Surinam	3
Caborne, W. F.	Waitara	833	The New Zealand Shipping Co., Christchurch, N.Z.	New Zealand	6
F.M.S.	-	-	-	-	-
Campbell, George	Janet Cowan	1,278	R. Shankland, Greenock	Point de Galle and Calcutta	8
Campbell, Hugh	Rajmahal	1,302	T. Brocklebank, Liverpool	Calcutta	8

## List of Documents, &amp;c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Carrey, Thomas	Seringapatam	1,128	A. Cassells, Liverpool	Bombay	9
<sup>6</sup> Cato, W. R.	S.S. Hibernia	3,087	Telegraph Construction and Maintenance Co., London.	Bombay, Penang, and Rangoon via Suez	4
<sup>7</sup> "	"	"	"	"	"
<sup>8</sup> Crombie, Robert	Caprena	756	A. Nicol, Aberdeen	Lat. 52° N., Long. 26° W.	2
<sup>9</sup> "	"	"	"	Valparaiso, Arica, British Columbia, Callao, and Mexillones.	14
Davidson, James	Xanthus	217	"	" and Iquique	7
<sup>10</sup> Dennis, W. C.	Royal Diadem	475	J. Duthie, London	To Cumberland Gulf	3
<sup>11</sup> Dobson, C. M.	S.S. Beta	1,293	J. Jones, Swansea	Cape Town, Mauritius, Bombay, Calcutta, and Zanzibar.	8
<sup>12</sup> "	"	"	H. F. Smith, Hull	Black Sea, &c., three voyages	5
Ellery, William	Baroda	1,364	"	Alexandria, three voyages	4
<sup>13</sup> Erskine, J. E., R.N.	Felipse	1,755	R. Brocklebank, Liverpool	Calcutta	7
Faithfull, Henry	Nelson	1,248	H.M.S.	From Vera Cruz, to Jamaica, Nicaragua, and St. Andrew's Island.	1
<sup>14</sup> Franklin, E. B. H., R.N.	Conway	"	The British Shipowner's Co., Liverpool.	Otago and Bassett	11
Freeman, T. W.	S.S. Nestor	1,869	School Frigate	Off Liverpool	4
<sup>15</sup> Garforth, E. St. J. R.N.	Philomel	774	The Ocean S.S. Co., Liverpool	China, via Suez	4
Gaye, Gerard	Zenone	1,437	H.M.S.	In Indian Ocean	10
Geach, George	Whitehall	937	W. Battersby, Liverpool	Calcutta	7
Gordon, James	S.S. City of Oxford	2,328	Mrs. S. Hocking, East Stonehouse	Bombay	7
Gray, David	S.S. Eclipse	435	G. Smith, Glasgow	Calcutta, via Suez	3
Gray, John	S.S. Hope	452	D. Gray, Peterhead	Towards Greenland	4
Gray, S. B.	Letterewe	798	R. Kidd, Peterhead	Greenland	5
			D. Irwin, Liverpool	Sydney and Manila	11

## List of DOCUMENTS, &amp;c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
17 Harrison, John	S.S. Aleppo	2,057	C. MacIver, Liverpool	Boston, three voyages	9
18 Hawkins, C. H., R.N.	Cracker	584	H.M.S.	South East Coast of America	11
Heggun, E. C. V.	Rozelle	1,286	R. Cuthbert, Greenock	Calcutta, Pondicherry, Bourbon, Madras, &c.	2
19 Herbert, W. W.	S.S. Elbe	3,063	Royal Mail Steam Packet Co., London.	Brazils	13
Holdich, J. P., R.N.R.	Behington	924	Savill and Temple, London	Auckland and Calcutta	4
Holmes, W. S.	Cambray	1,000	R. Brocklebank, Liverpool	From Calcutta	2
Hood, A. K.	Oamaru	1,306	The Albion Shipping Co., Glasgow	Towards Otago	3
20 Hoskins, A. H., R.N.	Pearl	2,187	H.M.S.	At Australian Stations New Zealand Samea and Fiji.	8
Hughes, E.M.	Royal Alice	1,199	H. Fernie, Liverpool	Calcutta, St. Helena and New York	7
Innes, George	Agnes Rose	991	W. Rose, Aberdeen	Sydney	10
"	Silistria	642	"	West Coast of South America	7
Jackson, J. N.	Knowsley Hall	1,774	The Sun Shipping Co., Liverpool	Calcutta	4
Jones, G. H.	S.S. Dwina	978	C. M. Norwood, London	St. Petersburg, three voyages	16 days.
"	S.S. Quang-Se	2,788	J. McGregor, London	From New York	9
Kempe, E. A.	Golden Gate	899	J. Lyne, Liverpool	San Francisco	8
Kerr, Alexander	Argowan	1,283	G. Adam, Greenock	Calcutta	2
Lee, S. W.	S.S. Aurora	1,268	J. Mudie, Dundee	Archangel, three voyages	9
Linskill, J. S. W.	Prince Amadeo	1,602	R. G. Moran, Liverpool	Kurrachee and Calcutta	5
Longley, H.	S.S. Yorkshire	2,273	W. H. Tindall, London	India, China and Japan, via Suez	3
McCoig, Alexander	Min	622	H. E. Crum Ewing, Glasgow	Demerara	3
McKechmie, D. F.	Celeste	600	D. Duncan, Rothesay	West Indies	7
McKenzie, Allen	Candahar	1,418	R. Brocklebank, Liverpool	Calcutta	

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

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Mackenzie, Richard -	County of Inverness -	1,636	R. Craig, Glasgow -	From Lat. 33° S. to Long. 30° W. to Bombay and Calcutta.	2
<sup>22</sup> Manning, Henry -	S.S. Seine -	3,493	Telegraph Construction Maintenance Co., London.	Bombay, viâ Suez -	3
<sup>23</sup> " " -	" -	"	" "	In the North Atlantic and to and from Heart's Content.	6
Marshall, David -	Lady Octavia -	1,172	G. Adam, Greenock -	From Calcutta -	4
Mason, George -	S.S. Astarte -	984	C. A. Hornstedt, Hull -	Baltic, four voyages; Mediterranean, four voyages.	9
<sup>24</sup> Mesnard, Thomas -	Mistley Hall -	1,772	The Sun Shipping Co., Liverpool	New York, one voyage; Calcutta, one voyage.	10
Miller, A. G. -	Camperdown -	1,293	G. De Wolf, Liverpool -	To Bombay, Mauritius, Havre, Mobile (U.S.), and home.	11
Morrish, Samuel -	Pendragon -	1,278	T. E. Greenshields, Liverpool -	Melbourne and Calcutta.	10
<sup>25</sup> Moulton, J. E. -	S.S. Batavia -	2,553	C. McIver, Liverpool -	Boston, six voyages; New York, four voyages.	7
<sup>26</sup> " " -	" -	"	" "	Boston, four voyages; New York, one voyage.	4
Murdoch, Henry -	Denbighshire -	1,367	C. Pierce, Bryn Dinon, Bangor -	Calcutta -	7
Murray, G. W. -	Scots Bay -	993	S. Sheffield, Cornwallis, N.S. -	To New York, Antwerp, and Quebec -	4
<sup>27</sup> Napier, R. H., R.N. -	Nassau -	877	H.M.S. -	In China Seas -	4
<sup>28</sup> " " -	" -	"	" -	" -	3
<sup>29</sup> " " -	" -	"	" -	" -	4
<sup>30</sup> " " -	" -	"	" -	" -	4
Owen, Robert -	Victoria Cross -	669	W. Hope, Liverpool -	Iquique -	8

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

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Parry, Moses	Queen of Cambria	865	W. Thomas, Nevin, Carnarvon	Bombay	9
Parsell, Henry	S.S. Gaelic	2,652	Oceanic Steam Navigation Co., Liverpool.	From Hong Kong to Yokohama and San Francisco.	1
" "	S.S. Oceanic	3,707	" "	Between San Francisco, Yokohama, and Hong Kong, six voyages.	10
Peacock, J. W.	S.S. Nellie Wise	1,058	W. H. Wise, West Hartlepool	Black Sea	2
Pearson, C. W.	S.S. Strathleven	2,436	W. Burrell, Glasgow	Bombay, via Suez, two voyages	4
" "	Otago	"	" "	India, via Suez	4
Peebles, Robert	"	993	The Allion Shipping Co., Glasgow.	Lyttleton, N.Z.	7
Pepper, George	S.S. Tasso	608	A. Wilson, Hull	Dronheim, nine voyages	4
<sup>32</sup> Popham, John	Sparkenhoe	1,253	H. P. Bicknell, London	Bahia and New Orleans	7
Potts, T. C.	Majestic	1,884	T. & R. Brocklebank, Liverpool	From Calcutta	3
Prehn, C. C.	Mikado	643	W. Lund, London	Shanghai and New York	9
Price, J. J.	Sorata	332	C. C. Dawson, London	Jamaica	3
Raeburn, John, R.N.R.	Airlie	1,500	D. Bruce, Dundee	Adelaide and Calcutta	8
Randall, William	Iron Cross	1,508	H. Fernie, Liverpool	Calcutta, Mauritius, and Table Bay	9
Raymond, C. T.	Theophane	1,525	J. M. Hepb. Liverpool	To Melbourne and Akyab	4
Renaut, C. H.	Pleione	1,092	W. Savill, London	Wellington, New Zealand, and Calcutta	9
<sup>33</sup> Roe, A. G. R., R.N.	Druid	1870	H.M.S.	To and at Barbados, and St. Vincent	2
<sup>34</sup> St. John, H. C., R.N.	Sylvia	877	" "	In China and Japan Seas	12
Scott, William	Alliance	300	J. Grierson, Glasgow	Surinam	3
" "	S.S. Beta	1,087	W. Cunard, London	"	4
Slaw, Gilbert	"	"	"	Between Halifax, Bermuda, and St. Thomas, three voyages.	2
<sup>35</sup> Shearer, George	Early Mora	1,057	P. Bicknell, London	" " seven voyages	4
" "	"	"	"	Calcutta	8

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

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Simpson, Alexander	Perseverance	164	R. J. Kidd, Peterhead	Between Peterhead, Ivigut, Amsterdam, Rotterdam, Copenhagen, and Charleston (U.S.).	20
"	Traveller	196	A Simpson, Peterhead	Between Peterhead, Ivigut, and the Baltic.	13
<sup>35</sup> Smith, Adam	"	"	"	Ivigut and Philadelphia	7
" J. H., R.N.R.	Catherine	191	W. Baxter, Peterhead	"	7
Spratly, William	Worcester	"	Training ship	Off Greenhithe	3
	Summer Cloud	698	South Lancashire Ship Owners Co., Liverpool.	Valparaiso	8
Strang, Robert	Oamaru	1,306	The Albion Shipping Co., Liverpool.	From Otago	3
Stuart, G. R.	S.S. Nemesis	3,396	P. Denny, Dumbarton	Melbourne	4
<sup>36</sup> Studdert, Robert	Liguria	4,666	The Pacific Steam Navigation Co., Liverpool.	West Coast of South America	4
<sup>37</sup> Swan, John	City of Madrid	1,191	G. Smith, Glasgow	Adelaide	6
Synington, William	S.S. Hankow	3,594	E. H. Watts, London	New York, one voyage; Melbourne, Sydney, Hong-Kong, &c., via Suez, one voyage.	6
"	"	"	"	To Melbourne and Sydney, via Cape of Good Hope, and home, via Suez.	4
Trench, C. E. Le P.	Newcastle	1,137	J. B. Foley, London	Melbourne	6
"	S.S. Sultan	2,502	H. Green, Blackwall	To Madras and Calcutta	40 days.
Turner, E. W.	Mertola	392	F. T. Barry, London	Pomeron, three voyages	3
Waken, W. J. S.	River Thames	501	J. Hargrove, Liverpool	Valparaiso	4
Warden, William	S.S. Alpha	633	W. Cunard, Halifax, N.S.	Between Halifax, Bermuda, and St. Thomas, four voyages.	3

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

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Waring, William	S.S. Atalanta	2,668	H. N. Hughes, Liverpool	India, via Suez	5
"	"	"	"	"	4
Watson, William	S.S. Algeria	3,428	C. Melver, Liverpool	New York, eight voyages	6
"	"	"	"	four "	3
Watts, R. A.	Outalpa	676	T. L. Devitt, London	Adelaide	7
Wheaton, W. J. L., R.N.	Fawn	1,045	H.M.S.	In the Red Sea	4
"	"	"	"	Between Aden and Zanzibar	4
"	"	"	"	Off Zanzibar	4
Wilcox, H. G., R.N.R.	S.S. Glenfinlas	2,115	J. McGregor, London	China, via Suez	3
Young, Alexander	City of Berlin	1,012	G. Smith, Glasgow	Rangoon	11

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

- 1 Kept by Messrs. Wilson, Graham, Wilcox, and Potts.
- 2, 3 Kept by Gerard Humphreys, 3rd Officer.
- 4 Kept by C. E. Drake, Navigating Lieutenant.
- 5, 20 Kept by Henry Hosken, Staff Commander.
- 6, 7 Kept by Campbell M. W. Hopworth, Second Officer.
- 8, 9 Kept by J. Boyton, Chief Officer.
- 10 Assisted by W. Vaughan Nichols.
- 11 Assisted by Messrs. R. W. Harvey, Webster, and George Frost.
- 12 Assisted by Messrs. R. W. Harvey and George Frost.
- 13 Kept by Angus William Sholto Douglas, Sub-Lieutenant.
- 14, 15 Kept by the Boys.
- 16 Kept by Robert W. Williams, Surgeon, and C. E. Drake, Navigating Lieutenant.
- 17, 18 Assisted by Officers.
- 17 Kept by Thomas Roberts.

- 18 Kept by William J. N. Baird, Navigating Lieutenant.
- 19 Kept by Anthony Standidge Thompson, 2nd Officer.
- 21 Kept by James Henry Hiebman.
- 22, 23 Kept by A. Kellett, 2nd Officer.
- 24 Kept by S. Johnson.
- 27, 28 Kept by G. N. A. Pollard, Lieutenant.
- 29, 30 Kept by Alfred Carpenter, Lieutenant.
- 31 Assisted by 2nd Officer.
- 32 Kept by the 1st Officer.
- 33 Kept by George Henry Stoate, Navigating Lieutenant.
- 34 Kept by Francis S. Wheeler, Navigating Sub-Lieutenant.
- 36 Kept by H. Brown, 2nd Officer.
- 37 Kept by J. W. Robertson, 3rd Mate.
- 38, 39, 40 Kept by G. C. Frederick, Sub-Lieutenant.
- 41 Kept by J. A. C. Brittain, Chief Officer.

## APPENDIX IV.

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

Per Account.	Baro- meters.	Ane- roids.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1877, afloat -	184	385	959	21	64	57	131
Issued since -	68	90	326	153	109	21	37
Returned since -	252	475	1,285	174	173	78	168
April 1st, 1878, afloat -	56	83	295	26	28	12	30
	196	392	990	148	145	66	138

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

April 1st, 1877, in use -	48	84	65	16	11	4	14
Issued since -	3	5	13	—	1	—	—
Returned since -	51	89	78	16	12	4	14
	2	2	8	4	6	—	—
April 1st, 1878, in use -	49	87	70	12	6	4	14

## DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1878.

Afloat in Royal Navy -	196	392	990	148	145	66	138
In use at stations -	49	87	70	12	6	4	14
In store at M.O. -	125	45	116	75	53	45	99
" Chatham -	4	7	29	3	3	8	4
" Sheerness -	4	2	15	2	4	10	27
" Portsmouth -	5	6	30	6	6	6	18
" Devonport -	3	5	14	4	4	3	8
" Queenstown -	2	2	4	1	1	—	8
" Gibraltar -	1	2	9	—	—	—	4
" Malta -	7	10	8	1	—	4	24
" Halifax -	6	7	22	3	5	—	12
" Bermuda -	—	6	20	4	4	—	15
" Jamaica -	2	4	12	2	3	—	8
" Cape of Good Hope -	2	8	26	3	3	—	31
" Trincomalee -	4	6	19	—	—	—	—
" Hong Kong -	6	4	27	9	10	1	14
" Coquimbo -	—	—	1	1	—	—	23
" Sydney -	4	7	24	2	2	—	—
" Esquimalt -	5	5	17	—	—	—	—
Under repair -	16	12	—	—	—	—	—
Total -	441	617	1,453	276	249	147	447
Lost, &c. since April 1st, 1877.	1	14	254	22	22	7	9
On way to Malta -	—	—	24	—	—	—	—
" from Hong Kong -	—	3	45	1	1	—	2
" " Devonport -	2	1	—	—	—	—	—
" " Portsmouth -	1	2	2	—	2	—	—

## APPENDIX V.

## INSTRUMENTS, &amp;c. supplied to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1877, afloat -	111	1	667	—	1	105	421
Issued since -	102	—	609	1	17	98	379
Returned since -	213	—	1,276	1	18	203	800
April 1st, 1878, afloat -	92	—	537	1	9	91	330
	121	1	739	—	9	112	470

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

April 1st, 1877, in use -	89	3	234	47	50	40	42
Issued since -	10	—	21	8	14	7	4
Returned since -	99	3	255	55	64	47	46
April 1st, 1878, in use -	20	1	43	3	12	6	4
	79	2	212	52	52	41	42

## DISPOSITION of Board of Trade Instruments.

In merchant ships -	121	1	739	—	9	112	470
In use at stations -	79	1	212	52	52	41	42
In store at M.O. -	40	45	230	24	59	—9	66
At Liverpool agency -	6	8	9	—	—	2	5
„ Aberdeen „ -	2	—	24	—	—	1	17
„ Glasgow „ -	5	—	18	—	—	5	16
„ Dundee „ -	2	—	10	—	1	1	4
„ Hull „ -	4	—	19	—	—	5	12
„ Southampton „ -	1	—	6	—	—	1	4
„ Cardiff -	2	—	17	—	—	3	12
„ Kew -	—	—	2	—	—	—	—
Under repair -	15	—	—	—	—	2	—
Total, April 1st, 1878 -	277	56	1,286	76	121	164	648
Lost, &c. since April 1st, 1877 -	12	1	172	2	4	25	93

## APPENDIX VI.

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

Sumburgh Head	-	Rev. W. Brand	-	-	Minister of Dunrossness.
Stornoway	-	J. Sutherland	-	-	Schoolmaster.
*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	-	F. Shaw, F.M.S.	-	-	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. Lowry	-	-	Schoolmaster.
Donaghadee	-	J. MacGowan, jr.	-	-	Telegraph Clerk.
Kingstown	-	G. Mitchell	-	-	Keeper of Sailors' Home.
*Holyhead	-	J. Tilston	-	-	Do.
Liverpool	-	J. Hartnup, junr.	-	-	Bidston Observatory.
*Valencia	-	J. E. Cullum	-	-	Superintendent of the Observatory.
Roche's Point	-	W. Kennedy	-	-	Telegraph Clerk.
Pembroke	-	J. C. Walker	-	-	Do.
Portishead	-	W. Sandford	-	-	—
*Scilly	-	W. Thomas	-	-	Signalman.
Plymouth	-	J. Merrifield, LL.D., F.R.A.S.	-	-	Teacher of Navigation.
Hurst Castle	-	T. Lanceley	-	-	Lightkeeper.
Jersey	-	J. Fisher	-	-	Signalman.
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, Sailors' Home.

## Summary :

England and Wales	-	-	-	17
Scotland	-	-	-	3
Ireland	-	-	-	5

\* Those marked with an asterisk report twice daily. The Office also receives daily reports from 22 places on the Continent.

## APPENDIX VII.

The principal operations connected with the preparation and issue of the Daily Weather Report and of Storm Warnings are as follows:—

The Office receives, when the telegraphic communications are perfect, fifty-two reports every morning, nine every afternoon, except on Sundays, and eleven each evening. The reason of the suspension of the afternoon reports on Sundays is that almost all the telegraphic circuits are closed at the hour at which the messages would be transmitted.

The foreign reporting stations extend along the entire western coast of the Continent, from Christiansund in lat. 63° N. to Corunna in lat. 43° N., and also include four stations on the coast of the Baltic, and one at Cape Sicié near Toulon, on the Mediterranean. The information is received in accordance with various arrangements made with the Meteorological organisations in France, Holland, Germany, Denmark, Norway, and Sweden.

At the British stations the morning observations are taken at 8 a.m. Greenwich time, and most of the telegrams arrive in London at 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 transmitted to the Office by its private wire, where the majority of them usually arrive between 9 and 10 a.m.

As fast as the reports come in the information is entered on a chart, which shows for each station at 8 a.m. the barometrical and thermometrical readings, with their respective alterations during the preceding 24 hours, the direction and force of the wind and the state of the weather, together with any changes of importance which may have been noticed in the course of the preceding day. From this chart, which is preserved in the Office, other charts are then drawn for publication in the newspapers, as described further on.

A brief telegraphic *resumé* of the weather is despatched shortly after 10 a.m. to the harbour authorities in Jersey and also to the Marine Ministry in Paris, by which department it is afterwards transmitted to Florence for the benefit of the Italian Naval Service. If necessary, telegraphic intelligence of storms or of atmospherical disturbance is sent to our own coasts and to foreign countries.

Another telegraphic message of about 75 words is sent to the Underwriters Association, Liverpool, containing reports of the pressure, wind and weather at 14 stations on the coasts of the British Islands; and a third message of about the same length is forwarded to the Central News for despatch to the provinces. The last of these messages consists of a brief statement of the general condition of the weather in Western Europe, as shown by the reports for the morning.

About an hour is occupied in the preparation and transmission of these telegrams, and the drawing up of the "remarks" which are sent to the London newspapers, so that the MS. copies of the Weather Report for the "Times" and other papers are ready for issue soon after 11 a.m.

The Charts prepared daily for newspaper publication are as follows:—

For the "Times,"	-	-	two daily, viz.:	for 8 a.m. and 6 p.m.
"    "Shipping Gazette"	}	one	"	for 8 a.m.
and "Morning Chronicle"				
For the Patent Type-found-	}	one	"	for 8 a.m.
ing Company, to be dis-				
tributed to the provincial				
press				

The first and second of these are sent out at about 10.15 a.m.; the third at 11.30 a.m.

The draft of the Daily Weather Report, which is issued as a separate sheet, with four charts attached, is drawn on transfer paper and is ready by noon, when it is at once sent to the lithographer to be printed. The copies for delivery by hand in London are issued by the lithographer at about 1.30 p.m., while the remaining portion are received at the Office at about 3.30 p.m., and are transmitted by post to the subscribers and others.

In addition to the charts referred to above, the Patent Type-founding Company are supplied with various diagrams showing the changes in pressure, temperature, rainfall, wind, and weather. These are engraved daily for the "Daily Chronicle," weekly for the "Observer," "Graphic," "Lloyd's Weekly London Newspaper," and the "Agricultural Gazette," and monthly for the "Miller." They are all accompanied by remarks on the phenomena exhibited.

At about 3 p.m. the observations taken at seven home stations at 2 p.m. are received, and copies of these reports are issued, together with the 8 a.m. report, to several newspapers and subscribers. Eleven copies of the "Remarks" are sent to the Type-founding Company for issue to the provincial newspapers for publication, in order to illustrate the 8 a.m. charts. On the information derived from the 8 a.m. and 2 p.m. reports a second telegram of about 200 words is prepared and transmitted soon after 6 p.m. to the Intelligence Department of the Post Office for the Central News, and is distributed by that agency in the provinces for publication in the next morning's newspapers.

At 7 p.m. the eleven evening (6 p.m.) reports arrive and are charted and discussed for the "Times," in accordance with the arrangement referred to on p. 11. The chart and remarks are usually ready by 8 p.m., but in bad weather, owing to the delay of the reports and the additional care which is necessary in dealing with them, it is frequently 8.30 or 9 p.m. before they are issued.

It is scarcely necessary to remark that the charts for 2 p.m. and for 6 p.m. are far less complete than that for 8 a.m. That for 2 p.m. is drawn on the information received from seven home stations, supplemented by that from two foreign ones, whenever these latter arrive in time to be used, which is a rare occurrence. The material for the charts for 6 p.m. is supplied by reports from only eleven stations in the United Kingdom. It is evident that all that is wanted to render the telegraphic weather service more efficient is the power to expend more money on the collection and transmission of reports.

Whenever the telegrams come in (*i. e.*, at about 10 a.m., 3 p.m., and 7 p.m., and also on the receipt of any special telegram,) the condition of the weather is carefully considered, and, when necessary, cautionary messages are issued to any of our coasts which may be threatened by bad weather, and also to the neighbouring continental coasts, in accordance with the special arrangements for each country.

The Sunday duty is conducted as follows:—Two of the clerks attend on Sunday morning at the Central Telegraph Station from 8.30 a.m. to about 10.15 a.m. By an arrangement with the Post Office these clerks are supplied with the telegrams immediately they arrive in London. They are examined and charted, with the view of issuing, when necessary, warnings of coming storms, to our own and neighbouring coasts. It is necessary that the utmost promptitude should be observed in this service, as the observations must be dealt with and the warnings issued so as to reach the coast before the telegraph offices close for the day, which is usually at about 10 a.m. No work of any kind for the news-

papers is transacted on Sunday mornings, the main object being to give prompt information of storms to our coasts, but a telegram is sent to Paris and Jersey in the same way as on week days, and there is the ordinary interchange of messages with foreign countries.

At 6 p.m. the same clerks attend at the Meteorological Office to receive the evening reports for the "Times," and another opportunity is thus offered for the correction or extension of any warnings which may have been issued in the morning.

#### *Weekly Summary.*

Soon after the end of each week a Weekly Summary of the Weather in Western Europe is issued as a supplement to the Daily Weather Report, giving an account of the changes which have been observed in the weather from day to day, together with a brief general statement showing what have been the more prominent features in the weather conditions during the whole period.

In this manner the main meteorological features of the week are presented as a connected story, and additional facility is afforded for future reference.

#### *Correction and Addition List.*

Some further steps are taken to insure accuracy in this branch of the work. At the close of each month a return is received from each of the telegraphic reporting stations containing a copy of all the observations which have been transmitted to London by wire during the month. These schedules are used for checking the daily telegrams, for the preparation of the average and other values of the different elements, and also as evidence in the case of legal proceedings; and about the middle of every month a lithographic sheet is issued with the Daily Weather Report, containing corrections for all discrepancies which have been discovered and supplying any observations which have been omitted in the published reports.

#### *Weekly Weather Report.*

The Weekly Weather Report is a publication which has appeared since the beginning of February 1878. A specimen of the publication will be found as Appendix XI. It consists of the average and extreme temperatures and the rainfall values in each week for ten districts in Great Britain and Ireland, together with the difference between them and their respective mean values for the corresponding weeks in previous years. These statistics are given on page 1 of the publication, the corresponding values for *each station* being given on page 2. In addition to the telegraphic reports weekly returns from 17 volunteer observers are used in this report, the names of the observers at each station being as under:—

Names of Stations.		Names of Authorities.
Audley End (Saffron Walden)	Ⓐ	J. Bryan.
Cirencester - - -	-	Professor Church, the Agricultural College.
Douglas, Isle of Man - - -	-	A. W. Moore, Esq.
Dunfanaghy - - -	-	C. Brooke Wolsley, M.D.
Durham - - -	-	G. A. Goldney, the Observatory.
Glenalmond - - -	-	Rev. W. P. Robinson, D.D., Trinity College.
Hastings - - -	-	A. E. Murray, F.M.S.
Hereford - - -	Ⓐ	T. A. Chapman, M.D.
Kelstern (Lincolnshire) - - -	Ⓐ	D. G. Briggs, F.M.S.

Names of Stations.	Names of Authorities.
Laudale (Loch Sunart) - - -	A. Fletcher, for T. G. Newton, Esq.
Leicester - - -	W. J. Harrison, F.G.S., the Museum.
Marlborough - - -	Rev. T. A. Preston, M.A., F.M.S.
Parsonstown - - -	J. Dreyer, for the Earl of Rosse, F.R.S.
Prestwich (near Manchester) - - -	T. R. H. Clunn, Esq., M.D.
Rothamsted - - -	Rainfall by Messrs. Lawes and Gilbert; temperature by T. Wilson, Esq., F.M.S.
Shrewsbury - - -	Rev. E. V. Pigott, F.M.S.
Silloth - - -	Rev. F. Redford, F.R.S.E.
Strathfield Turgis - - -	Rev. C. H. Griffith, F.M.S.

The returns from stations marked "M" are supplied by the Meteorological Society (of London).

This report is prepared on Wednesday in every week, and the summary on its first page appears in the "Times" and "Daily News" on Thursday morning.

#### *Testing the Storm Warnings.*

The method of testing the warnings is as follows: The intelligence issued has usually been compared with the weather experienced on the coasts, as reported by the various self-recording anemometers maintained by the Office, by the telegraphic reporters, and by the several gentlemen who have volunteered to observe for the Office, and whose names will be found at pp. 18-19.

In order to render the information in the possession of the Office as to the weather experienced on our coasts more complete, the Council have in 1877, as in the preceding year, made application to the various Lighthouse Boards, and have obtained from them the original log-books from some of the best exposed lightships and lighthouses. They would here express their cordial thanks for the co-operation so readily granted to them by these Boards.

The coasts were subdivided into nine districts, as will be seen in the table on p. 12. Two large tracts of coast are entirely omitted: The west of Ireland from the Shannon to Malin Head, and the West of Scotland from the Mull of Cantyre to Cape Wrath. No warnings are issued to any place within the limits indicated, except to Galway, and the amount of information as to the weather received from the omitted tracts of coast is, as yet, very scanty.

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

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

Any spare time of the clerks engaged on Weather Telegraphy is employed in obtaining average values for the different elements, and in such other meteorological investigations as may be directed by the Council.

## APPENDIX VIII.

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

*Newspapers :*

Daily News.  
 Echo.  
 Globe.  
 Lloyd's Shipping List.  
 Mark Lane Express.  
 Morning Advertiser.  
 New York Herald.  
 Observer.  
 Pall Mall Gazette.  
 Press Association (Plymouth Daily Mercury).  
 Shipping and Mercantile Gazette (with special daily chart).  
 Standard (Morning and Evening).  
 Times (1st and 2nd editions).

*For Exhibition at following Seaports :*

Banff.	Holyhead.
Barrow-in-Furness.	Kingstown.
Belfast.	Lancaster.
Blackpool.	Leith.
Bo'ness.	Margate.
Boscastle.	Nairn.
Bournemouth.	Newquay.
Brighton.	Penarth.
Briton Ferry.	Plymouth.
Broughty Ferry.	„ G. W. Docks.
Buckie.	Port Dinorwic.
Budehaven.	Porthcawl.
Caernarvon.	Queenstown.
Cork.	Scarboro'.
Cowes.	Silloth.
Cromer.	Southport.
Deptford Yard.	Teignmouth.
Dover.	Thurso.
Exeter (2 copies).	Ventnor (2 copies).
Falmouth.	Weston-super-Mare.
Great Grimsby (2 copies).	Whitley.
Hastings.	Wick.
Hayle.	Yarmouth.

*In exchange for Observations :*

Aird, G. H., Seaham.  
 Barnstaple Meteorological Committee.  
 Cambridge Observatory.  
 Chatham Instructor in Surveying.  
 Clouston, Rev. C., LL.D., Sandwick, Orkney.  
 Clunn, T. R. H., M.D., Prestwich, Manchester.  
 Cooper, Col., F.R.A.S., Markree, nr. Sligo.  
 Cooper, W. F., F.M.S., Sheffield.  
 Durham University Observatory.  
 Fernley Observatory, Southport.  
 Greenwich Observatory.

*In exchange for Observations.—cont. :*

Harrison, W. J., F.G.S., Leicester.  
 Hoskins, Dr. S. E., F.R.S., Guernsey.  
 Indian C.E. College, Staines.  
 Liverpool Observatory.  
 Lowe, E. J., F.R.S., Nottingham.  
 McCormack, J., Aberdeen.  
 Mackay, Rev. W. P., M.D., Hull.  
 Miller, S. H., F.R.A.S., Lowestoft.  
 Moore, J. W., M.D., Dublin.  
 Moyle, M. P., F.R.C.S., Helston.  
 Mullins, Rev. G. H., Uppingham.  
 Murray, A. E., F.M.S., Hastings.  
 Northumberland, Duke of, Alnwick.  
 Radcliffe Observatory, Oxford.  
 Richards, W. H., Penzance.  
 Robinson, Rev. W. P., D.D., Glenalmond.  
 Rosse, Earl of, F.R.S., Parsonstown.  
 Royal Horticultural Society.  
 Rugby Natural History Society.  
 Taylor, Rev. C. J., Folkestone.  
 Walker, J. C., St. Ann's Head.  
 Whitty, Rev. S. J., B.A., Oscott.  
 Yorkshire Philosophical Society.

*Government Offices, Societies, Individuals, &c. :*

J. R. Mann, Esq., Osborne, for the Queen.  
 The Principal Government Offices : 53 copies.  
 "Resistance," H.M.S., Rock Ferry, Cheshire.  
 Aldershot, Garrison Library.  
 Association of Underwriters, Liverpool.  
 Do. Lloyd's : 5 copies.  
 "Britannia," H.M.S., Dartmouth.  
 British Museum.  
 Buchan, A. F.R.S.E., Edinburgh.  
 Crossley, L. J., Halifax.  
 Devonport Dockyard : 3 copies.  
 " Commander-in-Chief.  
 " Captain of Steam Reserve.  
 " Master Attendant.  
 Greenwich, R.N. College : 4 copies.  
 Griffith, Rev. C. H., Strathfield Turgiss.  
 "Indus," H.M.S., Devonport.  
 Ireland, Lord Lieutenant.  
 " Geological Survey.  
 " Royal College of Science : 2 copies.  
 Meteorological Council : 4 copies.  
 " Society, London.  
 "Nankin," H.M.S., Milford Haven.  
 Observatories : 7 copies.  
 Patent Office.  
 Portland, Senior Naval Officer.  
 Portsmouth, Commander-in-Chief.  
 " Dockyard.  
 " R. N. College Observatory.  
 Reuter's Telegram Company.  
 Richards, Vice-Adm., Sir G. H., F.R.S., London.

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

Royal Artillery Institute : 2 copies.  
 Royal Military Academy.  
 Royal Society.  
 Royal United Service Institution.  
 Sandhurst Staff College.  
 Scottish Meteorological Society.  
 Sheerness, Commander-in-Chief.  
 „ Dockyard.  
 Spottiswoode, W., F.R.S., London.  
 Smythe, Lt.-Gen. W. J., F.R.S., Belfast.  
 Stewart, Professor B., LL.D., F.R.S., Manchester.  
 Stow, Rev. F.W., F.M.S., Aysgarth, Yorkshire.

*Foreign Places :*

Algiers, Meteorological Service.  
 Brussels, Royal Observatory.  
 Calcutta, Meteorological Department.  
 Christiania, Meteorological Institute.  
 Constantinople, Imperial Meteorological Observatory.  
 Copenhagen, Meteorological Institute.  
 Cracow Observatory.  
 Emden, Dr. Prestel.  
 Florence, Meteorological Office.  
 Freeden, W. H. v., Bonn.  
 Hamburg, German Ocean Observatory.  
 Hébert, M., Draguignan.  
 Lisbon, Observatory.  
 Madrid, Royal Observatory.  
 Meudon, French Balloon Corps.  
 Nice, Société de Médecine.  
 Paris, Meteorological Observatory, Montsouris.  
 „ Meteorological Society.  
 „ Ministry of Marine.  
 „ Observatory.  
 „ M. Harold Tarry.  
 Rome, Ministry of Agriculture.  
 St. Petersburg, Central Physical Observatory.  
 Tiflis, Physical Observatory.  
 Toronto, Meteorological Office.  
 Upsala, University Observatory.  
 Utrecht, Royal Meteorological Institute.  
 Vienna, Imperial Meteorological Institute.  
 Washington, Smithsonian Institution.  
 „ United States Naval Observatory.  
 „ Chief Signal Officer, War Office.  
 Zürich, Central Meteorological Institute.

## 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 “drum” and “cone” 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, 80 in England and Wales, 30 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.	Eyemouth.
Inverness.	Maryport.	Barnstaple.	Berwick-on-
Nairn.	Workington.	Port Isaac.	Tweed.
Burghead.	Whitehaven.	Boscastle.	Tynemouth.
Lossiemouth.	Ramsey.	Newquay.	S. Shields.
Buckie.	Douglas.	Hayle.	Sunderland.
Portsoy.	Castletown.	Pendennis.	Middlesborough.
Banff.	Barrow.	Scilly.	Redcar.
Fraserburgh.	Morecambe.	Penzance.	Whitby,
Peterhead.	Fleetwood.	Falmouth.	Filey.
Aberdeen.	Blackpool.	Plymouth, four	Withernsea.
Stonehaven.	Lytham.	stations.	Hull.
Montrose.	Runcorn.	Teignmouth.	Goole.
Broughty Ferry.	Southport.	Exeter.	Grimsby.
St. Andrews.	Liverpool.	Exmouth.	Boston.
Dundee.	Hawarden.		Sutton Bridge.
Anstruther.	Mostyn.		Lynn.
Burntisland.			Cromer.
Alloa.	ENGLAND, W.		
Grangemouth.	Port Penrhyn.		
Bo'ness.	Holyhead.		
Granton.	Carnarvon.	ENGLAND, S.	
Leith.	Port Dinorwic.	Guernsey.	ENGLAND, S.E.
Fisherrow.	Aberystwith.	St. Helier, Jersey.	Yarmouth.
Dunbar.	Milford.	Gorey, Jersey.	Southwold.
	Pembrey.	Weymouth.	Ipswich.
	Llanelly.	Poole.	Harwich.
	Briton Ferry.	Cowes.	Chatham.
	Porthecawl.	Ventnor.	Sheerness.
	Penarth.	Portsmouth.	Faversham.
	Cardiff.	Portsmouth.	
	Newport.	Littlehampton.	
	Weston-super-	Brighton.	
	Mare.	Newhaven.	
	Burham.	Hastings.	
	Bridgewater.	Rye.	
		Dover.	
	IRELAND, E.	Margate.	
	Belfast.		
	Howth.		
	Kingstown.		
FIRTH OF CLYDE.	IRELAND, S. and W.		
Glasgow.	New Ross.		
Greenock.	Dunmore, East.		
Rothesay.	Dungarvan.		
Campbeltown.	Youghal.		
Girvan.	Queenstown.		
	Passage.		
	Cork.		
	Tralee.		
	Limerick.		
	Galway.		

Circular No. 717.

TELEGRAPHIC WEATHER INTELLIGENCE.

Board of Trade, February 14th, 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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\* The "explanatory pamphlet" referred to is a circular entitled "Telegraphic Weather Intelligence," printed in large type on four pages, so as to be posted up on a board.

## APPENDIX X.

LIST of STATIONS from which DAILY SYNCHRONOUS OBSERVATIONS  
(at Oh. 43m. p.m. G. M. T.) have been received.

Stations.	Observers.	Remarks.
ENGLAND AND WALES.		
Bradford - - -	J. McLandsborough	—
Cambridge - - -	H. Todd.	—
Cardington - - -	J. McLaren.	—
Chatham, School of Military Engineering.	C. N. Martin, Col., R.E. -	—
Dartmoor - - -	R. E. Power, L.R.C.P.	—
Dover - - -	J. Costello.	—
Eccles - - -	T. Mackereth.	—
Falmouth Observatory -	The Staff.	—
Greenwich Observatory -	The Staff, for Sir G.B. Airy.	—
Guernsey - - -	Dr. Hoskins, F.R.S.	—
Helston - - -	Dr. Moyle.	—
Holyhead - - -	J. Tilston.	—
Jersey (St. Helier's) -	J. Fisher.	—
Kew Observatory - - -	The Staff.	—
Leicester (Museum) - -	W. J. Harrison, F.G.S.	—
Liverpool Observatory (Bidston).	J. Hartnup, Jun.	—
Nottingham - - -	E. J. Lowe, F.R.S.	—
Oscott (St. Mary's Col.)	Rev. S. Whitty.	—
Oxford, Radcliffe Obs. -	J. Lucas.	—
Plymouth - - -	J. Merrifield, LL.D., F.R.A.S.	—
Sheffield - - -	W. F. Cooper, F.M.S.	—
Silloth - - -	Rev. F. Redford, M.A., F.R.S.E.	—
St. Ann's Head (Milford Haven).	J. C. Walker.	—
Stonyhurst Observatory -	The Staff.	—
Strathfield Turgiss - -	Rev. C. H. Griffith, M.A.	—
Truro (Royal Institution)	W. Newcombe.	—
Yarmouth (Norfolk) - -	G. T. Watson.	—
SCOTLAND.		
Aberdeen Observatory -	The Staff.	—
Ardrossan - - -	W. McNeil.	—
Glasgow Observatory - -	The Staff.	—
Nairn - - -	W. D. Penny.	—
Orkneys, Sandwick - - -	Rev. C. Clouston, LL.D.	—
Stornoway - - -	J. Sutherland.	—
Thurso - - -	J. Trotter.	—
IRELAND.		
Armagh Observatory - -	S. Call for Dr. Robinson.	—
Donaghadee - - -	J. McGowan.	—
Galway, Queen's College	B. G. Clare, for Professor Curtis.	—
Kingstown - - -	G. Mitchell.	—
Parsonstown - - -	J. Dreyer for Lord Rosse.	—
Roche's Point - - -	W. Kennedy.	—
Valencia Observatory - -	The Staff.	—

Stations.	Observers.	Remarks.
<b>BRITISH COLONIES, POSSESSIONS, &amp;C.</b>		
Barbadoes, W. I.	G. W. Roberts, Priv. A.H.C.*	—
Gibraltar	C. Aitken, Serg. A.H.C.	—
Malta	Corp. Travis, A.H.C.	—
Nassau (Bahamas)	Surgeon-Maj. J. Jamieson, M.D.	—
Natal	Priv. G. Salmon, A.H.C.	—
Scutari, British Cemetery	Serg. W. H. Lyne, R.E.	—
Sierra Leone	—	—

## SUMMARY.

England and Wales	27
Scotland	7
Ireland	7
Colonies and British Possessions	7
Total	48

\* A.H.C.—Army Hospital Corps.

## WEEKLY WEATHER REPORT.

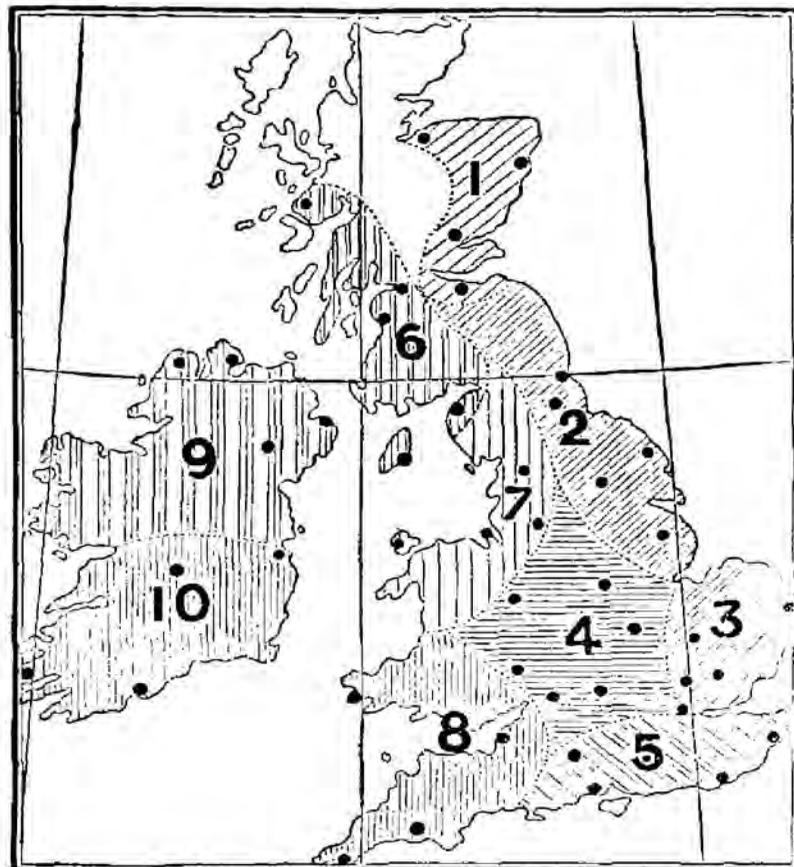
ISSUED BY THE METEOROLOGICAL OFFICE, LONDON.

PUBLISHED BY J. D. POTTER, 31 POULTRY, AND 11 KING STREET, TOWER HILL;  
AND E. STANFORD, CHARING CROSS.

VOL. I. No. 19.]

WEEK ENDING MONDAY, JUNE 17, 1878.

[Price 2d.

[Annual Subscription  
post paid, 12s. 6d.]I.—SUMMARY OF TEMPERATURE AND RAINFALL IN THE UNITED KINGDOM  
FOR AGRICULTURAL AND SANITARY PURPOSES.

**Explanation of the Map.**—The United Kingdom has been divided into Meteorological districts, ten of which are included in the following Summary. They are separately numbered and shaded on the Map, and are similarly numbered in the letterpress, where they are also named.

The black dots show the positions of the Stations furnishing the reports on which the Summary is based. The names of the Stations are given in the following list under those of the districts to which they severally belong.

1. SCOTLAND, E.—Nairn, Aberdeen, Glenalmond, Leith.
2. ENGLAND, N.E.—Shields, Durham, Scarborough, York, Kelstern (Lincolnshire).
3. ENGLAND, E.—Yarmouth, Cambridge, Audley End (Saffron Walden), Rothamsted.
4. MIDLAND COUNTIES.—Nottingham, Leicester, Shrewsbury, Hereford, Cirencester, Oxford.
5. ENGLAND, S.—London, Marlborough, Strathfield Turgiss, Dover, Hastings, Hurst Castle.
6. SCOTLAND, W.—Laudale (Loch Sunart), Glasgow, Ardrossan, Silloth, Douglas (Isle of Man).
7. ENGLAND, N.W.—Stonyhurst, Manchester, Liverpool Observatory (Bidston), Holyhead.
8. ENGLAND, S.W.—Pembroke, Portishead, Falmouth, Plymouth.
9. IRELAND, N.—Dunfanaghy, Greencastle, Armagh, Donaghadee.
10. IRELAND, S.—Kingstown, Parsonstown, Roche's Point, Valencia.

**Explanation of Summary.**—The data for mean *Temperature* in the corresponding week of previous years are derived from the 13 years observations (1857-69), as determined by Mr. Buchan. Those for mean *Rainfall* have been obtained from the 10 years observations 1866-75. A Rainy day is one on which at least a hundredth of an inch has fallen.

DISTRICTS.		Temperature.				Rainfall.		
		Highest observed.	Lowest observed.	Average for the Week.	Above or below the Mean for the Week.	Number of Rainy Days.	Rainfall for the Week.	More or less than the Mean for the Week.
		Degrees Fahr.	Degrees Fahr.	Degrees Fahr.	Degrees Fahr.		In tenths of an inch.	In tenths of an inch.
Principal Wheat- producing Districts.	1. SCOTLAND, EAST	67	39	51	5 below.	3	5	1 more.
	2. ENGLAND, NORTH-EAST	63	37	51	8 below.	4	8	4 more.
	3. ENGLAND, EAST	66	38	54	7 below.	5	10	5 more.
	4. MIDLAND COUNTIES	71	40	55	6 below.	5	6	2 more.
	5. ENGLAND, SOUTH	70	39	56	5 below.	5	7	3 more.
Principal Grazing, &c. Districts.	6. SCOTLAND, WEST	73	38	55	2 below.	2	4	1 less.
	7. ENGLAND, NORTH-WEST	64	40	54	5 below.	4	9	4 more.
	8. ENGLAND, SOUTH-WEST	68	44	57	3 below.	3	6	2 more.
	9. IRELAND, NORTH	70	42	55	3 below.	3	6	2 more.
	10. IRELAND, SOUTH	68	47	57	2 below.	4	8	3 more.

**General Remarks.**

*Weather* has continued changeable and showery. Temperature generally below the mean for the time of year (especially about the 14th and 15th); the maximum readings have seldom exceeded 70° even at our midland stations, and in "England, North-east," they have not been above 63°. The nights have been cool on some occasions, but no frosts are reported.

*Rainfall* has varied much in different localities, but has been generally above the mean. At some stations only one rainy day has occurred, while at others in the same districts four or five have been reported. Thunderstorms have occurred on many occasions.

*Wind* was fresh from south or south-west at the commencement of the week. Moderate northerly to easterly breezes then set in, but the period closed with light variable airs.

The data from which the summary on the preceding page has been calculated, are as follow:—

DISTRICTS.	NAMES OF STATIONS.	Temperature.				Rainfall.			
		Highest observed.	Lowest observed.	Average for the Week.	Difference from the Mean.	No. of Days with Rain.	Total fall in the Week.	Difference from the Mean.	
1. SCOTLAND, E.	Nairn	62	39	51.1	-4.6	2	0.18	-0.23	
	Aberdeen	57	39	49.7	-6.6	5	0.74	+0.38	
	Glenalmond	64	39	51.1	-5.4	4	0.56	?	
	Leith	67	42	52.6	-4.2	2	0.49	+0.08	
2. ENGLAND, N.E.	Shildon	57	41	49.9	-8.1	4	0.60	+0.21	
	Durham	63	37	50.2	-8.1	4	1.40	+0.98	
	Scarborough	60	44	52.2	-8.3	3	0.67	+0.23	
	York	60	44	52.6	-6.2	4	1.03	+0.47	
	Kelstead (Lincolnshire)	fs	62	37	50.4	-8.9	4	0.39	-0.06
3. ENGLAND, E.	Yarmouth	61	45	53.2	-6.1	4	0.27	-0.25	
	Cambridge	64	39	54.2	-6.2	5	1.42	+0.95	
	Audley End (Saffron Walden)	fs	62	38	53.0	-7.5	5	0.81	?
	Rothamsted	66	47	53.7	-7.5	5	1.35	+0.84	
4. MIDLAND COUNTIES	Nottingham	71	44	55.5	-4.4	5	0.47	-0.07	
	Leicester	62	44	53.2	-7.3	4	0.18	?	
	Sheffield	fs	63	45	51.8	-4.8	3	0.54	?
	Hemel Hempstead	fs	67	43	55.5	-4.3	5	0.55	+0.13
	Gloucester	68	49	55.0	-5.6	5	0.66	+0.13	
	Oxford	66	41	51.9	-6.3	5	1.02	+0.54	
5. ENGLAND, S.	London	70	49	59.0	-5.2	6	1.03	+0.52	
	Merthyr Tydfil	fs	67	42	54.7	-6.3	5	1.49	+1.04
	Stratfield Turf	fs	67	39	51.8	-6.0	5	0.45	+0.02
	Dover	63	49	56.2	-3.5	2	0.44	+0.03	
	Hastings	61	45	51.5	-3.2	5	0.39	+0.08	
	Hurst Castle	64	49	57.2	-2.7	4	0.30	?	
	Landale (Loch Sunart)	63	42	53.2	-2.4	1	0.05	?	
6. SCOTLAND, W.	Glasgow	65	45	51.5	-2.0	3	0.33	-0.34	
	Ambleside	67	47	56.5	-0.1	2	0.25	-0.28	
	Silloth	73	38	55.7	-2.3	2	0.76	+0.33	
	Douglas (Isle of Man)	64	45	53.1	-4.8	4	0.41	?	
	Stonchurst	63	40	52.6	-6.2	4	0.98	+0.27	
7. ENGLAND, N.W.	Melton	62	41	52.2	-7.2	4	0.77	+0.17	
	Liverpool Observatory (Bidston)	62	46	53.9	-5.2	5	0.72	+0.24	
	Holyhead	64	50	56.3	-2.5	3	1.10	+0.72	
	Pembroke	66	48	56.5	-3.1	1	0.36	-0.01	
8. ENGLAND, S.W.	Parishhead	68	44	56.5	-4.0	2	0.23	-0.26	
	Falmouth	63	51	56.9	-3.4	4	0.77	+0.17	
	Plymouth	64	49	57.4	-2.9	6	1.11	+0.74	
9. IRELAND, N.	Dunfanaghy	63	59	55.9	-1.3	3	0.44	?	
	Greenestown	70	42	54.8	-2.4	4	0.72	+0.15	
	Annagh	64	46	53.8	-4.1	4	0.62	+0.27	
	Donaghadee	65	44	53.5	-4.1	2	0.72	?	
10. IRELAND, S.	Kingstown	60	50	53.7	-2.9	6	1.10	+0.75	
	Parsonstown	66	48	56.6	-2.0	3	1.29	+0.82	
	Roche's Point	68	50	58.1	-1.1	1	0.44	-0.12	
	Valencia	63	47	55.5	-3.3	6	0.49	-0.18	
SCOTLAND, N.	Sumner's Head	55	39	47.2	-4.6	3	0.12	-0.15	
	Stornoway	60	45	50.9	-2.5	0	—	?	
	Thurso	64	36	49.9	-3.7	0	—	-0.36	
	Wick	60	33	48.0	-6.1	1	0.01	-0.36	
	Seilly (St. Mary's)	62	52	56.7	-3.5	7	0.91	+0.39	
	Jersey (Noirmont)	63	49	56.2	-4.5	4	0.37	+0.04	

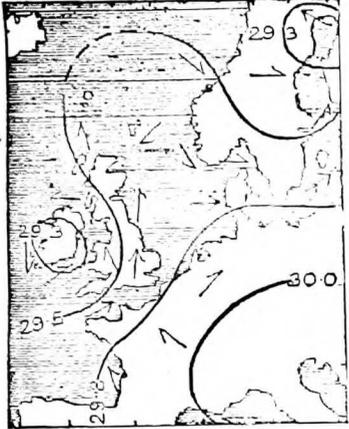
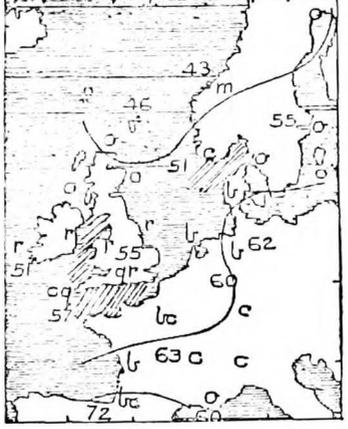
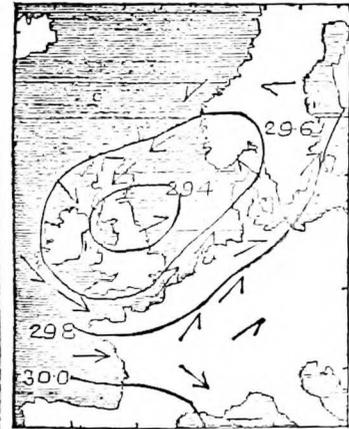
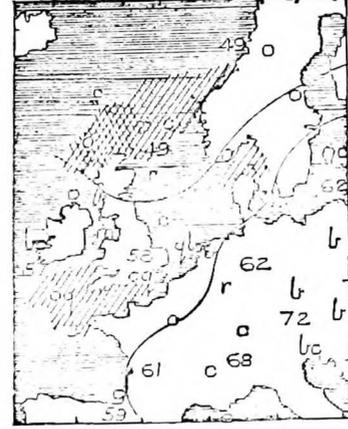
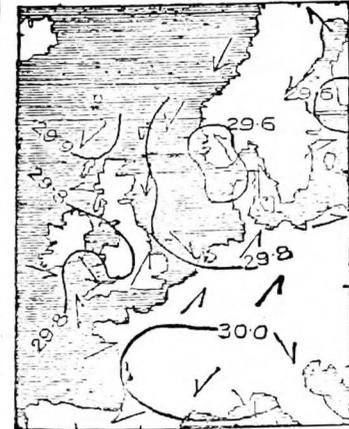
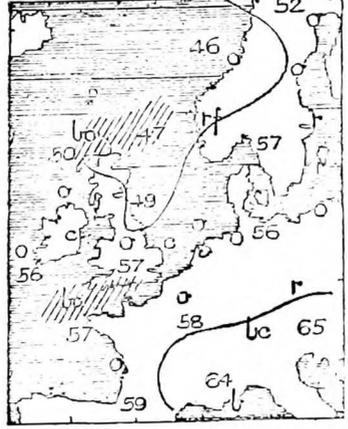
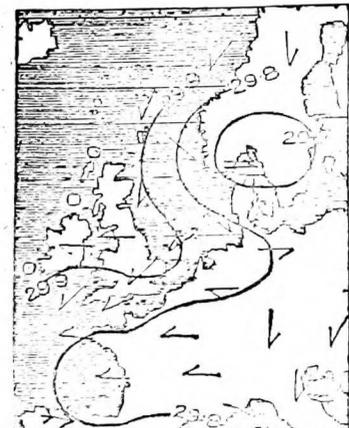
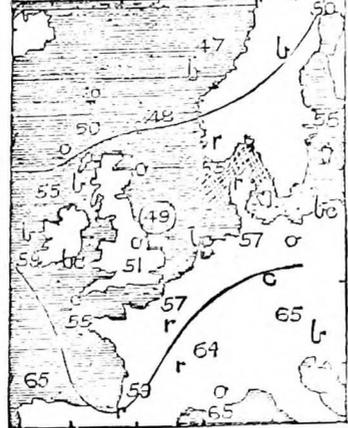
The observations made in "Scotland, N." and the "Channel Islands" are not included in the Summary on page 1. The stations marked with "fs" are in connection with the Meteorological Society.

The data from which the summary on the preceding page has been calculated, are as follow:—

DISTRICTS.	NAMES OF STATIONS.	Temperature.				Rainfall.		
		Highest observed.	Lowest observed.	Average for the Week.	Difference from the Mean.	No. of Days with Rain.	Total fall in the Week.	Difference from the Mean.
		°	°	°	°		Inches.	Inches.
1. SCOTLAND, E.	Nairn - - - - -	62	39	51·1	-4·6	2	0·16	-0·23
	Aberdeen - - - - -	57	39	49·7	-6·6	5	0·74	+0·36
	Glenalmond - - - - -	64	39	51·1	-5·4	4	0·56	?
	Leith - - - - -	67	42	52·6	-4·2	2	0·49	+0·08
2. ENGLAND, N.E.	Shields - - - - -	57	41	49·9	-8·1	4	0·60	+0·21
	Durham - - - - -	63	37	50·2	-8·1	4	1·40	+0·98
	Scarborough - - - - -	60	44	52·2	-6·3	3	0·67	+0·23
	York - - - - -	60	44	52·6	-6·2	4	1·03	+0·47
3. ENGLAND, E.	Kelstern (Lincolnshire) - <i>fs</i>	62	37	50·4	-8·9	4	0·30	-0·06
	Yarmouth - - - - -	64	45	53·2	-6·1	4	0·27	-0·25
	Cambridge - - - - -	64	39	54·2	-6·2	5	1·42	+0·05
	Audley End (Saffron Walden) <i>fs</i>	62	38	53·0	-7·5	5	0·81	?
4. MIDLAND COUNTIES	Rothamsted - - - - -	66	47	53·7	-7·5	5	1·35	+0·84
	Nottingham - - - - -	71	44	55·5	-4·4	5	0·47	-0·07
	Leicester - - - - -	62	44	53·2	-7·3	4	0·18	?
	Shrewsbury - - - - -	63	45	54·8	-4·8	3	0·54	?
	Hereford - - - - -	67	43	55·5	-4·3	5	0·55	+0·13
	Cirencester - - - - -	68	40	55·0	-5·6	5	0·66	+0·13
5. ENGLAND, S.	Oxford - - - - -	66	41	54·9	-6·3	5	1·02	+0·54
	London - - - - -	70	46	56·0	-5·2	6	1·03	+0·52
	Marlborough - - - - -	67	42	54·7	-6·3	5	1·49	+1·04
	Strathfield Turgiss - - <i>fs</i>	67	39	54·8	-6·0	5	0·45	+0·02
	Dover - - - - -	63	49	56·2	-3·5	2	0·44	+0·03
	Hastings - - - - -	61	45	54·5	-5·2	5	0·39	+0·08
6. SCOTLAND, W.	Hurst Castle - - - - -	64	49	57·2	-2·7	4	0·39	?
	Laudale (Loch Sunart) - -	63	42	53·2	-2·4	1	0·05	?
	Glasgow - - - - -	65	45	54·5	-2·0	3	0·33	-0·34
	Ardrossan - - - - -	67	47	56·5	-0·1	2	0·25	-0·28
	Silloth - - - - -	73	38	55·7	-2·3	2	0·76	+0·33
7. ENGLAND, N.W.	Douglas (Isle of Man) - -	64	45	53·1	-4·8	4	0·41	?
	Stonyhurst - - - - -	63	40	52·6	-6·2	4	0·98	+0·27
	Manchester - - - - -	62	41	52·2	-7·2	4	0·77	+0·17
	Liverpool Observatory (Bidston)	62	46	53·9	-5·2	5	0·72	+0·24
8. ENGLAND, S.W.	Holyhead - - - - -	64	50	56·3	-2·5	3	1·10	+0·72
	Pembroke - - - - -	66	48	56·5	-3·1	1	0·36	-0·01
	Portishead - - - - -	68	44	56·5	-4·0	2	0·23	-0·26
	Falmouth - - - - -	63	51	56·9	-3·4	4	0·77	+0·17
9. IRELAND, N.	Plymouth - - - - -	66	49	57·4	-2·9	6	1·11	+0·74
	Dunfanaghy - - - - -	63	50	55·9	-1·3	3	0·44	?
	Greencastle - - - - -	70	42	54·8	-2·4	4	0·72	+0·15
	Armagh - - - - -	64	46	53·8	-4·1	4	0·62	+0·27
10. IRELAND, S.	Donaghadee - - - - -	65	44	53·5	-4·1	2	0·72	?
	Kingstown - - - - -	60	50	55·7	-2·9	6	1·10	+0·75
	Parsonstown - - - - -	66	48	56·6	-2·0	3	1·29	+0·82
	Roche's Point - - - - -	68	50	58·1	-1·1	1	0·44	-0·12
SCOTLAND, N.	Valencia - - - - -	63	47	55·5	-3·3	6	0·49	-0·18
	Sumburgh Head - - - - -	55	39	47·2	-4·6	3	0·12	-0·15
	Stornoway - - - - -	60	45	50·9	-2·5	0	—	?
	Thurso - - - - -	64	36	49·9	-3·7	0	—	-0·36
	Wick - - - - -	60	33	48·0	-6·1	1	0·01	-0·36
	Scilly (St. Mary's) - - -	62	52	56·7	-3·5	7	0·91	+0·39
Jersey (Noirmont) - - -	63	49	56·2	-4·5	4	0·37	+0·04	

The observations made in "Scotland, N." and the "Channel Islands" are not included in the Summary on page 1. The stations marked with "*fs*" are in connection with the Meteorological Society.

## II.—SUMMARY OF WEATHER IN WESTERN EUROPE during the Week ending June 17, 1878.

Synoptic Weather Charts.—8 a.m.		Weather during the 24 hours succeeding the date of the Charts.
BAROMETER AND WIND.	CLOUD, RAIN, SEA, AND TEMPERATURE.	
		<p style="text-align: center;"><b>Tuesday, June 11.</b></p> <p><i>Weather</i> very much disturbed. Rain at all but the most northern stations, the amounts being large in the N. and N.W. Thunderstorms in the E. and N. of England.</p> <p><i>Temperature</i> varying from 46° in the Shetlands to 57° in the S. and S.W. of England, much higher in the S. of France. The maximum readings for the day varying from 60° to 65° over England, and 54° to 60° in Ireland.</p> <p><i>Wind</i> strong to a gale from S. to W. in the southern parts of the Kingdom, and moderate from the eastward in the N.</p> <p><i>Sea</i> rough in the west and south.</p> <p><i>Barometer.</i> The barometer highest (about 30.0 in.) over the E. and S. of France. A depression travelling from S.W. to N.E. over Ireland and the Irish Sea during the day, and reaching the N.W. of England at night.</p>
		<p style="text-align: center;"><b>Wednesday, June 12.</b></p> <p><i>Weather</i> still unsettled and showery, and becoming colder, but the sky inclined to clear in the W. and the rainfall less heavy than on the 11th.</p> <p><i>Temperature</i> fallen at almost all stations, but rising above 60° over England during the day, while in Scotland the maximum varied from 50° to 54°.</p> <p><i>Wind</i> still strong and squally from the south-westward over England and the Channel, but gradually moderating in force during the day. The north-easterly wind in the N. (on the contrary) becoming stronger, and blowing a gale in the Hebrides.</p> <p><i>Sea</i> rather high both in the N. and in the S.</p> <p><i>Barometer</i> still highest in France. The centre of the depression is now over the N. of England and moving slowly to the north-eastward.</p>
		<p style="text-align: center;"><b>Thursday, June 13.</b></p> <p><i>Weather</i> very much disturbed in many places, though on the whole finer than of late. Some rain reported at a few stations, heavy hail and rain showers about London in the afternoon and evening; and nearly an inch of rain at Cambridge.</p> <p><i>Temperature</i> changing suddenly and irregularly, but rising to 68° at Roche's Point and 70° in London during the day, while at Shields the maximum did not exceed 53°.</p> <p><i>Wind</i> fresh from N. at the northern stations, but moderating; chiefly westerly in the S. of England as well as over the N. of France; very variable in the W.</p> <p><i>Sea</i> still rough both in the N. and S.</p> <p><i>Barometer</i> very unsteady. The depression of the past few days now found near Norway, and becoming much less deep. Fresh disturbances appearing in the West, keeping the atmosphere in a very damp unsettled condition.</p>
		<p style="text-align: center;"><b>Friday, June 14.</b></p> <p><i>Weather</i> quieter and finer in the United Kingdom than of late, but cold and very gloomy, especially in the S.E. Very little rain reported except over France, where it fell very generally.</p> <p><i>Temperature</i> very low except on our S.W. coasts, the S.A.M. reading being as low as 49° at our north-easterly stations, and the highest point reached during the day being as low as 56° at London, Oxford, and York.</p> <p><i>Wind</i> moderate from the northward over the northern parts of the Kingdom, and from the N.E. to E. in the S., as well as in the Channel and N. and W. of France. North-westerly to westerly winds in Norway and Denmark. The easterly wind subsequently "backing" to N. and N.W.</p> <p><i>Sea</i> little disturbed on our coasts, but high in the Skager Rack.</p> <p><i>Barometer</i> risen considerably in the N. and fallen over France, but readings more regular than of late. A large shallow depression over France, and another deep one in the S. of Scandinavia.</p>

**II.—SUMMARY OF WEATHER IN WESTERN EUROPE**  
during the Week ending June 17, 1878.

**Synoptic Weather Charts.—8 a.m.**

BAROMETER AND  
WIND.

CLOUD, RAIN, SEA, AND  
TEMPERATURE.

**Weather** during the 24 hours succeeding the  
date of the Charts.



**Tuesday, June 11.**

*Weather* very much disturbed. Rain at all but the most northern stations, the amounts being large in the N. and N.W. Thunderstorms in the E. and N. of England.

*Temperature* varying from  $46^{\circ}$  in the Shetlands to  $57^{\circ}$  in the S. and S.W. of England, much higher in the S. of France. The maximum readings for the day varying from  $60^{\circ}$  to  $65^{\circ}$  over England, and  $54^{\circ}$  to  $60^{\circ}$  in Ireland.

*Wind* strong to a gale from S. to W. in the southern parts of the Kingdom, and moderate from the eastward in the N.

*Sea* rough in the west and south.

*Barometer.* The barometer highest (about  $30.0$  in.) over the E. and S. of France. A depression travelling from S.W. to N.E. over Ireland and the Irish Sea during the day, and reaching the N.W. of England at night.



**Wednesday, June 12.**

*Weather* still unsettled and showery, and becoming colder, but the sky inclined to clear in the W. and the rainfall less heavy than on the 11th.

*Temperature* fallen at almost all stations, but rising above  $60^{\circ}$  over England during the day, while in Scotland the maximum varied from  $50^{\circ}$  to  $54^{\circ}$ .

*Wind* still strong and squally from the south-westward over England and the Channel, but gradually moderating in force during the day. The north-easterly wind in the N. (on the contrary) becoming stronger, and blowing a gale in the Hebrides.

*Sea* rather high both in the N. and in the S.

*Barometer* still highest in France. The centre of the depression is now over the N. of England and moving slowly to the north-eastward.



**Thursday, June 13.**

*Weather* very much disturbed in many places, though on the whole finer than of late. Some rain reported at a few stations, heavy hail and rain showers about London in the afternoon and evening; and nearly an inch of rain at Cambridge.

*Temperature* changing suddenly and irregularly, but rising to  $68^{\circ}$  at Roche's Point and  $70^{\circ}$  in London during the day, while at Shields the maximum did not exceed  $53^{\circ}$ .

*Wind* fresh from N. at the northern stations, but moderating; chiefly westerly in the S. of England as well as over the N. of France; very variable in the W.

*Sea* still rough both in the N. and S.

*Barometer* very unsteady. The depression of the past few days now found near Norway, and becoming much less deep. Fresh disturbances appearing in the West, keeping the atmosphere in a very damp unsettled condition.



**Friday, June 14.**

*Weather* quieter and finer in the United Kingdom than of late, but cold and very gloomy, especially in the S.E. Very little rain reported except over France, where it fell very generally.

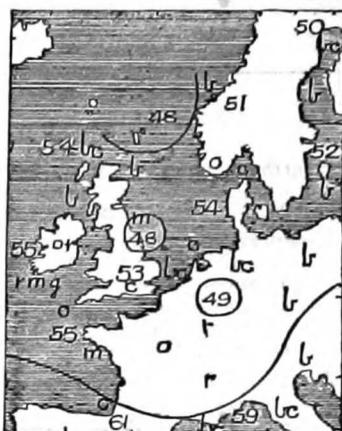
*Temperature* very low except on our S.W. coasts, the S.A.M. reading being as low as  $49^{\circ}$  at our north-easterly stations, and the highest point reached during the day being as low as  $56^{\circ}$  at London, Oxford, and York.

*Wind* moderate from the northward over the northern parts of the Kingdom, and from the N.E. to E. in the S., as well as in the Channel and N. and W. of France. North-westerly to westerly winds in Norway and Denmark. The easterly wind subsequently "backing" to N. and N.W.

*Sea* little disturbed on our coasts, but high in the Skager Rack.

*Barometer* risen considerably in the N. and fallen over France, but readings more regular than of late. A large shallow depression over France, and another deep one in the S. of Scandinavia.

(Continued.)

**Synoptic Weather Charts.—8 a.m.****Weather** during the 24 hours succeeding the date of the Charts.**BAROMETER AND WIND.****CLOUD, RAIN, SEA, AND TEMPERATURE.****Saturday, June 15.**

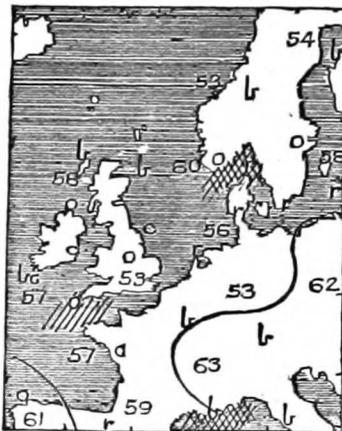
*Weather* very quiet everywhere, and fine at the northern and north-eastern stations. Elsewhere sky cloudy or overcast generally, with rain in several places.

*Temperature* still low but inclined to rise slightly. The maximum readings still below 60° in the S.E. of England.

*Wind* light from the southward at the western and north-western stations, northerly in the east, and north-westerly over France. The southerly current in the W. subsequently disappearing.

*Sea* smooth or nearly so on all our coasts.

*Barometer* very uniform over western Europe, and changing very slightly indeed.

**Sunday, June 16.**

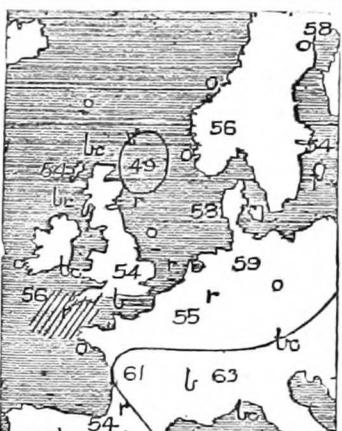
*Weather* fine at first in the N. and W. but dull and unsettled elsewhere, and very rainy in Denmark and the S. of Sweden. Rain subsequently extending to all but the Irish stations, and severe thunderstorms occurring over the S.E. of England.

*Temperature* slightly higher except in the N., the maxima over England varying from 60° to 66°.

*Wind* North-easterly and northerly in the northern parts of our islands, and drawing into N.W. in the S. and to W.S.W. in N. Germany, while strong north-easterly winds and gales are felt in the Gulf of Bothnia.

*Sea* high in the Skager Rack, rough at Scilly.

*Barometer* highest in northern Europe. A well-formed depression advancing from N. Germany in a westerly and north-westerly direction across Denmark.

**Monday, June 17.**

*Weather* fine in the W. of our islands, and though dull and wet elsewhere yet inclined to improve as the day advanced. Much finer to the eastward of the North Sea than in the United Kingdom.

*Temperature* still low and showing very little change of importance.

*Wind* still northerly over the greater part of the United Kingdom, north-westerly to westerly at the south-eastern counties, south-westerly at the mouth of the Elbe, and north-easterly in the Gulf of Bothnia.

*Sea* gone down in the Skager Rack, but still rather rough at Scilly.

*Barometer* rising briskly in N. Germany, and slightly in the S. of our islands. The centre of the depression noticed in the E. on the 16th now found over the S.W. of Norway and apparently becoming much shallower.

**Explanation of Charts.**—The two Charts for each day show the general condition of the weather over Western Europe at 8 a.m. In the left-hand Chart the height of the barometer is expressed by "isobars," the value of each line being given in figures. The prevalent winds are shown by arrows, which are drawn flying *with the wind*, the force being indicated thus:  $\gggg$  = a heavy gale;  $\gg$  = a gale;  $\longrightarrow$  = a fresh to strong breeze;  $\rightarrow$  = a light to moderate breeze; and  $\odot$  = a calm. In the right-hand Chart the weather is indicated as follows:—b = blue sky; c = detached clouds; o = overcast; m = misty (hazy); f = foggy; q = squally; r = rain; h = hail; s = snow; l = lightning; and t = thunder. The general distribution of temperature is shown by "isotherms," the readings at certain places being given in figures. Diagonal lines = rough sea, the shading being proportional to the disturbance.

(Signed) **ROBERT H. SCOTT,**  
Secretary.

## APPENDIX XII.

## FISHERY BAROMETERS.

## LIST of PLACES supplied with FISHERY BAROMETERS.

*Shetland Isles.*—Sandsair, Lerwick.

*Orkney Isles.*—Burray. Kirkwall.

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

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

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

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

*Wales.*—Briton Ferry, Swansea, Angle, Milford, Abersoch.

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

*Isle of Man.*—Port St. Mary, Peel.

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

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

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

*Ireland, west coast.*—Valencia, Dingle, Tralee, Tarbert, Kilcredane, Elly Bay, Ballina, Tribane, Killybegs, Teelin, Burton Port, Bunbeg.

*Ireland, north coast.*—Dunfanagly, Rathmullen, Buncrana, Greencastle, Portrush.

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

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

## SUMMARY of INSTRUMENTS ON SERVICE.

England and Wales	-	-	-	62
Scotland	-	-	-	48
Ireland	-	-	-	33
				<hr/>
				143
				<hr/>

## APPENDIX XIII.

## DONATIONS RECEIVED DURING THE YEAR ENDING 31 MARCH 1878.

## Presented by Societies, Institutions, &amp;c.

Adelaide	Observatory - -	Meteorological Observations. Jan.-Dec. 1876.
Algiers - -	Service météorologique de l'Algérie.	Bulletin Mensuel, 1875, Part I., pp. 1-40; Part II., pp. 229-344. "Le Mobacher," 1877.
Allahabad -	Met. Reporter of the N.W. Provinces.	Weekly Rainfall Return from N.W. Provinces and Oudh. June 1876 to May 1877.
Aschaffenburg	K. Först-academie - -	Beobachtungs-Ergebnisse der im Königreich Bayern zu fürstlichen Zwecken errichteten meteorologischen Stationen, 1876-7.
Berlin - -	K. Hydrographisches Bureau.	Nachrichten für Seefahrer. Vol. VIII., Nos. 13 to end; Vol. IX., Nos. 1-12.
	" " "	Annalen der Hydrographie und maritimen Meteorologie, Vol. V., Parts 4-12; Vol. VI., Parts 1-2.
	K. Statistisches Bureau -	Preussische Statistik. No. 44: Monthly means of Pressure, Temperature, &c. for 1876.
Brisbane -	Government Meteorological Reporter.	Report for 1876.
Brussels -	Observatoire Royal -	Annales, Vols. XXIII., XXIV., XXV. 1876, pp. 97-104. " 1877, pp. 1-48.
	" "	Bulletin Météorologique, 1877.
	" "	Observations Météorologiques faites aux Stations Internationales, 1877, pp. 1-52.
	" "	Notices extraites de l'annuaire, 1875-6.
Calcutta -	Meteorological Office -	Annuaire, 1877.
	"	Abstract of observations, Dec. 1876 to Nov. 1877.
	"	Weekly report of Rainfall, Feb. 1877 to Jan. 1878.
	"	Telegraphic reports, Feb 1877 to Jan. 1878.
	"	Results of Observations at Alipore, April 1877 to Jan 1878.
	"	Abstract of do., May-Dec. 1877.
	"	Tables for the reduction of Meteorological Observations in India.
	"	Report on Variation of Rainfall in Tropical India.
	"	The Indian Meteorologist's Vademecum.
	"	Report of the Vizagapatam and Backergunge Cyclones, Oct. 1876.
	"	Administration Reports, 1875-6.
	"	Report on the Meteorology of India in 1875.
	"	Indian Meteorological Memoirs, Vol. I., Part 1.
	Surveyor General's Office	Abstracts of the Results of Hourly Observations, Jan. to March 1877.
Carlsruhe	Meteorologische Central-Station.	Jahresbericht, 1876.

Christiania	-	Norske Meteorologiske Institut.	Meteorologisk Aarbog, 1875.
		" "	Aars-beretning, 1872-6.
		" "	Askeregnen den 29de-30te Mars 1875.
		" "	Oversigt over Veirforholdene i Norge, 1876.
Coimbra	-	Observatorio - - -	Observações, 1876.
Colába (Bombay).		Observatory - - -	Report for the year ending 30 June 1877.
Colombo (Ceylon).		Surveyor General's Office	Results of Meteorological Observations at Ceylon. Dec. 1876 to Nov. 1877. Results of observations in Colombo during 1877. Rainfall in Ceylon, during 1876; and Means during seven years.
Copenhagen	-	Danske Meteorologiske Institut.	Bulletin Météorologique du Nord, 1877.
		" "	Weather Charts, 1877. Maanedsoversigt over Veirforholdene, March 1877 to Feb. 1878. Meteorologisk Aarbog, 1876, Part 1.
		" "	Le Foehn du Groenland. Contributions à la Climatologie du Danemarck.
		K. Danske Videnskaberne's Selskab.	Forhandlinger, 1876, part 2; 1877, Parts 1, 2.
Cork	-	Royal Institution - - -	Meteorological Observations, 1869-71, 1876.
Cracow	-	K.K. Sternwarte - - -	Meteorologische Beobachtungen, Feb. 1877 to Jan. 1878. Resultate 1877.
Cronstadt	-	Compass Observatory - - -	Russian Nautical Compendium, Nos. 2-12, 1877; Nos. 1-2, 1878.
Dorpat	-	Meteorolog. Observatorium der K. Universitat.	Meteorologische Beobachtungen, 1875. Zehnjährige Mittelwerthe (1866-75) nebst neunjährigen Stunden-mitteln (1867-75) für Dorpat.
Dublin	-	General Register Office - - -	Weekly and Quarterly Returns of Marriages, Births, Deaths, &c.
Eberswalde (Prussia).		K. Forst-akademie - - -	Jahresbericht, 1876.
Edinburgh	-	Royal Observatory - - -	Astronomical Observations, Vol. XIV. (1870-77).
		Royal Society - - -	Proceedings, Sessions 1876-7.
		Scottish Meteorological Society.	Journal, Nos. 51-54.
Fiume	-	I. R. Accademia di Marina	Osservazioni delle Stazioni Meteorologica, Feb. to Dec. 1877. Resultate, 1877.
Frankfort o/M.		Physikalisches Verein - - -	Jahresbericht, 1875-6.
Geneva	-	Bibliothèque Universelle	Archives des Sciences, Vols. 59-61.
		Société Géographique - - -	Le Globe, Vol. XVI., Nos. 1-3.
Gorizia	-	Osservatorio - - -	Osservazioni della Stazione Meteorologica, Jan. 1877.
Greenwich	-	Royal Observatory - - -	Report of the Astronomer Royal to the Board of Visitors, 1877.
		" - - -	Magnetical and meteorological observations for 1875.
		" - - -	Weekly Returns to the Registrar-General.
		" - - -	Daily Weather Report.
Hamburg	-	Deutsche Seewarte - - -	Wetterbericht.
		" " - - -	Monatliche Übersicht der Witterung, May 1876 to Sept. 1877.
Hobarton	-	Royal Society of Tasmania	Meteorological Observations, 1877.
		" "	Synchronous Observations, 1st Jan. to 15th Dec. 1877.
		" "	Report, 1875.

Hong Kong	-	Government Lock Hospital Harbour Office	- -	Meteorological Observations in Victoria, 1877.
		"	- -	China Coast, Meteorological Register, Jan. 1877 to Jan. 1878.
Kew	-	Observatory	- -	Report of the Kew Committee for year ending 31st Oct. 1877.
Kiel	-	Ministerial-Commission zur Untersuchung der deutschen Meere.	- -	Ergebnisse der Beobachtungs-Stationen an den deutschen Küsten, July 1876 to Feb. 1877.
Lahore	-	" Sanitary Administration of the Punjab.	- -	Jahresbericht für die Jahre, 1874-6. Report, 1876.
Leicester	-	Literary and Philosophical Society.	- -	Transactions, Parts 1-2. Report, to 18th June 1877.
Leipzig	-	Sternwarte	- -	Monatliche Übersicht der Resultate, Sept. to Dec. 1876. Meteorologische Beobachtungen, 1876.
Lisbon	-	Observatory	- -	Observations at Angra do Heroismo Funchal, Lisbon, Campo Maior, and Ponta-Delgada, Jan. 1877 to Jan. 1878.
		"	- -	Annaes, Vols. XII.
		"	- -	Postos Meteorologicos, 1874, Parts 1-2.
London	-	Admiralty	- -	Tide Tables for 1878. Hydrographic Notices, 1877. General Instructions for Hydrographic Observers. Reports, 1875-6.
		Army Medical Depart- ment.	- -	Report of Wrecks, Casualties, &c. from July 1875 to June 1876.
		Board of Trade	- -	Report for 1876.
		British Association	- -	Returns from various colonies and settlements.
		Colonial Office	- -	Returns from various Observers in India. Report for 1876.
		India Office	- -	Quarterly Journal, Parts 22-24.
		Medical Department of the Navy.	- -	Monthly Notices, Vol. XXXVII., Nos. 5-9. Vol. XXXVIII., No. 1-4.
		Meteorological Society	- -	Memoirs, Vol. XLIII.
		Royal Astronomical Society	- -	Abstract of Meteorological Observa- tions made at the Gardens of the Royal Botanical Society, with remarks by G. J. Symons.
		Royal Botanical Society	- -	Proceedings, Vol. XXI., No. 4-6. Vol. XXII., No. 1.
		Royal Geographical Society	- -	Proceedings, Nos. 66-7.
		Royal Institution of Great Britain.	- -	Journal, Nos. 104-7.
		Royal National Lifeboat Institution.	- -	Proceedings, Nos. 178-185.
		Royal Society	- -	Journal Nos. 89-93.
		Royal United Service In- stitution.	- -	Catalogue of the Special Loan Collec- tion of Scientific Apparatus. 3rd Ed.
		Science and Art Depart- ment.	- -	Journal Nos. 1272-1322.
		Society of Arts	- -	Daily Weather Reports, 1877.
Madrid	-	R. Observatorio	- -	Monthly Notices of Meteorological Society; New Series, No. 1.
Mauritius	-	Observatory	- -	Law of Storms (incomplete). Report for 1876. Meteorological Results, 1876. Sunspots and Rainfall.
		"	- -	12th Report of the Board of Visitors. Monthly Record of Results of Obser- vations in Meteorology, &c., Aug. 1876 to Oct. 1877.
Melbourne	-	Flagstaff Observatory	- -	Results of Observations, 1875, Vol. IV.
		"	- -	

Mexico -	Observatorio Central	-	Boletin Meteorologico, March 1877.
	" "		Anales del Ministerio de Fomento, Tom. I., II. Régistro Meteorologico, April to June 1877. Boletin de Ministerio de Fomento, Vol. I. Nos. 1-2, 4-88. Vol. II., Nos. 1-11.
	" "		Synchronous Observations, May to Dec. 1877.
Milan -	Observatorio Reale	-	Su alcuni Temporalis osservati nell' Italia Superiore (Estate 1876), by Prof. P. Frisiani. Sopra alcuni scandagli del cielo, by Sr. G. Celoria.
Modena -	R. Osservatorio	-	Andamento Annuale della Pressione Atmosferica.
	Societa Meteorologica Italiana.		Annuario, Vol. I., Nos. 1-10.
Moncalieri -	Observatory	-	Bulletino Meteorologico:
	"	-	Vol. XI., Nos. 1-12.
	"	-	" XII., " 1-4.
	"	-	Osservazioni Meteor. fatte nelle stazioni presso le Alpi Italiane, Anno VI., Nos. 3-12.
	"	-	" VII., " 1-2.
	"	-	La Corrispondenza Meteorologica Italiani Alpini—Appennina. Studi sulla Climatologia della Valle d'Aosta. Riviste mensuali di Meteorologia agraria per l'anno, 1875-6.
Munich -	K. Sternwarte	-	Meteorologische und magnetische Beobachtungen, Jan. to Dec. 1876.
Naples -	Specola Reale	-	Bulletino Meteorologico, April to Dec. 1876.
Neuchatel -	Société des Sciences Naturelles.		Bulletin, Tom. XI. Cahier 1.
New York -	Central Park Observatory		Abstract of Registers from S. R. Instruments. 1877.
	"		Report 1876.
Nice -	Société de Médecine et de Climatologie.		Nice-Medical, Nos. 7-12, 1877. Nos. 1-5, 1878.
Oxford -	Radcliffe Observatory	-	Results of Meteorological Observations, 1875.
	" "	-	Observations and Delineations of Solar Spots made with the Heliometer in 1874-5.
Palermo -	R. Osservatorio	-	Bullettino Meteorologico:—
			Vol. XI., Nos. 1-12.
Paris	Académie des Sciences	-	Comptes-Rendus Hebdomadaires.
			Vol. LXXXIV., Nos. 12-26.
			" LXXXV.
			" LXXXVI., Nos. 1-10.
	Association Scientifique de France.		Bulletin Hebdomadaire, Nos. 491-541.
	Dépôt des Cartes et Plans		Annales Hydrographiques: Parts 1-3 of 1877.
	" "		Phares des Côtes.
	" "		M. Brault's Cartes de la direction et de l'intensité probables des Vents.
	Ministère de la Marine, &c.		Revue Maritime et Coloniale. Nos. 187-197.
	Observatoire de Paris	-	Bulletin International, 1877.
	"	-	Atlas Météorologique, 1875.
	Observatoire de Montsouris.		Annuaire Météorologique, 1878.
	" "		Bulletin Mensuel, 1877, pp. 17-104.

Paris	-	-	Service Hydrométrique, (Seine.)	Résumé des Observations Centralisées, 1875.
			" "	Observations sur les Cours d'Eau et de la Pluie, 1875.
			Société Météorologique	Nouvelles Météorologiques, Nov. to Dec. 1876.
			" "	Annuaire:
				Vols. Bulletin. Tab. Met.
				21 6-30 5-11
				22 16-25 20-23
				23 ... 5-16
				24 19-35 5-17
				25 12-44 1-13
				26 1-2 ...
			" "	La Quinzaine Météorologique, 1877, pp. 1-144.
Pekin	-	-	Customs	Medical Reports, Half-years ended 30th Sept. 1876 and 31st March 1877.
Perth (W. Australia).	-	-	Surveyor-General's Office	Meteorological Report, 1876.
Pesaro	-	-	Observatorio Meteorico e Magnetic.	Diagram of Mag. and Met. Observa- tions, 1877, March to August.
Pesth	-	-	K. Ung. Central-Anstalt für Meteorologie und Erdmagnetismus.	Jahrbuch, 1874-5.
Philadelphia	-	-	American Phil. Society - Franklin Institute -	Proceedings, No. 96-99. Journal, Nos. 616-627.
Pola	-	-	K.K. Hydrographisches Amt.	Meteorologische Beobachtungen, March 1877 to Feb. 1878.
			" "	Mittheilungen aus dem Gebiete des Seewesens.
				Vol. V., Nos. 3-10 and 12. Vols. VI., Nos. 1-3.
Prague	-	-	K.K. Sternwarte	Magnetische und meteorologische Beob- achtungen, 1876, pp. 33-40.
			" "	1877, pp. 1-24.
			" "	Astronomische, magnetische und me- teorologische Beobachtungen, 1876.
			" "	Über die wahrscheinliche Abhängigkeit des Windes von den Perioden der Sonnenflecke.
Rome	-	-	Ministero d'Agricoltura, &c.	Bollettino Decadico— 1877, Nos. 4-36.
			" "	Meteorologia Italiana,— 1876, pp. 245-320.
			" "	1877, pp. 1-256.
			" "	Supplemento alla Meteorologia Ita- liana, 1876, IV. 1877, I.-III.
			Osservatorio del Collegio Romano.	Bollettino Meteorologico— Vol. XVI., Nos. 2-10.
Rugby	-	-	Natural History Society	Report, 1876.
St. Petersburg	-	-	Central Physical Observa- tory.	Annalen, 1875. Meteor. Bulletin, 1877. Jahresbericht, 1875 and 1876. Re- pertorium. Band V. Heft 2. Die Temperatur-Verhältnisse des Russi- schen Reiches. Untersuchung eines Nickel-Magnets. Beseitigung des Capillaritäts-Fehlers beim Wag- Barograph.
Santiago	-	-	Oficina Central Meteoro- logica.	Anuario, 1871-2.
Singapore	-	-	Convict Jail Hospital	Meteorological Observations and register of rainfall, 1876.

Stockholm	-	Meteorologiska Central-Anstalten.	-	Kort instruktion för anställande af meteor-observationer. Om Storleken af temperatursens dagliga variation i Sverige.
Stonyhurst	-	R. Academy of Sciences Observatory	- - -	Meteorologisk Jakttagelser, 1875. Results of Magnetical and Meteorological Observations, 1876-7.
Sydney	-	Observatory	- - -	Meteorological observations, May to Sept. and Dec. 1876, Jan. to May 1877.
		"	- - -	Weather Maps, 5th Feb. to 17th March 1877.
		"	- - -	Climate of New South Wales.
		Royal Society, N.S.W.	-	Journal and Proceedings, 1876, Vol. X.
		"	"	The progress and resources of N.S. Wales by C. Robinson.
Syracuse	-	Observatory	- - -	Osservazioni Meteorologiche, Nos. 1-43. 1877.
Tiflis	-	Observatory	- - -	Materialien zu einer Klimatologie des Kaukasus, Abth. I. Bd. J. Das Reflections-Thermometer. Über die geographische Lage und die absolute Höhe der Stadt Teheran.
Tokai (Japan)		Imperial Meteorological Observatory		Meteorological Observations, 1876.
Toronto	-	Education Office	- - -	Journal of Education, Vol. XXX. Nos. 1-7.
		"	- - -	Report of the Normal, Model, High, and Public Schools of Ontario, 1876.
		Magnetical Observatory	-	Monthly Meteorological Register, 1876.
		"	"	General Meteorological Register, 1876.
		"	"	Monthly Weather Review, March 1877 to Feb. 1878.
		"	"	Reports of the Meteorological, Magnetical, and other Observatories of the Dominion of Canada, 1876.
		"	"	Meteorological Abstract, 1877.
		"	"	1st Report of the Meteorological Office of the Dominion of Canada.
		Parliament Library	- - -	Sessional Papers.
Trieste	-	R. Accademia di Commercio e Nautica.	- - -	Osservazioni Meteorologiche, Feb. to Nov. 1877.
Turin	-	R. Osservatorio Astronomico.	- - -	Effemeridi del Sole, della Luna, &c., per l'anno 1878.
Upsala	-	Observatoire	- - -	Atlas des mouvements supérieurs de l'atmosphère.
		"	- - -	Bulletin Météorologique Mensuel: Vol. VIII., Nos. 9-12. Vol. IX., Nos. 1-5.
		"	- - -	Observations horaires, 1865-8, par R. Rubenson.
Utrecht	-	K. Nederlandsch Meteor. Instituut.	- - -	Meteorologisch Jaarboek, 1872, II. 1875, I. 1876, I.
		"	"	Observations Météorologiques des Stations du second ordre dans les Pays-Bas, 1876.
Vienna	-	Adria Commission	- - -	Instruction zur Behandlung der selbstregistrierenden Fluthmesser, by Dr. F. Schaub.
		"	- - -	Istruzione per le osservazioni sulla temperatura e sulla salsedine de Mare, by Dr. G. R. Lorenz.

Vienna	-	K. K. Central-Anstalt für Meteorologie, &c.	Beobachtungen, February 1877 to January 1878. Jahrbuch, 1875. Meteor. Beobachtungen, an 10 Stationen in Oesterreich, 1877, Jan. to Nov. Internationaler telegraphische Wetterbericht 1877.
		Oesterreichische Gesellschaft für Meteorologie.	Zeitschrift. Bd. XII, Nos. 7-22, Bd. XIII, Nos. 1-6.
Washington	-	K. K. Sternwarte	Meteor. Beobachtungen, 1874-6.
	-	Smithsonian Institution	Reports 1875-6. U.S. Arctic Expedition, Vol. I. Discussion and Analysis of Prof. Coffin's Tables and Charts of the Winds of the Globe by Dr. A. J. Woeikof. Constants of Nature. Suppt. Parts 1-3.
	-	U.S. Geological Survey	List of Elevations in that portion of the U.S. West of the Mississippi River.
	-	U.S. Coast Survey	Meteor. Researches, Part I.: On the Mechanics and the General Motion of the Atmosphere, by W. Ferrel.
	-	U. S. Naval Observatory	Astronomical and Meteorological Observations, 1874. Narrative of the North Polar Expedition, U.S. Ship "Polaris." Report of the Secretary of the Navy, 1873.
	-	War Office	Daily Weather Reports, 1877. Daily Bulletin, Synopses, Probabilities, and Facts, Jan. to Aug. 1874. March to Dec. 1877. Jan. 1878.
	-	"	Bulletin of International Synchronous Meteor. Observations, Aug. 1876 to March 1877. Monthly Weather Review, Jan. to Sept. 1877. Monthly Charts showing dry and wet Wind Quadrants. Storm Tracks or Mean Tracks of low Barometers, 1871-6. Report 1876.
	-	Department of Agriculture	Report of Commissioner 1875.
Wellington, N.Z	-	Observatory	Monthly Reports, 1875-6. Meteorological Observations in New Zealand, 1876. Abstract of do., Aug. 1876 to July 1877. Meteorological Observations at Wellington, Nov. 1876 to June 1877.
Zürich	-	Meteor. Central-Anstalt der schweizerischen naturforschenden Gesellschaft.	Meteorologische Beobachtungen: 1875, pp. 241-372 1876, ,, 241-288 1877, ,, 9-240 1878, ,, 1-8

Presented by the Individuals.

Allison, F.	-	-	General Meteorological Register for Halifax, N.S., 1876.
Bateman, J. F., F.R.S.S., L. and E.	-	-	Address on his election as President of the Institution of Civil Engineers; Session 1877-8.
Blasius, W.	-	-	A brief discussion of some opinions in Meteorology.
Brault, Lt. L.	-	-	Étude sur la circulation atmosphérique de l'Atlantique nord. See also Paris (Dépôt des Cartes, &c.)
Brewer, W. H.	-	-	Woods and Woodlands, with map.
Broun, J. Allan, F.R.S.	-	-	On the Directions, &c. of the Lines of equal Barometric Pressure.
Cantoni, Prof. G.	-	-	Su due Stromenti Meteorologici ideati da Angelo Bellani. Su alcuni principij sperimentali nel magnetismo. Norme per le osservazione di Meteorologia agraria; and 3 excerpt papers on Electricity.
Chambers, F.	-	-	Report on the administration of the Meteorological Department in Western India for the year 1876-7. Brief sketch of the Meteorology of the Bombay Presidency in 1876.
Cora, G.	-	-	"Cosmos." Vol. IV., Nos. 3-5.
Cundall, H. J.	-	-	Abstract of Meteorological Register at Charlottetown, P. Edward's Id., 1876.
Darwin, G. H., M.A.	-	-	On Fallible Measures of variable quantities, and on the treatment of Meteorological Observations.
De La Rue, W., F.R.S.	-	-	Tables for the reduction of the Barometer, &c.
Diriks, Capt.	-	-	Fyre og Somerker paa den Norske Kyst.
Dunlop, W. H.	-	-	Results of Meteorological Observations at Annanhill, N.B., March 1877 to February 1878. Abstract for 1877.
Ellis, W., F.R.A.S.	-	-	Note on the degree of accordance of Mr. Glaisher's and the Kew thermometer standards. Results derived from the sun-shine records, year ending April 30, 1877. On the diurnal variation of the barometer at the Royal Observatory, Greenwich.
Freeden, v. W. H.	-	-	"Hansa." April 1, 1877—March 31, 1878.
Galton, F., F.R.S.	-	-	Description of the process of verifying Thermometers at the Kew Observatory.
Gautier, Prof.	-	-	Nouvelles Études sur le climat de Genève par Professor Plantamour; analyse par Professor Gautier. Notice sur deux années d'observations thermométriques faites à Rama sur la côte du Labrador.
Gray, T.	-	-	Observations on the Rule of the Road at Sea.
Gruss, Dr. G.	-	-	Über die Bahn der Lorely.
Hagemann, G. A.	-	-	Sur les Anémomètres.
Hebert, F. F.	-	-	Histoire de l'Atmosphère. Sept. 1876. Etude sur les grands mouvements de l'atmosphère et sur le Fœhn et le Sirocco pendant l'hiver 1876-7.
Hellmann, Dr. G.	-	-	Ueber die Sommer-regenzeit Deutschlands. Distribution de la lluvia en la peninsula Iberica.
Hennessy, J. B.	-	-	Report of the Great Trigonometrical Survey of India, 1875-6.
Hinrichs, Dr. G.	-	-	Annual Report of the Iowa Weather Stations.
Hoskins, S.E., M.D., F.R.S.	-	-	Meteorological Observations March 1877 to February 1878.
Howgate, Capt. U. S. A.	-	-	Polar Colonization: the preliminary Arctic Expedition, 1877.
Hunter, W. W., LL.D.	-	-	The cycle of drought and famine in Southern India.
Jevons, W. S., LL.D.	-	-	Some data concerning the climate of Australia and New Zealand.
Kiefer, H.	-	-	Magnetische Inclinationen in Tiñis.
Lancaster, A.	-	-	Traits caractéristiques du climat de Bruxelles. L'étude des orages en Belgique.

Lawes, J. B., F.R.S.	-	Memoranda of the plan and results of the Field Experiments conducted on the Farm at Rothamsted, Herts.
Lawes and Gilbert, Messrs.	-	On the home produce Imports, or Consumption of Wheat.
Loomis, Prof. E.	-	Contributions to Meteorology, 7th and 8th Papers.
Luvini, G.	-	Miroir tremblant pour la récomposition des couleurs du spectre.
Mally, E.	-	Essai sur la Vie et les Ouvrages de L. A. J. Quetelet.
Marriott, W.	-	Instructions for taking Meteorological Observations.
Melsens, M.	-	De l'application du Rhé. Electromètre aux paratonnerres des Télégraphes. Des paratonnerres à pointes. &c.
Miller, S. H.	-	The Fenland Meteorological Circular and Weather Report, April 1877—Jan. 1878.
Moyle, M.P.	-	Abstract of Observations at Helston, 1876, 1877.
Müby, Dr. A.	-	Über die exacte Natur-Philosophie.
Murray, A. E., F.M.S.	-	Sprat's History of the Royal Society.
Pearce, F. N.	-	Remarks on Mr. Embleton's diagrams on the observations taken at the Oaks Colliery, near Barnsley.
Perry, Rev. S. J., F.R.S.	-	Bulletin mensuel de l'Observatoire de Zi-ka-wei (China), July, August 1877.
Petermann, Dr. A.	-	Mittheilungen, Vol. 23, Nos. 2-12, Vol. 24, 1-3. Ergänzungs-heft, Nos. 50-53. Inhalts-verzeichniss, 1865-74.
Plantamour, Prof. E.	-	Résumé météorologique de l'année 1876 pour Genève et le grand Saint-Bernard.
Poey, A.	-	Rapports entre les variations barométriques et la déclinaison du soleil.
Power, R. E., L.R.C.P.	-	Proposed modification of the mechanism at present in use for reading barometers, so that the third decimal may be obtained absolutely. An improved form of mercurial barometer.
Prestel, Dr. M. A. F.	-	Jahresbericht der naturforschenden Gesellschaft in Emden, 1876.
Punnett, W. C.	-	Summary of Meteorological Journal kept at Tonbridge, 1877.
Quetelet, E.	-	Quelques remarques à propos de l'hiver de 1876-7. Périodicité des hivers doux et des étés chauds. Mémoire sur la température de l'air à Bruxelles. 1833-72.
Richards, W. H.	-	Abstract of the Weather at Penzance and Neighbourhood, 1877.
Ringwood, A.	-	Méans by which the height of clouds can be obtained by one observer.
Schrenck, Dr. L. v., M.D.	-	Reisen und Forschungen im Amur-Lande, 1854-6, Part II.
Schück, Capt. A.	-	Die bogenförmigen Böen (arched squalls) der Passatgrenzen und der Gegenden, in welchen die Monsoon mit geringer Stärke und mit Unterbrechungen wehen.
Seeland, F.	-	Magnetische und meteorologische Beobachtungen, zu Klagenfurt, March 1877 to February 1878.
Shadwell, Sir C., K.C.B., F.R.S.	-	A contribution to Terrestrial Magnetism.
Smith, Harold	-	Results of 20½ years' observations on the Beverley Road, Hull.
Sofka, Dr. F. O.	-	Die kosmischen Abkühlungen, ein meteorologisches Prinzip.
Stewart, Dr. B., F.R.S.	-	On the variations of the daily range of atmospheric Temperature at Kew Observatory. Ditto of the Magnetic Declination at Kew Observatory. On an instrument for measuring the direct heat of the sun.
Symons, G. J., F.R.S.	-	Monthly Meteorological Magazine, April 1877-March 1878; British Rainfall, 1876.
Tebbutt, J., F.R.A.S.	-	Results of Meteorological Observations at Windsor N.S.W., 1871-6.

Tennent, R., F.R.S.E.	-	Why the Barometer does not always indicate Vertical Pressure.
Thiesen, M.	-	Zur Theorie des Robinson'schen Schalen-Anemometers.
Walcott, R. B., M.D.	-	Meteorological Observations at Barbadoes, 1876, and 30th November 1877 to January 2, 1878.
Walker, W. L.	-	Rotation of the Earth and Planetary Bodies.
Weyprecht, Lt. C.	-	Die Nordlichtbeobachtungen der Österreichisch-Ungarischen arktischen Expedition, 1872-4.
Whipple, G. M., B. Sc.	-	On the Temperature-correction, and Induction-coefficients of Magnets.
Wijkander, Dr. A.	-	Über die magnetischen Störungen und ihren Zusammenhang mit dem Nordlichte. Sur la périodicité des perturbations de la déclinaison magnétique dans la Scandinavie septentrionale. Astronomiska observationer under den Svenska Arktiska Expeditionen, 1872-3. Observations magnétiques faites pendant l'expédition Arctique Suedoise en 1872-3. Parts I. and II.
Williams, C. T., M.D.	-	Influence of Climate in Pulmonary Consumption.
Woeikof, Dr. A.	-	Zum Klima von Inner-Asien. Die Monsune und das Klima Indiens. See also Washington (Smithsonian Institution).
Zurher and Margollé, M.M.	-	Le monde où nous vivons. Leçons de Géographie par M. F. Maury.

## APPENDIX XIV.

METEOROLOGICAL OFFICE : ACCOUNT OF RECEIPTS AND PAYMENTS for  
the year ending 31st March 1878.

RECEIPTS.	PAYMENTS.
Balance from year 1876-7 - £645 19 6	ADMINISTRATION :
Parliamentary Vote - - 12,000 0 0	Payment of Council - 749 19 10
Sale of Instruments and Commissions for Colonial and Foreign Instruments, &c. - 533 3 8	Secretary - - 800 0 0
Subscriptions for D. W. Charts - 272 9 0	<u>£1,549 19 10</u>
Subscriptions for tabulated Hourly Readings of S.R. Observatories - 10 0 0	Special Researches and Experiments - 52 0 6
Subscriptions for Danish Synoptic Charts - 17 10 0	OFFICE EXPENSES :
Supply of Meteorological Information, Telegrams, &c. - 1090 18 6	Salaries and Wages - 621 6 5
Sundry small items - 11 16 4	Rent, Fuel, and lighting 571 14 8
<u>1,935 17 6</u>	Incidental and Contingent Expenses - 362 12 5
	<u>1,555 13 6</u>
	LAND METEOROLOGY :
	Observatories and other Stations - 2,289 10 11
	Discussion and Reduction of Observations. 1,207 11 8
	<u>3,497 2 7</u>
	WEATHER TELEGRAPHY :
	Telegrams, Storm Warnings and Reports - 3,238 13 3
	Inspectors - 101 16 8
	Preparation, issue and Discussion of Weather Reports - 1,268 16 10
	<u>4,609 6 9</u>
	OCEAN METEOROLOGY :
	Supply of Instruments, and other Expenses:
	Royal Navy - 233 3 0
	Mercantile Marine - 623 15 0
	Reduction and Discussion of Observations and care of Instruments - 1,159 14 2
	Marine Superintendent 400 0 0
	<u>2,416 12 2</u>
	Commissions executed for Colonial and Foreign Institutions, &c. - 391 18 8
	<u>14,027 14 0</u>
	Cash in hand - 161 6 7
	Bank of England - 297 16 5
	Advance to Valencia Observatory - 50 0 0
	<u>509 3 0</u>
	<u>£14,581 17 0</u>

May 10, 1878.

(Signed)

ROBERT H. SCOTT, Secretary.

(Signed)

HENRY J. S. SMITH,

FRANCIS GALTON

} Auditors.

## APPENDIX XV.

LIST of COUNCIL and the STAFF of the METEOROLOGICAL OFFICE on 31st March 1878, with the Occupations and Amount of Salary of the latter.

Name.	Duties.	Salary	
		Yearly.	Weekly.
		£ s. d.	£ s. d.
<i>Administration.</i>			
Council - - -	- - - - -	1000 0 0	—
R. H. Scott - -	Secretary - - - - -	800 0 0	—
<i>Office Expenses.</i>			
J. S. Harding, jun. -	Correspondence, Accounts, Library -	250 0 0	—
T. D. Bell - -	Registering of documents, issue of publications.	100 0 0	—
A. W. Green - -	Assistance in work of "office," and in care of instruments.	—	0 12 6
J. S. Harding, senr.	Office keeper - - - - -	—	1 18 6
<i>Commissionaire</i>	Messenger - - - - -	- - -	1 3 6
<i>Land Meteorology.</i>			
R. H. Curtis - -	Reproduction of observatory curves by pantographs, and preparation for publication.	170 0 0	—
A. J. Rigby - -		—	1 18 6
C. H. Thompson - -		—	1 12 0
H. N. Cobley - -		—	1 9 0
C. Stodart - -		—	2 2 0
T. E. Allen - -	Examination of Observatory Returns.	130 0 0	—
E. G. Aldridge - -		—	1 5 0
J. A. Curtis - -	Discussion of returns, and computations of mean results.	130 0 0	—
H. Chivers - -		—	0 19 6
A. H. Bell - -		—	0 12 6
H. Newton - -		—	0 12 6
<i>Weather Telegraphy.</i>			
F. Gaster - -	Preparation, issue, and discussion of weather reports.	190 0 0	—
W. L. Dallas - -		120 0 0	—
F. Brodie - -		106 0 0	—
G. G. Francis - -		100 0 0	—
R. Sargeant - -		—	1 9 0
A. R. Simpkins - -		—	1 2 0
H. Lynn - -		—	0 9 0
<i>Ocean Meteorology.</i>			
Capt. H. Toynebee -	Marine Superintendent - - - - -	400 0 0	—
R. Strachan - -	Charge and disposal of instruments and reduction of meteorological returns.	250 0 0	—
C. Harding - -	Reduction and discussion of observations.	180 0 0	—
H. Harries - -		—	1 18 6
W. Allingham - -		—	1 18 6
H. H. Bourne - -		—	1 5 0
H. J. Green - -		—	0 17 6
J. E. Callum - -	Superintendent of Valencia Observatory.	170 0 0	—
A. Buchan - -	Inspector of Scotch Stations - -	150 0 0	—

\* The salaries and wages of clerks are for six hours daily. A *pro rata* addition is made to them for extra hours in lieu of overtime.

## APPENDIX XVI.

LIST OF PUBLICATIONS, &c. issued under the Authority  
of the Meteorological Committee.

## OFFICIAL.

- No. 1. Report for 1867. Presented to Parliament. 1s.
2. Instructions for Meteorological Telegraphy. New Edition. (1875.) 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. 5s. each.
8. Barometer Manual. 1s. [New Edition in the Press.]
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5s. each.
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. 2s. 6d.
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. 2s. 6d.
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.
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5s. each.
15. Report for 1871. Presented to Parliament. 10d.
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5s. each.
17. Report for 1872. Presented to Parliament. 1s.
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2s.
19. Quarterly Weather Report, 1873.—Parts I. to IV. 5s. each.
20. Charts of Meteorological Data for Square 3. Lat. 0° - 10° N. Long. 20° - 30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20s.
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1s.
22. Report for 1873. Presented to Parliament. 4d.
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2s.

LIST OF PUBLICATIONS, &c.—*continued.*

- No. 24. Instructions in the Use of Meteorological Instruments  
1s. 6d.
25. Quarterly Weather Report for 1874.—Parts I., II., and IV.  
5s. each. Part III., 5s. 9d.
26. Report for 1874. Presented to Parliament. 6d.
27. Charts of Meteorological Data for the Nine 10° Squares of  
the Atlantic which lie between 20° N. and 10° S., and  
extend from 10° to 40° W., with accompanying Remarks,  
ending with the best routes across the Equator. 24s.
28. Contributions to our Knowledge of the Meteorology of  
Japan. By Staff-Commander Thomas H. Tizard, H.M.S.  
*Challenger.* 1s.
29. Report for 1875. Presented to Parliament. 4d.
30. Quarterly Weather Report for 1875.—Parts I., II., III.,  
and IV. 5s. each.
31. Report for 1876-7. Presented to Parliament. 3s. 5d.
32. A Discussion of the Meteorology of the North Atlantic  
during August 1873, with 31 Synoptic Charts. 15s.
33. Quarterly Weather Report for 1876.—Part I. [In the  
Press.]
34. Contributions to our Knowledge of the Meteorology of the  
Arctic Regions.—Part I. [In the press.]
35. Report for 1877-8.

## NON-OFFICIAL.

- No. 1. Report to the Committee on the Connexion between  
Strong Winds and Barometrical Differences.—By Robert  
H. Scott, Director of the Office. 6d.
2. Report to the Committee on the Meteorology of the  
North Atlantic.—By Captain H. Toynbee, Marine Super-  
intendent. 1s.
3. Report to the Committee on the Use of Isobaric Curves.—  
By Captain H. Toynbee, Marine Superintendent. 1s.
4. Routes for Steamers from Aden to the Straits of Sunda and  
back. Translated from a Paper issued by the Royal  
Meteorological Institute of the Netherlands. 6d.
5. On the Winds, &c. of the North Atlantic along the Tracks  
of Steamers from the Channel to New York. Translated  
from a Paper issued by the Deutsche Seewarte, Hamburg.  
6d.
6. Report of the Proceedings of the Meteorological Conference  
at Leipzig. 1s.
7. Notes on the Form of Cyclones in the Southern Indian  
Ocean.—By C. Meldrum, Esq., M.A., F.R.A.S. 6d.
8. Report on Weather Telegraphy and Storm Warnings. Pre-  
sented to the Meteorological Congress at Vienna.  
6d.

**LIST OF PUBLICATIONS, &c.—continued.**

- No. 9. Report of the Permanent Committee of the Vienna Congress for 1874. 1s. 6d.
10. On the Physical Geography of the part of the Atlantic which lies between 20° N. and 10° S., and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875, by Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1s. 6d.
11. Report of the Permanent Committee of the Vienna Congress for 1876. 2s.
12. Reports to the Permanent Committee of the Vienna Congress. 2s.
1. On Atmospheric Electricity, by Prof. J. D. Everett.
  2. On Maritime Meteorology in 1877, by R. H. Scott, F.R.S.
  3. On Weather Telegraphy in 1877, by R. H. Scott, F.R.S.
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