

**R E P O R T**  
**OF THE**  
**METEOROLOGICAL COUNCIL,**

**For the Year ending 31st of March, 1900,**

**TO THE**  
**PRESIDENT AND COUNCIL**

**OF THE**  
**ROYAL SOCIETY.**

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

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THE METEOROLOGICAL COUNCIL,  
1899-1900.

ERRATUM.

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“Contents,” line 1 *should read* :—

Map of Stations in connexion with the Office, Faces p. 100.

# THE METEOROLOGICAL COUNCIL,

1899-1900.

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Lieutenant-General SIR RICHARD STRACHEY, R.E., G.C.S.I.,  
LL.D., F.R.S., Chairman.

MR. ALEXANDER BUCHAN, M.A., LL.D., F.R.S., F.R.S.E.

Professor GEORGE HOWARD DARWIN, M.A., LL.D., D.Sc., F.R.S.

MR. FRANCIS GALTON, M.A., D.C.L., D.Sc., F.R.S.

Rear-Admiral SIR WILLIAM J. L. WHARTON, K.C.B., F.R.S.  
Hydrographer of the Admiralty.

MR. WILLIAM NAPIER SHAW, M.A., F.R.S., Secretary.

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R E P O R T  
OF THE  
M E T E O R O L O G I C A L   C O U N C I L,

For the Year ending 31st of March, 1900,

TO THE  
P R E S I D E N T   A N D   C O U N C I L

OF THE  
R O Y A L   S O C I E T Y.

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The Council have to record important changes in the executive of the Office.

Changes  
in the  
Executive.

On the 24th June, 1899, Navigating-Lieut. C. W. Baillie, R.N., F.R.A.S., Marine Superintendent, died suddenly; and on 24th July Captain M. W. Campbell Hepworth, R.N.R., from whom the Council have at various times received a number of excellent meteorological logs, was appointed as his successor.

Captain Hepworth commenced his duties at the Office on his return to England from the Pacific in October last.

On the 28th February, 1900, Mr. R. H. Scott, D.Sc., F.R.S., retired from the office of Secretary, and his place was taken by Mr. W. N. Shaw, M.A., F.R.S., a Member of the Council, whose appointment as Secretary had been approved by the President and Council of the Royal Society and by the Lords Commissioners of Her Majesty's Treasury. At the time of his appointment Mr. Shaw was a Fellow and Tutor of Emmanuel College, Lecturer in Experimental Physics, and Assistant Director of the Cavendish Laboratory, Cambridge. He was also a Member of the Kew Observatory Committee of the Royal Society.

By the premature death of Lieutenant Baillie the Council lost the services of an efficient officer, who had carried on the duties of his department with zeal and ability since the retirement of Captain Toynbee on March 21, 1888.

Upon the occasion of Mr. Scott's retirement the Council passed the following resolution:—

*Resolved.*—"That on the resignation of Mr. R. H. Scott of the post of Secretary, which he has held since the formation

of the Meteorological Council in the year 1876, having previously served in a similar position, as Director, from the time of the institution of the Meteorological Committee in 1867, the Council desire to record their sense of the great value of his services during the prolonged period over which he has discharged the duties of the responsible post which he now quits, and to recognize cordially the constant attention he has bestowed on all the numerous details of the administration, to which the successful management of the business entrusted to the Council has been so greatly due."

Superannuation allowances for Clerks.

After prolonged consideration the Council have formulated a scheme of regulations for the grant of superannuation allowances to Classified Clerks, which has been transmitted to the Royal Society to be reported to the Treasury.

The systematic provision for such allowances has long been recognized as desirable, but its realization has presented serious difficulties. By the practice of the strictest economy and the reduction of the work of the Office in certain directions the Council have, however, been able to arrange a scheme of appropriation of the grant at its disposal, under which they will be able to make the necessary provision by the purchase of annuities as the occasions for superannuation arise.

The regulations which have been adopted are appended to this report (Appendix I).

National Physical Laboratory.

The management of the Kew Observatory has, from the 1st January, 1900, become vested in the Executive Committee of the National Physical Laboratory. The Council have agreed to continue the allowance made out of their funds for the maintenance of the Meteorological Observations, and for other services rendered to the Council by the Kew Observatory, upon terms identical with those agreed upon between the Council and the Kew Observatory Committee. A statement of these terms is included in the correspondence which is printed in Appendix II.

Ben Nevis Observatories

Further correspondence relating to the maintenance of the Observatories on Ben Nevis and at Fort William, in continuation of that printed in the last Annual Report of the Council (p. 21), will be found in Appendix III.

Telegraphic Reports to Hamburg.

In the course of the summer the Council received an application from Dr. Neumayer, the Director of the Deutsche Seewarte, Hamburg, asking that arrangements might be made for observations to be taken at Blacksod Point, Stornoway, North Shields, and Scilly, at 7 a.m. (in addition to those already taken at 8 a.m.), and transmitted forthwith to the Seewarte, to be incorporated with other observations made at the same hour at continental stations.

The proposed arrangement involved some intricacy in its details because the Rural Post Offices are, as a rule, not open until 8 a.m. The Postmaster-General has, however, lent his assistance, and the Council have been able to comply with the application. The Seewarte bears all the costs of the additional service.

Charges for Weather Inquiries.

Towards the close of the year a suggestion was forwarded to the Council by the Secretary to the Treasury to the effect that the

number of inquiries on the part of the public for weather information by telegram might be considerably increased if the charge made by the Office, in addition to the necessary cost of the telegrams, were reduced from one shilling to sixpence for each inquiry. The Council have lately learned that, in view of such a reduction, the Postmaster-General would be willing to forego the deduction which has hitherto been made by the Post Office from the sums received for inquiries addressed to the Office by telegram on account of the expenses of collecting and transmitting them to the Office. The Council are glad to avail themselves of this opportunity of making the information in their possession more accessible to the public, and desire to record their thanks to Mr. Hanbury and the Postmaster-General for their assistance in the matter.

They have also to record their acknowledgment to the Postmaster-General for the reduction in the extra cost of telegrams on Sundays from certain stations in Ireland, to the War Office for the use of the old guard room at St. Mary's, Scilly and to the Board of Trade for the use of a site and for the erection of a stage for the Robinson Anemograph at Holyhead.

Acknowledgments.

In the discharge of the duties entrusted to them the Council have to rely largely upon the help of volunteer observers on sea and on land, and they desire to record their recognition of the assistance thus afforded them, and their appreciation of the care and skill that have been devoted to securing accurate and regular records.

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The administration of the Office is conducted by the Secretary, under the direction of the Council, with the assistance of the Marine Superintendent and a staff of 37 clerks and attendants.

Administration.

The work of the Office may be briefly summarised under the following heads :—

Summary of the work of the Office.

I. OCEAN METEOROLOGY.—The collection, tabulation and discussion of meteorological data for all parts of the ocean traversed by British ships. The preparation and issue of charts or other publications exhibiting the results obtained from the discussion of the observations.

II. WEATHER TELEGRAPHY.—The collection of observations transmitted by telegraph, three times in each day, from selected stations in the British Isles (chiefly on the coasts), and on the Continent of Europe, the preparation of a Daily Report embodying the observations, and of forecasts of weather based upon them, and the issue of warnings to ports on the coasts of the United Kingdom whenever there are indications of the approach of severe storms.

III. CLIMATOLOGY.—The collection of information of various kinds from observatories and other land stations in the British Isles, and from a few stations in British possessions or in Foreign countries, with the view of extending the accurate knowledge of the meteorological conditions obtaining in the various districts in which the observations are made, and of the changes to which they are subject.



IV. LIBRARY.—For the collection and preservation of weather maps and other publications issued by the Colonies and Dependencies of the British Empire, and by Foreign Countries, so that they may be available for consultation by those requiring information as to the weather in various parts of the globe.

V. MISCELLANEOUS INVESTIGATIONS.

VI. PUBLICATIONS.

VII.—FINANCE.

All the branches of the Office are utilised for the preparation of replies to inquiries on questions connected with the weather, which are made from time to time by public bodies or by private persons.

Details of the work of the Office during the past year are given below under the headings which have been enumerated.

## PART I.

### OCEAN METEOROLOGY.

Collection of  
Information.

*Collection of Information.*—The Office systematically collects data with respect to the meteorology of the ocean, and for this purpose complete outfits of meteorological instruments are supplied to selected officers of merchant ships who are willing to make observations at sea.

The instruments supplied are :—

One barometer ; six thermometers, with a screen ; four hydrometers.

On the return of the ship to England the officer sends in a fair copy of the meteorological log and returns the instruments to the Office or to its agents.

Her Majesty's ships also are supplied with instruments, which, however, differ slightly from those lent to the Mercantile Marine. The Council continues to receive valuable observations from the officers of the Royal Navy.

Agents.

In order to facilitate the supply of instruments to the Mercantile Marine, agencies are established at some of the principal ports.

The following is a list of the agents :—

Cardiff—T. L. Ainsley, Bute Docks.

Dundee—Capt. John McGlashan, Dock Street.

Glasgow—Messrs. D. McGregor and Co., Clyde Place.

Greenock—Messrs. D. McGregor and Co., Brymner Street.

Hull—Messrs. Castle and Co., Commercial Road.

Liverpool—Messrs. D. McGregor and Co., South Castle Street.

Southampton—Capt. D. Forbes, High Street.

The number of merchant ships supplied with instruments and log books during the year has been 96. Taking into account the

ships which had instruments in their possession at the beginning of the year, the approximate number of ships of the merchant service employing instruments belonging to the Office for observations during the year was 209.

Sets of instruments are kept in working order at the Office in London, and at each agency, for the purpose of instructing observers in the method of observation. Notices to captains as to the supply of instruments are frequently distributed from the Office.

As a mark of recognition of valuable co-operation, the Council present various publications to observers who return well-kept logs. A list of the publications of the Office is given in Appendix XXI., p. 144.

Recognition  
of "excellent"  
observers.

Appendix IV. (p. 34) contains a list of the observers who have, during the past year, contributed logs classed as "excellent." The Council take this opportunity of expressing their best thanks to those who have thus assisted them. Several of these observers have co-operated with the Office for many years. The names which appear in the list for the first time are as follows:—

Observer's Name.	Ship.
Achard, E. C. S. ... ..	"Loch Finlas."
Duguid, W. ....	S.S. "Prome."
Elliott, G. ... ..	S.S. "Breconshire."
Fisher, R. J. ... ..	S.S. "Mayfield."
Hayes, B. F. ... ..	S.S. "Britannic."
Lawrence, Sub-Lieut. H. J. G., R.N.	H.M.S. "Rambler."
McAllister, W. ... ..	S.S. "Clan Ferguson."
Seymour, F. H. ... ..	S.S. "Britannia."

The Council have to note with great regret the death of two of their old observers. Capt. H. M. Lambert, Marine Superintendent and Harbour Master at Newhaven, died in March last. He was formerly an observer for this Office in the P. & O. s.s. "Brindisi." Capt. Wm. Spratly, an old observer, was drowned in February or March last while in command of the s.s. "Cuvier," which was run down in the English Channel. He had supplied the Office with seventeen logs, fourteen of which were "excellent."

Death of  
observers.

The meteorological logs received during the year numbered 155, of which 131 were either "excellent" or "very good."

Character of  
logs received

The Council desire to note specially that they have continued to receive, through the Ocean Steamship Company of Liverpool, a considerable number of logs, principally relating to voyages to and from the China Seas via Suez. They have also received logs from the Pacific Steam Navigation Company, which have supplied wind observations that are much needed in dealing with the west coast of South America.

A list of the meteorological logs received at the Office from ships during the year is given in Appendix V. (p. 36).

Districts  
from which  
observations  
are obtained.

The following list gives a summary of the voyages for each ocean made by the ships specified in this Appendix :—

North Atlantic ... ..	500	Pacific Ocean, South ...	109
South " ... ..	130	Mediterranean ... ..	109
Indian Ocean ... ..	145	Red Sea ... ..	82
Pacific Ocean, North ...	87	Arctic Ocean ... ..	4

Publications.

Various publications of the Office in connexion with ocean meteorology have been either completed during the year or are in progress.

Southern  
Ocean.

*The Meteorology of the Southern Ocean.*—The region referred to lies between the Cape of Good Hope and New Zealand, south of latitude 30° S. These charts, which have already been described (*See Report, 1898, p. 8*), have been published since the last Annual Report.

South  
Atlantic.

*The Meteorology of the South Atlantic and of the East and West Coasts of South America.*—All the available information extracted from the mercantile logs in the Office, and from those of Her Majesty's Ships has been analysed, and a large proportion of this material has been made use of for discussion. The charting of the data is now being taken in hand. The Hydrographer of the Admiralty has undertaken the publication of the work, his Office having special facilities for disseminating the information provided.

Observations  
from the  
Pacific  
Ocean.

*Observations from the Pacific Ocean.*—The arrangements described in the Report for 1898, p. 8, for the supply of instruments from Her Majesty's Dockyard at Sydney to observers navigating the Pacific Ocean have been in operation. Arrangements have also been made for the supply of instruments from Her Majesty's Dockyard at Hong Kong to the Commanders of the Canadian-Pacific Railway Company's Steamers running between British Columbia, Japan and China. The observations contained in these logs are of special importance in regard to the material which they afford for the gradual improvement of the Current Charts for the Pacific Ocean issued by the Office.

The Weather  
of the Winter  
1898-99.

*The Weather of the Winter, 1898-99, over the North Atlantic.*—The enquiry which the Council decided upon carrying on, relative to the unusually severe weather which prevailed in the Atlantic during the winter 1898-99, has been completed, and the Charts illustrating the results of the investigations will be ready for publication shortly. In the compilation of this work observations supplied by the log books of about 200 vessels have been utilised, yielding on an average about 60 observations a day. The Office has found great assistance from the valuable data supplied by the Transatlantic Steamship Companies of London and Liverpool, and from observations received through the French and Danish Meteorological Offices. The Daily Weather Charts published by the United States Weather Bureau have furnished valuable information required for that part of the American Continent which is embraced in the charts. Fairly representative Charts for 60 days have been prepared from these observations.



*Drift Ice in Northern Seas.*—On behalf of the Danish Meteorological Institute, which has undertaken a work having for its object the collection of information in regard to the state of the ice in the waters East and West of Greenland and elsewhere, within the limits of Arctic navigation, between the months of March and August inclusive, the Office has secured the co-operation of the Captains of several Arctic Whalers, and of two vessels owned by the Hudson's Bay Company.

Observations  
of Drift Ice  
in Northern  
Seas.

*Collection of Meteorological Observations from Distant Stations.*—It has been the custom of the Office to supply instruments to observers in unfrequented parts of the world, when it has reason to believe that the observations will be taken with due care, and the observers undertake to send in copies of their observations.

Instruments  
for distant  
stations.

A list of the documents received during the year from these and other foreign land stations is given in Appendix XV. (p. 101).

No new station of this class has been supplied with instruments during the past year.

A siphon mountain barometer has been lent to Mr. E. J. Garwood for use during a tour in the Himalayas in Sikkim, in company with Mr. D. Freshfield.

*Climatological Information for the Admiralty.*—Statistics as to the climates of foreign ports are from time to time required by the Admiralty for use in various publications; a good deal of research is required to supply the necessary information. The districts so dealt with during the year have been New Zealand, various Islands in the Pacific Ocean, and localities in the Ægean Sea.

Information  
supplied  
for the  
Admiralty.

*Supply and Stock of Instruments.*—In Appendix VI. (p. 46) a return is given of the meteorological instruments supplied during the year by the Office to the Royal Navy, together with a statement of the stock and of the distribution of the instruments for the use of the Navy standing on the books at the 31st March, 1900.

Stock of  
instruments  
belonging to  
the Office.

Appendix VII. (p. 47) gives similar information with regard to the disposal of the other instruments belonging to the Office, which either remain in store or have been supplied to the Mercantile Marine, to Observatories, or to Telegraphic Stations, &c.

## PART II.

### WEATHER TELEGRAPHY AND FORECASTS.

The forecasts issued by the Office of the probable weather throughout the United Kingdom are based on meteorological observations made at a number of stations, which are in direct telegraphic communication with the Office.

General

The Telegraphic Reporting Stations are those marked with the letter "T" in the list given in Appendix XIII. (p. 62), and the same Appendix contains at p. 69 a list of the Foreign Stations which send daily telegrams to the Office.

There have been a considerable number of changes in the stations during the course of the year. For reasons of economy

Changes in  
the Stations



the reports from Hawes Junction, York, and Cambridge have been discontinued, in addition to those from Ardrossan mentioned last year, and a station has been established at Portland Bill to take the place of two stations at Hurst Castle and Prawle Point respectively. The new station is, by permission of the authorities of Trinity House, placed in charge of the keeper of the high lighthouse on the Bill, and affords a very satisfactory exposure of the instruments.

With the sanction of the Admiral-Superintendent of Naval Reserves, the instruments hitherto located at Belmullet have been transferred to Blacksod Point, and placed in charge of the Coastguard officer there.

Observations  
from Lloyd's  
Signal  
Stations.

By way of supplementing the observations of weather on the coast transmitted by telegram, the Office gladly accepted the offer made by Colonel Hozier, C.B., on behalf of Lloyd's, to send periodically by post records of weather from the following signal stations maintained by Lloyd's, viz., Butt of Lewis, Tory Island, Brow Head, Kildonan, Calf of Man, Lundy Island, Barry Island, the Lizard, Prawle Point, St. Catherine's Point, Beachy Head, Dunnet Head, St. Abb's Head, Flamborough Head, Deal.

Inspection of  
the Stations.

*Inspection of the Telegraphic Reporting Stations.*—The stations in the United Kingdom have been inspected during the year, those in England by Messrs. Gaster, R. H. Curtis, J. A. Curtis, and Brodie of the Meteorological Office; those in Scotland by Mr. Buchan, and in Ireland and Wales by Mr. Scott.

The Reports of the Inspectors are printed in Appendix XIV. (p. 73); they show that efficiency has been maintained.

Discussion of  
the observa-  
tions.

*Discussion and Publication of the Information received.*—A detailed account of the manner in which the meteorological information received by telegraph is utilised was given in Appendix X. of the Report for 1891, and there has been no change of procedure since that date. The Daily Weather Report contains a synopsis of the weather on the day of issue, based on the telegraphic data; this has appeared regularly during the year. About 250 copies of the Daily Weather Report are distributed without charge to newspapers, for public exhibition at seaports, to Government Offices and public institutions, to correspondents of the Office, and to foreign meteorological institutions. The issue to subscribers amounted to about 165 copies.

Distribution  
of reports.

Weekly  
Weather  
Report.

The Weekly Weather Report, and the various Appendices, contain Weekly and Monthly Summaries of the chief elements of the Weather. Details as to those publications are contained in Part III., p. 19, and in Appendix VIII., p. 48.

Display of  
information  
in front of  
the Office.

*Display at the Meteorological Office in London of Information as to the Weather on British Coasts.*—At 9.30 a.m. and 3 p.m. every week day the substance of the reports received by telegraph, as to the state of the weather and of the sea at the following stations: Yarmouth, Dover (Dungeness), Portland Bill, Scilly, Holyhead, and Valencia Island, is conspicuously displayed on the balcony of the Office, at 63, Victoria Street, S.W. At the same hours charts are suspended in the portico of the street door, which exhibit the

latest information from all our coasts, and the latest forecasts and storm warnings that have been issued.

*Supply of Forecasts to the Admiralty.*—At the request of the Admiralty daily forecasts are supplied regularly to the Commander-in-Chief, at Devonport. Forecasts for the Admiralty.

*Weather Forecasts.*—Forecasts are now made twice a day, namely, at 11 a.m. and 8.30 p.m. The forecasts issued at 11 a.m. are based on the telegrams of observations made at 8 a.m., and refer to a period of 24 hours from noon on the day of issue. These forecasts are exhibited at several places in London,\* and are supplied to newspapers for their later editions. The forecasts at 8.30 p.m. are prepared for the next morning's newspapers. Each of the forecasts has its special applicability, and is available to the public on inquiry at the Office either by letter, by telegram, or in person. The inquiries received by telegram through the Post Office for special forecasts amounted during the year to 90 and the personal applications to 69. The rules of the Office relating to such inquiries are stated in Appendix VIII., p. 52. Forecasts.  
Inquiries at the Office.

A comparison for the year of the Forecasts for the United Kingdom issued at 8.30 p.m., with the subsequent weather actually experienced, is given in detail in Appendix IX., p. 53. The complete success, partial success, partial failure, and complete failure of the forecast is estimated according to definite rules which are designed to eliminate bias as far as possible. Results of Forecasts.

It will here suffice to state that partial success means that the Forecast was correct for more than half the elements dealt with at the places of observation situated in the district in question, and a similar interpretation is to be applied to the term partial in the case of the failures.

The detailed comparison of the Forecasts with actuality may be summarised as follows:— Results of Forecasts.

#### SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1899-1900.

Districts.	Per-centages.				
	Complete Success.	Partial Success.	Partial Failure.	Complete Failure.	Sum of Successes, Complete and Partial.
SCOTLAND, N. ...	56	26	12	6	82
" E. ...	52	28	13	7	80
ENGLAND, N.E. ...	54	31	11	4	85
" E. ...	52	29	14	5	81
MIDLAND COUNTIES...	57	28	13	2	85
ENGLAND, S. ...	58	29	11	2	87
SCOTLAND, W. ...	58	24	10	8	82
ENGLAND, N.W. ...	55	24	14	7	79
" S.W. ...	59	23	12	6	82
IRELAND, N. ...	52	29	13	6	81
" S. ...	49	29	13	9	78
Summary ...	55	27	12	6	82

\* In the City at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's, Cornhill, and Messrs. de la Rue & Co.'s, Bunhill Row; in the West End, in the Libraries of the House of Lords and the House of Commons; at Messrs. Elliott's, St. Martin's Lane; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; and at the Office, 63, Victoria Street.

In order to test the success of the Forecasts of the year in comparison with those of previous ones, the following table has been drawn up. It shows for each year of the decade 1890-99 the percentages of complete and partial success of the Forecast issued at 8.30 p.m. It will be noticed that the highest degree of complete success was obtained in 1893, and that 1899 did not fall far short of that figure, and the number of complete successes was above the average for the whole decade.

PER-CENTAGES of SUCCESS in the FORECASTS for the whole of the BRITISH ISLES.

Year.	Complete Success.	Partial Success.	Sum of Successes, Complete and Partial.
1890 ... ..	50	32	82
1891 ... ..	50	30	80
1892 ... ..	46	33	79
1893 ... ..	59	25	84
1894 ... ..	56	27	83
1895 ... ..	55	25	80
1896 ... ..	54	27	81
1897 ... ..	55	26	81
1898 ... ..	55	28	83
1899 ... ..	55	27	82
Average ... ..	53.5	28.0	81.5

Harvest Forecasts.

*Harvest Forecasts.*—The practice of distributing, by telegraph, special Forecasts to a selected number of prominent Agriculturists in the several districts of England, Scotland, and Ireland during the period of harvest, had been continued for a long period, in order to give the Council an opportunity of putting the Forecasts to a practical test. The returns of success and failure were made up from the observations of the recipients themselves, and for many years past the totals of partial and complete success had reached an average of about 90 per cent. for all districts, varying from 76 per cent. for Ireland, N., to 96 per cent. for England, S.

In May 1899, the Council decided that the free distribution of the Forecasts should be discontinued, and a circular was issued announcing this decision, and stating that the Forecasts would be sent to applicants who were willing to pay the cost of the daily telegram, without any additional charge. Twenty applications for the Forecasts were received, one from Scotland, W., and the remainder from the various districts of England, and Forecasts were sent daily at 3.30 p.m. for varying periods extending in the whole over eight weeks.

Storm Warnings.

*Storm Warnings for the Coasts of the United Kingdom.*—Warnings of coming storms are dispatched by telegraph to certain stations on the coast. These stations are supplied with signals which are hoisted as warnings to mariners of expected storms. The signals are defined in Circular 717 of the Board of Trade, issued in February, 1874.



A list of the stations is given in Appendix X., p. 54. At the end of March, 1900, there were 234, of which 121 were in England and Wales, 70 in Scotland, 31 in Ireland, 4 in the Isle of Man, and 3 in the Channel Islands.

A comparison has been made in the Office between the warnings issued during the year and the subsequent weather actually experienced. The method of comparison is explained in Appendix VIII., p. 52, and the results are exhibited in the following table:—

### STORM WARNING CHECKING.

COMPARISON between the WARNINGS and the subsequent WEATHER in 1899.

Coasts.	Total No. of Warnings.	Warnings justified by subsequent Gales. Force 9 and upwards.	Warnings justified by subsequent strong Winds. Forces 6 & 7.	Warnings not justified by subsequent Weather.	Warnings late. Forces 9 reached at two Stations before issue.	Warnings partially late. Force 9 reached at one Station before issue.	Warnings issued in consequence of telegraphic errors.	Storms for which no Warning was issued.
Scotland, N.E. ...	47	36	7	4	—	—	—	Oct. 29.
"    E. ...	32	8	16	8	—	—	—	—
"    N.W. ...	48	27	17	2	1	1	—	Sept. 18.
"    W. ...	48	18	28	2	—	—	—	—
Ireland, S.W. ...	47	30	12	3	2	—	—	Jan. 11-12.
"    N.W. ...	53	34	13	—	3	3	—	Sept. 18.
Irish Sea ...	39	25	12	—	—	2	—	Sept. 18, Sept. 22.
St. George's Channel	33	18	11	2	1	1	—	Sept. 22.
Bristol Channel ...	36	30	4	—	—	2	—	—
England, S.W. ...	34	25	7	—	—	2	—	—
"    S. ...	26	13	13	—	—	—	—	—
"    S.E. ...	22	10	11	1	—	—	—	—
"    E. ...	19	14	5	—	—	—	—	Sept. 22, Sept. 30.
"    N.E. ...	20	11	5	2	1	1	—	Jan. 18, Mar. 28-29.
Totals ...	504	299	161	24	8	12	—	
Percentages...		59.3	31.9	4.8	1.6	2.4	—	

NOTES as to GALES EXPERIENCED in 1899, for which no WARNING was issued.

*January 11th.*—IRELAND, S.W. A W. to N. W. gale.

Very sporadic, and no indication of its advent at 6 p.m. on 10th. Barometer rising,

*January 12th.*—IRELAND, S.W. A W. to N.W. gale.

Very sudden. No indication of its approach at 6 p.m. on 11th. (Previously noted gale was then passing off.)

*January 18th.*—ENGLAND. N.E. A S.W. gale.

The W. and N. coasts were duly warned, but the air driving through the valley of the Solway caused a gale on the Northumberland coast which had not been warned.

*March 28th-29th.*—ENGLAND, N. E. A S.W. to W. gale.

Our W., S.W. and S.E. coasts had been duly warned, but gale extended to N.E. coast also.

*September 18th (Sunday).*—SCOTLAND, N.W. ; IRELAND, N.W. ; and IRISH SEA.

A deep secondary disturbance reached Scotland from the N.W. on night of 17th-18th.

*September 22nd.*—IRISH SEA, ST. GEORGE'S CHANNEL, and ENGLAND, E. A W. to N.W. gale.

Scotland and Ireland had been warned at 2.30 p.m. on 21st, but the depressions moved so rapidly, that by 8 a.m., 22nd, our E. coasts were already involved.

*September 30th.*—ENGLAND, E. A gale from various points.

A very complex condition prevailed on 29th, and the appearance on the E. coast was *doubtful*, but hardly justified warning.

*October 29th (Sunday).*—SCOTLAND, N.E.

Our W. and N.W. coasts were duly warned on morning of 29th, but the depression unexpectedly grew rapidly deeper, and in the absence of 2 p.m. reports the non-warning was unavoidable.

The following table contains a statement of the amount of success of storm warnings in the decade 1890-99 :—

Comparison  
of results for  
1899 with  
previous  
years.

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.
		p.c.	p.c.	p.c.	p.c.
1890	525	61.0	25.5	86.5	9.3
1891	522	62.3	24.5	86.8	7.5
1892	488	59.4	31.2	90.6	6.8
1893	480	60.8	28.6	89.4	7.1
1894	502	68.5	23.5	92.0	6.0
1895	523	63.3	26.4	89.7	8.0
1896	467	67.7	23.8	91.5	2.9
1897	596	60.1	31.7	91.8	4.5
1898	581	59.8	27.5	87.3	4.5
1899	504	59.3	31.9	91.2	4.8

Fishery  
Barometers.

*Fishery Barometers.*—Barometers have for many years been lent by the Office to fishing villages and other places on the coast for the benefit of sailors and fishermen. A list of the stations thus provided is given in Appendix XI., p. 57. There are 220 stations of this kind, of which 67 are in England, 7 in Wales, 62 in Ireland, 79 in Scotland, 4 in the Isle of Man, and 1 in Jersey.

## PART III.

## CLIMATOLOGY.

## I.—BRITISH ISLES.

The Council do not attempt to deal completely with the details of the Climatology of the British Isles. It has been their practice to subsidise or maintain an intimate relationship with a small number of observatories of the highest class, to obtain continuous records of barometric changes, of the direction and force of the wind, or of sunshine, from other suitably placed stations, and to compile statistics from the observations sent in from these and from Telegraphic Reporting Stations and to supplement them by observations sent to the Office periodically from other land stations in various parts of the country.

Stations  
supplying  
Information.

The various observing stations of the Office fall consequently into groups according to the nature and completeness of the information which they supply, and the seven categories in which they are classified are as follows :—

Classification  
of Stations.

1. *Observatories of the First Order*, maintained or subsidised by the Office, and furnishing continuous photographic records of the barometrical pressure and the temperature, and continuous records of rainfall, wind, and bright sunshine, with frequent eye observations of the weather and of the kind and amount of cloud.

Observatories  
of first order.

2. *Anemographic Stations* which furnish continuous records of the direction and force of the wind.

Anemo-  
graphic  
Stations.

3. *Barographic Stations* which furnish continuous records from the aneroid barometer.

Barographic  
Stations.

4. *Sunshine Stations* which furnish continuous records of bright sunshine. At nearly all of these the record is made by the Campbell-Stokes instrument, of which an account was given in the Annual Report of the Office for 1879, p. 32.

Sunshine  
Stations.

5. *Telegraphic Reporting Stations* which furnish the data for the forecasts and storm warnings, as explained in Part II.

Telegraphic  
Reporting  
Stations.

6. *Stations of the Second Order* which furnish complete climatological data. The observations are taken twice a day; the observers are volunteers, and they provide their own outfit of instruments.

Second Order  
Stations.

7. *Stations of the Third Order* which resemble those of the second order, except that the information sent to the Office is less full.

Third Order  
Stations.

8. *Sea Temperature Stations*, at which observations of the temperature of the sea-surface and of the air are taken twice a day. These are nearly all either Coast Guard Stations or Light Vessels.

Sea  
Temperature  
Stations.

A complete list of all the stations is given in Appendix XIII., p. 62. The nature of the information supplied by each station is indicated by the letters in the last column but one of the table, as explained on pp. 62 and 63. It should, however, be mentioned that some of the stations which supply the Office with information corresponding to stations of the Second Order and classified in the list accordingly are in reality Observatories of the First Order, such as the Observatory of the Mersey Docks.

List of  
Stations.



and Harbour Board at Bidston, Liverpool, and the Radcliffe Observatory at Oxford.

The stations may be summarised as follows :—

Class.	Description.	Number.
1	Observatories ... ..	8
2	Anemographic stations ... ..	15
3	Barographic (Aneroid) stations ... ..	16
4	Sunshine stations ... ..	73
5	Telegraphic stations ... ..	30
6	Second Order stations ... ..	84
7	Third Order stations ... ..	87
8	Sea Temperature stations ... ..	50

The majority of the stations included in the list are in direct communication with the Office, but some of them, on the other hand, make returns to the Royal Meteorological Society and others to the Scottish Meteorological Society, and, by special arrangements with the Societies, copies of the observations, or of monthly summaries, are prepared by them and forwarded to the Office to be incorporated with those furnished directly to the Office.

**Inspection of Stations.**

*Inspection of the Stations.*—In order to secure uniformity of method and to guard against instrumental errors, the stations classified under the heads 1, 2, 5, and 6 are regularly inspected, while those in Classes 3, 4, and 7 are visited as opportunity offers. The stations of Class 6, which belong to the Royal Meteorological Society, are visited by an Inspector appointed by that Society. In accordance with the recommendation of the Treasury Committee (1877), a contribution towards the cost of this inspection is made by the Office. The rest of the stations of Class 6 are visited, in most cases annually, by the Inspectors of the Office. The inspection of the principal observatories and of some of the anemographic stations was carried out by Messrs. T. W. Baker and E. G. Constable, of Kew Observatory.

Extracts from the reports of the Inspectors are given in Appendix XIV., p. 73.

**Presentation of the Results obtained.**

*Discussion of the Observations.*—Detailed information as to the mode of dealing with the material which is thus obtained is given in Appendix XII., p. 58. It will be sufficient here to give a general indication of the forms adopted for the presentation of the results obtained from the observations.

**First Order Stations.**

*Observatories of the First Order.*—After careful examination of the curves traced by the instruments, and of the measurements of the curves made at the observatories, the readings for each hour are tabulated, and from them a volume is prepared giving the means of the readings for the several hours, of barometric pressure, temperature, wind, rainfall, and sunshine, for each consecutive group of five days, for the months, and for the year.

The form adopted for the presentation of these observations has been varied from time to time. For some years the curves themselves were reproduced. From 1874 to 1886 the hourly readings at the several observatories were published; but from

1887 the plan now in use, of giving the five-day means, was adopted, while in the volume for 1895, at the suggestion of the International Conference at Paris, the hourly readings at Kew and Valencia were included in addition, and this was continued in the volume for 1896 prepared in the current year.

Means of the meteorological elements for each hour of the day over a long period of years are also occasionally prepared; and the harmonic components are calculated for the curve representing the diurnal variation of pressure and temperature for the hourly means thus obtained for the several months over which the observations extend.

*Anemograph Stations.*—The returns from the Anemograph Stations are used for checking the accuracy of storm warnings. They have also been found to be of considerable importance from time to time in affording evidence in Courts of Law, and the information derived from Sunshine Stations has been found to have a similar application.

Anemograph  
Stations.

Comparisons of the results of different forms of anemometer and of the records at different stations are made from time to time, to furnish evidence as to the best form of anemometer for use in any particular circumstances, and the proper meaning to be attached to the readings obtained, which are still questions open to considerable doubt.

*Telegraphic Reporting Stations.*—The observations made at 8 a.m. and 6 p.m. at Telegraphic Reporting Stations, supplemented by records of maximum and minimum temperature, duration of sunshine and rainfall at other climatological stations, furnish the materials for a weekly statement of mean and extreme temperature, "accumulated" temperature, Rainfall and Sunshine in the principal wheat growing and grazing districts of the British Isles, with quarterly and annual summaries for agricultural purposes. These are included in the Weekly Weather Report and its appendices. Tables of means of pressure, temperature, and other elements for the Telegraphic Reporting Stations are prepared from time to time and issued as a supplement to the Daily or Weekly Report. The preparation of the means for the 30 years 1871–1900 is now in progress.

Telegraphic  
Reporting  
Stations.

*Second Order Stations.*—The returns from all the Second Order Stations are arranged to give monthly means of pressure and temperature at 9 a.m. and 9 p.m., with the means of maximum and minimum temperature for the month, as well as data concerning rainfall, the direction and force of the wind, &c. These are arranged in a form "B," adopted for International use by the Meteorological Congress at Rome in 1879; while for certain selected stations the details of the actual observations made at 9 a.m. and 9 p.m., with intermediate observations of the actual state of the weather, are set out *in extenso* in a form "A," adopted in a similar manner. These returns are prepared with a view to the publication of an annual volume, which is entitled "*Observations at Stations of the Second Order*," of which twenty-two volumes have been issued, the last being that for 1896.

Second Order  
Stations.

The volume for 1896 differs from that for 1895 by the disappearance from the "A" list of Margate, and from the "B" list of Brookeborough, Co. Fermanagh, and by the inclusion of



Woolacombe, North Devon, as an "A" station in place of Margate, and the addition to the "B" list of four stations—namely, Strathpeffer Spa, Gilerux, near Maryport, Belvoir Castle, Grantham, and Norwood in South London, thus increasing the total number of stations by three.

Reports  
supplied to  
Registrar-  
General for  
Ireland.

Weekly results of the Temperature and Rainfall Observations are also prepared and regularly supplied to the Registrar-General for Ireland from 10 of the Irish stations for use in his "Weekly Return of Births and Deaths," while a full table of Monthly and Quarterly results from seven stations is prepared in the Office, and supplied to him at the beginning of each quarter for publication in his "Quarterly Return of Marriages, Births, and Deaths."

Sea  
Temperature  
Stations.

*Sea Temperature Stations.*—Daily observations of the temperature of the sea-surface have been taken since 1879 at a number of stations. The observations for the three years 1879–1882 were used in the preparation of the "Meteorological Atlas," published in 1883.

In May last year, Mr. H. N. Dickson contributed to the Royal Meteorological Society a paper on "The Mean Temperature of the Surface Water of the Sea round the British Coasts, and its relation to the Mean Temperature of the Air," based upon the observations lent by the Meteorological Council.

#### FOREIGN AND COLONIAL STATIONS.

Observations made at various Foreign and Colonial Stations are regularly received at the Meteorological Office.

During the year under review returns from 43 such stations have come in, and a list of them will be found in Appendix XV., p. 101.

The information contained in these returns varies considerably. At some stations a full set of observations is recorded twice daily, while at others only Rainfall and Temperature, or Rainfall alone is noted. These returns are being treated in the same way as those from stations of the second and third orders (Classes 6 and 7, page 17), and the Council has authorized the regular publication of the results in volumes that—after the first one—will appear at five yearly intervals. It had been hoped that the first volume would have been issued during the year 1899–1900, but although a considerable amount of preparatory work has been done upon it, nothing is as yet in print. Efforts will be made to have the volume published during the current year.

Six of the stations referred to are in the Island of Cyprus, where the observations are taken under the direction of Dr. Heidenstam, the Chief Medical Officer. The Tables of results of these observations required for the Cyprus Blue Books have been prepared in the Office as in previous years.

#### PART IV.

##### LIBRARY.

The main part of the Library consists of the weather maps and other publications of the weather offices of different countries, and meteorological reports and publications received from all quarters of the globe. Most of these are presented or obtained

by way of exchange, but a few standard works and serial publications are purchased. Each work, immediately on receipt, is entered on a card under the author's name, and is subsequently entered in a classified catalogue under the subject to which it refers. The Library consists at present of about 15,500 volumes and pamphlets.

Appendix XVIII., p. 114, gives a list of the additions to the Library during the year. These amounted to 482 books and pamphlets.

## PART V.

### MISCELLANEOUS INVESTIGATIONS.

*Anemometer Experiments.*—The four anemometers of different patterns, viz., the Robinson Anemometer, the Bridled Anemometer, the Pressure Tube and the Pressure Plate Anemometers are still in action at Holyhead, and the records obtained from them have been examined in the Office by Mr. R. H. Curtis who, for some years past, has given special attention to this subject.

Comparison  
of the Results  
of Anemo-  
meters.

The Robinson Anemometer has been removed from its old site to a much more suitable one upon Salt Island, where a very satisfactory stand for it has been erected by Mr. F. Cotton, C.E., the Harbour Engineer. (See p. 7, and Report of Inspection, p. 84.)

A short paper by Mr. R. H. Curtis, giving some additional results of the comparison of the records is printed in Appendix XVI., p. 104.

*Atmospheric Electricity.*—As mentioned in their last Report (p. 19), the Council had arranged with Mr. C. T. R. Wilson, F.R.S., of Sidney Sussex College, Cambridge, for an investigation of certain phenomena connected with atmospheric electricity with the view of enabling the Council to make effective use of the records of atmospheric electricity which have been continued for many years at Kew Observatory, and a grant of £200 had been obtained for this purpose from the Government Grant Committee.

Atmospheric  
Electricity.

The provisional programme adopted by the Council after consultation with Mr. Wilson dealt partly with an examination of the records obtained at Kew and at other observatories at which records of electrical potential are kept, and partly of experimental work intended to elucidate the process of electrification of the atmosphere.

To carry out the programme of work in connexion with the records of observatories the Astronomer Royal kindly allowed the Greenwich records to be used for comparison with those of Kew. It appeared however that the practice adopted in the mounting and use of the instruments at the two observatories is too widely different for any effective comparison of the atmospheric data to be practicable, and this difficulty has prevented the further prosecution of that part of the programme up to the present time.

Mr. Wilson has been very successful in the experimental work which has been carried on in Cambridge, either at the Cavendish Laboratory or in a field near the observatory, kindly placed at his disposal by Professor Sir R. S. Ball. In May, 1899, he completed an important paper "On the Comparative Efficiency as

Condensation Nuclei of Positively and Negatively charged Ions," which was forwarded by the Council to the Royal Society and has been published in the Philosophical Transactions (vol. 193, A., p. 289). The results of this paper are particularly valuable because they apply to problems of direct meteorological importance the most recent developments of the physical investigation of electrical discharges, itself largely carried out at the Cavendish Laboratory. They also supplement work which is being prosecuted upon somewhat similar lines on the Continent, particularly by Professors Elster and Geitel, of Wolfenbüttel, so that it seems probable that important modifications and extensions of our views of the origin of Atmospheric Electricity will be reached. Some outstanding questions still remain, such as the possibility of the existence in the atmosphere of air in a state suitable for the condensation associated with electrical effects to take place; but such problems are of general scientific interest, and there is no doubt that the discussion will be continued.

In the course of his inquiry into the means for registering the potential of the atmosphere, Mr. Wilson has noticed a remarkable action of the collectors of electricity, which requires further investigation.

In order to enable Mr. Wilson to carry on these researches the Council have received, in addition to the original grant of £200 from the Government Grant Committee referred to in last year's report, a further grant of £100 from the same Committee, and an application for an additional grant of £100 to complete the total of £200 for two years is now (May, 1900) under the consideration of the Committee.

A letter setting forth the grounds of the application together with Mr. Wilson's preliminary programme and his further report on the stage which the investigation had reached at the beginning of the current year, 1900, are printed in Appendix XVII., p. 108.

The Council regret that they have been hitherto unable to furnish the means of investigation of the upper strata of the atmosphere by means of the balloon observations which Mr. Wilson's second report indicates as desirable. Apart from questions of expense there are special difficulties attending the prosecution of such experiments in England by means either of balloons or kites. The comparative nearness to the coast of all stations in these islands, the disposition of the land and its intersection by enclosures and roads, tend to aggravate the possible consequences of any misadventure with the apparatus, and having regard to these circumstances the Council are not at present aware of any site that would be both suitable and available for experiments of this character, which could not be carried out without a specially organized staff, at considerable expense.

Small  
Oscillations  
of Sea Level.

*The Use of Small Oscillations of Sea Level in forecasting weather.*—The Council have received through Professor Darwin a suggestion from Mr. F. Napier Denison, now of the British Columbia Weather Service, to the effect that certain small oscillations in the sea level, noticed in the records of tide gauges, were connected with atmospheric disturbances, and might prove useful in forecasting weather. (See British Association Report,



1899). The Council have at present no means for putting this suggestion to a really satisfactory test, but through the kindness of the Admiralty in lending a selection of the tidal records of the Portland Bill tide gauge, they have been able to institute a comparison between the oscillations noticed in the records for that station, and the march of the weather in the British Islands. No correspondence between the two has been recognised in the comparison, but the peculiarities of the tidal records and of the weather during the period selected made it impossible to form any final opinion upon the matter, which is one of very considerable theoretical and practical interest. It is one, however, which cannot be properly investigated without special experimental appliances, which the Council have at present no means of furnishing or using.

## PART VI.

## PUBLICATIONS.

During the year the Office has prepared and issued regularly the Daily and Weekly Weather Reports (*see* pp. 12 and 48) with Monthly, Quarterly, and Annual Summaries. These publications are issued to subscribers as well as to certain Public Offices and Institutions, and to foreign Weather Offices in exchange for similar publications. The number of subscribers for the Daily Weather Report has been about 165.

Daily and  
Weekly  
Weather  
Reports.

The publication of the Charts for the Southern Ocean has already been referred to, p. 10.

The Office work in connexion with the preparation of Weather Charts for the North Atlantic Ocean during the exceptional weather of the winter of 1898-9 (*see* p. 10) has been completed and the Charts will shortly be ready for issue.

Atlantic  
Weather  
Maps for  
Winter of  
1898-9.

The annual volume embodying the observations taken at the five Observatories of the First Order (*see* p. 18) in connexion with the Office, during the year 1896, and the volume based upon observations in the same year at stations of the Second Order (*see* p. 19) have been completed and issued. The corresponding volumes for 1897 are now being prepared. The publication of the volume of results for 1895 from the Observatories of the First Order also falls, as a matter of fact, within this year, as it was not quite completed at the close of last year (*see* Report for 1899, p. 18).

Observations  
from First  
and Second  
Order  
Stations.

The translation into English of the Report of Proceedings at the St. Petersburg meeting in September 1899 of the International Meteorological Committee has been completed, and the English version will be issued shortly.

International  
Conference

Mr. Scott's paper on the Diurnal Range of Rain during the 20 years (1871-90), recorded by the Beckley's self-recording gauge at the seven observatories in connexion with the Office, has been published.

Diurnal  
Range of  
Rain.

A paper upon Types of Weather, by Mr. E. Douglas Archibald, has been under the consideration of the Council. The paper deals with the practicability of making forecasts of weather for a longer period than the *one day in advance*, to which the forecast of the Office are restricted, by applying to the weather maps of the

Weather  
Types

British Islands certain principles which, according to the researches of MM. van Bebbber and Teisserenc de Bort on the Continent, may be supposed to underlie successive changes in the weather over Europe. The Council are of opinion that the subject is of such practical importance that the paper should be made accessible for those who are interested in the further development of the principles of weather prediction, and they have accordingly decided to undertake the publication of the paper by the Office.

Previous  
Publications.

A complete list of publications issued by the Office is given in Appendix XXI., p. 144, and in Appendix XX., p. 138, is given a list of important contributions to meteorology, which have not been issued as separate publications, but have been included in various reports issued by the Office since 1866.

## PART VII.

### FINANCE.

Appendix XIX., p. 137, shows the receipts and payments during the year ending 31st March 1900. The amount voted by Parliament was 15,300*l.*, as in the previous year, and the miscellaneous receipts amounted to £1,039 9*s.* 4*d.* In addition to these amounts the sum of £100 was received from the Government Grant Committee, as above explained.

The following abstract of expenditure shows the true net charge against the Parliamentary grants of this and the preceding year, together with the increase or decrease in 1899-1900, as compared with the previous year :—

NET EXPENDITURE.	1898-99.	1899-1900.	Increase.	Decrease.
GENERAL ADMINISTRATION :				
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
<i>Payment of Council</i> ...	990 0 0	1,721 7 2	—	68 12 10
<i>Secretary</i> ...	800 0 0			
<i>Office</i> ...	930 0 0			
<i>Rent, Fuel, and Lighting</i> ...	710 13 2	726 11 7	15 18 5	—
<i>Alterations to premises and contingencies</i> ...	236 2 9	262 14 0	26 11 3	—
<i>Expenses incidental to International Meteorological Congress</i> ...	4 3 10	3 5 0	—	0 18 10
<i>Pensions</i> ...	144 0 0	177 6 8	33 6 8	—
SPECIAL RESEARCHES ...	786 11 5	900 5 4	113 13 11	—
LAND METEOROLOGY ...	3,609 3 0	3,298 4 8	—	310 18 4
WEATHER INFORMATION ...	3,871 13 2	3,477 12 10	—	394 0 4
INSPECTIONS ...	431 17 4	434 11 4	2 14 0	—
OCEAN METEOROLOGY ...	2,489 1 7	2,276 4 3	—	212 17 4
Total ...	£ 15,003 6 3	14,187 16 4	192 4 3	1007 14 2†

In the year 1899-1900 the sum of £1,403 6*s.* 1*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires, &c.

(Signed) R. STRACHEY,  
Chairman.

June, 1900.

† At the close of the year £400 per annum was, with the sanction of the Treasury, assigned as a pension to the retiring Secretary and £1,500 is required to provide superannuation allowance for a retiring Clerk in the ensuing year.

## APPENDIX.

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### APPENDIX I.

#### REGULATIONS FOR SUPERANNUATION ALLOWANCES FOR CLASSIFIED CLERKS.

Subject to the continuance of the Parliamentary grant now made, the Meteorological Council will make provision for superannuation allowances for Classified Clerks on the following basis :—

1. Every clerk will be retired on his attaining the age of 65 years unless his service be specially extended by the Council. On being so retired he will receive a yearly allowance not exceeding one-half of his average salary during the last three years of his service. Provided that the maximum allowance will be at the rate of £150 per annum, after approved service of not less than 30 years.
2. For the purpose of these regulations, regular payments authorised by the Council for attendance in the evenings and on Sundays will be reckoned in computing the annual salary, but no other allowances beyond the normal annual salary, fixed under the regulations of the Council from time to time, will be so reckoned.
3. The provision made by the Council for superannuation allowances under Regulation 1, will be based upon the assumption that such superannuations will not take place oftener than at the rate of one in every two years.
4. Should the services of any clerk be dispensed with by the Council before he reaches the age of 65 years, on reduction of establishment, on account of ill-health, or for any other reason except for misconduct or incapacity (as to which causes of disqualification the decision of the Council shall be final), the Council will take into consideration the length of service of the clerk whose services are dispensed with, and will make such retiring allowance as they may think fit at the time, but in no case will the allowance exceed an annual payment of ten-sixtieths of the clerk's average salary during the last three years of his service, in respect of the first twenty years of approved service, together with one additional sixtieth of such salary for each additional year of service after the twentieth.
5. In all cases, for the purposes of these regulations, service under the Council shall be only reckoned after the age of 25 years.

6. Retiring allowances will be paid quarterly, and the payments will be subject to such regulations as the Council may prescribe as to furnishing life certificates, or the like.
  7. The Council will recognise no alienation or assignment of any retiring allowance granted under these rules, and they reserve the right to cancel any retiring allowance in the event of the insolvency of the person to whom it was granted, or of any flagrant misconduct on his part.
  8. The customary right of the Council to dispense with the services of persons in their employment, after due notice, at their discretion, shall not be affected by these regulations.
  9. Voluntary retirements from the service of the Council will give no claim to superannuation or retiring allowances.
  10. These rules are subject to alteration from time to time by the Council, and no claim or vested interest shall be created by these or any similar rules having been in force at any time during the period of service of any clerk.
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APPENDIX II.

CORRESPONDENCE relating to the CONTINUATION with the NATIONAL PHYSICAL LABORATORY of the relations hitherto subsisting between the METEOROLOGICAL OFFICE and KEW OBSERVATORY.

(1.)

Meteorological Office, 31st October, 1899.

SIR,

As a part of the arrangements made consequent on the contemplated transfer of the Kew Observatory to the National Physical Laboratory, it has been agreed by the Meteorological Council that the relations hitherto subsisting between the Council and Kew shall be continued after the transfer has taken effect.

As it will be desirable that there shall be a definite record made of the relations thus referred to, I am to request that you will be so good as to convey to the Council your approval of the annexed Memorandum, designed to supply such a record, subject to any modifications that may appear to you to be necessary to bring it into accord with what the Kew Committee consider to be the understanding under which the Meteorological Office has received from the Kew Observatory the records of observations made there, and has obtained certain services from the staff of the observatory.

I am, &c.,

ROBERT H. SCOTT, Secretary.

The Chairman of the Kew Committee  
of the Royal Society, Kew Observatory.

MEMORANDUM.

In the year 1869 the Meteorological Office agreed to grant to Kew a sum of £250 as an ordinary self-recording observatory, and £400 in addition for undertaking the examination of the records and tabulations of all the observatories maintained by the Meteorological Office. In 1871, on the Royal Society taking over the charge of the Kew Observatory from the British Association, the Meteorological Committee undertook to continue the grants on the former basis. In 1876, shortly before the Meteorological Council was established, the grant was re-considered, and the amount was reduced to £400, with the consent of the Kew Committee, in accordance with the terms of the following resolution :—

“Mr. Scott was instructed to arrange with Mr. Whipple (the Superintendent of the observatory) for the relinquishment by Kew of the examination of the records and tabulations from all observatories, together with a reduction of the sum allocated to Kew by the Meteorological Office, and to propose that in future a sum of £400 a year shall be given, in lieu of the present sum of £650 (£250 observatory and



£400 examination), on condition that a qualified assistant be kept at the observatory ready to be sent wherever his services may from time to time be required."

Under these arrangements, which have not since been changed, the Kew Observatory has supplied the Meteorological Office with the following observations :—

\* *Atmospheric Pressure* (continuous) by the Barograph.

————— 5 check readings daily of the Standard barometer, attached thermometer, and Barograph thermometer.

\* *Temperature of the Air* (continuous) by the Thermograph.

————— 5 check readings of the Standard thermometer daily.

————— Daily Maximum and Minimum at 10 p.m.

\* *Temperature of Evaporation* (continuous) by the Thermograph.

————— 5 check readings of the Standard thermometer daily.

\* *Direction of the Wind* (continuous) by anemometer.

\* *Velocity of the Wind* (continuous) by anemometer.

\* *Rainfall* (continuous) by Beckley Gauge.

————— Daily amount by Check Gauge.

*Weather.* 5 observations daily, and general in the interval between successive observations, also special remarks when necessary.

*Cloud.* 5 observations daily of "form" and "amount."

Some reduction in the number of eye observations under all these heads is made on Sundays and holidays.

*Sunshine.* Continuous, by the Sunshine Recorder, and weekly tabulations.

*Electrograms.* Continuous.

An annual inspection of the self-recording Meteorological observatories is made by the Kew staff, and occasional visits in case of breakdowns. Travelling expenses, including personal subsistence allowance, are paid by the Meteorological Office. Special investigations or observations are undertaken at Kew at the request of the Meteorological Council, on terms mutually agreed to in each case.

The meteorological instruments at Kew, and, *with some exceptions*, the apparatus for observations of Atmospheric Electricity, should be regarded as having been the property of the

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\* The curves obtained by the self-registering instruments indicated by the asterisks in the above list are measured and tabulated for each hour, and in the case of the first two, the daily maximum and minimum values and times of occurrence are given.

In the case of the first four, subsidiary hourly tabulations are made.

Meteorological Office, but permanently placed at the disposal of the Kew Observatory.

During the last five years the average time occupied yearly by the Kew staff in the inspection of observatories and anemograph stations has been as follows :—

Superintendent	...	...	...	= 1 day.
2 Assistants (together)	...	...	...	= 50 days.

R. STRACHEY,  
Chairman of Meteorological Council.

(2.)

National Physical Laboratory,  
Kew Observatory, Richmond, Surrey,  
February 3rd, 1900.

DEAR MR. SCOTT,

Your letter and memorandum were laid before the Committee at their last meeting and I enclose copy of the minute. I trust that the proviso is clear to you and will not give rise to any difficulty. It was thought that the words on page 2 might give the Committee a claim to practically the whole time of an assistant for special inspection work. We knew that this had not been the practice and it appeared clear from page 4 that it was not intended to make it the practice in the future, but the Committee thought it right that a proviso of the kind in the minute should be expressed.

Yours truly,  
R. T. GLAZEBROOK.

#### MINUTE AS TO WORK FOR METEOROLOGICAL COUNCIL.

A letter from the Secretary of the Meteorological Council dated 24th January, 1900, stating that "with the concurrence of the Treasury the Meteorological Council will continue to pay quarterly from the Parliamentary grant made to the Council the sum of £100 for the services rendered to the Meteorological Office by the Kew Observatory," and enclosing a memorandum signed by the chairman of the Council which had been accepted by the Kew Committee as a correct statement of the relations now existing between the Kew Observatory Committee and the Council, was laid before the Committee.

It was agreed to accept the terms in the memorandum as those on which the National Physical Laboratory should continue to carry out work for the Meteorological Council with the proviso that the words on page 2 of the memorandum "On condition that a qualified assistant be kept at the Observatory ready to be sent wherever his services may from time to time be required" are to be interpreted in the light of the words on page 4, which provide for "occasional visits" by the members of the Kew staff "in case of breakdowns."

(3.)

Meteorological Office,

1st March 1900.

SIR,

I AM directed by the Meteorological Council to acknowledge the receipt of your letter of 3rd February 1900, enclosing a minute of the Committee of the National Physical Laboratory with reference to the continuation of the arrangement between the Council and the Kew Observatory.

The Council have no desire to vary the practice that has hitherto obtained with regard to the employment of Kew assistants by the Meteorological Office, and they are, therefore, prepared generally to interpret the condition expressed in the resolution of 1876 (set forth in the Memorandum which forms the subject of your letter) in the light of the words of page 4 of the Memorandum. But the Council think it desirable, in order to avoid any uncertainty as to the circumstances to be regarded as constituting a "break-down," that the text of the resolution should be held to cover any cases of emergency which require such skilled assistance as the Kew Observatory has been in the habit of supplying.

I am, &amp;c.,

W. N. SHAW, Secretary.

The Director, National Physical Laboratory.

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APPENDIX III.

FURTHER CORRESPONDENCE RELATING to the MAINTENANCE  
of the BEN NEVIS OBSERVATORIES.

1. From the Right Hon. R. W. HANBURY, M.P., Secretary of  
the Treasury, to the Meteorological Council.

Treasury Chambers,  
25th July, 1899.

GENTLEMEN,

I AM directed by the Lords Commissioners of Her Majesty's Treasury to transmit herewith, for your information, a copy of a letter from the Scottish Meteorological Society, dated 15th instant, and of their Lordships' reply thereto, of this day's date, on the subject of the grant of further assistance from public funds to the Ben Nevis Observatories.

I am, &c.,  
R. W. HANBURY.

The Meteorological Council,  
63, Victoria Street, S.W.

2. From SIR ARTHUR MITCHELL, K.C.E., M.D., Honorary  
Secretary of the Scottish Meteorological Society, to the Secretary  
of the Treasury.

Scottish Meteorological Society,  
122, George Street, Edinburgh,  
15th July, 1899.

SIR,

It seems to the directors of the Ben Nevis Observatories that the concluding words of the second paragraph of your letter of 19th April, 1899, to the Meteorological Council—a copy of which was sent to the Directors, and a copy of which is appended—"assuming the Parliamentary grant of £15,300 not to be increased"—indicate the possibility of such an increase being obtained, and I am instructed to say that the Directors sincerely hope that the increase will be made, in order that the work of the two Ben Nevis Observatories may be continued.

(1.) In expressing this hope, I am to remind you that the Directors specially desire to continue the observations in their present form for other two years, and to say that, as the assistance now given by the Meteorological Council is promised for two years, a sum of £500 will be sufficient, and will be required, for the first year and a like sum for the second.

(2.) It is, perhaps, desirable to inform you that the Royal Society of Edinburgh have applied to the Royal Society of London for assistance in the publication of the Ben Nevis observations from January 1888 to December 1901, and that a sum of £500, corresponding to the half of the whole estimated cost, has been promised. The two Royal Societies, therefore,



have agreed to bear equally between them the cost of the second, third, and fourth volumes containing the observations, as we hope, down to the end of 1901. The cost of the first volume, a copy of which is forwarded to you, containing the observations from December 1883 to December 1887, was wholly borne by the Royal Society of Edinburgh.

The publication of the observations for the whole period, that is, from 1883 to 1901, will thus be accomplished without aid from the State.

(3.) The contributions from the public towards the establishment and carrying on of the observatories from 1883 down to June of this year have been £15,180; and the contributions during the same period from the Meteorological Council, which may be regarded as State aid, amount to £3,900, making the whole expenditure on the construction and working of the two observatories £19,080.

(4.) I am further to state that the Directors will not be able without State aid to go on with the work of the observatories after October, and that they require soon to know whether such aid is to be given, because the provisioning of the high level station must begin in the month of August. In view of this circumstance, the Directors hope that they will receive an early answer.

I am, &c.,

ARTHUR MITCHELL.

To the Secretary of the Treasury.

3. Reply from the Right Hon. R. W. HANBURY, M.P., Secretary of the Treasury, to SIR ARTHUR MITCHELL.

Treasury Chambers,

25th July, 1899.

SIR,

I HAVE laid before the Lords Commissioners of Her Majesty's Treasury your letter of the 15th instant, by which, on the behalf of the Directors of the Ben Nevis Observatories, you apply for further assistance to those institutions from public funds, and I am instructed by their Lordships to reply as follows to that letter :—

My Lords are not competent to form an opinion as to the scientific value of the work carried on at the observatories, whether taken by itself, or in relation to other branches of meteorological research, and they desire to guard themselves against the supposition that they have any views on the subject.

Looking at the matter from a more general point of view, my Lords are satisfied that it would be inexpedient to depart from the present well-established practice under which State aid to the study of meteorology is given solely through the medium of the Meteorological Council, a representative body of experts selected and designated for this purpose, and including, as you are aware, an eminent member of the Scottish Meteorological Society.

Neither are they prepared to depart from the rule under which that Council is allowed to spend in its own way the funds assigned to it, without interference from Government.

My Lords have received no such evidence as to the insufficiency of the total amount of the grant placed annually at the disposal of the Council as would warrant them in applying to Parliament for an increase in it; and they can hold out no hopes of any such application being made.

It follows from what has been said that my Lords regret that it is their duty to return an unfavourable answer to your application for a special grant towards the branch of meteorological inquiry on behalf of which you appeal.

I am, &c.,

R. W. HANBURY.

Sir Arthur Mitchell, K.C.B., etc., etc.,  
Scottish Meteorological Society,  
122, George Street, Edinburgh.

4. From SIR ARTHUR MITCHELL, K.C.B. to the Meteorological Council.

Scottish Meteorological Society, Edinburgh,

September 12, 1899.

DEAR SIR,

I AM instructed by the Directors of the Ben Nevis Observatories to inform you that they have received from Mr. Mackay Bernard, of Dunsinnan, a second donation of £500. This will enable them to carry on the two observatories for a year

Yours faithfully,

ARTHUR MITCHELL.

R. H. Scott, Esq.,  
Secretary, Meteorological Council.

## APPENDIX IV.

LIST of CAPTAINS and OFFICERS who have sent in Logs classed as "Excellent" during the year ending March 31, 1900. Figures are attached to the name of each observer to show the number of "Excellent" logs which he has supplied during the whole time of his co-operation with the Office.

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Achard, E. C. S. ... ..	1	Loch Finlas.
Alford, F. ... ..	7	S.S. Monarch.
Alsop, J. J. ... ..	2	Hermione.
Angus, T. S. ... ..	20	S.S. Britannia.
Bertie, J. L. ... ..	3	S.S. American.
Bolton, S. H. ... ..	23	S.S. Britannic.
Bright, H. ... ..	13	Hornby Castle.
Clarke, W. H. ... ..	4	S.S. Tauric.
Clinock, T. C. ... ..	3	S.S. Harlech Castle.
Crewe, E. ... ..	5	S.S. Victoria.
Crowley, C. ... ..	11	Verajean.
Cust, Comr. H. E. P., R.N. ...	5	H.M.S. Rambler.
Davies, H. ... ..	3	S.S. La Plata.
Dawson, W. P., R.N. ... ..	5	H.M.S. Waterwitch.
De la Garde, P., R.N. (Assistant Paymaster).	5	H.M.S. Waterwitch.
Docherty, H. ... ..	9	Barque Tinto Hill.
Duguid, W. ... ..	2	S.S. Prome.
Dupen, P. P. ... ..	14	S.S. Biafra and S.S. Jebba.
Dyke, H. W. ... ..	14	Rathdown.
Elliott, G. ... ..	1	S.S. Breconshire.
Field, A. M., R.N. ... ..	29	H.M.S. Penguin.
Fisher, R. J. ... ..	1	S.S. Mayfield.
Gifford, H. C. ... ..	4	S.S. Amber.
Haddock, H. J., R.N.R. ...	2	S.S. Britannic.
Hayes, B. F., R.N.R. ...	1	S.S. Britannic.
Hepworth, M. W. C., R.N.R. ...	18	S.S. Aorangi.
James, E. Gates, R.N.R. ...	2	Airlie.
Lawrence, Sub-Lt. H. J. G., R.N.	2	H.M.S. Rambler.
Lobb, Comr. F. J., R.N. ...	6	L.H. Tender Richmond.
Lowe, J. ... ..	3	S.S. Duffield.
McAllister, W. ... ..	2	S.S. Clan Ferguson.
Macdonald, J. ... ..	2	Barque Marion Fraser.
MacKay, H., R.N.R. ... ..	3	S.S. Lucania.
Millican, J. W. ... ..	18	S.S. Loughrigg Holme.
Milner, W. H. ... ..	32	S.S. Atrato and S.S. Tagus.
Mitchell, G. ... ..	6	S.S. California.

Name of Captain or Officer.	Number of "Ex- cellent" Logs.	Ship.
Moseley, F. J., R.N.R....	2	S.S. Goorkha.
Mullan, F. C. ...	6	S.S. Reynolds.
Murdoch, P. ..	19	Sierra Lucena.
Norman, F. ...	12	S.S. Indravelli.
Peebles, R. ...	25	S.S. Breconshire and S.S. Lincoln- shire.
Philip, W., Junr. ...	4	S.S. Thermopylae.
Reynolds, R., R.N.R. ...	3	S.S. Norman.
Scott, G. P., F.R.Met.Soc. ...	17	Buckingham.
Seymour, F. H....	2	S.S. Britannia.
Simpson, A. ...	29	S.S. Moravian.
Smyth, M. H., R.N. ...	12	H.M.S. Egeria.
Squares De Carteret, W.G., F.R. Met.Soc.	9	S.S. Minia.
Turner, A. C., R.N.R. ...	6	S.S. Britannia.
Tyson, J. ...	3	S.S. Moor.
Veale, E. A., R.N.R. ...	4	S.S. Ormuz.
Walker, H., R.N.R. ...	23	S.S. Campania.
Watson, Lieut. H. C., R.N. ..	9	H.M.S. Egeria.
Wilson, J., R.N.R. ...	19	S.S. Anchoria.
Worcester, W. D. G., R.N.R. ...	13	S.S. India.



## APPENDIX V.

## LIST of METEOROLOGICAL LOGS and DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Voyage.	Year.	Officers who have assisted in keeping the Meteorological Log.
Achard, E. C. S.	Ship Loch Finlas ...	Rio de Janeiro, Newcastle (N.S.W.) and New Caledonia.	1898-99	John Gregory.
Adams, William	S.S. Diana ...	Davis Straits	1899	
Alford, Francis...	S.S. Monarch ...	Off Coasts of British Islands	1899-1900	W. C. Hart, A. Broadbridge, and H. F. Bourdeaux.
Alsop, J. J.	Ship Hermione ...	New Zealand...	1899-1900	
Angus, T. S.	S.S. Britannia ...	Sydney, via Suez	1898-99	E. P. Stroud, 3rd Officer, S. Bedwell, 4th Officer, E. R. Collyer, 5th Officer.
Barker, D. Wilson, R.N.R.	Training Ship Worcester.	Off Greenhithe	1899	The Cadets.
Barr, John	S.S. Falls of Keltie ...	New York, St. Vincent, Cape Town, New-castle (N.S.W.), Java, and Calcutta.	1898-99	W. S. Ralph, Chief Officer.
Bertie, J. L.	S.S. American ...	New York	1899	E. E. Drakeford, 2nd Officer.
" "	"	New Orleans and New York	1899	E. E. Drakeford, J. Dixon, and C. B. Harman, 2nd, 3rd, and 4th Officers.
" "	S.S. European ...	New York	1899	W. J. Brysson, A. C. Broadbridge, A. W. Melling.
Bolton, S. H.	S.S. Britannic ...	Cronstadt	1899	A. Wrangham, Chief Officer.
Bright, H.	Ship Hornby Castle...	Adelaide	1898-99	Messrs. Gordon and Thomas, 1st and 2nd Officers.
Cameron, J. G., R.N.R.	S.S. Teutonic...	New York	1898	
Campbell, —	Barque Drumalis ...	San Francisco	1897	
Carey, F.	S.S. Lake Ontario . .	Quebec	1898-99	
Chamberlin, W. C.	Ship Narcissus ...	Albany	1899	
" "	Ship Poseidon ...	Honolulu	1899	

Clarke, W. H. ...	S.S. Tauric ...	...	New York ...	...	...	1899	A. Holme, 2nd Officer, assisted by Messrs. Freeman and Lewis, 3rd and 4th Officers.
" ...	" ...	...	" ...	...	...	1899-1900	Robert Learmouth, 2nd Officer, P. Leight, John Stivey, and E. Cleaves.
Clinock, T. C. ...	S.S. Harlech Castle ...	...	Cape Ports and Mauritius ...	...	...	1898-99	J. Cruise, E. J. Holl, E. Holmes, and E. Hughes.
Constantine, T. ...	R.M.S. Medway ...	...	West Indies ...	...	...	1898-99	C. H. Weddall, 5th Officer.
Corner, F. W., R.N.R. ...	Ship Macquarie ...	...	Sydney ...	...	...	1898-99	F. Groves, Chief Officer.
Crews, E. ...	S.S. Victoria ...	...	Sydney, via Suez ...	...	...	1899	E. Roberts, D. Asbury, C. G. Smith, C. E. Hudson, S. McC. Hopkins, A. E. Wearn.
" ...	" ...	...	" ...	...	...	1899	E. E. C. Roberts, Chief Officer, C. G. Smith, 2nd Officer, C. E. Hudson, 3rd Officer, B. B. Hetherington, Sup. 3rd Officer, H. H. Mannering, 4th Officer, C. L. Martin, 5th Officer.
" ...	" ...	...	" ...	...	...	1899-1900	E. E. C. Roberts, R.N.R., Chief Officer, W. R. Le Mare, R.N.R., Supernumerary Chief Officer, C. G. Smith, R.N.R., 2nd Officer, C. E. Hudson, R.N.R., 3rd Officer, H. H. Mannering, R.N.R., 4th Officer, C. L. Martin, R.N.R., 5th Officer.
Crowley, C. ...	Ship Verajean ...	...	Nagasaki ...	...	...	1898-99	W. C. Jackson, Chief Officer, and V. R. O'Reilly, 2nd Officer.
" ...	" ...	...	Nagasaki and Newcastle (N.S.W.) ...	...	...	1899	Do.
Cust, Commander H.E.P., R.N. ...	H.M.S. Rambler ...	...	Labrador, Straits of Belle Isle, Halifax, Bermuda, Sierra Leone, Fernando Po, Fernando Po, St. Paul de Loanda, Ascension, and Congo River.	...	...	1898-99	Sub-Lieut. H. J. G. Laurence, R.N.
" ...	" ...	...	" ...	...	...	1899	Do.
Davidson, J. S. ...	Ship Celticburn ...	...	New York and Melbourne ...	...	...	1898-99	P. Cochrane, 2nd Officer, T. S. Blay, 3rd Officer, C. W. Stevens, 4th Officer.
Davies, Herbert ...	S.S. La Plata ...	...	East Coast of S. America ...	...	...	1898-99	A Smith, 2nd Officer, J. Gair, 3rd Officer, J. P. Band, 4th Officer, — Lindsey, 5th Officer.
" ...	R.M.S. Medway ...	...	West Indies ..	...	...	1899	Officer.



Field, A. M., R.N. Fisher, R. J., ...	...	...	South Pacific and Sydney ... Barcelona, Carthage, and Cronstadt ...	1898-99 1898-99	P. McDonald, Chief Officer, E. A. Olzen, R. L. Mackie, J. W. Kitwood, 2nd Officers.
Ford, M., ...	...	...	Wellington, via Cape Good Hope, and Monte Video.	1899-1900	
French, A. L., ...	...	...	Philadelphia ...	1899-1900	F. A. White, 1st Officer.
Gedge, Com. H. J., R.N. Gifford, H. C., ...	...	...	Malta, Alexandria and Red Sea ... Cape Town and West Coast of Africa ...	1898-99 1899	Lieut. H. P. Douglas, R.N. Gilbert C. Hogg, Chief Officer, D. P. Morrell, 2nd Officer, W. F. R. Mist, 3rd Officer, G. C. Napier, 4th Officer.
" " " "	...	...	On West Coast of Africa ...	1899	Do. do.
" " " "	...	...	West Coast of Africa ...	1899	Do. do.
Glegg, Robert ...	...	...	China, Japan, and New York, via Suez...	1899	Robert Logan, 2nd Officer.
Haddock, H. J., R.N.R.	...	...	New York ...	1899	G. R. Metcalfe, 2nd Officer, assisted by S. S. Cannan, 3rd Officer, J. B. Bulman, 4th Officer.
Hamon, J. J., ...	...	...	New Zealand, via Cape Good Hope, and home, via Cape Horn.	1899	Messrs. Burrill, Nye, and Porter, 2nd, 3rd, and 4th Officers.
Hay, C. W., ...	...	...	Sydney, Wellington, Suva, Honolulu, and Vancouver.	1898-99	G. Hammon, W. Ellis, and J. Heron, 2nd, 3rd, and 4th Officers.
" " " "	...	...	Brisbane and Victoria (B.C.) ...	1899-1900	W. Bishop, 3rd Officer.
Hayes, B. F., R.N.R., ...	...	...	New York ...	1899	G. R. Metcalfe, 2nd Officer, assisted by S. S. Cannan, 3rd Officer, J. B. Bul- man, 4th Officer.
Henning, F. A., ...	...	...	Sydney, Wellington, Suva, Honolulu, and Vancouver.	1899	
Hepworth, M. W. C., R.N.R.	...	...	Vancouver, Honolulu, Suva, Wellington, and Sydney.	1898-99	S. Phillips, Chief Officer, R. M. Read, 2nd Officer, F. G. Baydon, 3rd Officer, R. Bailey, 4th Officer.



LIST of METEOROLOGICAL LOGS and DOCUMENTS received from SHIPS—continued.

Captain's Name,	Ship.	Voyage.	Year.	Officers who have assisted in keeping the Meteorological Log.
James, E. G. ...	Ship Airlie ...	Algoa Bay, Newcastle (N.S.W.), Valparaiso	1898-99	H. F. B. Gape, 1st Officer, and F. R. Bishop, 2nd Officer.
Jarvis, W. ...	S.S. Den of Airlie ...	Bombay, viâ Suez ...	1898-99	Alexander Hunter.
Johnston, T., R.N.R. ...	S.S. Goorkha ...	Calcutta, viâ Suez ...	1899	H. J. Brooks, J. Middleton, L. G. Spurrett, and A. Darling.
Jones, John ...	Ship Travancore ...	Table Bay and Adelaide ...	1898-99	John Davies.
Jones, R. O. ...	S.S. Vancouver ...	Montreal ...	1898-99	W. D. Moloney, L. M. Davies, T. M. Winslow.
Jones, T. G., R.N.R. ...	S.S. Bovic ...	New York ...	1898-99	
Kelly, R. ...	Ship Westland ...	New Zealand... ..	1898-99	J. Samuels, 1st Officer, assisted by R. Nellist, 3rd Officer.
Kempson, C. H. ...	S.S. Ionic ...	Cape Town, Wellington, and Rio de Janeiro.	1899	Mr. Moloney and Mr. Lewis.
" ...	" ...	" ...	1899	E. O. Kemp, 3rd Officer, Patrick Moloney, 4th Officer.
Leigh, T. ...	S.S. India ...	Sydney, viâ Suez ...	1899	G. C. Holloway, Sup. 2nd Officer, assisted by C. Renton, Chief Officer, C. W. Burleigh, 2nd Officer, E. M. Hussey-Cooper, 3rd Officer, V. L. Trumper, 4th Officer, and P. S. Bateman.
Lindquist, A. ...	S.S. Britannia ...	Bombay, viâ Suez ...	1899	R. A. Browne, 2nd Officer.
Livett, H. ...	S.S. Ormuz ...	Sydney ...	1899-1900	P. N. Layton, H. R. Lesslie, and T. S. Monteith.
Lobb, F. J., R.N. ...	Lighthouse Tender Richmond.	Bermuda and Bahamas ...	1898-99	F. W. Holden.
Lowe, J. ...	S.S. Duffield ...	Baltimore, Batoum, and Philadelphia ...	1898-99	F. A. White, Chief Officer.
McAllister, W. ...	S.S. Clan Ferguson ...	Calcutta, viâ Suez ...	1899	C. Joel Higgins, 2nd Officer.
" ...	" ...	" ...	1899-1900	Do. do.

McCracken, J. ...	...	Barque Lord Temple- town.	San Francisco and Iquique	...	1898-99	M. Loverock, 3rd Officer.
MacDonald, John	...	Barque Marion Frazer	Sydney, Newcastle (N.S.W.), and Iquique	...	1898-99	George Clark, 3rd Officer.
McKay, Horatio, R.N.R.	...	S.S. Lucania ...	New York	...	1898-99	A. H. Reade, R.N.R.
"	"	"	"	...	1899-1900	
Martin, T. C. ...	...	Barque Loch Tay	Melbourne	...	1899	The Cadets.
Miller, A. T., R.N.	...	School Ship Conway	Off Rock Ferry, Birkenhead	...	1899	D. S. Turney, W. S. Hodgson, and F. A. Little.
Millican, J. W. ...	...	S.S. Loughrigg Holme	Savannah, Bremen, Charlestown, Leg- horn, and Louisburg.	...	1898-99	
"	"	"	Quebec	...	1899	F. A. Little, Chief Officer, and W. S. Hodgson, Second Officer.
Milne, W. F. ...	...	S.S. Eclipse ...	Davis Straits...	...	1899	S. N. Braithwaite.
Milner, W. H. ...	...	S.S. Atrato ...	West Indies	...	1899	Stanley Braithwaite, 5th Officer.
"	"	"	"	...	1899	H. B. Popplewell, 4th Officer.
"	"	S.S. Tagus ...	" and Colon	...	1899-1900	Malcolm McNeil.
Mitchell, George	...	S.S. California	Mediterranean Ports and New York	...	1898-99	Messrs. McNeil and McIlwraith.
"	"	"	New York and Mediterranean Ports	...	1899	W. H. Lloyd, 3rd Officer.
Morrison, G. ...	...	Ship Celtic Monarch	Yokohama, Seattle, and home	...	1898-99	George Gray, Chief Officer, E. L. Travers,
Moseley, F. J., R.N.R. ...	...	S.S. Goorkha...	Cape Town	...	1899	Chief Officer, W. M. Betts, R.N.R., 2nd
"	"	"	"	...	1899-1900	Officer, J. Attwood, R.N.R., 3rd Officer,
"	"	"	"	...		W. Haywood, 4th Officer.
Mullan, F. C. ...	...	S.S. Reynolds	Port Said, Batoum, Bombay, via Suez	...	1898-99	G. Gray, R.N.R., Chief Officer, W. M. Betts,
"	"	"	Novorossisk, Colombo, Vladivostok, and	...	1899	R.N.R., 2nd Officer, J. Attwood, R.N.R.,
"	"	"	Singapore.	...	1899-1900	3rd Officer, A. N. Cowell, R.N.R., 4th
Murdoch, Peter...	...	Ship Sierra Lucena	Port Said and Baltimore	...		Officer.
"	"	"	Cape Town and Rangoon	...	1898-99	W. H. Davis, W. H. Knox, and P. H. Hore.
Nasbet, I. R., R.N.R. ...	...	S.S. Sabine Rickmers	In China Sea...	...	1899	W. H. Davis, Officer, W. H. Knox, 2nd
"	"	"	"	...	1899	Officer, I. Strathern, 3rd Officer.
"	"	"	"	...		W. H. Davis, W. H. Knox, and I. Strathern.
"	"	"	"	...		E. Maycock, Apprentice.
"	"	"	"	...		Thomas Powell and A. Dransfield.
"	"	"	"	...		Do.

LIST of METEOROLOGICAL LOGS and DOCUMENTS received from SHIPS—*continued*.

Captain's Name.	Ship.	Voyage.	Year.	Officers who have assisted in keeping the Meteorological Log.
Norman, F. ...	S.S. Indravelli ...	New York, Yokohama, via Suez, Vizagapatam and Philadelphia, via Suez.	1899	F. L. Fletcher and D. Mansfield, Midshipmen.
Parry, J. F., R.N. ...	H.M.S. Dart ...	At Australian Station ...	1899	Albert O. Bobardt, Surgeon, assisted by Lieutenants May, Stamer, and Petty Officers.
Pattman, R. ...	Barque Loch Torridon ...	Sydney and Lyttelton ...	1898-99	Messrs. Valentine and King, 1st and 2nd Officers.
Pearce, T. R. ...	S.S. Severn ...	East Coast of South America ...	1898-99	A. Sampson, F. Sweeting, and G. Hillier.
" " ...	" " ...	West Indies and River Plate ...	1899	A. Sampson, 2nd Officer, F. Sweeting, 3rd Officer, M. Watkins, 4th Officer.
Peebles, Robert ...	S.S. Breconshire ...	Kilindini (E. A.) and Karachi, via Suez...	1899	Messrs. Elliott, Matthews, and Owens.
" " " " ...	S.S. Lincolnshire ...	" " " " ...	1899	A. Mell and H. Pritchard.
Philip, W., Junr. ...	S.S. Thermopylae ...	Sydney, via Cape Town ...	1899	W. Douglas, W. M. Jermyn, and E. Legge, 1st, 2nd, and 3rd Officers.
Phillips, J. D. S. ...	R.M.S. Warrimoo ...	Brisbane and Victoria (B.C.) ...	1899-1900	W. Bishop, 3rd Officer.
Potter, R. H. ...	Barque Alliance ...	Brisbane ...	1898-99	R. O. Harris and W. Griffiths, 1st and 2nd Officers.
Pritchard, A. T., R.N.R. ...	R.M.S. Guzeo ...	Sydney, via Suez ...	1898-99	W. S. Shelford, Chief Officer, J. F. Ridsdale, 2nd Officer, H. Stanston, 3rd Officer, J. Bowley, 4th Officer.
" " " " " " ...	S.S. Orient ...	" " " " " " ...	1899	Ernest G. H. Brady.
Pybus, H., R.N.R. ...	S.S. Tartar ...	Nagasaki and San Francisco ...	1899	Do.
Reeves, Isaac ...	S.S. Australia ...	Sydney, via Suez ...	1899	J. V. Williams, 1st Officer, H. D. Watts.
" " " " " " ...	" " " " " " ...	" " " " " " ...	1899	Russell, 2nd Officer, T. A. Jones, 3rd Officer, D. E. Easton, 4th Officer.
Reynolds, R., R.N.R. ...	S.S. Norman ...	Cape Town ...	1899	

Robinson, E. R., R.N.R.	S.S. Goorkha...	...	Calcutta, via Suez	...	...	1899	John Ross, Chief Officer, L. G. Spurrett, 2nd Officer, T. S. Thompson, 3rd Officer, John Coney, 4th Officer.
"	"	...	"	...	...	1899-1900	J. A. Ross, Chief Officer, J. Middleton, 2nd Officer, and L. Spurrett, 3rd Officer.
Rohde, H.	Ship King Edward	...	Batavia and Yokohama	...	...	1898	
"	"	...	Yokohama and Tacoma	...	...	1898-99	
Scott, G. P., F.R. Met. Soc.	Ship Buckingham	...	Tacoma and Rio Janeiro	...	...	1898-99	W. Bourke, Chief Officer, and J. Mawdesley, 2nd Officer.
"	"	...	Calcutta	...	...	1899	W. Calvert, 1st Officer, W. Cocker, 2nd Officer.
Seymour, F. H.	S.S. Britannia	...	Sydney, via Suez	...	...	1899	J. W. Ireland, Sup. 2nd Officer, assisted by R. P. Stevenson, 2nd Officer, and W. Lake, 5th Officer.
"	"	...	"	...	...	1899	R. Stevenson, 2nd Officer, E. B. White, 3rd Officer, L. Bedwell, 4th Officer, R. Collier, 5th Officer.
Shepherd, D.	Ship Frankistan	...	San Francisco, Calcutta, New York, Yokohama, and Tacoma.	...	...	1896-99	Messrs. F. Jackson, Rowland, and Sellars.
Simpson, Alexander	S.S. Moravian	...	Melbourne, via Cape Town	...	...	1899	H. W. Schleman, Chief Officer, George Elrick, 2nd Officer, D. M. Ross, Aux. 2nd Officer.
Sinclair, William	Barque Cupica	...	New Zealand	...	...	1899	Alexander Hunter.
Singer, P.	S.S. Den of Airie	...	Bombay, via Suez	...	...	1899	Robert Boyd and V. Jorgensen.
Smith, A. H.	Barque Cape Clear	...	San Francisco	...	...	1898	Lieut. H. C. Watson, R.N., and Quartermasters.
Smyth, Comr. M. H. R.N.	H.M.S. Egeria	...	At Vancouver	...	...	1898-99	
"	"	...	Honolulu and Esquimalt	...	...	1899	Do.
"	"	...	Esquimalt, San Francisco, and Honolulu	...	...	1899	Do.
"	"	...		...	...	1899	Do.



LIST of METEOROLOGICAL LOGS and DOCUMENTS received from SHIPS—*continued*.

Captain's Name.	Ship.	Voyage.	Year.	Officers who have assisted in keeping the Meteorological Log.
Squares De Carteret, W. G., F.R.Met.Soc.	S.S. Minia ...	East Coast of North America and North Atlantic.	1899	James Adams, Chief Officer, E. R. Williams, 2nd Officer, H. Winter, and T. R. Applegate, Junr., 2nd Officers, J. F. Jeffries, 3rd Officer.
Suffern, R. ...	Barque Craigerne ...	Hong Kong, Batavia, and New Caledonia	1898-99	R. Gregson, 1st Officer, and C. Waring, 2nd Officer.
Trenaman, R. W. ...	S.S. Romney ...	Monte Video ...	1899	Alfred Gittins, 2nd Officer.
" " ...	" " ...	River Plate ...	1899	A. Gittins.
" " ...	" " ...	Monte Video ...	1899-1900	Do.
Turner, A. C., R.N.R. ...	S.S. Britannia ...	Bombay, via Suez	1899	R. A. Browne, 2nd Officer.
" " " ...	" " " ...	" " " ...	1899	James Young, 2nd Officer.
" " " ...	" " " ...	" " " ...	1899-1900	Robert A. Brown, 2nd Officer.
Tyson, John ...	S.S. Moor ...	Cape Town ...	1899	W. Godfrey, 2nd Officer, H. B. Rake, 3rd Officer, and P. J. Page, 4th Officer.
" " " ...	" " " ...	" " " ...	1899	— Thwaites, 1st Officer, — Sweeney, 2nd Officer, H. B. Rake, 3rd Officer, H. B. Harvey, 4th Officer.
Veale, E. A., R.N.R. ...	R.M.S. Ormuz ...	Sydney, via Suez	1899	H. R. Lesslie.
" " " ...	" " " ...	" " " ...	1899	
Wadsworth, F. H. ...	S.S. Ethiopia...	New York ...	1898-99	
" " " ...	" " " ...	" " " ...	1899	
" " " ...	" " " ...	" " " ...	1899-1900	
Walker, H. ...	S.S. Campania ...	" " " ...	1898-99	C. A. Smith, R.N.R., assisted by W. Han-kinson, H. Nelson, and R. Capper.

Watt, A. ...	...	Barque Iranian	...	New York, Hong Kong, and Vancouver ..	1898-99	I. Wallace, 3rd Officer, assisted by I. Thomson, 2nd Officer. Graham P. M. Robb, 3rd Officer. John Duncan, 3rd Officer.  G. A. Rae and S. Spearpoint. C. J. Benton, Chief Officer, B. Bartlett, 2nd Officer, G. C. Holloway, Sup. 2nd Officer, L. M. Gordon, 3rd Officer, V. Trumper, 4th Officer, P. S. Bateman, 5th Officer. G. C. Holloway, Sup. 2nd Officer, assisted by C. Benton. Chief Officer, C. W. Burleigh, 2nd Officer, E. M. Hussey-Cooper, 3rd Officer, V. L. Trumper, 4th Officer, and H. Monro, 5th Officer.
Williamson, J. C. ...	...	S.S. Lennox ...	...	China and Japan, via Suez, New York, Honolulu, Portland (Oregon) ..	1898-99	
Wilson, John, R.N.R. ...	...	S.S. Anchoria	...	New York ...	1899	
" " " " " "	...	" "	...	" ...	1899-1900	
Wood, G. H. B. ...	...	Ship Soukar ...	...	Mauritius and Dunedin ...	1898-99	
Woodward, E. A. ...	...	Barque Cambrian	...	Sydney ...	1899	1899-1900
Worcester, W. D. G., R.N.R.	...	S.S. India ...	...	Sydney, via Suez ...	1899	
" " " " " "	...	" "	...	Colombo and Australia, via Suez...	1899-1900	
Young, H. ...	...	S.S. Ethiopia...	...	New York ...	1899-1900	
	...		...			

## APPENDIX VI.

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

Per Account.	Baro- meters.	Anemo- meters.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1899, afloat ...	235	634	1,391	415	403	233	45
Issued since ...	119	228	425	101	98	40	38
Returned since ...	354	862	1,816	516	501	273	83
April 1st, 1900, afloat ...	115	188	416	89	83	35	26
April 1st, 1900, afloat ...	239	674	1,400	427	418	238	57

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

April 1st, 1899, in use ...	75	83	252	34	54	10	11
Issued since ...	1	7	44	—	2	—	—
Returned since ...	76	90	296	34	56	10	11
April 1st, 1900, in use ...	1	7	47	1	1	—	—
April 1st, 1900, in use ...	75	83	249	33	55	10	11

## DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1900.

Afloat in Royal Navy ...	239	674	1,400	427	418	238	57
In use at stations ...	75	83	249	33	55	10	11
In store at M.O. ...	32	163	86	100	107	65	29
" Chatham ...	20	41	137	46	45	19	12
" Sheerness ...	4	11	17	6	6	8	6
" Portsmouth ...	24	55	158	52	58	24	4
" Devonport ...	22	43	136	38	40	21	3
" Queenstown ...	2	3	10	3	3	—	—
" Gibraltar ...	2	3	10	3	3	—	4
" Malta ...	13	13	76	11	9	2	6
" Bombay ...	4	5	13	5	6	2	4
" Halifax ...	8	5	22	4	3	2	7
" Bermuda ...	9	11	22	4	5	3	—
" Jamaica ...	4	5	16	—	1	1	3
" Cape of Good Hope ...	6	6	26	7	6	2	4
" Trincomalee ...	3	5	21	5	6	1	4
" Hong Kong ...	14	20	33	12	13	4	23
" Coquimbo ...	3	4	18	3	4	1	19
" Sydney ...	4	6	27	5	6	2	22
" Esquimalt ...	3	3	10	2	6	2	4
Total April 1st, 1900 ...	491	1,159	2,487	766	800	407	221
Lost, &c., since April 1st, 1899 ...	—	5	275	—	35	26	17
Under repair, April 1st, 1900 ...	48	6	3	1	—	—	—

## APPENDIX VII.

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

Per Account.	Baro- meters.	Com- passes.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1899, afloat ...	113	—	706	—	—	104	399
Issued since ... ..	36	—	258	—	—	31	136
Returned since ... ..	149	—	964	—	—	135	535
	46	—	311	—	—	37	172
April 1st, 1900, afloat ...	103	—	653	—	—	98	363

INSTRUMENTS at Stations, viz., Telegraphic Reporting Stations  
Observatories, Fishing Villages, &c.

April 1st, 1899, in use ...	310	2	290	61	71	58	10
Issued since ... ..	17	—	18	5	8	5	1
Returned since ... ..	327	2	308	66	79	63	11
	14	1	25	7	13	7	1
April 1st, 1900, in use ...	313*	1	283	59	66	56	10

## DISPOSITION of INSTRUMENTS on April 1st, 1900.

In merchant ships ... ..	103	—	653	—	—	98	363
„ use at stations ... ..	313	1	283	59	66	56	10
„ store at M.O. ... ..	43	3	154	18	44	40	111
At Liverpool Agency ... ..	7	—	50	—	—	8	23
„ Glasgow ... ..	7	—	37	—	—	5	24
„ Dundee ... ..	5	—	27	—	—	4	25
„ Hull ... ..	3	—	15	—	—	3	10
„ Cardiff ... ..	10	—	40	—	—	3	34
„ Southampton „ ... ..	5	—	10	—	—	2	9
Total, April 1st, 1900 ...	496	4	1,269	77	110	219	609
Lost, &c., since April 1st, 1899	1	—	130	2	3	28	49
Under repair, April 1st, 1900	1	—	—	—	—	—	—

\* Of these barometers, 22 are lent for use of seafaring communities at fishing villages and ports.



## APPENDIX VIII.

## METHOD of DEALING with TELEGRAPHIC WEATHER INTELLIGENCE.

The operations connected with the preparation and issue of the Forecasts and Storm Warnings have not undergone any material change.

Full details will be found in Appendix IX. to the Report for 1890-91.

## DAILY WEATHER REPORT.

The Office now receives, when the telegraphic communications are perfect, fifty-five reports each morning, seven each afternoon (except on Sundays), and twenty-seven each evening. A reduction of the number of stations has been made after mature consideration. The reports from Ardrossan, York, Cambridge, Prawle Point, and Hurst Castle—the last two of them being adequately represented by a new station at Portland Bill—have been discontinued. Reports from additional stations are, however, received in the afternoon during the summer months, with a view to the issue of Harvest Forecasts. It is also to be noted that at 6 p.m. all the stations then send in their 2 p.m. as well as their 6 p.m. readings, so that the record for reference is almost as complete as before.

The change made in the Daily Weather Report during 1894, by the insertion of reports from the Azores (forwarded by the courtesy of the Portuguese Meteorological Authorities), is still in force. The Report fills four large quarto pages, as it has for several years past.

The standing portions (maps, &c.) are printed in blue, and the information for each day is in black.

The Monthly "Correction and Addition List" is published as before.

The subscription for the Report is—

<i>For delivery by hand, where feasible,</i>	<i>£2 per annum ;</i>
<i>" by book post</i>	<i>£1 "</i>

N.B.—Subscriptions are payable in advance, Annually or Quarterly ; those for a Quarter end at the Official Quarter days, *e.g.*, March 31, June 30, &c.

## WEEKLY WEATHER REPORT.

The Weekly Weather Report, which has appeared since February, 1878, and was re-arranged at the commencement of 1890, is prepared for the calendar week, Sunday to Saturday, and is steadily increasing in value. It is published on Thursdays, and is illustrated by three maps for each day, which, like those in the Daily Reports, show the outline of the land and surface of the sea in blue, while the daily information is in black. The maps show (1) for 8 a.m. the temperature, weather, and sea disturbance ; and (2) for 8 a.m. and (3) for 6 p.m. the distribution of pressure, and the winds over and on the coasts of Europe. The information on the first and second pages

of each Report consists of observations of Temperature and Rainfall made at 73 stations, the individual values for which are given on the second page of the Report. Sunshine records taken at 62 stations are given on the second and sixth pages of each Report.

Tables of *Accumulated Temperature*, designed to give persons engaged in agriculture better means for estimating the manner in which vegetation is affected by temperature than that afforded by the more usual methods of treating the readings of the thermometer, are still published on the first and second pages, and show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard, or *base temperature*. The base value adopted is  $42^{\circ}$  Fahr.

Accumulated Temperature is expressed in *Day degrees*, a Day degree signifying  $1^{\circ}$  F. of excess or defect of temperature above or below the base ( $42^{\circ}$  F.) continued for 24 hours, or any other number of degrees for an inversely proportional number of hours.

The following are the rules for computing, for a weekly period, from the observed maxima and minima, the accumulated temperature above or below  $42^{\circ}$  F. :—

1. Obtain the mean temperature, from the means of the seven observed maxima and minima, suitably corrected for non-periodic changes of temperature.

2. In obtaining the accumulated temperature four cases may occur, to which the following rules will apply :—

Conditions of Temperature.	To obtain the daily Accumulated Temperature.	
	Above $42^{\circ}$ F.	Below $42^{\circ}$ F.
If the minimum is <i>above</i> $42^{\circ}$ F., or <i>equal</i> to $42^{\circ}$ F.	Subtract $42^{\circ}$ F. from the mean.	There is none.
If the minimum is <i>below</i> $42^{\circ}$ F., but the mean for the day is <i>above</i> $42^{\circ}$ F.	From the difference between the mean for the day and the minimum deduct the accumulated temperature below $42^{\circ}$ F., calculated as stated in the next column.	The required quantity is the excess of $42^{\circ}$ F. over the minimum, multiplied by the coefficient 0.4.
If the mean for the day is <i>below</i> $42^{\circ}$ F., but the maximum is <i>above</i> $42^{\circ}$ F.	The required quantity is the excess of the maximum over $42^{\circ}$ F., multiplied by the coefficient 0.4.	From the difference between the mean for the day and the minimum deduct the accumulated temperature above $42^{\circ}$ F., calculated as stated in the preceding column.
If the maximum is <i>below</i> $42^{\circ}$ F., or <i>equal</i> to $42^{\circ}$ F.	There is none.	Subtract the mean from $42^{\circ}$ F.

In each of the above cases the result will be the average *daily* value, and must be multiplied by 7 in order to obtain the value for the whole week.

The coefficient varies with the duration of the period, and also with the base temperature.

The coefficient given in the second and third rules of the preceding table is for a weekly period, and for the base temperature  $42^{\circ}$  F. The following are its values for other base temperatures :— for  $32^{\circ}$  F., 0.4 ; for  $52^{\circ}$  F., 0.33 ; for  $62^{\circ}$  F., 0.25.\*

For the preparation of the tables, in addition to the reports from the Telegraphic Reporting Stations, and the returns from certain self-recording Observatories, weekly schedules from 56 volunteer observers are used, the names of the stations and observers being given in Appendix XIII., p. 62.

An early copy of the MS. of the Report is prepared on Tuesday in each week, and the summary on its first page is sent to several papers on that evening ; the printed copies of the complete Report are ready for sale on Thursday afternoon.

#### *Summaries and Appendices to the Weekly Weather Reports.*

Two Appendices have appeared similar to those for several recent years. They comprise : I.—Summaries for the separate Quarters, and for the Year. II.—Weekly and Progressive Values of the different elements.

The *Monthly Summary Supplement* gives the average values for Pressure, Temperature, Rainfall, and Bright Sunshine of the current month, and the difference between these values and the means for the corresponding months in a long series of years, together with the number of days on which rain, snow, hail, thunder, &c., occurred, and the number of days on which the wind blew from the eight principal points of the compass, and a brief *résumé* of the principal features which have marked the weather of the month. It is illustrated by four maps, showing the distribution of the average pressure and temperature and of the rainfall for the period, and the movements of the principal depressions which have passed over the British Islands and their neighbourhood.

#### ISSUE OF FORECASTS.

REMARKS on the actual state of the weather, and FORECASTS *for not more than one day in advance*, are prepared at the Meteorological Office as under :—

##### *On Week Days.†*

- (1.) At 11 a.m. (from the morning reports), for the 24 hours ending at Noon on the day following the date of issue. These are intended especially for the early editions of the evening papers, for the Clubs, and for exhibition at certain selected places (see note on page 13).
- (2.) At 3.30 p.m., during the months of June, July, and August (from the morning and afternoon reports). This set of forecasts is prepared during the Harvest Season, so that they may be available for transmission by telegram to agriculturists who apply for them. They are applicable to the civil day following the time of issue.
- (3.) At 8 p.m. (from the 8 a.m., 2 p.m., and 6 p.m. reports), for the civil day following that of issue. These are supplied gratis to any newspaper or news agency which may apply

\* A full explanation of the principles on which these rules are based will be found in Appendix II. to the Quarterly Weather Report for 1878.

† Good Friday, Christmas Day, and Bank Holidays are reckoned as Sundays.



for them, and send for them regularly. A very large number of the more important papers and news agencies avail themselves of this advantage.

The forecasts are made for the following districts :—



0. SCOTLAND, NORTH.
1. SCOTLAND, EAST.
2. ENGLAND, N.E.
3. ENGLAND, EAST.
4. MIDLAND, COUNTIES.
5. ENGLAND, SOUTH (and English Channel).
6. SCOTLAND, WEST (with Isle of Man).
7. ENGLAND, N.W. (with North Wales).
8. ENGLAND, S.W. (with South Wales).
9. IRELAND, NORTH.
10. IRELAND, SOUTH.

The remarks and forecasts are posted at the doors of the Meteorological Office, 63, Victoria Street, S.W., on week days,\* for the inspection of the public. Copies or extracts from them are communicated under the conditions stated below, but no information which is not substantially included in them will be supplied.

A series of boards is exhibited on the front of the Office showing in large type the state of the wind, weather, and sea disturbance at six stations, situated on our S.E., S., and W. coasts. The stations selected are Yarmouth, Dungeness, Portland Bill, Scilly, Holyhead, and Valencia (Ireland), and the observations posted up are those for 8 a.m. and for a few stations at 2 p.m., daily, except on Sundays,\* the boards being changed at about 9h. 45m. a.m. and 3h. p.m. The information can be easily read from the street.

**FORECASTS FOR SUBSCRIBERS.**—Any person can be supplied with a copy of the Forecasts by post, once on each week day,\* on payment of a subscription of ten shillings per annum, or 2s. 6d. per official quarter, or any part thereof, *in addition to the cost of transmission*; the charges will therefore be, by *letter* post, 9s., by *book* post, 5s. 9d., per quarter.

The forecasts for any individual district and for either of the hours mentioned above can be forwarded by telegraph, on payment of 3d. per day, for any definite period, in addition to the cost of transmission.

**FORECASTS FOR CLUBS.**—These are drawn up at 11 a.m., for all the districts, and are supplied to Clubs, for a subscription of ten shillings per annum. They are delivered by hand to Clubs situated in or near Pall Mall. Special arrangements can be made for delivery at a greater distance by hand or by post.

**FORECASTS FOR HAY AND CORN HARVESTS, OR FOR PUBLIC USE.**—Special facilities are offered for the transmission of Forecasts for these purposes, no charge being made beyond the cost of the telegrams. These are supplied only to Agriculturists, or to persons making public use of them.

\* Good Friday, Christmas Day, and Bank Holidays are reckoned as Sundays.



**EXHIBITION OF TELEGRAPHIC FORECASTS AT LOCAL POST OFFICES.**—The Post Office has sanctioned the exhibition of Forecasts at Local Post Offices, provided space is available, if the persons to whom they are addressed desire them to be so exhibited instead of being delivered to themselves.

*Unless otherwise arranged, all forecasts transmitted by post are sent by book post, not as letters.*

#### INQUIRIES as to the WEATHER.

**INQUIRIES PERSONALLY OR BY MESSENGER.**—Any person applying at the Meteorological Office between 11 a.m. and 8 p.m. on week days, and between 7 p.m. and 8 p.m. on Sundays,\* can be supplied, in writing, with the latest information in the possession of the Office, with regard to the weather in any district, or the latest forecast issued for any specified district, on payment of one shilling† for each inquiry.

**INQUIRIES BY LETTER.**—Application may be made by letter, enclosing thirteen pence in stamps if the reply is to be *by post*, and one shilling† in stamps, *in addition to the cost of the reply* (consisting of ten words, exclusive of the address) if the reply is to be *by telegraph*.

**INQUIRIES BY TELEGRAPH.**—Any person may obtain *by telegraph* from the Meteorological Office the latest information as to the weather in, or the latest forecast for any district of, the United Kingdom by payment of a fee of one shilling† *in addition to the cost of a telegram and reply to any post office*. The telegram containing the inquiry must be addressed as follows:—

To

WEATHER,

LONDON.

The payment for the reply must be for at least ten words in addition to the address.

Application may also be made for similar information to be sent either *by telegraph* or *post* on any future specified day.

#### CHECKING OF FORECASTS and STORM WARNINGS.

The forecasts and storm warnings issued by the Office are carefully checked by being compared with the conditions actually experienced during the time to which they refer. The method adopted was fully explained in the Annual Report for 1891, and the results for 1899 will be found on pp. 13-16.

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

\* Good Friday, Christmas Day, and Bank Holidays are reckoned as Sundays.

† NOTE (May, 1900).—Since the close of the period to which this Report refers arrangements have been made for the reduction of the fee to sixpence (*see p. 7*).

## APPENDIX IX.

REPORT ON THE COMPARISON OF THE FORECAST ISSUED AT 8h. 30m. p.m., WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 Months April 1899 to March 1900. The results are for the United Kingdom as a whole.

The letters used have the following signification :—

**a**=complete success.

**b**=partial (more than half) success.

**c**=partial failure.

**d**=total failure.

The checking has been conducted on the same system as that employed in previous years, *i.e.*, each forecast has been considered under the separate headings of "Wind" and "Weather," but the results of the 8.30 p.m. Forecasts only are here published.

The first column gives the percentage of success in "Wind," the second in "Weather," and the third the average of the two.

The Summary for the various districts is given at page 13.

Months.		Percentages.				Months.		Percentages.			
		Wind.	Weather.	Average.	a + b.			Wind.	Weather.	Average.	a + b.
April	a	40	57	49	84	November	a	37	63	50	79
	b	36	34	35			b	34	23	29	
	c	17	7	12			c	20	6	13	
	d	7	2	4			d	9	8	8	
May	a	58	70	64	84	December	a	49	54	52	82
	b	23	16	20			b	28	32	30	
	c	16	8	12			c	15	8	11	
	d	3	6	4			d	8	6	7	
June	a	48	68	58	83	January	a	43	63	53	80
	b	31	18	25			b	31	22	27	
	c	16	5	10			c	19	11	15	
	d	5	9	7			d	7	4	5	
July	a	61	63	62	86	February	a	39	64	52	79
	b	24	23	24			b	31	23	27	
	c	10	10	10			c	23	7	15	
	d	5	4	4			d	7	6	6	
August	a	55	63	59	86	March	a	48	59	54	81
	b	26	28	27			b	27	28	27	
	c	15	5	10			c	17	9	13	
	d	4	4	4			d	8	4	6	
September	a	33	58	46	77	The entire year	a	47	63	55	82
	b	36	27	31			b	30	25	27	
	c	24	10	17			c	17	7	12	
	d	7	5	6			d	6	5	6	
October	a	50	69	60	86						
	b	31	22	26							
	c	14	3	9							
	d	5	6	5							

## APPENDIX X.

## STORM WARNINGS.

The Meteorological Office issues notices of atmospherical disturbances on or near the coasts of the British Islands (free of charge) to ports and fishing stations recommended by responsible local authorities.

The fact that one of these notices has been received at any station is made known by hoisting a black canvas cone, 3 feet high, and 3 feet wide at base, which has the appearance of a triangle when hoisted. The telegram directing the cone to be hoisted should be exhibited near the signal staff.

At dusk, whenever a signal ought to be flying if it were daylight, a night signal, consisting of three lanterns hung on a triangular frame, may be hoisted in place of the cone.

The Meteorological Office supplies the canvas cone, but does not undertake to supply the lanterns. 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 as to the keeping of the apparatus in repair, painting, &c.

The following is a list of the stations to which storm-warning telegrams are sent :—

NORTHERN.	WESTERN.	SOUTHERN.	EASTERN.
SCOTLAND, N.E.	IRELAND, S.W.	ENGLAND, S.W.	ENGLAND, N.E.
Lerwick.	Tuskar L.H.	The Lizard.	Berwick-on-
Scalloway.	New Ross.	Falmouth.	Tweed.
Dunrossness.	Dunmore East.	Pendennis.	Cullercoats.
Sumburgh Hd. L.H.	Dungarvan.	Mevagissey.	Tynemouth.
Noup Head L.H.	Minehead L.H.	Mount Batten.	South Shields.
Stromness.	Youghal.	Plymouth.	Souter Point L.H.
Kirkwall.	Queenstown.	Devonport.	Sunderland.
Cantick Head L.H.	Cork.	Prawle Point.	Hartlepool.
Holborn Head.	Passage.	Teignmouth.	Middlesborough.
Dunnet Head.	Kinsale.	Exmouth.	Redcar.
Wick.	Do. (Old Head).		Whitby.
Tarbet Ness L.H.	Galley Head L.H.		Filey.
Avoch.	Castletownshend.		Flamborough Hd.
Inverness.	Fastnet Rock L.H.		Bridlington.
Nairn.	Brow Head.		Hull.
Burghead.	Tralee.		Goole.
Lossiemouth.	Limerick.		Grimsby.
Buckie.	Loophead L.H.		Boston.
Port Knockie.	Galway.		
Cullen.			
Portsoy.	IRELAND, N.W.		
Banff.	Killybegs L.H.		
Fraserburgh.	Tory Island L.H.		
Peterhead.	Lough Swilly L.H.		
Aberdeen.	Rathmullan.		
Girdleness L.H.	Malin Head.		
	Portrush.		
	Port Ballintrae.		

[ *Continued* ]

NORTHERN.	WESTERN.	SOUTHERN.	EASTERN.
SCOTLAND, E.	IRISH SEA.	ENGLAND, S.	ENGLAND, E.
Stonehaven.	Belfast.	Guernsey.	Sutton Bridge.
Montrose.	Donaghadee.	St. Helier's	Lynn.
Scurdy Ness L.H.	Burr Point.	(Jersey).	Sheringham.
Broughty Ferry.	Howth.	Gorey	Cromer.
Dundee.	Kingstown.	Portland L.H.	Great Yarmouth.
St. Andrews.	Pt. of Ayre (I. of M.)	Weymouth.	Southwold.
Anstruther.	Ramsey	Anvil Point L.H.	Orford Ness L.H.
Pittenweem.	Douglas	Poole	Ipswich.
Buckhaven.	Castletown	Hurst Castle L.H.	Harwich.
Methil.	Silloth.	Southampton.	Gunfleet L.H.
Wemyss, West.	Maryport.	Hamble.	
Burntisland.	Workington.	Yarmouth.	
Grangemouth.	Whitehaven.	Cowes.	
Bo'ness.	Barrow.	Ryde.	
Granton.	Walney I. L.H.	St. Catherine's Pt.	
Newhaven.	Morecambe	Portsmouth.	
Leith.	Fleetwood.	Littlehampton.	
Fisherrow.	Blackpool.	Brighton.	
Dunbar.	Lytham.	Newhaven.	
Cockburnspath.	Southport.		
St. Abb's Head.	Formby.		
Eyemouth.	Liverpool.		
	Runcorn.		
	Hoylake.		
	New Brighton.		
	Conuagh's Quay.	ENGLAND, S.E.	
	Penmaenmawr.	Beachy Head.	
SCOTLAND, N.W.	Port Penrhyn.	Eastbourne.	
Fair Isle L.H.	Point Lynas L.H.	Hastings.	
C. Wrath L.H.	Skerries L.H.	Rye.	
Stourhead L.H.	Holyhead.	Sandgate.	
Port of Ness.	South Stack L.H.	Folkestone.	
Stornoway.	Caernarvon.	Dover.	
Island Glass L.H.	Port Dinorwic.	Deal.	
Portnaguiran.		Ramsgate.	
	ST. GEORGE'S	Margate.	
	CHANNEL.	Faversham.	
	Aberystwyth.	Sheerness.	
	Milford.	Chatham.	
		Greenhithe.	
	BRISTOL CHANNEL.		
SCOTLAND, W.	Small's L.H.		
Glasgow.	Caldy L.H.		
Greenock.	Pembrey.		
Rothsay.	Llanelly.		
Lamlash.	Swansea.		
Carradale.	Briton Ferry.		
Campbelton.	Porthcawl.		
Mull of Cantire L.H.	Nash L.H.		
Rhuvaal L.H.	Penarth.		
Rhinns of Islay L.H.	Cardiff		
Ardrossan.	(Bute Dock).		
Girvan.	Do. (Barry Dock)		
Ballantrae.	Newport.		
Cairn Ryan.	Weston-super-Mare.		
Corsewall Point	Burnham.		
L.H.	Bridgewater.		
Mull of Galloway	Lundy Island.		
L.H.	Ilfracombe.		
	Bull Point L.H.		
	Barnstaple.		
	Appledore.		

[ Continued



NORTHERN.	WESTERN.	SOUTHERN.	EASTERN.
	BRISTOL CHANNEL —cont. Hartland Pt. L.H. Boscastle. Port Isaac. Newquay. Hayle. Godrevy L.H. St. Ives. St. Sennen. Newlyn, West. Penzance. Scilly.		

## APPENDIX XI.

## FISHERY BAROMETERS.

## LIST of PLACES supplied with FISHERY BAROMETERS.

*Shetland Isles*.—Balta Sound, Uya Sound, Burravoe, Nesting, Lerwick, Sandwick, Scalloway, Symbister.

*Orkney Isles*.—Westray, Papa Westray, Burray, Kirkwall.

*Scotland, east coast*.—Duncansbay, Freswick, Auchengill, Keiss, Ackergill, Staxigoe, Wick, Lybster, Dunbeath, Inver, Portmahomack, Ballintore, Cromarty, Avoch, Nairn, Burghead, Portessie, Port Knockie, Portsoy, Whitehills, Gardenstown, Roseheart, Pitullie, Fraserburgh, Inverallochy, Pointlaw, Findon, Portlethen, Skateraw, Stonehaven, Arbroath, East Haven, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monance, Burntisland, Newhaven.

*England, east coast*.—Berwick, North Shields, South Shields, Sunderland, West Hartlepool, Staithes, Scarborough, Filey, Flamborough, Bridlington Quay, Withernsea, Hull, Lynn (2), Wells, Gorleston, Lowestoft, Orford Haven, Felixstowe, Harwich, Brightlingsea, West Mersea, Maldon, Leigh, Margate, Deal, Kingsdown, Dover.

*England, south coast*.—Bognor, Ryde, Bembridge, Brixton, Atherfield, Ventnor, Yarmouth (Isle of Wight), Gorey (Jersey), Haslar Hospital, Poole, Weymouth, Portland, Budleigh Salterton, Exmouth, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscatho, Penryn, Durgan, Porthallow, Falmouth, Coverack, Newlyn (2), Mousehole, Penberth, Porth Guarra.

*England, south-west coast*.—St. Ives, Hayle, Port Isaac, Boscastle, Bideford, Burnham, Highbridge, Weston-super-Mare.

*Wales*.—Briton Ferry, Swansea, Angle, Milford, Aberystwyth, Navin, Carnarvon.

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

*Isle of Man*.—Douglas, Port St. Mary, Peel (2).

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

*Ireland, east coast*.—Cushendall, Belfast, Bangor, Groomsport, Donaghadee, Ardglass, Warren Point, Carlingford, Greenore, Dundalk, Malahide, Howth, Kingstown (2), Bray, Wicklow.

*Ireland, south coast*.—Dunmore East, Dungarvan, Crosshaven, Kinsale, Union Hall, Castletownsend, Baltimore, Schull (2), Crookhaven, Castletown (Berehaven), Lawrence Cove, Ballydonegan, Ballycrovane.

*Ireland, west coast*.—Valencia, Dingle, Tralee, Ballyheigue, Tarbert, Kilcredane, Kilronan, Galway, Spiddal, Elly Bay, Cleggan, Ballyglass, Ballycastle (Co. Mayo), Donegal, Tribane, Killybegs, Teelin, Malinmore, Portnoo, Burton Port, Kincaslugh, Bunbeg.

*Ireland, north coast*.—Dunfanaghy, Rathmullen, Buncrana, Malin Head, Moville, Greencastle, Portstewart, Portrush, Port Ballintrae, Ballycastle (Co. Antrim).

*Scotland, west coast*.—Lamlash, Tarbert (Loch Fyne), Loch Ranza, Campbeltown, Carradale, Portnahaven and Portwemyss (Islay), Portree and Armadale (Isle of Skye), Isle of Soay, Plockton, Ardsneaskan, Shieldaig, Gruinard, Badachro, Ullapool, East Mey, Gills, Stroma (2), Bowmore (Islay).

*Hebrides*.—Stornoway, Portnaguran, Obb, Valtos, Carloway, Ness, Berneray.

## APPENDIX XII.

## METHODS FOLLOWED IN DEALING WITH METEOROLOGICAL RETURNS FROM LAND STATIONS IN THE BRITISH ISLES.

These stations are of eight classes, as stated on page 17.

1.—*Observatories continuously recording all the Meteorological Elements.*

Returns  
from obser-  
vatories.

Hourly measurements of the curves obtained from the self-recording instruments at the observatories of the Office are made by the observers at each station, on printed forms supplied for the purpose, which, together with the curves, are forwarded to the Office weekly. They comprise measurements of the barograms, of the dry-bulb and wet-bulb thermograms, of the anemograms, and of the rain-gauge curves.

Examination  
of returns.

The measurements are subjected to a careful examination in order to ensure as far as possible their accuracy, and the revised regulations which have been adopted to secure this end will be found in the Report of the Office for 1890. They comprise rules for the guidance of the observers, as well as of the assistants charged with the examination of the work at the Office. Attention need be called here to only two of these rules, viz., (a) the use of subsidiary sheets on which are entered the results of a second set of measurements of the curves made after, and quite independently of, the first set, and with a different form of scale, the two sets of measurements being afterwards compared together, and any differences found inquired into and set right; and (b) the re-measurements of the curves made by the assistants at the Meteorological Office, and which are always at least 40 in number, and in doubtful cases many more, per month, for each element.

Results of  
examination  
and report to  
Council.

The attention of the observers is always drawn to such errors as may be detected, and to any failures in the continuity of the curves arising from failure of the light, stoppage of the clock, defective photography, faulty action of the wet-bulb thermometer, &c.; a report containing the results of the examination of each observatory being also submitted to the Council periodically. The tabulations are eventually bound and stored with the curves in the Office.

General  
supervision  
of observa-  
tory work.

In connexion with this work should be mentioned the general watch which has to be kept over the working of the observatories and of the instruments, not only to secure uniformity amongst them and observance of rules, but also to guard against small changes which are liable to occur at certain times, especially with the thermographs, and which may affect the scale-values of the instrument or the datum lines used for the tabulation of the curves. About twice a year this work calls for special examination, entailing some considerable time, and occasionally the engraving of new scales, for measuring the curves.

## METHOD OF DEALING WITH THE NUMERICAL RESULTS FROM THE SELF-RECORDING OBSERVATORIES.

Interpolations.

In dealing with the tabulations the first step is to go over the sheets and fill up by interpolation, wherever possible, any gaps or breaks in the continuity of the record.

The records having been made as complete as possible are then used for the calculation of daily and hourly mean values, for periods of five days, calendar months, and for the year ; which, together with other data obtained from the same source, are published under the title of "Hourly Means of the Readings obtained from the "Self-Recording Instruments at the Five Observatories under the "Meteorological Council." The volume for 1897 is in the press. See p. 18. Publication of results.

It will be noticed that this publication includes results from only five observatories, while on page 18 eight observatories are mentioned. Since the year 1884 the records at Glasgow and Stonyhurst have not been fully published by the Office (although the stations are partially subsidized by it, in order to maintain the record established in 1868 and published for the years 1869 to 1883), where, however, the curves are stored for future use if required.

Returns from both these observatories are published in "Returns from Stations of the Second Order," and meteorological results for Stonyhurst and Falmouth are printed independently by the College authorities, and by the Royal Cornwall Polytechnic Society respectively.

## II.—*Anemographic Stations at which the Wind is recorded continuously.*

The anemograms received from Alnwick Castle, Armagh, Deerness, Dublin, Fleetwood, Holyhead, North Shields, Scilly, and Yarmouth are regularly examined and tabulated in the Office (except those for Armagh, which are tabulated at the Observatory), and the sheets bound up in volumes. Besides special inquiries on legal and other points which arise from time to time, and in which these documents are of high importance, the tabulations are always employed in the preparation of the various Reports issued by the office. They are also regularly used in the checking of the Storm Warnings. Anemographs.

## III.—*Barographic Stations at which the Atmospheric Pressure is continuously recorded.*

These stations are for the most part either telegraphic reporting stations or stations of the second or third order. The instrument in most general use is Richard's self-recording aneroid. At the telegraphic stations the record is first used to indicate to the observers the changes which have occurred since the last observing hour, and these changes, when large, are reported by wire to London, and are used in preparing the forecasts. The curves themselves are forwarded to the Office weekly and are stored for future use. Barographs

## IV.—*Sunshine Stations at which the duration of Bright Sunshine is continuously recorded.*

The daily sunshine cards which are now received from 63 Stations in the British Islands are examined generally, to guard against accidental changes in the adjustment of the instruments. Notes explaining any omission or accidental defect are added to the cards, if required, and they are duly stamped, dated, and then stored in the Office. It should, however, be added that returns of sunshine are received from other stations, at which the original records are retained. Sunshine records.



Weekly  
totals of  
duration of  
sunshine.

A tabulation of most of the curves is published in the Weekly Weather Report, mentioned in Appendix VIII., and for those stations, which are also Stations of the Second Order, the monthly totals of bright sunshine in hours, together with the percentages of its possible duration, are published as Part IV. of "Returns from Stations of the Second Order." Hourly tabulations are made in the Office of the returns from the observatories, and the mean hourly amounts are published in the volumes of "Hourly Means." A table showing the daily amount of sunshine at Bunhill Row, one of the London stations, is also prepared quarterly, for the Royal Meteorological Society.

#### V.—*Telegraphic Reporting Stations.*

Telegraphic  
stations.

These are now 25 in number in these islands, and the particulars as to the observations taken at them, and the methods adopted in dealing with them, will be found fully detailed in Appendix VII. to the Report for 1888-89, and in Appendix VIII. to the present volume.

#### VI.—*Land Stations.*

Origin and  
progress of  
system.

Ever since the year 1866 returns of more or less completeness have been received from land stations in the United Kingdom.

The number of stations has gradually increased, until at the end of March, 1900, the total number was 170, including 23 belonging to the Royal Meteorological Society and 19 belonging to the Scottish Meteorological Society. Copies of these latter returns are sent to the Office under special arrangements with the Societies.

The Stations of the Second Order are 84 in number, and distributed as follows:—46 in England, 3 in Wales, 24 in Scotland, and 11 in Ireland.

The methods followed with regard to the examination and publication of these returns have been fully detailed in previous Reports, and need not now be repeated. The changes introduced into the volume for 1886 have been continued in those for later years. These refer to the barometer readings, which are now given at station-level instead of being reduced to the mean sea-level; and to the humidity, where the depression of wet bulb is shown, the international forms A and B being modified accordingly.

The volume of "Returns from Stations of the Second Order" for 1897, now in the Press, will contain returns from 78 stations.

Reports from the Irish stations are regularly supplied to the Registrar-General for Ireland for his Weekly and Quarterly Returns.

New stations.

When an application for the adoption of a new station is received, a schedule is forwarded to the observer containing a series of questions as to the outfit of the station, the exposure of the instruments, and the influence likely to be exerted on their indications by surrounding objects, such as houses and trees. Only mercurial barometers are accepted, and only such as have been duly verified. All thermometers must have been tested at Kew. A plan of the station, showing the positions of the instruments with regard to neighbouring objects, is also required.

On the return of this schedule the answers are considered, and, when necessary, alterations are advised.

If, however, the existing arrangements are satisfactory, tables for reducing the barometer readings to 32° Fahrenheit at mean sea-level are prepared and duplicates sent to the observer, together with a set of Hygrometrical Tables, and a copy of "Instructions in the Use of Meteorological Instruments."

The first returns are compared and examined with special care, and a report of the result of the examination is forwarded to the observer, with instructions how best to improve and complete the returns.

There are still many parts of the British Islands very poorly represented by the existing stations; for instance, Wales, the northern coasts of Cornwall and Devon, Somersetshire, Essex, the south-east of Ireland, &c., and any information for these districts would be valuable.

#### VII.—*Land Stations of the Third Order.*

These are 87 in number. The information supplied from them is, in some cases, similar to that supplied by a station of the second order, but taken only once daily, or at irregular hours, or perhaps less complete. At other stations less detail is given; for instance, 52 stations furnish only the daily rainfall. All the information thus afforded is utilised in some way or other, though it is not all included in the Office publications. The rainfall values are copied and supplied for publication in "British Rainfall," which was compiled for many years by the late Mr. G. J. Symons, F.R.S., and is being continued under the editorship of Mr. Sowerby Wallis, F.R.Met. Soc.

#### VIII.—*Sea Temperature Stations.*

These are 50 in number, comprising 19 light-vessels, 28 coast-guard stations, and 3 others,—Scilly, Holyhead, and St. Ann's Head. The observations are taken twice daily, namely, at or about sunrise, and at 4 p.m., and they are sent to the Office quarterly.

#### INSPECTION.

All the Stations supplying information to the Office are inspected. Inspections  
Some of them are visited every year, but the less important stations are not visited so frequently. Extracts from the reports of the inspectors will be found in Appendix XIV., p. 73.

#### LIST OF STATIONS.

In Appendix XIII., p. 62, is given a complete list of the stations from which information has been received by the Office during the year ended March 31st, 1900.

## APPENDIX XIII.

LIST of STATIONS in the BRITISH ISLANDS from which INFORMATION has been received at the METEOROLOGICAL OFFICE during the Year ended March 31st, 1900.

The Stations marked "S" are in connexion with the Scottish Meteorological Society, and those marked "M" are in connexion with the Royal Meteorological Society. The returns from these Stations are received by the Office under an arrangement which will be found detailed in previous reports.

In certain cases where the actual station at which the Observations have been taken is not generally known, and could not be readily identified, the name of some village or town near has been inserted following the name of the station, within brackets.

The nature of the information received from each station is indicated by letters, as follows:—

- A.—Continuous record of pressure, temperature, wind, sunshine, and rain, with eye observations of the amount, form, and motion of the clouds, and notes on the weather. (Class 1, Observatories, p. 17.)
- B.—Continuous record of the direction and velocity (or force) of the wind. (Class 2, Anemographic Stations, p. 17.)
- C.—Continuous record of pressure. (Class 3, Barographic Stations, p. 17.)
- D.—Monthly sheets, containing the regular observations at 9 a.m. and 9 p.m. each day, local time, of pressure, temperature (dry bulb and wet bulb), wind, cloud, and weather, with the daily maximum and minimum of temperature, the daily rainfall, and general remarks on the weather. (Class 6, Second Order Stations, p. 17.)
- E.—Monthly means and summaries on Form B. of observations taken at 9 a.m. and 9 p.m. each day as above. (Class 6, Second Order Stations, p. 17.)
- F.—The maximum and minimum temperature, and the rainfall for each day, with remarks on the weather. This information is received in the Meteorological Office each week for use in the "Weekly Weather Report." (Various Classes, p. 17.)
- G.—Observations of the same kind as at Second Order Stations, but either—
  - (a) Less full.
  - (b) Taken only once daily.
  - (c) Taken at hours other than 9 a.m. and 9 p.m. (Class 7, Third Order Stations, p. 17.)
- R.—Monthly sheets containing the daily observations of the amount of rainfall, with remarks on the weather. (Class 7, Third Order Stations, p. 17.)

- S.—Continuous record of bright sunshine. (Class 4, Sunshine Stations, p. 17.)
- T.—Regular observations at 8 a.m. and 6 p.m. G.M.T. (and from some stations at 2 p.m. in addition), of pressure temperature, wind and weather, with the daily maximum and minimum of temperature, the daily rainfall, and, where possible, the sea disturbance at 8 a.m. each day, and the daily amount of bright sunshine. This information is received at the Meteorological Office each day by telegraph, for use in the "Daily Weather Report" and in the "Weekly Weather Report." (Class 5, Telegraphic Stations, p. 17.)
- W.—Daily observations of the temperature of the sea water. (Class 8, Sea Temperature Stations, p. 17.)
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Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Informa- tion supplied.	Page where Inspec- tor's Report for 1899 will be found.
Aberdeen Observatory ..	57 10	2 6 W.	48	Prof. O. Niven, F.R.S. ..	A. T. C	79, 98
" Cove Bay ..	57 9	2 5 "	—	Coastguard ..	W.	
Aberdovey ..	52 33	4 4 "	—	John Edwards ..	S.	
Adare ..	52 33	8 47 "	—	W. Bowles ..	R.	
Alnwick Castle ..	55 25	1 43 "	210	Humphry Willyams, for the Duke of Northum- berland.	B. F.	97, 100
Ampleforth ..	54 12	1 5 "	349	Rev. J. B. McLaughlin, O.S.B.	D.	
Ardross Castle, N.B. ..	57 45	4 21 "	449	W. Minty ..	R.	
Arlington Court (Barnstaple) ..	51 8	3 58 "	613	Lady Chichester ..	F.	80
Armagh Observatory ..	54 21	6 39 "	196	J. L. E. Dreyer, Ph.D. ..	B.D.F.S.	93, 96
Arran, North, Galway ..	53 6	9 40 "	—	Coastguard ..	G. W.	
Aspley Guise, Beds. ..	52 1	0 38 "	410	E. E. Dymond ..	S.	
Aysgarth Vicarage, Yorks. ..	54 18	1 58 "	646	Rev. F. W. Stow, M.A. ..	D.	81
Bahama Bank Lightship ..	54 20	4 13 "	—	Light-keepers ..	W.	
Ballantrae, Ayrshire ..	55 6	5 0 "	—	Coastguard ..	W.	
Ballydonegan, Co. Cork ..	51 38	10 3 "	—	" ..	W.	
Ballyglass, Co. Mayo ..	54 17	9 52 "	—	" ..	W.	
Baltimore, Co. Cork ..	51 28	9 22 "	—	" ..	G.	
Barvin (Potter's Bar) ..	51 41	0 8 "	7400	W. E. Dalston ..	R.	
Belfast, Queen's College ..	54 35	5 56 "	61	John Wylie ..	D.	73
Belmullet, Co. Mayo ..	54 13	9 59 "	40	Miss E. Tolan ..	T.	
Belvoir Castle (Grantham) ..	52 54	0 47 "	259	W. H. Divers, for the Duke of Rutland.	D.	
<b>S</b> Ben Nevis ..	56 48	5 0 "	4,405	A. Rankin, for Directors Ben Nevis Observatory.	A. E.	
<b>M</b> Bennington, Herts. ..	51 54	0 5 "	407	Rev. J. D. Parker, LL.D. ..	E.	
<b>M</b> Berkhamsted ..	51 48	0 34 "	400	E. Mawley, F.R. Met. Soc. ..	E.	
Bidston Observatory (Liver- pool).	53 24	3 4 "	188	W. E. Plummer, F.R.A.S. ..	D. T.	81
Birr Castle (Parsonstown) ..	53 6	7 55 "	175	J. Spooner and T. Colvin, for the Earl of Rosse.	D. S. T.	74
<b>M</b> Blackpool ..	53 48	3 3 "	62	A. J. Anderson, M.A., M.B., for the Corporation.	F. S.	
Blacksod Point, Co. Mayo ..	54 6	10 4 "	37	A. Marshall ..	W. T.	73
Bognor ..	50 47	0 40 "	—	H. C. L. Morris, M.D., for the Corporation.	S.	
Bolton ..	53 35	2 27 "	389	W. W. Midgley, for the Corporation.	G.	
Bournemouth ..	50 43	1 53 "	—	Messrs. Primavesi, for Town Council.	S.	
<b>S</b> Braemar ..	57 0	3 24 "	1,111	J. Aitken, J.P. ..	D. F. S.	
Bramley, Surrey ..	51 11	0 33 "	148	J. Bartlett, M.A. ..	D.	
Bray, Co. Wicklow ..	53 12	6 6 "	—	Coastguard ..	G.	
Brighton ..	50 49	0 8 "	65	A. Newsholme, M.D., for the Corporation.	S.	
Burford, Oxon ..	51 48	1 38 "	420	M. Jacobs ..	R.	
Burnmouth (Ayton, Berwick) ..	55 51	2 4 "	—	Coastguard ..	W.	
Burntisland ..	56 4	3 14 "	—	" ..	W.	
<b>M</b> Buxton ..	53 14	1 54 "	987	W. Pilkington ..	E.	
Caernarvon Bay Lightship ..	53 6	4 45 "	—	Light-keepers ..	W.	
Cambridge ..	52 13	0 6 E.	83	Miss A. Walker, for Sir Robt. Ball, F.R.S.	T. S. D.	
Cardigan Bay Lightship ..	52 25	5 1 W.	—	Light-keepers ..	W.	
<b>S</b> Cargen ..	55 2	3 37 "	72	A. Peacock ..	E.	
Carrigallen, Co. Leitrim ..	53 58	7 38 "	7350	Mrs. J. Godley and Miss Morrow.	R.	
Castletownshend, Co. Cork ..	51 32	9 11 "	—	Coastguard ..	G.	
Chatham ..	51 23	0 32 E.	136	The Instructor in Survey- ing.	G.	89
<b>M</b> Cheddar ..	52 58	1 57 W.	646	J. C. Philips ..	E. F.	
<b>M</b> Cheltenham ..	51 54	2 3 "	184	R. Tyrer, B.A. ..	E.	
Chester ..	53 12	2 54 "	59	Rev. J. Cairns Mitchell, B.D.	D.	
Churchill, Oxon ..	51 58	1 34 "	509	Giles Edmonds ..	R.	
<b>M</b> Churchstoke ..	52 31	3 5 "	538	P. Wright, F.C.S. ..	D. F. S.	
Cirencester ..	51 43	1 57 "	446	Prof. G. T. Locke, M.A. ..	F. S.	
Cleggan, Co. Galway ..	53 33	10 8 "	—	Coastguard ..	W.	
Clifton ..	51 27	2 37 "	230	D. Rintoul, M.A. ..	F.	

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Page where Inspec- tor's Report for 1899 will be found.
Colly Weston .. ..	52 37	0 31 W.	280	Miss A. Tasker .. ..	R.	
Colwyn Bay .. ..	53 17	3 43 "	—	R. E. Lord, M.D., B.Sc. ..	S.	
Coningbeg Lightship ..	52 2	6 40 "	—	Light-keepers .. ..	W.	
Cooper's Hill (Egham) ..	51 26	0 34 "	279	Prof. H. McLeod, F.R.S. ..	G.	
† Cranleigh .. ..	51 8	0 29 "	232	Rev. G. C. Allen .. ..	F.	
Cromarty .. ..	57 41	4 0 "	—	Coastguard .. ..	W.	
Cronkbourne (Douglas) ..	54 10	4 29 "	137	A. W. Moore, M.A. .. ..	D. F. S.	
Crookhaven .. ..	51 28	9 43 "	—	Coastguard .. ..	G.	
Crosshaven .. ..	51 48	8 18 "	—	.. ..	G.	
Cuckfield, Sussex .. ..	51 1	0 9 "	389	John Howe .. ..	R.	
† Cullompton .. ..	50 51	3 23 "	202	T. Turner, J.P. .. ..	F. S.	
Currygrane (Edgeworths- town), Co. Longford.	53 45	7 39 "	267	J. M. Wilson, M.A. .. ..	D.	
Darwen, Lancashire ..	53 41	2 28 "	710	G. Mainland, for the Cor- poration. .. ..	S.	82
Deerness, Orkney Islands..	58 56	2 45 "	160	M. Spence .. ..	B. D. S.	98
Disserth (Llandrindod) ..	52 13	3 24 "	711	Rev. J. Le Herbert .. ..	R.	
Dolmelynllyn (Dolgelly) ..	52 47	3 53 "	—	W. Simmonds .. ..	R.	
Donaghadee .. ..	54 38	5 32 "	40	J. Conolly .. ..	T.	73
Doneraile, Co. Cork ..	52 13	8 34 "	266	Capt. J. W. Evans, J.P. ..	R.	
Dover .. ..	51 7	1 18 E.	198	H. E. Stilgoe, C.E. .. ..	R.	
Dublin, Botanic Gardens ..	53 23	6 16 W.	87	F. W. Moore, M.R.I.A. ..	D.	74
" City .. ..	53 20	6 15 "	47	Sir J. W. Moore, M.D. ..	D. F.	
" Phoenix Park .. ..	53 22	6 21 "	155	Major Sim, R.E. and Major Haynes, R.E. .. ..	B. D. S.	94, 95
Duddington .. ..	52 36	0 32 "	152	The late Fred Coventry ..	F. R.	86
§ Dundee .. ..	56 28	2 56 "	160	J. Carnochan .. ..	D. S.	79
Dungeness .. ..	50 55	0 58 E.	26	W. H. Taylor .. ..	T.	90
§ Dunrobin Castle .. ..	57 59	3 56 W.	12	D. Melville, for the Duke of Sutherland. .. ..	D.	78
Durham .. ..	54 46	1 35 "	336	H. J. Carpenter and Prof. R. A. Sampson, M.A. ..	D. F. S.	85
Dursley, Glos. ... ..	51 41	2 21 "	250	R. W. Pinney .. ..	R.	
Eastbourne .. ..	50 46	0 17 E.	39	R. Sheward, for the Corpo- ration. .. ..	D. S.	89
East Goodwin Lightship ..	51 13	1 36 "	—	Light-keepers .. ..	W.	
East Dereham .. ..	52 41	0 57 "	158	G. H. H. Cooper .. ..	R.	
Edgbaston (Birmingham)..	52 28	1 56 W.	534	Alf. Cresswell .. ..	D. F. S.	81
Edinburgh .. ..	55 57	3 12 "	253	R. C. Mossman, F.R.S.E. ..	D. S.	79
English and Welsh Grounds Lightship.	51 27	3 0 "	—	Light-keepers .. ..	W.	
Ennis, Co. Clare .. ..	52 51	8 59 "	38	Miss A. L. Scott .. ..	R.	
Ennistymon, Co. Clare ..	52 57	9 17 "	131	Rev. C. W. McDowell, M.A.	R.	
Falmouth .. ..	50 9	5 4 "	167	E. Kitto .. ..	A. F.	94, 96
Felixstowe .. ..	51 58	1 22 E.	76	Rev. J. G. Munday, M.A. ..	F. S.	86
Fleetwood .. ..	53 56	3 1 W.	—	M. S. Gaultier, C.E. .. ..	B.	92
Forquandenny, Perth ..	56 21	3 29 "	175	C. L. Wood .. ..	C.	
Forest Row, Sussex .. ..	51 7	0 2 E.	619	Rt. Hon. J. Bryce, D.C.L., M.P. .. ..	R.	
§ Fort Augustus .. ..	57 8	4 40 W.	68	Rev. J. M. Wall .. ..	E. F. S.	78
Fort William .. ..	56 49	5 7 "	31	A. Rankin, for Directors, Ben Nevis Observatory. ..	A. F.	77, 82
Foynes, Co. Limerick ..	52 37	9 7 "	108	W. H. Ward, for Lord Monteagle. .. ..	F.	
Fulbeck, Lincolnshire ..	53 3	0 37 "	185	Rev. V. F. Willson, M.A. ..	C. D.	86
Geldeston (Beccles) .. ..	52 28	1 31 E.	37	E. T. Dowson .. ..	D. F. S.	86
Glasgow .. ..	55 53	4 18 W.	180	Prof. L. Becker, Ph.D. ..	A. D. F.	79, 99
Glencarron .. ..	57 30	5 14 "	489	D. D. Munro .. ..	E. F.	
Glenlee .. ..	55 5	4 12 "	203	W. Melville .. ..	E. F.	
§ Gordon Castle .. ..	57 37	3 5 "	101	C. Webster, for the Duke of Richmond and Gordon, K.G. .. ..	E.	79
Gorleston (Gt. Yarmouth)	52 35	1 43 E.	—	The late R. J. C. Day ..	G.	
Haslar Hospital, Hants. ..	50 47	1 7 W.	—	C. Seaman .. ..	G.	

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Hawes Junction .. ..	54 19	2 18 W.	1,135	W. H. Bunce .. ..	G.	85
Hesley Hall (Bawtry) ..	53 27	1 4 ..	65	B. I. Whitaker, J.P. ..	F.	
St Hereford .. ..	52 5	2 45 ..	291	Rev. J. M. Dawson and Rev. T. B. Harrington.	F.	
Heysham Hall, Lancashire	54 3	2 54 ..	95	S. Lomas, for Miss L. Grafton.	D.	86
Hidcote (Campden), Glos...	52 5	1 46 ..	524	Capt. W. Wright, R.A. ..	B.	
St Hillington .. ..	52 48	0 33 E.	88	Rev. H. E. B. Folkes, M.A.	D. F. S.	
Hollesley Bay, Suffolk ..	52 3	1 27 ..	38	Prof. C. G. Freer Thon- ger, F.C.S.	D. S.	84
Holyhead, Harbour Office..	53 18	4 39 W.	57	F. M. Cotton, C.E. ..	B. W.	
" Sailors' Home ..	53 18	4 39 ..	48	T. Choje .. ..	T.	
Hoylake, Cheshire ..	53 23	3 12 ..	—	T. Foster .. ..	S.	80
Hurdlestown (Broadford), Co. Clare.	52 48	8 38 ..	157	Lieut.-Col. W. O. Bentley, R.A.	R.	
Hurst Castle .. ..	50 42	1 33 ..	12	E. T. Tremble .. ..	T.	
Kearsney Abbey (Dover) ..	51 8	1 17 E.	2100	C. W. Curtis .. ..	R.	86
" Chilton Farm ..	51 8	1 17 ..	135	H. E. Stilgoe, C.E. ..	R.	
Ketton Hall (Stamford) ..	52 38	0 32 W.	—	J. H. Browett .. ..	R.	
" Vicarage .. ..	52 38	0 32 ..	109	Rev. A. Swire .. ..	R.	74
Kew Observatory .. ..	51 28	0 19 ..	18	C. Chree, D.Sc., F.R.S. ..	A.	
Kilcredane, Co. Clare ..	52 35	9 47 ..	—	Coastguard .. ..	W.	
Kilkenny .. ..	52 39	7 14 ..	212	H. Carlton, for the Marquis of Ormonde.	C. F.	74
St Killarney .. ..	52 4	9 30 ..	86	Ven. Archdeacon Wynne	G. F.	
Killiney, Co. Dublin ..	53 18	6 7 ..	249	R. O'Brien Furlong ..	R.	
Kirkwall .. ..	58 59	2 57 ..	—	Coastguard .. ..	W.	74
Kish Bank Lightship ..	53 19	5 55 ..	—	Light-keepers .. ..	W.	
Ladylaw (Hawick) .. ..	55 28	2 47 ..	447	T. Wilson .. ..	D.	78
Lahinch, Co. Clare .. ..	52 55	9 21 ..	52	Miss I. F. K. Bowes ..	R.	
Lairg .. ..	58 1	4 22 ..	335	Rev. D. Macrae .. ..	E. F.	
Lamlash, Isle of Arran ..	56 32	5 8 ..	—	Coastguard .. ..	G. W.	83
Laudale, Argyleshire ..	56 41	5 41 ..	14	A. Fletcher, for T. H. G. Newton, M.A.	D. F.	
S Lednathie .. ..	56 45	3 7 ..	719	W. Morrison, for P. Stor- month Darling.	E.	
Leith .. ..	55 58	3 10 ..	19	T. Richardson .. ..	T.	79
Leman and Ower Lightship	53 8	2 2 E.	—	Light-keepers .. ..	W.	
Lerwick .. ..	60 9	1 8 W.	—	Coastguard .. ..	W.	
Limerick .. ..	52 39	8 36 ..	—	A. W. Shaw .. ..	R.	83
Liscannor, Co. Clare ..	52 56	9 23 ..	—	Coastguard .. ..	W.	
S Lissan, Co. Tyrone .. ..	54 41	6 45 ..	300	The late Sir N. Staples, Bt.	E.	
Littlestone-on-Sea .. ..	50 59	0 59 E.	—	W. Walsh, for H. T. Tubbs	G. S.	81
Llandinam, Montgomery ..	52 29	3 26 W.	500	John Owens .. ..	R.	
Llandovery .. ..	51 59	3 48 ..	217	J. Watkins .. ..	F.	
St Llandudno .. ..	53 21	3 50 ..	72	Wm. Little, for Town Council.	E. F. S.	73
London, Brixton .. ..	51 27	0 8 ..	77	F. Gaster .. ..	T.	
" City .. ..	51 31	0 5 ..	80	Messrs. de la Rue .. ..	S.	
" Hampstead .. ..	51 34	0 10 ..	—	H. R. Beeton .. ..	C.	87
" Pall Mall .. ..	51 30	0 7 ..	—	Athenæum Club .. ..	C.	
" Westminster .. ..	51 30	0 8 ..	76	The Staff of the Met. Office	C. G.	
" Westminster Training College.	51 30	0 8 ..	—	H. A. Reatchlous, M.A. ..	S.	81
Londonderry .. ..	55 0	7 19 ..	67	J. Conroy .. ..	D. F.	
Loughborough .. ..	52 47	1 12 ..	146	W. Berridge .. ..	T.	82
Lowestoft .. ..	52 29	1 44 E.	—	C. J. Heppell .. ..	G.	
St Lowestoft .. ..	52 29	1 44 ..	84	S. H. Miller .. ..	E. S.	
Lytham .. ..	53 44	2 58 W.	21	Medical Officer of Health, for the Corporation.	D. S.	89
Maidenhead .. ..	51 30	0 43 ..	99	G. H. Palmer .. ..	G.	
Malin Head, Co. Donegal ..	55 23	7 24 ..	230	J. Putt .. ..	T. C.	
Mallaranny .. ..	53 55	9 40 ..	119	Miss M. Kilsby .. ..	R.	82
Manchester .. ..	53 29	2 13 ..	190	J. Niven, M.A., M.B., for the Corporation.	D.	
S Marchmont .. ..	55 44	2 25 ..	498	J. A. Wood .. ..	E. F. S.	
St Margate .. ..	51 24	1 24 E.	83	J. Stokes, J.P. .. ..	S.	83
Market Rasen .. ..	53 23	0 20 W.	83	W. B. Jevons .. ..	R.	



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Markree Castle, Co. Sligo ..	54 11	8 27 W.	123	F. W. Henkel, B.A., for Col. Cooper.	D. F. S.	73
Minard, Co. Kerry ..	52 7	10 8 "	—	Coastguard ..	W.	
Morpeth ..	55 13	1 41 "	324	G. P. Berry and T. V. Steele	D. S.	87
Mount Callan (Inagh), Co. Clare.	52 53	9 16 "	479	Lt.-Col. Tottenham ..	R.	
Nairn ..	57 36	3 52 "	32	Miss Penny ..	T.	78
Newarp Lightship ..	52 45	1 53 E.	—	Light-keepers ..	W.	
Newcastle, Co. Wicklow ..	53 5	6 6 W.	256	Dr. B. H. Steede ..	D.	74
Newcastle-on-Tyne ..	54 59	1 36 "	152	N. H. Martin, F.C.S. ..	G. S.	87
Newmarket-on-Fergus ..	52 46	8 53 "	—	W. W. FitzGerald ..	R.	
Newport, Monmouth ..	51 35	3 0 "	—	C. Callum ..	R.	
Newquay, Cornwall ..	50 25	5 4 "	250	J. Pearce ..	S.	
Newton Reigny (Penrith) ..	50 25	5 5 "	—	Coastguard ..	W.	
Northallerton ..	54 41	2 48 "	579	T. G. Benn ..	F. S.	81
North-West Lightship ..	54 20	1 26 "	129	W. Stead, C.E. ..	R.	
† Norwood ..	53 31	3 31 "	—	Light-keepers ..	W.	
	51 26	0 6 "	220	W. Marriott ..	E.	
§ Ochertyre ..	56 23	3 53 "	329	G. Croucher, for Sir P. K. Murray, Bt.	E. F.	77
Omagh (Edenfel) ..	54 36	7 19 "	300	Col. Buchanan, C.B. ..	F.	73
Oswaldkirk, Yorkshire ..	54 12	1 3 "	510	R. Thompson ..	S.	
Outer Dowsing Lightship ..	53 27	1 5 E.	—	Light-keepers ..	W.	
Owers Lightship ..	50 39	0 41 W.	—		W.	
Oxford ..	51 46	1 16 "	208	A. A. Rambaut, M.A. ..	T. S.	99
Pant-y-reos ..	51 38	3 4 "	449	C. Cullum ..	R.	
Parkstone, Dorset ..	50 43	1 56 "	197	R. H. Barnes, B.A. ..	D.	
Penbedw (Mold) ..	53 12	3 11 "	650	H. W. Buddicom ..	C.	
Pennant Bay (Aberdour) ..	57 40	2 16 "	—	Coastguard ..	W.	
Pennington ..	50 46	1 35 "	—	Miss H. Fullerton ..	R.	
Peper Harow ..	51 11	0 40 "	199	John Warner ..	R.	
§ Pinmore (Girvan) ..	55 12	4 49 "	187	P. Donald, for Capt. Hamil- ton.	E.	79
Plumstead ..	51 29	0 6 E.	785	J. G. Waller ..	S.	
Plymouth, The Hoe ..	50 22	4 8 W.	116	H. Victor Prigg, C.E., for the Corporation.	D. F. S.	80
§ Poltalloch ..	56 8	5 30 "	132	D. S. Melville, for Lord Malcolm.	E.	
Portland Bill ..	50 32	2 27 "	177	C. Smith ..	T.	
Portrush ..	55 13	6 40 "	—	Coastguard ..	W.	
Port Talbot ..	51 34	3 45 "	—	R. Milner, for Miss Talbot	S.	
Prawle Point ..	50 12	3 43 "	332	T. Howse ..	T.	80
Prestwich (Manchester) ..	53 32	2 17 "	320	T. R. H. Clunn, M.D. ..	D. F. S.	82
Quin, Co. Clare ..	52 48	8 52 "	—	Mrs. Hallam Studdert ..	R.	74
Recess, Co. Galway ..	53 28	9 44 "	90	A. A. Smith ..	R.	
Rede Court (Rochester) ..	51 24	0 29 E.	224	W. H. Tingey, B.A. ..	D.	89
Rhyl ..	53 19	3 29 W.	—	T. F. Hughes ..	S.	
Ridgmont ..	52 1	0 36 "	291	H. A. Mann, B.Sc., and H. M. Freear.	D.	
Ridlington ..	52 37	0 45 "	523	N. W. Wortley ..	R.	
Roche's Point, Co. Cork ..	51 47	8 15 "	42	W. Kennedy ..	T.	74
Rochford (Tenbury) ..	52 18	2 36 "	316	Rev. John Tomson ..	C. R.	
§ Rosewell ..	55 51	3 7 "	690	R. B. Mitchell ..	E.	79
Rothamsted ..	51 48	0 22 "	368	Sir J. B. Lawes, Sir J. H. Gilbert, and T. Wilson.	F. G. S.	90
§ Rothesay ..	55 50	5 4 "	115	J. Kay ..	E.	
† Rounton, Yorkshire ..	54 24	1 18 "	242	Sir I. L. Bell, Bart., F.R.S.	E.	
† Rousdon, Devon ..	50 43	3 0 "	515	Sir C. E. Peek, Bart., M.A.	E.	
Roxborough, Co. Limerick ..	52 35	8 36 "	111	A. W. Shaw ..	R.	
Royal Sovereign Lightship ..	50 43	0 27 E.	—	Light-keepers ..	W.	
Rugby ..	52 22	1 15 W.	379	E. Kitchener, M.A., and St. J. B. W. Willson, M.A.	G.	
St. Ann's Head, Pembroke ..	51 41	5 30 "	150	G. H. Dunsford ..	T. S. W.	74
St. Aubin's, Jersey ..	49 12	2 11 "	25	J. Fisher ..	I.	90



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St. David's, Pembrokeshire	51 53	5 16 W.	215	W. P. Propert, LL.D.	D.	
St. Helen's, Lancashire ..	53 28	2 45 "	151	F. Drew Harris, M.D., for the Corporation.	G.	
St. Heliers, Jersey .. ..	49 11	2 6 "	—	Signal Officer, Fort Regent	S.	
St. Leonard's .. ..	50 51	0 33 E.	178	H. Colborne, M.R.C.S., for the Corporation.	D. F. S.	89
" (West Marina)	50 51	0 32 "	—	T. Eldridge, for the Corpo- ration.	G.	89
St. Peter Port, Guernsey ..	49 32	2 32 W.	222	F. E. Carey, M.D. .. ..	S.	
Salcombe, Devon .. ..	50 14	3 46 "	—	Coastguard .. ..	W.	
Sandgate, Kent .. ..	51 4	1 9 E.	56	A. Robert Bowles, C.E. ..	R.	91
Scarborough .. ..	54 18	0 24 W.	219	E. W. Ellerbeck and W. W. Larkin, for the Corpora- tion.	D. F. S.	87
Scarborough .. ..	54 17	0 23 "	—	Coastguard .. ..	W.	
Schull .. ..	51 32	9 32 "	—	" .. ..	G.	
Scilly Islands, St. Mary's ..	49 58	6 18 "	65	A. Hicks .. ..	B. S. T. W.	81, 82
Seafeld, Co. Clare .. ..	52 48	9 30 "	—	Coastguard .. ..	C.	
Seaham Harbour .. ..	54 50	1 19 "	148	G. H. Aird .. ..	W.	87
Seven Stones Lightship ..	50 4	6 5 "	—	Light-keepers .. ..	D.	
Shaftesbury .. ..	51 1	2 12 "	722	Miss L. H. Harris .. ..	W.	
Shambles Lightship .. ..	50 31	2 20 "	—	Light-keepers .. ..	F.	
Sheffield .. ..	53 23	1 29 "	429	E. Howarth, F.R.A.S. ..	W.	82
Sheephaven (Dunfanaghy)	55 11	7 58 "	—	Coastguard .. ..	D. S.	
Shields, North .. ..	55 0	1 27 "	99	W. B. Clark .. ..	W.	100
Shields, North, High Light- house.	55 0	1 27 "	—	T. Robson .. ..	T.	97
Shipwash Lightship .. ..	52 2	1 38 E.	—	Light-keepers .. ..	B.	
Shirley (Birmingham) ..	52 25	1 49 W.	460	B. Boothroyd .. ..	W.	81
Skipton .. ..	53 58	2 9 "	567	W. Farrer .. ..	F.	82
Solway Lightship .. ..	54 48	3 32 "	—	Light-keepers .. ..	G.	
Southampton .. ..	50 55	1 24 "	78	J. T. Cook, for Dir. Gen. of Ordnance Survey.	W.	
Southport .. ..	53 39	2 59 "	37	J. Baxendell, for the Cor- poration.	D. F. S.	
South Rock Lightship ..	54 25	5 22 "	—	Light-keepers .. ..	S.	
Spiddal, Co. Galway .. ..	53 15	9 17 "	—	Coastguard .. ..	W.	
Spurn Head .. ..	53 34	0 7 E.	26	A. S. Badcock .. ..	G.	87
Spurn Lightship .. ..	53 34	0 13 "	—	Light-keepers .. ..	T.	
Stokesay (Craven Arms) ..	52 26	2 52 W.	370	Rev. W. M. D. La Touche	W.	
Stonyhurst College .. ..	53 51	2 28 "	375	Rev. W. Sidgreaves .. ..	D.	
Stornoway .. ..	58 11	6 22 "	29	J. Mackenzie .. ..	A. D. F.	92, 96
" .. ..	58 11	6 22 "	—	Coastguard .. ..	T. S. C.	78
Stranraer .. ..	54 54	5 2 "	—	" .. ..	W.	
Strathpeffer-Spa, N.B. ..	57 37	4 28 "	253	J. Trégelles Fox, M.D. ..	G.	
Sumburgh Head (Shet- lands).	59 51	1 17 "	126	Rev. W. Brand .. ..	D. S.	78
Sunderland .. ..	54 54	1 23 "	—	Coastguard .. ..	T. C.	
Symbister, Shetlands ..	60 14	1 25 "	—	J. S. Nicolson .. ..	W.	
Syston, Leicester .. ..	52 43	1 5 "	178	S. K. Daniels .. ..	G.	
Tealby, Lincolnshire .. ..	53 24	0 16 "	251	Rev. S. Lewin, B.A. ..	R.	
Teelin, Co. Donegal .. ..	54 38	8 39 "	—	Coastguard .. ..	D.	
Temple Bruer, Lincolnshire	53 4	0 30 "	—	Miss G. Morley .. ..	W.	87
Tenby .. ..	51 41	4 42 "	79	R. J. Truscott, for the Cor- poration.	R.	75
Thurcaston (Leicester) ..	52 42	1 10 "	253	Rev. T. A. Preston, M.A. ..	D. S.	
Tixover Hall .. ..	52 35	0 33 "	129	Capt. H. E. Hotham .. ..	S.	88
Torquay .. ..	50 28	3 31 "	286	A. Chandler, for the Cor- poration.	G.	80
Totland Bay, Isle of Wight	50 41	1 33 "	84	J. Dover, M.A. .. ..	G.	
Union Hall, Co. Cork .. ..	51 33	9 8 "	—	Coastguard .. ..	G.	
Uzon (Montrose) .. ..	56 4	2 28 "	—	Coastguard .. ..	W.	
Valencia Observatory, Ca- hirciveen.	51 56	10 15 "	30	J. E. Cullum .. ..	A. T. C.	74, 93
" Island, Glanleam	51 56	10 20 "	—	Miss E. FitzGerald .. ..	R.	
" Knightstown	51 55	10 20 "	—	Coastguard .. ..	G.	
Ventnor .. ..	50 36	1 13 "	80	Miss M. Gibson .. ..	S.	

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Page where Inspec- tor's Report for 1899 will be found.
Wakefield .. .. .	53 41	1 30 W.	96	A. Clyde .. .. .	E.	90
Waterford .. .. .	52 16	7 7 "	—	Harbour Authorities ..	C.	
Watergate (Emsworth) ..	50 56	0 55 "	236	W. M. Christy .. .. .	R. S.	
Wealdstone .. .. .	51 37	0 20 "	179	G. E. Eland .. .. .	R.	
Wessington Court (Wool- hope) .. .. .	52 1	2 35 "	—	S. Lomas, for Miss L. Grafton.	D.	
Westbourne, Sussex .. ..	50 52	0 55 "	30	Rev. L. B. Birkett .. ..	S.	90
Westray, Orkney .. .. .	59 17	3 0 "	—	Capt. J. Hewison .. .. .	G.	
Whitchurch, Devon .. ..	50 32	4 6 "	593	E. E. Glyde .. .. .	E.	78
Wick .. .. .	58 27	3 6 "	80	J. Sinclair .. .. .	T.	
" .. .. .	58 27	3 6 "	—	Coastguard .. .. .	W.	
Wolfelee .. .. .	55 23	2 39 "	587	W. Gordon .. .. .	D.	90
Woolacombe, Devon .. ..	51 10	4 12 "	59	E. Henshall, C.E. .. ..	D.	
Workop .. .. .	53 22	1 5 "	56	H. Mellish .. .. .	S.	
Worthing .. .. .	50 49	0 22 "	38	C. Kelly, M.D., for the Cor- poration.	S.	
Yarmouth, Norfolk .. ..	52 37	1 43 E.	10	G. T. Watson .. .. .	B. T. C.	96, 100
Yarmouth, Isle of Wight ..	50 42	1 29 W.	—	Coastguard .. .. .	G.	
Ynis-y-bro (Newport) ..	51 38	3 3 "	115	C. Cullum .. .. .	R.	
York, Bootham .. .. .	53 57	1 5 "	105	H. Richardson .. .. .	S.	
" The Museum .. .. .	53 57	1 5 "	56	H. M. Platnauer, B.Sc. ..	D. T.	

In addition to those already mentioned, reports are received daily from the following Continental Stations.

Station.	Authority.	Station.	Authority.
Haparanda .. .. .	} Meteorological Office, Stock- holm.	†The Helder .. .. .	} Bureau Central Météorologique, Paris.
Hernösand .. .. .		Brussels .. .. .	
†Stockholm .. .. .		Cape Gris Nez .. .. .	
Wisby .. .. .		†Brest (St. Mathieu) ..	
Karlstad .. .. .	} Meteorological Institute, Christiania.	Lorient (Île de Groix) ..	
Bodö .. .. .		*†Rochefort (Île d'Aix) ..	
†Christiansund .. .. .		†Biarritz .. .. .	
*†Skudesnaes .. .. .		†Paris .. .. .	
Færder .. .. .		Belfort .. .. .	
†The Scaw .. .. .	} Meteorological Institute, Copenhagen.	Lyons .. .. .	
Fanø .. .. .		Nice .. .. .	
Cuxhaven .. .. .		Perpignan .. .. .	
	} Deutsche See- warte, Ham- burg.	Berlin .. .. .	} Cent. Met. Inst. of Germany.
		Wiesbaden .. .. .	
		Munich .. .. .	} Observatory, Lisbon.
		Corunna .. .. .	
		†Lisbon .. .. .	
		Azores (P. Delgada) ..	

Note.—The stations marked with an asterisk (\*) report also at 2h. p.m., and those with dagger (†) at 6h. p.m.; Lisbon reports at 4h. p.m. instead of 6h. p.m.  
The Helder does not send reports at 6 p.m. on Sundays.

## LIST OF BRITISH STATIONS ARRANGED UNDER COUNTIES.

County.	Station.	County.	Station.
England :—		England— <i>cont.</i>	
Bedford... ..	Aspley Guise.	Kent ... ..	Rede Court.
	Ridgmont.		Sandgate.
Berkshire ... ..	Maidenhead.	Lancashire ... ..	Blackpool.
Buckingham ... ..	—		Bolton.
Cambridge ... ..	Cambridge.		Darwen.
Cheshire ... ..	Bidston.		Fleetwood.
	Chester.		Heysham.
	Hoyle.		Lytham.
Cornwall ... ..	Falmouth.		Manchester.
	Newquay.		Prestwich.
	Scilly.		St. Helens.
Cumberland ... ..	Newton Reigny.		Southport.
Derby ... ..	Buxton.		Stonyhurst.
Devon ... ..	Arlington.	Leicester ... ..	Belvoir Castle.
	Cullompton.		Loughborough.
	Plymouth.		Syston.
	Prawle Point.		Thurcaston.
	Rousdon.	Lincoln ... ..	Fulbeck.
	Salcombe.		Market Rasen.
	Torquay.		Tealby.
	Whitchurch.		Temple Bruer.
	Woolacombe.	Middlesex ... ..	London :
Dorset ... ..	Parkstone.		City.
	Portland Bill.		Hampstead.
	Shaftesbury.		Pall Mall.
Durham ... ..	Durham.		Westminster.
	Seaham.		Wealdstone.
	Sunderland.	Monmouth ... ..	Newport.
Essex ... ..	—		Pant-y-reos.
Gloucester ... ..	Cheltenham.		Ynis-y-bro.
	Cirencester.	Norfolk... ..	East Dereham.
	Clifton.		Geldeston.
	Dursley.		Hillington.
	Hidcote.		Yarmouth.
Hampshire ... ..	Bournemouth.	Northampton ... ..	Colly Weston.
	Haslar.		Duddington.
	Hurst Castle.	Northumberland	Alnwick Castle.
	Pennington.		Morpeth.
	Southampton.		Newcastle-on-
	Totland Bay.		Tyne.
	Ventnor.		North Shields.
	Yarmouth.	Nottingham ... ..	Hesley Hall.
Hereford ... ..	Hereford.		Worksop.
	Wessington Court.	Oxford ... ..	Burford.
Hertford ... ..	Bennington.		Churchill.
	Berkhamsted.		Oxford.
	Rothamsted.	Rutland ... ..	Ketton Hall.
Huntingdon ... ..	—		Do. Vicarage.
Kent ... ..	Chatham.		Ridlington.
	Dover.		Tixover Hall
	Dungeness.	Shropshire ... ..	Stokesay.
	Kearsney.	Somerset ... ..	—
	Littlestone-on-Sea.	Stafford... ..	Cheadle.
	Margate.	Suffolk ... ..	Felixstowe.
	Plumstead.		Gorleston.

County.	Station.	County.	Station.
England— <i>cont.</i>		Islands :—	
Suffolk ...	Hollesley Bay.	Isle of Man ...	Cronkbourne.
	Lowestoft.	Jersey ...	St. Aubin's.
Surrey ...	Bramley.	Guernsey ...	St. Heliers.
	Brixton.		St. Peter Port.
	Cooper's Hill.		
	Cranleigh.		
	Kew.		
	Norwood.	Scotland :—	
	Peper Harow.	Aberdeen ...	Aberdeen.
Sussex ...	Bognor.		Braemar.
	Brighton.		Pennant Bay.
	Cuckfield.	Argyll ...	Laudale.
	Eastbourne.		Poltalloch.
	Forest Row.	Ayr ...	Ballantrae.
	St. Leonards.		Pinmore.
	Do. West	Banff ...	Gordon Castle.
	Marina.	Berwick ...	Burnmouth.
	Watergate Park.		Marchmont.
	Westbourne.	Bute ...	Lamlash.
	Worthing.		Rothsay.
Warwick ...	Edgbaston.	Caithness ...	Wick.
	Rugby.	Clackmannan ...	—
	Shirley.	Cromarty ...	Cromarty.
Westmoreland ...	—		Strathpeffer Spa.
Wiltshire ...	—	Dumbarton ...	—
Worcester ...	Rochford.	Dumfries ...	—
Yorkshire ...	Ampleforth.	Edinburgh ...	Edinburgh.
	Aysgarth.		Leith.
	Hawes.		Rosewell.
	Northallerton.	Elgin ...	—
	Oswaldkirk.	Fife ...	Burntisland.
	Rounton.	Forfar ...	Dundee.
	Scarborough.		Lednathie.
	Sheffield.		Uzon.
	Skipton.	Haddington ...	—
	Spurn Head.	Inverness ...	Ben Nevis.
	Wakefield.		Fort Augustus.
	York.		Fort William.
		Kincardine ...	Cove Bay.
		Kinross ...	—
		Kirkcudbright ...	Cargen.
			Glenlee.
			Glasgow.
		Lanark ...	—
		Linlithgow ...	—
		Nairn ...	Nairn.
		Orkney ...	Deerness.
			Kirkwall.
			Westray.
		Peebles ...	—
		Perth ...	Forgandenny.
			Ochertyre.
		Renfrew ...	—
		Ross ...	Ardross Castle.
			Glencarron.
			Stornoway.
		Roxburgh ...	Ladylaw.
			Wolfelee.
		Selkirk ..	—
		Shetlands ...	Lerwick.
			Sumburgh Head.
			Synbister.
Wales :—			
Anglesey ...	Holyhead.		
Brecknock ...	—		
Cardigan ...	—		
Carmarthen ...	Llandovery.		
Carnarvon ...	Llandudno.		
Denbigh ...	Colwyn Bay.		
Flint ...	Penbedw.		
	Rhyl.		
Glamorgan ...	Port Talbot.		
Merioneth ...	Aberdovey.		
	Dolmelynlyn.		
Montgomery ...	Churchstoke.		
	Llandinam.		
Pembroke ...	St. Ann's Head.		
	St. David's.		
	Tenby.		
Radnor ...	Disserth.		



County.	Station.	County.	Station.
Scotland— <i>cont.</i>		Ireland— <i>cont.</i>	
Stirling... ..	—	Dublin ... ..	Glasnevin Killiney.
Sutherland ... ..	Dunrobin Castle. Lairg.	Ferranagh ... ..	—
Wigton ... ..	Stranraer.	Galway ... ..	Arran. Cleggan. Recess. Spiddal. Killarney. Minard. Valencia. Do. Glanleam. Do. Knightstown.
Ireland :—		Kerry ... ..	—
Antrim ... ..	Belfast. Portrush.	Kildare ... ..	—
Armagh ... ..	Armagh.	Kilkenny ... ..	Kilkenny.
Carlow ... ..	—	King's Co. ... ..	Birr Castle.
Cavan ... ..	—	Leitrim ... ..	Carrigallen.
Clare ... ..	Ennis. Ennistymon. Hurdlestown. Kilcredane. Lahinch. Liscanor. Mount Callan. Newmarket-on-Fergus. Quin. Seafeld.	Limerick ... ..	Adare. Foynes. Limerick. Roxborough. Londonderry ... ..
Cork ... ..	Ballydonegan. Baltimore. Castletownshend. Crookhaven. Crosshaven. Doneraile. Roches Point. Schull. Union Hall.	Longford ... ..	Currygrane
Donegal ... ..	Malin Head. Sheep Haven. Teelin.	Louth ... ..	—
Down ... ..	Donaghadee.	Mayo ... ..	Ballyglass. Belmullet. Blacksod Point. Mallaranny.
Dublin ... ..	Dublin (City). Do. (Mountjoy Barracks).	Meath ... ..	—
		Monaghan ... ..	—
		Queen's Co. ... ..	—
		Roscommon ... ..	—
		Sligo ... ..	Markree Castle.
		Tipperary ... ..	—
		Tyrone ... ..	Lissan. Omagh
		Waterford ... ..	Waterford.
		Westmeath ... ..	—
		Wexford ... ..	—
		Wicklow ... ..	Bray. Newcastle.

## APPENDIX XIV.

## REPORTS OF INSPECTIONS, 1899.

## REPORT BY MR. R. H. SCOTT.

## IRISH AND WELSH STATIONS.

*Donaghadee*, visited September 15th.—The station is new, as the duty of reporting has been undertaken by the coast guard, the observer being Mr. D. Connolly, the station officer. I found him very intelligent and satisfactory, and the position of the instruments is better than formerly.

*Belfast*, visited September 16th.—I found that Mr. Andrew Carr, Secretary to Moore & Co., opticians, whose name had been mentioned to me by the Lord Mayor, had no proper place for thermometers and rain-gauge.

I then went to the Queen's College. Prof. Morton was unfortunately absent at the British Association Meeting, but I saw his demonstrator, Mr. Wylie. The observations are taken by the porter who seems very competent. The site for the rain gauge is rather sheltered by trees and the College buildings, but the space available is not extensive, so that there is no choice.

*Londonderry*, visited September 18th.—I regret to say that I do not see prospect of improving the arrangements at this station, but it is the only one to be found in the locality.

*Malin Head*, visited September 19th.—The observer here, John Putt, is new and is very satisfactory. I am very glad to find such a competent man at this important station.

*Edenfel, Omagh*, visited September 21st.—This station calls for no remark.

*Markree*, visited September 22nd.—I found everything right here. Col. Cooper wishes to undertake Earth Temperature observations, and also to institute magnetic observations, for which he has the necessary instruments, and an observer, Mr. Henkel, who has been trained at Kew Observatory.

*Blacksod*, visited September 25th.—I removed the instruments from Belmullet to this station. I had had some conversation with Mr. Abraham Marshall, the station officer, on the 24th, but on the day of inspection he had to leave for drill, so I had to instruct Hodge, the chief boatman.

The thermometers and rain-gauge are very well exposed in the coast guard enclosure. The site is good, and the sea disturbance is regularly observed by a look-out man from a signal tower, three times a day. Such information was unattainable at Belmullet. I have every confidence that Mr. Marshall will be a good observer. Blacksod commenced reporting by telegraph on October the 8th.

*Glasnevin*, visited September 28th.—This station was in good order. The observer, Pope, will be superannuated at the end of next month. I did not see his successor.

*Newcastle*, visited September 29th.—This station, at the Consumption Hospital, is very good. Dr. Steede, the physician in charge, is the observer. It is proposed to add to the buildings, and I cannot foresee whether the exposure will be affected.

*Holyhead*, visited October 2nd and 3rd.—I found that the new staging for the Robinson anemometer was all but completed. The altitude of the cups above the recording apparatus will be more than seven feet greater than it was at the old lighthouse, so I requested Mr. Cotton to send up the shafts to be lengthened before erection of the instrument. I also requested him to dismount the apparatus in the lighthouse. I visited the Sailor's Home on the 3rd, and found the reporting instruments in good order, and the station satisfactory.

*Birr Castle*, visited October 4th.—I found this station in fairly good order. The new climatological observer, John Spooner, is an army pensioner. I had occasion to speak to him about erroneous reports.

*Lahinch, Co. Clare*, visited October 6th.—This is a new rain station on the coast, not 100 yards back from the cliff. Miss Bowes, the observer, takes great pains.

*Hazelwood, Quin, Co. Clare*, visited October 7th.—Also a rain station. The gauge is in the garden, rather sheltered, and Mrs. Hallam Studdert, the observer, fears its being stolen if placed in an open field. I have recommended its being placed in front of the house.

*Valencia*, visited October 10th.—I found the instruments in very good order.

*Roche's Point*, visited October 11th.—The station is, as usual, in very good order.

*Kilkenny*, visited October 12th.—This is a weekly weather report station. Lord Ormonde takes the readings when he is at home. The instruments are in good order.

*St. Ann's Head*, visited October 13th.—The instruments are in order at this station. The observer, Mr. Knott, is to be removed on promotion, in a few days. His successor, Mr. Dunsford, wishes to have a second observer appointed, to share the responsibility with him.

*Tenby*, visited October 14th.—The old observer, Mr. Balmer, left in June, and his successor is Mr. R. J. Truscott, a consulting oculist, son of a local optician. He seems quite capable. The thermometers and rain-gauge are shortly to be removed from the private garden where they now are to a plot of ground belonging to the Corporation. This will be an improvement, but the new site is not unexceptionable, though no more open space is to be found at Tenby.

## CORRECTIONS FOR THE THERMOMETERS AT THE STATIONS.

STATIONS.	Inspector's Standard.	Dry Bulb.	Wet Bulb.	Max. Thermometer.	Min. Thermometer.	Gross Min.	Spare Thermometer.	REMARKS.
Belfast (Queen's College).	°	°	°	°	°	°	°	Examined at Kew, June, 1899.
Blacksod Point ..	54·8	-0·7	-0·6	+0·1	-0·6	—	—	
Donaghadee ..	55·7	-0·5	-0·6	-0·3	+0·3	—	-0·3	
Edenfel (Omagh)	51·9	—	—	0·0	-0·1	—	-0·6	
Glasnevin .. ..	52·1	-0·6	-0·5	0·0	+0·1	+0·8	—	
Holyhead .. ..	53·2	-0·6	-0·2	+0·4	+0·1	—	-0·5	
Kilkenny .. ..	54·9	—	—	-0·1	0·0	—	—	
Londonderry ..	54·3	-0·7	-0·7	+0·2	+0·3	—	—	
Malin Head .. ..	54·0	-0·3	-0·3	-0·2	-0·9	—	-0·8	
Markree .. ..	51·8	-0·3	-0·2	-0·4	+0·5	—	—	
Newcastle (Co. Wicklow).	55·4	-0·6	-0·7	+0·2	-0·5	—	—	Spirit separated in minimum.
Parsonstown ..	54·2	-0·7	-0·1	0·0	+0·1	—	—	For 9 a.m. and 9 p.m.
Ditto .. ..	—	—	—	-0·6	+0·1	—	—	For telegraphic reports.
Roche's Point ..	55·0	-0·4	-0·4	-0·1	+0·2	—	-0·8	
St. Ann's Head ..	52·2	-0·8	0·0	+0·1	-0·5	—	-0·6	
Tenby .. ..	52·1	-0·4	-0·4	-0·1	+0·1	0·0	—	
Valencia .. ..	58·0	-0·8	-0·7	-0·4	0·0	—	0·0	

## REPORT BY DR. BUCHAN.

## SCOTTISH STATIONS.

## BAROMETERS.

The barometers at the stations were compared with inspector's standard barometer No. 690, which continued to be in good order during the inspection. The station barometers were all found to be in good order.



Table I. gives the comparisons of the readings of No. 690 with the readings of the various station barometers.

TABLE I.

STATIONS.	Inspector's Standard No. 690 corrected.	Reporting Barometer uncorrected.	Check Barometer uncorrected.	REMARKS.
Ochtertyre .. ..	Inches. 29·872	Inches. 29·858	Inches. —	
Fort William .. .	30·295	30·290	—	
Fort Augustus .. .	30·290	30·288	—	
Stornoway .. ..	29·831	29·826	broken.	
Strathpeffer .. .	29·309	29·307	—	
Wick .. ..	29·884	29·884	29·882	
Dunrobin .. ..	30·195	30·194	—	
Lairg .. ..	29·764	29·750	—	
Nairn .. ..	30·274	30·274	30·274	
Kingussie .. ..	29·484	29·486	—	
Gordon Castle .. .	—	—	—	Barometer under repair.
Aberdeen .. ..	30·119	30·115	—	
Edinburgh .. ..	29·130	29·135	—	
Leith .. ..	29·370	29·368	29·367	
Rosewell .. ..	28·760	28·752	—	
Glasgow .. ..	28·890	28·894	—	
Pinmore .. ..	29·229	29·230	—	
Dundee .. ..	29·612	29·610	—	

## THERMOMETERS.

The thermometers were read twice, first, by the observers immediately on opening the thermometer screen where they are hung, and then by the inspector after being in water along with standard thermometer for the times specified in the table. Particular attention was given to the action of the maximum thermometers, and also to the state of the minimum thermometers.

As regards the latter at Rosewell, fully a degree of the spirit was lodged near the top of the tube, under the rather thickish guard. This the observer, under direction, rectified.

TABLE II.

STATIONS.	Inspector's Standard No. 433.	Dry Bulb.	Wet Bulb.	Max. Ther- mometer.	Min. Ther- mometer.	Spare Ther- mometer.	Time in Water.	Change of Temperature.	
Ochertyre ..	58.4	0.0	-0.1	0.0	-0.1	—	min. 130	0.0	B B. Min. 0.0°
Fort William ..	65.0	+0.1	+0.1	0.0	0.0	—	140	0.0	
Fort Augustus ..	65.4	+0.1	+0.1	+0.2	-0.5	—	135	0.0	
Stornoway ..	64.1	+0.7	+0.7	-0.2	0.0	—	135	+0.3	
Strathpeffer ..	58.6	0.0	0.0	0.0	+0.1	—	75	-0.2	
Wick ..	57.7	+0.4	+0.5	0.0	-0.1	—	80	-0.3	
Dunrobin ..	58.9	0.0	0.0	+0.1	+0.1	—	140	+0.3	
Lairg ..	55.1	+0.1	0.0	-0.1	0.0	—	75	+0.2	
Nairn ..	60.4	+0.7	+0.7	+0.2	-0.3	0.0	65	+0.2	
Kingussie ..	62.2	+0.2	+0.1	-0.3	-0.3	—	80	0.0	
Gordon Castle ..	61.2	+0.1	0.0	0.0	-0.1	—	60	+0.3	Min. on Grass 0.0°
Aberdeen ..	61.8	+0.1	+0.1	+0.1	+0.1	—	95	0.0	
Edinburgh ..	56.1	+0.2	+0.2	-0.4	0.0	—	90	+0.2	
Leith ..	57.3	+0.2	+0.3	0.0	-0.4	—	80	0.0	
Rosewell ..	53.0	-0.3	0.0	+0.1	-0.2	—	130	0.0	
Glasgow ..	52.3	-0.3	-0.1	—	—	—	205	+0.2	
Pinmore ..	51.7	0.0	+0.1	-0.2	-0.1	—	120	+0.2	
Dundee ..	52.0	-0.5	-0.4	+1.3	+0.3	—	80	0.0	

## HYGROMETERS.

The dry and wet bulb thermometers were in all cases read immediately on opening the thermometer screen, with the gratifying results that the readings well represented the hygrometric condition of the air at the time.

## NOTES OF INSPECTION OF THE STATIONS.

*Ochertyre*, August 7th, 1899.—The instruments were in excellent order, and the observations continue to be made with fulness, care, and much enthusiasm. Observations of underground thermometers are made five times daily.

*Fort William*, August 10th, 1899.—The instruments are in excellent order, and the observations are made with care, correctness, and punctuality. The maximum and the minimum

thermometers kept in the screen for photographic purposes were also examined, when the readings were :—

Maximum thermometer	...	...	0.0°
Minimum thermometer	...	...	—0.9°

This minimum thermometer appears to read lower every year, as if there was a slow leakage somewhere. A new one is required to replace it.

*Fort Augustus*, August 11th, 1899.—All the instruments were in very good order, and the greatest care is given to secure fulness and accuracy in the observations. Clouds are very fully observed as regards their species, velocity, and direction of movement, together with their heights on the surrounding mountains; and the height of snow on the hills is also noted.

*Stornoway*, August 15th, 1899.—The irregularities in the curves of the barograph have been occasioned by the clock being out of order. This is now rectified. The rack of the barometer slips down unless when kept up by the hand. The spare barometer taken to this station last year is broken. It is desirable that two new barometers, and a dry bulb and wet bulb hygrometer, and a thermometer screen be sent to Stornoway. So far as possible to the observer, the instruments are kept in good order, and the observations, particularly of the wind, are made with admirable care and skill.

*Strathpeffer*, August 16th, 1899.—A new rain-gauge was added some time ago, and was at once to be placed in a better position than the old one. Both gauges were read for some months together. The instruments are well attended to, and much care and attention is given to the observations.

*Wick*, August 17th, 1899.—The instruments are in good order, and Miss Sinclair, on whom the work of observing chiefly falls owing to the declining health of her father, makes the observations with intelligence and care.

*Dunrobin*, August 18th, 1899.—The instruments were in very good order, and the observations are made with much intelligence and care.

*Lairg*, August 19th, 1899.—The instruments were in excellent order, and the observations are made with accuracy and punctuality.

*Nairn*, August 21st, 1899.—The instruments were all in excellent order, and much care, expertness, and accuracy shown in making the observations.

*Kingussie*, August 21st, 1899.—The instruments are all good, and well attended to, and Dr. W. de Watteville is an intelligent and singularly accurate observer. He is assisted by the local chemist with the observations of the wind, which are made at 8 a.m. and 4.30 p.m.

*Gordon Castle*, August 23rd, 1899.—The barometer here had been sent to Aberdeen for repair, where I saw it on the 26th, and as the tube required to be reboiled it was forwarded to Edinburgh. Otherwise the instruments were in very good order, and the observations continued to be well attended to.

*Aberdeen*, August 24th, 1899.—All the instruments were in excellent order, and the observations are made in a manner leaving nothing to be desired. An earlier despatch on Sundays of the telegraphic report to London is promised. The following readings of thermometers in screen of the observatory were made: maximum,  $61.8^{\circ}$ ; minimum,  $61.4^{\circ}$ , the standard being at the same time  $61.8^{\circ}$ .

*Edinburgh*, September 18th, 1899.—A new soil thermometer for a depth of 3 inches had just been added to replace one that had recently been broken. The instruments were all in excellent order, and the observations are made with the greatest care and accuracy.

*Leith*, September 19th, 1899.—The wet bulb was very well moistened, but, as the cloth was somewhat dirtied with the dust of Leith, it was recommended that it be changed every fortnight. The rain-gauge, which is getting old, was deformed, and the observer was instructed to get it put right, otherwise the instruments were in fairly good order. Mr. Richardson, the chief observer, had been confined to the house through illness for some time. At this station a good deal of care and attention are given to the observations.

*Rosewell*, September 22nd, 1899.—About  $1.5^{\circ}$  of the spirit of the minimum thermometer was lodged near the top of the tube, concealed under the rather thickish guard. This was, under direction, rectified by the observer. Otherwise the instruments were in very good order, and the observations are made with accuracy and fulness, and, it may be added, that the figuring in the schedules sent is exceptionally good.

*Glasgow*, September 26th, 1899.—The instruments were all in excellent order, and the observations continue to be made with great care, skill, fulness, and accuracy. An electric light is used in reading the barometer.

*Pinnore*, September 27th, 1899.—The instruments were in very good order. Mr. Donald, the observer, is seriously ill, but still takes a general charge of the observations, which are now made by his son who is a remarkably good observer.

*Dundee*, September 29th, 1899.—The instruments were in very good order, and the observations continue to be made with much care and accuracy.

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## REPORT BY MR. F. GASTER.

*Arlington Court*, North Devon. Inspected on October 10th.—This is at present only a weekly weather report station, as far as this Office is concerned, but there are also dry and wet bulb observations taken daily from instruments *well* exposed in a Stevenson's screen, and a barometer. The error of this instrument I could not ascertain as I had no standard with me at the time.

The exposure is very good, there are two gauges, and everything (excepting the wet bulb mounting) was in perfect order.

*Prawle Point*, visited on October 11th.—I brought the instruments away from this station. They were all in good order, excellently exposed, and the wet bulb was properly mounted.

*Plymouth*, Second order station. Inspected on October 12th.—Instruments in remarkably good order, very well placed, and their indications carefully recorded.

*Hurst Castle*, visited on October 14th.—From this station also I brought away all the meteorological instruments—the station being no longer required.

*Totland Bay*, visited on October 16th.—This is a second order station. Since last inspection, the instruments have all been removed to a new position, about 50 feet higher than the old house. Their exposure is admirable, and the greatest care is taken by the observer, in order to ensure accuracy and promptitude. After dismounting the wet bulb for verification, the observer himself remounted it quite accurately.

## CORRECTIONS FOR BAROMETERS.

Stations.	Reading of Standard.	Correction to Observer's Bar.	Notes.
Plymouth .. ..	29.580	in. — '004	Observer's Bar No. 214.
Totland Bay .. ..	29.789	— '002	„ „ No. 565.

## CORRECTIONS FOR THERMOMETERS.

Stations.	Dry.	Wet.	Maximum.	Minimum.	Spare or Grass.	Standard No. 583.	Notes.
Arlington Court..	—	—	— 0.2	+ 0.2	—	53.6	Correction to grass minimum verified.
Plymouth .. ..	0.0	— 0.1	0.0	+ 0.5	— 0.3	56.0	
Totland Bay ..	— 0.6	— 0.1	0.0	+ 0.4	— 0.2	53.9	

## REPORT BY MR. R. H. CURTIS.

## TELEGRAPHIC REPORTING STATIONS.

*Scilly*.—At this station the stems of both the maximum and minimum thermometers were loose upon their frames, and as they are not divided upon the stems an error was always possible, which in the case of the minimum might exceed a degree. The errors of the instruments were determined after the stems had been secured. The can of the rain-gauge leaked badly, and I had it soldered. The deputy observer here has recently come from Malin Head, where he was the observer for the Office, and he is therefore quite familiar with the work.

*Bidston*.—Mr Plummer was away from home, but his assistant showed me the instruments. A new rain-gauge was recently substituted for the one previously in use, but no other alteration had been made in the equipment of the station since last inspection. The thermometer screen used here is not of the usual pattern adopted by the Office.

## STATIONS OF THE SECOND ORDER, AND WEEKLY WEATHER REPORT STATIONS.

*Edgbaston*.—This station was in excellent order, and the observer is keenly interested in the work. The position of the sunshine recorder could not be better than it is. The observer is willing to send a weekly return of sunshine if it is desired, and if the necessary forms are sent to him.

*Shirley*.—The instruments here are well-placed and were in very good order; the rain-gauge required to be made firm.

*Cronkbourne, Isle of Man*.—The index of the minimum thermometer does not always come back with the spirit, and the instrument requires to be carefully watched; but with this exception all was in perfect order, and the station is very carefully attended to. Rainfall stations are about to be established amongst the hills of the island.

*Lytham*.—The instruments have been removed to the Park, where they have an excellent exposure; there is, however, no barometer capable of giving accurate readings. Dr. Jenkins has been away for some months, and in his absence the observations are made by Dr. Birch.

*Newton Reigny*.—The observer here had intended to discontinue his observations in October, but in view of the fact that the Office is otherwise quite unrepresented in the district he has agreed to continue the station for Weekly Weather Report purposes. He was away from home when I called, but his instruments are good, and are well-placed, and the observations appear to be carefully made.

*Aysgarth*.—The observer was away and his house let during his absence. The observations were being taken by the Rev. Mr. Remington, in the village, about a mile distant from Mr. Stow's

house. I took particulars as to this temporary site and the instruments in use.

*Skipton*.—Everything at this station was in perfect order, and great care is taken with the observations. Up to now no arrangements have been made for evening observations.

*Darwen*.—The barometer here has been repaired since last summer, but owing to an accident to my standard I was not able to verify it. The minimum thermometer had been broken not long before my visit. The station is well-equipped with instruments, which appear to be carefully attended to.

*Manchester*.—The instruments here are all in good order, and the observations appear to be made carefully. Some further observations asked for will be supplied in future.

*Prestwich*.—Here also the condition of the instruments and the care bestowed upon the observations leaves nothing to be desired.

*Sheffield*.—The thermometer screen was very dirty, but is to be repainted at once, and this will in future be regularly done once a year. All the instruments were in good order, and are carefully observed.

#### ANEMOMETER STATION.

*Scilly*.—The *Robinson Cup* Anemometer was in fair condition but the top bearing of the cups was quite dry. The arrow head and the tail of the vane were both a little loose, and I therefore inserted lead washers and screwed them up tight. All the parts were cleaned and oiled, including the clock, and left working in a very satisfactory manner.

The *Pressure-tube* anemometer was in good order except that the water-level was too low, giving rise to an error of two miles in all the curves, and that the pen was dirty and clogged. I pointed out to the observer the importance of watching both these points. The vane worked very freely and I therefore did not dismount it, but I showed the observer how to do so in case of necessity, without using a ladder, as he has hitherto done. The water in the container showed a very slight white deposit. Since my visit to this date the traces have shown considerable improvement, and there have been no losses of record.

I looked carefully to see whether it was likely that the works now being carried out close to the anemometers would be likely to affect their records. At present it cannot be seen to what extent this will be the case when the works are completed, but I do not think their effect will be great, as the works are rather below the highest part of the hill; in any case the pressure-tube will not suffer. Temporarily there are some sheds, and heaps of debris, &c., which are level with the cups of the Robinson instrument; and since they are not many yards away the wind, when it blows from their direction, must be influenced by them. But they all lie between S.S.E. and S.W. from the anemometers, and I was told that within the next twelve months they would probably be removed. From S.W. through N. to S.S.E. the exposure is, and will remain, as it always has been.

## CORRECTIONS FOR BAROMETERS.

STATION.	Standard corrected.	Reporting Barometer.	Check Barometer.	Difference Standard—Reporting.	NOTES.
Scilly .. ..	ins. 29·874	ins. 29·878	ins. 29·870	ins. -·004	Owing to breaking of the Standard no barometer comparisons could be made at stations subsequently visited.
Edgbaston ..	·665	·666	..	-·001	
Cronkbourne ..	29·820	29·820	..	·000	

## CORRECTIONS FOR THERMOMETERS.

STATION.	Inspector's Standard.	Corrections found for:—						NOTES.
		Dry Bulb.	Wet Bulb.	Spare Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Grass Minimum.	
Scilly .. ..	62·0	-0·7	-0·5	-0·1	-0·7	-0·3	—	Maximum and minimum read at 8 a.m.
Edgbaston ..	60·7	-0·6	-0·5	—	-0·2	0	+0·2	
Shirley ..	65·8	—	—	—	-0·2	+0·1	—	
Bidston ..	62·0	0	-0·5	—	-0·1	-0·1	—	Maximum and minimum read at 9 a.m.
—	—	—	—	—	0	+0·4	—	The index of the minimum is apt to get left behind by the spirit.
Cronkbourne	55·5	-0·6	-0·7	—	-0·1	+0·2	+0·3	
Lytham ..	60·2	-0·5	-0·2	—	0	+0·1	—	
Newton Reigny.	54·5	—	—	—	-0·5	-0·1	—	These instruments were being used by the deputy observer, but I gathered they are not those used by Mr. Stow himself.
Aysgarth ..	51·8	-0·2	-0·4	—	-0·3	-0·2	—	
Skipton ..	50·9	-0·1	-0·1	—	0	0	+0·2	
Darwen ..	48·0	0	0	-0·8	0	—	+4·5	A large amount of spirit at top of tube of grass thermometer.
—	—	—	—	—	—	—	+1·0	Correction after spirit had been removed.
Manchester ..	56·8	-0·2	-0·2	—	+0·5	0	9	Second trial, in warmed water.
—	64·5	—	—	—	+0·5	—	—	
Prestwich ..	57·3	-0·5	-0·3	—	-0·2	-0·2	-0·2	
Sheffield ..	55·0	-0·4	-0·5	—	-0·2	-0·2	+0·1	



**HOLYHEAD ANEMOMETERS.****Robinson Anemometer : Removal to new site on Salt Island**

The stand, which had been already erected by Mr. F. Cotton, C.E., the Harbour Engineer, is in every way satisfactory. It is perfectly rigid—some additional struts having been inserted near the base to further secure this end; its exposure is good and it is so arranged as to afford ready access to the exterior portion of the anemometer; whilst the hut below for the accommodation of the recording apparatus is commodious and well lighted.

Every part of the anemometer was very carefully examined and found to be in good condition, those which had required repair having been to Munro's for the purpose. Every section, including the clock, was cleaned before being put in its place, and after re-erection the instrument yielded very satisfactory traces. Points for use in orienting the vane were determined and afterwards again verified.

The height of the platform upon which the base of the exterior portion of the anemometer rests is 20 feet above the ground, and the centres of the cups are 4 ft. 6 ins. above the platform. The hut is about 25 yards south of the Bridled and other two anemometers, and the ground level being a little higher, the cups are about 4 feet higher above sea level than the pressure-plate erected in 1897.

By reference to the vanes of the pressure tube and pressure plate anemometers it was quite apparent that the windmill vane did not point correctly to the "eye of the wind." I had suspected this before (Minutes 1894-95, p. 37), and I now adjusted the pencil so that it should record the direction indicated by the pressure-tube vane, which was pointing North when the windmill vane pointed N.N.W. I was able to test it with fresh winds, from S.S.E. through West to North, and found the error of two points constant throughout.

**BRIDLED ANEMOMETER.**

This instrument was dismounted and cleaned, and found to be in very good condition. The traces obtained are good, but the reservoir of the wheel-pen in use had a slight leak, which had to be made good. The cups were quite free from the indentations which have generally been found in previous examinations.

**PRESSURE TUBE ANEMOMETER.**

The only point calling for notice in this instrument was the continued corrosive action which was taking place in some of the joints. The float was in perfect order, but the lower part of the cover had become so bad as to make re-soldering absolutely necessary, and there was also a trifling leak at the bottom of the "container," which, however, was readily stopped by red lead. As I could not get the cover done during my stay I left instructions with Mr. Davis, who will get it done at once. The vane was working quite freely.

## PRESSURE-PLATE ANEMOMETER.

The head of this instrument was taken down and carefully examined. I found the lignum vitæ bearings had effectually stopped the grinding, which was at first such a source of trouble. It was evident, however, that the tube carrying the plate ought to have been square instead of round. This would have prevented the tendency to revolve, which seems to be due to slight inequalities of pressure upon the plate, and results in some friction being put upon the pulley which carries the chain leading to the spring, the top of which works within the tube.

The aluminium tail to the vane was too flexible, and I therefore stiffened it by two thin strips of yellow pine which I screwed along its upper edge. I also put upon a rod, which projects beyond the tube, a small grooved wheel to work against the lower edge of the vane, so as to assist in preventing the tube from revolving.

The wire cord leading from the chain to the spring was unsatisfactory, because it was impossible to free it from "kinks." A chain right through would no doubt be the best thing, except that its weight would be fatal to records of moderate winds; I therefore got and fixed a good whip cord, the only objection to which is its hygroscopic nature, but I think it will be easy, by soaking it in boiled linseed oil, or some similar medium; to get over this difficulty, and I anticipate better results by its use.

I altered the pawls of the ratchet so as to give readings to *half a pound*, instead of to pounds only as before.

The first hut, and all the exterior iron work of the three anemometers adjoining it, is much in need of repainting, and I therefore asked Mr. Cotton to have this done.

It is only due to Mr. Davis, the observer, to report that he keeps his instruments in excellent order.

With reference to the error in the Holyhead windmill vane, the question arises as to how far the indications of instruments of this form can be accepted as correct until each has been tested in some way. Up to the present time I believe this has never been done. Mr. Munro tells me that no actual test is applied to them by him, beyond taking care in their construction; the Holyhead instrument, however, was not made by him but by Beck.

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REPORT BY MR. JOHN A. CURTIS.

*Bawtry, Hesley Hall, October 5th.*—I found everything in good order at this station, and the observations are, I believe, carefully and intelligently attended to.

*Durham, October 2nd.*—Mr. H. J. Carpenter, F.R.A.S., has now left the observatory, and the new observer (who has been an assistant to Prof. Turner, at Oxford, for two years) had not yet

come into residence. I, however, saw Prof. Sampson, the Director of the observatory, who was acting as interim observer, and went over the details of the work with him. All the instruments were in good order except that the grass minimum had about  $5^{\circ}$  of detached spirit, which I corrected. A Stevenson screen has been obtained to replace the Glaisher stand at present in use. I selected a position for the new screen, and asked that observations may be taken in both screens for a time. This, it was promised, should be done.

*Felixstowe*, September 21st.—This is a new weekly weather report station. The observer, the Rev. J. G. Munday, was from home, but I saw the Rev. W. Ward, the deputy observer. The instruments are good and are well exposed, but the rain-gauge was not firmly fixed, and the wet-bulb (the observations from which, though regularly taken, are not sent to us) was not properly mounted. The sunshine recorder (a Jordan) is fixed on top of the Stevenson screen, and will lose a little sunshine in the early summer mornings, and *possibly* a little in the winter, about 11 a.m. I think the observations represent Felixstowe very well.

*Fulbeck*, September 28th.—All the instruments were clean and in good order at this station, and the work is very carefully done, though not with quite the same minuteness as at some other stations. The observer, the Rev. Vere F. Willson, M.A., takes great interest in the observations, especially in those of rainfall.

*Geldeston*, September 23rd.—Everything was in perfect order at this station, and the observations are conducted with the utmost care and accuracy.

*Hollesley Bay*, September 22nd.—Both the instruments and their exposure at this station leave nothing to be desired, and Prof. Thonger attends to the work with great care and enthusiasm. The maximum thermometer, however, has a large error owing to the separation of a portion of the mercury, which I quite failed to reunite. The observer had been applying a correction of  $+1.5$  for this, but I gave instructions to use  $+2.0$  in future.

*Ketton*, September 26th.—This is a new weekly weather report station, in succession to Duddington, some three miles distant. The observer (Mr. Fred. Coventry) and the instruments are the same, and the position of Ketton with regard to the valley of the Welland is so like that at Duddington that the one station may well be accepted as a continuation of the other. The instruments were clean and in good order, and their exposure is also good. Mr. Coventry takes great interest in the work.

*Ketton Hall*, September 26th.—This is a rainfall station, with a new observer. The gauge was firmly fixed, but the measuring glass was not quite clean, neither did it agree very exactly with the one supplied to me as standard. The difference however will not appreciably affect the record, and I made no change.

*Ketton Vicarage*, September 26th.—This is a new rainfall station. The gauge stood on a small lawn in front of the house, and was much sheltered by walls and trees. I recommended its



removal to a position—which I selected—on the edge of the lawn at the back of the Vicarage, where the exposure will be much improved, and the observer promised that this should be done.

*Lowestoft*, September 25th.—I was asked to report as to the sunshine recorder at this station. I found the instrument clean, in good order, and very carefully attended to. The exposure is certainly good, and is probably the best that can be obtained in Lowestoft. Some trees, however, interfere to a certain extent, and if these could be topped, it would be an advantage.

*Morpeth*, October 4th.—The instruments at this station were all in very good order, and Mr. Berry, the observer, is most painstaking and careful. The exposure of the instruments is excellent.

*Newcastle-on-Tyne*, October 4th.—Everything was in good order here. The outfit of instruments is very complete, including as it does a *Richard* barograph and thermograph, a sunshine recorder, and a small dial anemometer. The observations are taken with care and intelligence.

*Scarborough*, September 30th.—I was asked to report on the sunshine recorder. I found the instrument exposed on a wooden platform, 2 feet square, fixed on the ridge of the roof of the observer's house. The exposure, though not perfect, is certainly very good. The ball was not central in the bowl, but this I was able to correct. The wooden platform warps with changing weather, and the observer has applied to have a stone slab fixed in its stead. This will be a decided improvement.

*Seaham*, October 3rd.—Everything was in good order, and the observations are carefully made and reduced. Owing to the extension of the railway the present position of the thermometer screen and rain-gauge will become unsatisfactory. I therefore selected and marked out new positions in the same plot of land for use when required.

*Spurn Head*, September 29th.—The principal light-keeper had just been changed, and the new observer, Mr. A. Badcock, who came to Spurn on September 16th, had had no previous experience in reporting for the Office. I therefore went over the details of the work carefully with him, and I think he will prove to be a satisfactory observer. His minimum thermometer was altogether out of order, but I reunited the spirit and showed him how to proceed in any similar case in future. Owing to the constant drift of sand the thermometer bulbs are now too near the ground, the dry-bulb, wet-bulb and minimum being only 3 feet 4 inches from the surface. I recommend that instructions be given to have this altered.

*Temple Bruer*, September 28th.—This is the new rainfall station on Lincoln Heath, which has been established by the Rev. V. F. Willson, of Fulbeck. Miss Morley, the observer, was ill at the time of my visit, but I saw her brother. The station is about two miles from and 30 feet lower than the western edge of the Heath, in a very open situation, with but few trees. The gauge is placed in a kitchen-garden, and I impressed on



Mr. Morley the importance of taking care that no high crop was allowed to shelter it. He promised that, as now, it should be kept freely exposed.

*Tixover Hall*, September 26th.—This is a new rainfall station. The gauge is a new one, 5-inch, and is excellently exposed on the open lawn to the north of the Hall. It was not quite firmly fixed, but Mrs. Hotham (Capt. Hotham, who personally attends to the instrument, was from home) promised that this defect should be at once remedied.

*Uppingham*, September 27th.—The late observer, the Rev. G. H. Mullins, M.A., having left Uppingham, I called on Mr. C. H. Jones, the Master who had temporarily undertaken the work. I found, however, that owing to pressure of other duties Mr. Jones was unable any longer to continue the observations single handed, and that therefore they had now ceased.

#### CORRECTIONS FOR BAROMETERS.

STATIONS.	Reporting Barometer.	Check Barometer.	REMARKS.
Durham .. .. .	—	—	Standard deranged.
Fulbeck .. .. .	+ '005	—	
Geldeston .. .. .	+ '010	—	
Hollesley Bay .. .. .	+ '002	—	
Morpeth .. .. .	+ '015	—	
Newcastle-on-Tyne .. .. .	+ '018	—	
Seaham .. .. .	—	—	Standard deranged.
Spurn Head .. .. .	+ '017	+ '019	

#### CORRECTIONS FOR THERMOMETERS.

STATIONS.	Inspector's Standard.	Dry Bulb.	Wet Bulb.	Maxi- mum.	Mini- mum.	Grass Min.	Spare.	REMARKS.
Bawtrey .. .. .	50.3	0	0	0	0	0	0	
Durham .. .. .	47.4	-0.2	0.0	-0.3	-0.2	—	—	
Felixstowe .. .. .	58.0	+0.1	+0.2	+0.2	+0.2	—	—	
Fulbeck .. .. .	57.7	-0.3	-0.4	-0.2	-0.1	—	—	
Geldeston .. .. .	56.0	-0.6	-0.8	-0.4	0.0	—	-0.6	
Hollesley Bay .. .. .	59.1	-0.1	-0.1	+2.0	+0.3	+0.2	—	
Ketton .. .. .	56.2	0.0	+0.6	-0.1	+0.1	—	—	
Morpeth .. .. .	53.5	-0.2	0.0	-0.1	+1.1	0.0	—	
Newcastle-on-Tyne.	54.9	-0.2	-0.2	-0.2	-0.1	—	—	
Seaham .. .. .	65.9	-0.9	-0.9	+0.9	+0.2	—	-0.8	
Spurn Head .. .. .	55.8	-0.3	-0.1	-0.2	+0.5	—	—	

## REPORT BY MR. F. J. BRODIE.

## STATIONS OF THE SECOND ORDER.

*Eastbourne*, September 23rd.—Everything at this station appeared in a very satisfactory state. The observer had been in the habit of setting the vernier of the barometer too low, but will in future conform to the usual practice. Mr. Sheward hopes shortly to train a deputy observer.

*St. Leonards*, September 25th.—The instruments were all in a good condition. Since last year a new Stevenson's screen has been set up. A new sunshine recorder has also been procured, the glass ball of the old one having been found to be in an unsatisfactory state. The new recorder has been placed above and immediately behind the old one, which still remains in position.

*St. Leonards, West Marina*, September 25th.—Observations of temperature and rainfall only are made at this station. The instruments were all in good order, and the observer, Mr. Eldridge, seemed careful and intelligent.

*Littlestone-on-Sea*, September 26th.—This is a station to be presently established by Mr. H. T. Tubbs, who had already been in correspondence with the office on the subject. On my way to Dungeness I called upon the man who would in all probability be the acting observer, and selected sites for the various instruments. I suggested that the sunshine recorder should be placed on the top of the water tower. This would also form an excellent position for an anemometer.

*Chatham (School of Military Engineering)*, September 28th.—The rain-gauge here is of the Glaisher pattern, with a short curved delivery tube, and the receiving can seemed to be too small to catch all the rain unless placed with great care in the centre of the gauge. I advised the use of a larger can, and Major MacDonnell promised that one should be procured. The readings of the minimum thermometer, which were for some time entered to the day preceding that of observation, are now correctly inserted, the change commencing with January 1st of this year.

*Rochester, Rede Court*, September 29th.—Everything here was in a most satisfactory condition, and the observer evidently takes very great interest in the work.

*Maidenhead*, September 30th.—This is a new station, and had not hitherto been inspected. The instruments are good, but the thermometer screen is only a single louvred structure of the observer's own make. It is too small, and is placed close to a hedge. I strongly urged the importance of getting a Stevenson's screen, and selected a better site for it, but the observer was about to start shortly for Egypt, and said that no change could be made until his return, in about three months time.

*Harpenden*, October 2nd.—The two terrestrial radiation thermometers read much too low, but the cause of the error was not evident. The screen is still an enlarged "Stow," and is not very firmly fixed.

#### TELEGRAPHIC REPORTING STATIONS.

*Jersey (St. Aubins)*, September 18th.—The wet-bulb thermometer read nearly a degree and a half too high, and I therefore directed the observer to substitute for it the spare thermometer. Some time was spent in explaining the kind of "remarks" we required in the daily telegrams. The position of the sunshine recorder at Fort Regent had not been changed, and the instrument appeared to be properly looked after by Gunner Wright.

*Dungeness*, September 26th.—The instruments here were in a good condition, and the observer, Mr. Grimmer, seemed careful and intelligent. In order to test very carefully the accuracy of the barometers I employed as the standard an instrument with an uncontracted tube, and while at the station took observations at intervals of half an hour. A mean of eight observations showed that the reporting barometer (No. 618) read .015 inch lower, and the check barometer (No. 619) .011 inch lower than the standard, the readings being in every case corrected for index error. The weather at the time was squally, and the mercury was "pumping" a good deal.

#### WEEKLY WEATHER REPORT STATIONS.

*Rothamsted*, October 2nd.—The sunshine recorder and rain-gauge were in a satisfactory state. The thermometers in use are those employed for Harpenden (see notes on Second Order stations).

#### SUNSHINE STATIONS.

*Emsworth—Watergate Park*, September 22nd.—No change had been made in the exposure of the recorder since last year. Rainfall records are also supplied from this station. A Stevenson's screen has recently been procured, with maximum and minimum thermometers, but no dry and wet.

*Emsworth—Westbourne Rectory*, September 22nd.—This is a Jordan recorder, the exposure being fairly good, but slightly interfered with in the early mornings and evenings by trees. The recorder is placed under a glass shade, which I pointed out was unnecessary.

*Worthing*, September 22nd.—This station had not previously been inspected by this Office. The recorders (there are a Stokes and a Jordan) are on the roof of a house (the property of the corporation) in Chapel Road. The exposure is upon the whole good, though somewhat interfered with by trees in the early mornings about midsummer. Dr. Kelly seems to take great pains to tabulate the cards accurately.

## RAINFALL STATION.

*Sandgate*, September 27th.—The position of the gauge at this station had recently been changed. Its exposure is now good but the gauge was simply placed upon the border of a garden path. The observer was strongly urged to have it firmly fixed as soon as possible.

## CORRECTIONS FOR BAROMETERS.

STATIONS.	Inspector's Standard corrected. (No. 861.)	Reporting Barometer un- corrected.	Check Barometer un- corrected.	Reporting Barometer. — Correction required to reduce to Inspector's Standard.	REMARKS.
Eastbourne ..	ins. 30·056	ins. 30·056	ins. —	ins. 0·000	{ Reporting barometer can only be read to hundredths of an inch.
St. Leonards ..	29·739	29·732	—	+·007	
Rochester ..	29·535	29·534	—	+·001	
Maidenhead ..	29·281	29·269	—	+·012	
Harpenden ..	29·272	29·25	—	+·022	
Jersey .. ..	30·050	30·042	30·038	+·008	
Dungeness ..	29·621	29·609	29·606	+·012	

## CORRECTIONS FOR THERMOMETERS.

STATIONS.	Standard corrected. (No. 5881.)	Dry Bulb.	Wet Bulb.	Spare Ther.	Max.	Min.	Glass Min.	REMARKS.
Eastbourne ..	° 56·3	° -0·1	° -0·1	° —	° -0·1	° +0·2	° —	{ The observer was directed to substitute spare thermo- meter for wet bulb.
St. Leonards ..	59·2	-0·8	-0·8	—	-0·4	0·0	—	
Do. West Marina	60·2	-0·4	-0·3	—	-0·2	+0·2	—	
Rochester ..	54·4	+0·1	0·0	+0·1	+0·1	0·0	+0·1	
Maidenhead ..	54·8	-0·4	-0·5	—	-0·4	+0·4	—	
Harpenden and Rothamsted.	52·1	-0·1	-0·1	—	-0·7	+0·1	+2·8	
Jersey .. ..	62·3	-0·7	-1·4	0·0	-0·7	+0·1	—	
Dungeness ..	58·0	-0·3	-0·2	-1·2	-0·5	-0·1	—	

NOTE.—The rough notes containing the barometer and thermometer comparisons for Chatham were unfortunately lost.



## REPORT BY MR. T. W. BAKER.

*Stonyhurst Observatory*, September 20-21.—Both the barograph and thermograph at this observatory were in good order, and merely had their lenses cleaned and clocks oiled.

The exterior portions of the anemometer were dismantled and cleaned, and fresh sperm oil added to the bearings, but the clock and recording apparatus only required oiling; afterwards the orientation was examined and found correct.

The rain-gauge was also attended to, but the trace shown on the paper was rather coarse; this I partly rectified by altering the plan. A new pen and ink were much needed.

The thermometers were compared in water with the Kew Standard thermometer 720, and the following corrections determined:—

					°
Dry Standard, 619	...	...	...	...	— 0·1
Wet „ 382	...	...	...	...	— 0·3
Maximum, M.O., 1,525	...	...	...	...	— 0·1
Minimum, B.T., 501	...	...	...	...	+ 0·3
Grass Minimum, 265	...	...	...	...	+ 0·4
Attached thermometer to the Standard					
barometer, No. 696	...	...	...	...	— 0·7
Barograph thermometer, 339	...	...	...	...	— 0·4

*Fleetwood*, September 22-23.—Unfortunately at the time of my visit the weather was much too rough and stormy to dismount the external parts of the anemometer; indeed, Mr. Gaulter's men were quite unable to fix up the usual staging for taking down the instrument, although attempts were made to do so on both days.

The anemometer, however, was working very satisfactorily and seems to be well attended to.

I cleaned the clock and recording parts, but was only able to examine the orientation at the point from which the wind was blowing at the time of my visit.

*Fort William*, September 25-27.—The instruments at this observatory were found in good order. I dismantled the thermograph, cleaned the clock and lenses, and attached a new supporting line to the weight. Special attention was given to the action of the light stop. On examination it was discovered that the arm of the lever leading from the clock to the light shutter was slightly bent; this was corrected, and the action thereby greatly improved, and it is hoped that it will not give further trouble. The zero lines were changed from the summer to the winter position. The barograph clock was taken to pieces and cleaned, and the lenses received due attention.

With regard to the discolouration of the photographic sheets, which is attributed to impurities in the water at times of heavy rain, I find that there is no apparatus at the observatory for

distilling the water. If, however, a suitable tank was supplied, the rain water could be collected from the roof of the house and used for photographic purposes.

The rain-gauge was examined, and a new line fitted to carry the clock weight. Since the last inspection Mr. Rankin has adjusted and securely fixed the Sun recorder by cement on to its pedestal.

The various thermometers were compared in water at 55° by means of the Kew Standard thermometer 720, and the corrections found to be as follows :—

					°
Dry Standard, 671	...	...	...	...	0.0
Wet „ 672	...	...	...	...	— 0.2
Maximum, 1,092	...	...	...	...	0.0
Minimum, 1,322	...	...	...	...	+ 1.0
Thermometer attached to the Standard					
barometer, 7,222	...	...	...	...	— 0.3
Barograph thermometer, K.O., 690	...	...	...	...	— 2.1

NOTE.—The minimum thermometer reading rather low, I dismounted the tube from its frame and gently heated the chamber over a lamp ; after about two hours it was again tested, when the correction was found to be—

					°
Minimum, 1,322	...	...	...	...	+ 0.7

*Armagh*, September 29-30.—At this observatory the anemograph was in good order and all parts were found to be well lubricated.

The outside portions of the instrument were entirely dismounted and cleaned, and all the bearings supplied with fresh sperm oil. I also examined the clock and recording apparatus, and afterwards tested the orientation, which was found correct.

The rain-gauge received due attention, and “squeezes” were made of both the self-recording and spare rain funnels.

The Casella mercurial minimum thermometer having been reported to be out of order, I was requested by Dr. Scott to try and put it right. On examining the instrument I noticed that there was some air in the small pear-shaped chamber, which rendered the flow of the mercury uncertain. As I was unable to correct it, I brought the thermometer away, and sent it up to the Office with a letter on October 31st. In the meantime Dr. Dreyer is using an old Rutherford minimum, by Newman, in its place.

*Valencia Observatory*, October 3-6.—Here the instruments were found duly working in good order. First of all I dismounted the thermograph, cleaned the lenses and clock, and fitted a new line to the weight.

The photography was good, but Mr. Cullum drew my attention to the sheets, which were more or less discoloured, owing to stray light from the thermograph wet-bulb. I took out the tube and re-blackened the stem, and the curves which were afterwards

obtained showed that the stray light had been effectually blocked out. The dry and wet dots were not quite vertically one over the other on the drum, but this I put right.

The zero lines were shifted from the summer to the winter position.

The barograph was duly examined and the lenses carefully wiped; the clock also was taken to pieces and cleaned.

The thermometers were compared and their corrections found to be as follows, at 55° :—

Dry Standard,	399	...	...	...	— 0·7
Wet „	473	...	...	...	— 0·4
Maximum, M.O.,	1,003	...	...	...	0·0
Minimum	2,497	...	...	...	+ 0·5
Standard barometer attached thermometer,					
No. 71,062	...	...	...	...	— 0·1
Barograph thermometer (no number)				...	— 2·0

The minimum thermometer had a small quantity of spirit in its chamber; this was set right, and the thermometer again tested after an interval of about an hour, when the following correction was determined—

Minimum, 2,497	...	...	...	...	0·0
----------------	-----	-----	-----	-----	-----

The anemometer was going well and the clock did not require special cleaning. I entirely dismantled the instrument on the roof and added fresh sperm oil to all the bearings; afterwards the orientation was examined and found correct. The rain-gauge received due attention, and a new line was fitted to the clock weight. Mr. Cullum reported that the pen was very defective.

*Mountjoy Barracks, Dublin, October 9–10.*—Since the last inspection Colonel Hellard, R.E., has been succeeded by Major Sim, R.E., as the director of the Ordnance Office. Here I found the anemograph working satisfactorily, but the clock needed cleaning. This was duly performed, and the other parts of the instrument were cleaned and all the bearings oiled.

The orientation was tested and found correct, and the sheet accompanies this report.

The anemometer needed painting, and some new wire netting was required for the frames which are used to protect the grass minimum and solar radiation thermometers. Major Sim kindly promised to have these matters seen to at the earliest opportunity.

*Falmouth, October 13–16.*—The instruments were all in good condition, and the photography was excellent. I dismantled the thermograph and barograph, and cleaned both clocks and lenses and attached new cords to the weights.

The action of the barograph light shutter was improved by adding a small weight to the lever.



The zero lines were changed from the summer to the winter position.

A comparison of the various thermometers was made with the Kew standard, No. 720, and the following corrections determined:—

Dry Standard, 383	...	...	...	...	— 0.5
Wet „ 738	...	...	...	...	0.0
Maximum, M.O. 104	...	...	...	...	— 0.5
Minimum, M.O. 308	...	...	...	...	+ 0.3
Barograph thermometer (no number)	...	...	...	...	— 0.9
Standard barometer attached thermometer (no number) ...	...	...	...	...	— 1.0

On dismantling the anemometer the oil in the direction well was found quite limpid, and the other parts of the instrument, were lubricated in a satisfactory manner. All parts were cleaned and the different bearings were supplied with fresh sperm oil.

Whilst cleaning the wheels of the reducing gearing I accidentally dropped the direction wheel down the hollow iron support of the anemometer. I had to get a carpenter to cut away the roof in order to recover the wheel, and to avoid any future mishap a wooden tray was fitted into the gearing box, which will prevent any screw or wheel from falling down the shaft again.

The orientation was duly examined and found satisfactory.

The rain gauge was taken to pieces and the clock thoroughly cleaned, and a new cord attached to the weight.

A new iron hook was got for holding the weight, and I had the stop, which is used for regulating the pen to the zero line, repaired by soldering.

The funnel of the spare gauge was not quite circular, but this was corrected.

## SECOND ORDER STATIONS.

*Mountjoy Barracks, Dublin, October 9–10.*—The observer, Corporal Blackburn, who was away ill at the date of the last inspection, has since returned to his duties and is now regularly taking the observations. He shows great interest in the work, and reads the barometer and thermometers correctly. Some new wire netting is required for the frames which are used to protect the grass minimum and solar radiation thermometers from being interfered with by the jackdaws.

Major Sim undertook to have this done as soon as practicable.

The thermometers were tested and the following corrections found:—

Dry bulb, B.T., 1925	...	...	...	...	— 0.6
Wet „ „ 1922	...	...	...	...	— 0.4
Maximum, B.T., 457	...	...	...	...	— 0.4
Minimum, M.O., 444	...	...	...	...	0.0
Grass minimum, M.O., 266	...	...	...	...	+ 0.1



*Stonyhurst*, September 20-21.—This observatory calls for no special remark, the instruments being in good order. The thermometers were examined and the following corrections found :—

					°
Dry bulb, 619	...	...	...	...	— 0·1
Wet „ 382	...	...	...	...	— 0·3
Maximum, 1525	...	...	...	...	— 0·1
Minimum, 501	...	...	...	...	+ 0·3

*Armagh*, September 29-30.—All the instruments here were in good order, with the exception of the Casella mercurial minimum (*see* p. 93).

The following corrections to the various thermometers were determined :—

					°
Dry bulb, B.T., 3256	...	...	...	...	— 0·4
Wet „ „ 3254	...	...	...	...	— 0·4
Maximum, 3404	...	...	...	...	— 0·9
Rutherford minimum (no number)				...	0·0
Grass minimum, M.O., 196	...	...	...	...	+ 0·6

*Falmouth*, October 13th-16th.—Here the thermometers, &c., were all in good order, excepting that the spare rain gauge funnel was not quite circular; this was put right, and the thermometers were found to require the following corrections :—

					°
Dry bulb, 383	...	...	...	...	— 0·5
Wet „ 738	...	...	...	...	0·0
Maximum, M.O., 104	...	...	...	...	— 0·5
Minimum „ 308	...	...	...	...	+ 0·3

#### REPORT BY MR. E. G. CONSTABLE.

##### OBSERVATORIES AND ANEMOGRAPH STATIONS.

*Yarmouth*, July 28th-29th.—The anemometer here is apparently regularly attended to and oiled, as all parts were well lubricated, and the sperm oil was in excellent condition.

There was nothing in the exterior part of the instrument calling for special remark, it was thoroughly cleaned and new sperm oil supplied. Some parts of the wood scaffolding shew signs of dry rot at the base, and it would perhaps be well if the structure could be overhauled. The direction pencil has for some time past been “skipping” the trace, and I dismantled the frames and pencils,

but could not find any satisfactory cause for this defect, but every part was cleaned and carefully remounted, especial attention being given to the freedom of the cross clutches, and I am in hopes that the trace may be a little improved, but with this old type of recording pencil, lacking modern additions and improvements, I do not think that the traces are likely to be made perfectly satisfactory, but I did what I could in the matter.

The velocity shafting was noticed to have loosened somewhat. I took it down and found that one of the joint pins was partially cut through, this was rectified. The thin steel spring on the pricker had partially rusted away from its bed, it was made good, but the pricker arrangement is by no means of the best.

The orientation was examined and found satisfactory, and the check lines will be found on curves 209 and 211. The fusee spring clock decidedly wanted cleaning; this was done, the clock oiled, and a new pin fitted to the cylinder spindle.

About the middle of August I heard from Mr. Watson that the velocity trace was becoming blurred or thickened in places and that he could not remedy it, so I again visited this station on August 20th, on my way back from the North.

It was difficult to assign a definite reason for this development, but I attended to pencil and eased the marking where required, letting the instrument run for some hours between each attempt on 20th and 21st, and the subsequent traces were much improved, but to test this thoroughly a series of curves would be necessary.

*North Shields*, August 1st-2nd.—The Robinson anemometer here has been in the care of Mr. Robson for the past three months. I fully explained to him the working of the instrument, and the testing of the orientation, and this latter will now be done monthly if possible.

He apparently finds some trouble at present in starting the curves exactly to the required G.M.T., as owing to its confined position it is difficult to see the paper, but no doubt this little difficulty will disappear in time. The curves showed that the clock was slow each day, I altered the rating nut and asked Mr. Robson to further alter it when required. All parts of the instrument, both inside and outside, were dismantled and cleaned. The exterior portion was in good order and well lubricated, and the sperm oil for direction rollers fairly clean.

A new line was fitted to the clock, and the recording part was cleaned. The orientation was examined before and after touching anemometer, and was good.

*Alnwick Castle*, August 3rd-4th.—The Robinson anemometer here has not been taken down and overhauled for several years. I am pleased to say I was able this year to entirely dismount it, although considerable difficulty was experienced in doing so.

The oil, as might be expected, was thick and dirty, the rollers were not revolving freely on their bearings, and the face of one, probably through "jamming," has been slightly rubbed. The

direction tube could only be revolved with considerable pressure, and this must have tended of late to slow down the vane. The bearings, endless worm, and oil cup on the velocity shaft show no signs of wear, but the stays to the cup arms are beginning to perish, and to strengthen them I got the smith at the Castle to fit additional copper cross-stays.

All parts of the instrument were soaked in paraffin, thoroughly cleaned and freshly oiled, and left in good order.

The orientation—considering the large amount of “back-leash” due to the shafting—was good enough, and sheets showing the same are sent herewith. The sheets also have traces on the velocity division which show that the curves overlap the printed scale both top and bottom, thus confirming the accuracy of the traced copies.

I subsequently heard from Mr. Willyams that they could not get the velocity pencil to mark properly, probably owing to the shafting, and at his request I called again on August 19th, on my way South. I found the anemometer itself and the recording portion in good order, but the shafting was not revolving properly.

The rods and bevelled wheels were examined length by length, and the fault was finally located at the junction end of the long vertical tubing by the library wall. It was corrected as far as possible, but as I met with an accident by falling through an opening whilst testing the shafting under the roof, I was not physically capable of finishing it myself, and it was done by the smith. Since my return, I have been in communication on the subject with Mr. Willyams, and in his last letter he states that the instrument is now in excellent order, and the curves sent me show that the pencil is now marking satisfactorily.

*Aberdeen*, August 7th–9th.—The various instruments at this observatory were in their usual good order. There was nothing calling for remark either in the barograph or thermograph; both clocks were cleaned, and the mirrors and lenses polished. The thermometers were compared with K. S. 720 at 61°, and the corrections required are given in the table. The anemometer was cleaned on August 8th. All parts were well lubricated, and the sperm-oil for the direction-rollers was fluid but rather dirty. Fresh sperm was put in. The instrument is in good order, excepting that the endless screw on the direction fan-spindle is beginning to show signs of wear, but at present the “back-leash” is not unduly large.

The orientation was satisfactory.

The Beckley rain-gauge has been shifted since my last visit to a more convenient and decidedly more suitable position in the college grounds, where it has a good exposure.

The clock, etc., was cleaned and oiled, and squeezes taken of both rain-gauges.

*Deerness*, August 11th–12th.—I found the anemometer here well oiled and cared for. The cups, arms, etc., have been painted, as well as the hut—inside and out—and the enclosure for the sunshine recorder.



The sperm oil for the direction bearings although rather dirty was fluid; and according to Mr. Spence, showed a decided improvement upon the condition of the lubricant last autumn.

The new direction fan-spindle and lignum-vitæ bearings are satisfactory, but they were fitting rather too closely. This was corrected.

All the exterior parts were cleaned and freshly lubricated with sperm.

According to my instructions I endeavoured to correct the error in the marking of the velocity pencil, but it is not an easy thing to do, and I had a good deal of trouble with it.

It was adjusted several times, and the traces finally obtained by revolving the spiral in various positions on the cylinder throughout the 24-hours' scale are more satisfactory and fairly regular with the zero line, and I am in hopes that it will mark better now, and keep so more permanently. In taking down the frame, the screw nut holding the bevel-wheel to the upright plate broke off (possibly flawed), but I fitted a thinner washer and another turn to the thread, and the nut should now hold securely.

It was necessary to dismount this, as some oil running down the coupling rod had "caked" on the bearings, and the wheel ran stiffly.

The clock was cleaned and oiled, and the orientation tested.

*Glasgow, August 16th–18th.*—The meteorological instruments at this observatory were all working satisfactorily.

The anemometer was dismounted on August 16th, and thoroughly cleaned and lubricated.

The oil was good, it was replaced with fresh sperm.

The clock and pencils were cleaned, and all left in good order. The orientation was satisfactory.

The clocks of both barograph and thermograph required cleaning, which was done, and a new driving line was fitted to the barograph.

The dry and wet bulb lights were equalized, and shields were fitted to block out the stray light.

The clock of the Beckley rain-gauge was cleaned, and "squeezes" taken of both gauges.

*Oxford (Radcliffe Observatory), October 20th–21st.*—The self-recording meteorological instruments at this observatory were as usual in a satisfactory condition.

I dismounted the anemometer, as it was not taken down in 1898. The asbestos lubricant which had been in use for 2 years was still fluid, but rather dirty, and had caked a little on the direction roller bearings. All parts were thoroughly cleaned, fresh oil added, and the instrument left in good order.

The orientation was satisfactory, and the sheet is sent with this report.

There was nothing calling for remark in the barograph and thermograph; they have been cleaned, and the photographic curves are very good.

No "second" curves are obtained here.



The rain-gauge was examined and found to be working satisfactorily, but a supply of ink and a "Richard" pen were required, and these have been since supplied.

#### TELEGRAPHIC REPORTING AND CLIMATOLOGICAL STATIONS.

*Yarmouth*, July 29th.—The instruments generally were in good order, but the "Richard" barograph was reading about 0.35 inch too high. It was not possible to correct this by means of the set-screw, as the threads of the latter are worn, and it does not hold, so I had the slot in the aluminium index-arm drilled out, so that it could take up at a slightly different angle, and by carefully readjusting this the error has been reduced to practically nothing.

I went into the question of its indication with Mr. Watson, explaining what was required, and think its records should prove more useful in the future.

*North Shields*, August 2nd.—The thermometers and barometers at this station were in good order, and Mr. Clarke appears to take pleasure in the observations.

The new rain-gauge, M.O. 414, is in good order.

*Alnwick Castle*, August 4th.—The present observer has been in charge since February, and seems to take interest in the observations.

I gave him instructions on various points, especially with respect to the management of the wet bulb, and the maximum and minimum thermometers.

The instruments were in good order, with the exception of the wet bulb, but it was promised that the muslin and capillary threads should be changed more frequently.

The 5-inch bottle rain-gauge is a very poor and old instrument, and is perishing at the junction of rim and cylinder.

#### CORRECTIONS FOR THERMOMETERS.

Stations.	Tem- pera- ture of water.	Dry Bulb Stand.	Wet Bulb Stand.	Maxi- mum.	Mini- mum.	Additional thermometers.	
						Description.	Correction.
Oxford (Rad- cliffe).	45	Thermograph Screen.				Grass minimum .. ..	+0.4
		-0.2	-0.2	..	..	Attached to barometer (above 32°).	-0.8
		Stevenson Screen.					
		-0.4	-0.3	-0.4	+0.1	Attached to barometer (below 32°).	-0.4
Yarmouth ..	62	-0.1	-0.2	-0.4	+0.6	Spare tube .. ..	-0.6
North Shields ..	60	-0.1	-0.3	-0.3	+0.6	" " .. ..	0.0
Alnwick Castle ..	62	-0.2	-0.3	-0.2	+0.3		
Glasgow .. ..	59	-0.1	0.0	0.0	0.0	Grass minimum .. ..	+0.2
Aberdeen ..	61	-0.1	-0.7	+0.1	+0.4	Attached to barometer ..	-0.3

MAP SHOWING THE APPROXIMATE POSITIONS OF THE STATIONS FROM WHICH OBSERVATIONS HAVE BEEN RECEIVED.



For details of Information Received. — See Appendix XIII.



## APPENDIX XV.

LIST OF DOCUMENTS received from FOREIGN AND COLONIAL LAND STATIONS during the year ending March 31st, 1900.

Place.	Observer.	Nature of Observations.
Antigua ... ..	Francis Watts and K. McDonald ...	Observations twice daily, 1899, March to December; 1900, January, February.
Bahamas (Abaco) ... ..	Lightkeepers ...	Lighthouse Register, 1899, January to December.
" (Cat Cay) ... ..	A. S. Haigh ...	Barometer diagram, 1899, March.
" (Cay Lobos) ... ..	Lightkeeper ...	Lighthouse Register, 1899, January to December.
" (Cay Sal) ... ..	" ...	" " " "
" (Inagua) ... ..	" ...	" " " "
" (Nassau) ... ..	J. A. Kerr ...	Observations once daily, 1899, March to December; 1900, January.
" (Watling Island) ... ..	Lightkeeper ...	Lighthouse Register, 1899, January to December.
Barbados ... ..	J. R. Bovell ...	Monthly summary of observations twice daily, 1899, February to December; 1900, January, February.
Beyrout (Lee Observatory) ... ..	R. H. West, M.A., & B. S. Dugan ...	Observations twice daily, 1898, October to December; 1900, January, February.
Cape Pembroke (Falkland Islands) ... ..	G. K. Broom, Lightkeeper ...	Lighthouse Register, 1899, January to December.
Cape Spartzel (Tangier) ... ..	J. J. Emmott and E. C. Hathaway, Lloyd's Signalmen.	Observations twice daily, 1899, March to December; 1900, January, February.
Colon, Isthmus of Panama ... ..	Rev. S. P. Hendrick ...	Observations twice daily, 1899, March to June.
Cyprus (Famagusta) ... ..	G. Eliades ...	Observations twice daily, 1899, January to December.
" (Kyrenia) ... ..	P. Michaelides ...	" " " "
" (Larnaca) ... ..	V. Feneck ...	" " " "
" (Limassol) ... ..	Luigi Béraud ...	" " " "
" (Nicosia) ... ..	P. Nicopoulos ...	" " " "
" (Papho) ... ..	E. A. Malliotis and M. Theodorides ...	" " " "
Fort Johnston (B.O.A.) ... ..	F. S. S. Wright ...	Monthly Summary of Observations, July, 1896, to February, 1899.







## APPENDIX XVI.

## ANEMOMETER EXPERIMENTS AT HOLYHEAD.

REPORT BY MR. R. H. CURTIS.

In the reports of the office for the years 1896 and 1898 some account was given of comparisons which had been made of the records of four different anemometers erected by the Council at Holyhead.

One point of considerable importance which these comparisons had made clear was the necessity for erecting anemometers in positions where their exposure to the wind should be perfectly free from the influence of any local obstacles capable of breaking up the currents of air. It was shown that the records of the Robinson cup anemometer which had been erected upon the old lighthouse at the entrance to the Inner Harbour—a position which had hitherto been regarded as exceptionally good—were influenced in a peculiar manner by the adjoining railway sheds, and, therefore, when shortly afterwards this anemometer had to be dismantled for repair, it was decided not to re-erect it in its old position, but to place it on Salt Island, close to the pressure anemometers which were already there.

Accordingly in 1899 a suitable stand of open ironwork was erected to receive it, and at the end of November the anemometer was restarted in its new position, which is within a few yards of the pressure anemometers, at the end of the island. As yet there has not been time to collect a sufficient number of observations for the purpose of making a comparison of its records in its new position with those of the other anemometers, but this work will probably be commenced in the course of the ensuing year.

Meanwhile the comparison of the records of the pressure-plate anemometer,\* with the corresponding maxima recorded by the pressure-tube anemometer erected close beside it, has been continued.

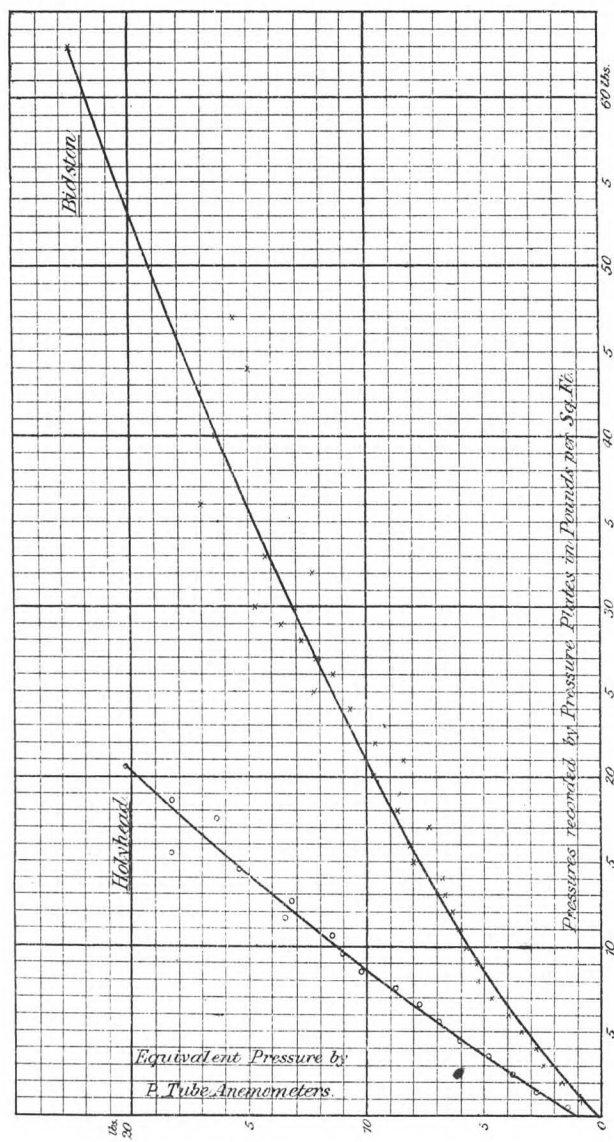
The pressure-plate anemometer was designed with a view to preventing the plate from oscillating to and fro with the variations of wind force, and of thus reducing the effect due to momentum, which it was thought was probably the cause of the very high readings which have from time to time been registered by freely oscillating plates. It is only the maximum force reached since the last observation which is recorded by the plate, and this accounts for the comparatively small number of observations which is available even now after the lapse of two years, and naturally the deficiency is most marked in the case of the more rarely occurring high pressures.

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\* The construction of this instrument is described in the Report for 1897-98, page 25.







Curves showing for each pound pressure per square foot registered by the Pressure Plates at Holyhead and Bidston the Mean Equivalent Pressure recorded by the Pressure Tube Anemometers. Holyhead Observations shown thus o; Bidston thus x.

The method employed in making the comparison was to compare the maximum pressure registered by the plate with the maximum recorded during the same interval of time by the pressure-tube anemometer. These tube equivalents were then grouped and meaned, and the results are shown in the following Table, which gives the mean equivalent pressure by the tube for each pound recorded by the plate. The results are also given graphically in the accompanying diagram.

COMPARISON OF PRESSURE-PLATE AND PRESSURE-TUBE  
ANEMOMETERS AT HOLYHEAD.

Equivalent Mean Pressure per square foot by the Tube instrument for increments of one pound in the pressure recorded by the Plate.

Mean Pressure by Plate.	Mean Corresponding Pressure by Pressure Tube.	No. of Observations.
Pounds per Square Foot.		
$\frac{1}{2}$	1.4	295
$1\frac{1}{2}$	2.8	97
$2\frac{1}{2}$	3.8	77
$3\frac{1}{2}$	4.9	61
$4\frac{1}{2}$	6.1	44
$5\frac{1}{2}$	6.9	42
$6\frac{1}{2}$	7.8	29
$7\frac{1}{2}$	8.8	18
$8\frac{1}{2}$	10.3	18
$9\frac{1}{2}$	11.1	17
$10\frac{1}{2}$	11.5	8
$11\frac{1}{2}$	13.5	2
$12\frac{1}{2}$	13.2	3
$13\frac{1}{2}$	No observation.	—
$14\frac{1}{2}$	15.4	
$15\frac{1}{2}$	18.3	
$16\frac{1}{2}$	No observation.	—
$17\frac{1}{2}$	16.4	1
$18\frac{1}{2}$	18.3	3
$19\frac{1}{2}$	No observation.	—
$20\frac{1}{2}$	20.2	2

In constructing the pressure plate no attempt was made to counterpoise the weight of the chain by which the plate is connected with the spring, and therefore this weight, together with the friction of the moving parts, has to be considered as an

addition to the indication of pressure yielded by the scale of the instrument, and will to some extent account for the excess of about one and a half pounds which the tube anemometer generally registers as compared with the plate. With very strong winds, however, it will be noticed that this difference decreases, and for the highest forces hitherto registered the two instruments yield practically the same pressure.

The observations in gales are as yet too few to enable one to predict the further course of the curve on the diagram. Too much weight must not be given to isolated observations, especially for two reasons which it is well to bear in mind. The first of these is the tendency for the maxima recorded by the tube anemometer in gusts of very brief duration to be too low, owing to the time not being sufficient to allow the float to fill before the actual maximum of wind force has passed. The effect of this would be to pull down the curve at high pressures, since the fault would probably not be very marked except with the strongest gusts. The second consideration is suggested by some of the observations, namely, that occasionally the distribution of a gust is such that the few feet of distance which separates the plate from the vane of the pressure tube is sufficient to prevent both instruments from being equally affected. Such a fault would not, however, be peculiar to either instrument, and its effect might be expected to disappear from the mean of a few observations.

The reports of the Bidston Observatory of the Mersey Docks and Harbour Board for the years 1897 and 1898 contained tables showing the maximum wind force recorded daily at that observatory by a pressure-tube anemometer precisely similar to the one in use at Holyhead, and by an Osler pressure-plate anemometer of the usual construction, in which the movement of the plate is not restrained as it is in the Holyhead instrument.

These tables give, therefore, the data for making a similar comparison to that already described, but for an oscillating instead of a non-oscillating plate, and it is interesting to compare the results for the two instruments.

The wind pressures as measured by the tube anemometers were pretty much the same at both Holyhead and Bidston, the actual maximum in the two years occurring at the latter place, but only exceeding the corresponding record at Holyhead by about two pounds per square foot.

On the other hand the corresponding pressures indicated by the two plates, for winds of the same force as measured by the tubes, differed very widely, and whereas the actual maximum pressure by the plate at Holyhead was only between 20 and 21 pounds per square foot, which agreed very closely with the record of the tube anemometer, the plate at Bidston recorded a pressure of 63 pounds when  $22\frac{1}{2}$  pounds was registered by the tube; and records amounting to between 30 and 50 pounds per square foot occurred on ten other occasions upon neither of which did the tube records exceed 17 pounds per square foot. In the year 1871 the plate at Bidston registered the remarkable pressure of 90 pounds per square foot.

The approximate identity of the extreme readings of the pressure-tube records at the two stations may be taken to indicate that the large differences in the extreme pressures shown by the two-plate instruments are to be attributed to differences in the construction of the instruments and not entirely to differences in the force of the wind at the two stations.

The conditions under which the scale of the Bidston plate was graduated are not in fact similar to those which exist in a gale of wind. In the former case the pressure was steadily and continuously augmented, whilst in the latter it is applied intermittently; and where the plate is able to oscillate under intermittent impulses an excessive record is always possible.

In the case of the Holyhead plate the chance of error from this cause is reduced, because the plate was so constructed that it could not return after having been once moved by the wind, subsequent movement being possible only with yet stronger gusts of wind, a condition which approximates more closely to that under which the scale is graduated.

The results of the Bidston comparison are shown graphically in the lower curve upon the diagram, so that the results of the two comparisons may be examined together.

R. H. CURTIS.

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## APPENDIX XVII.

## I.

## RESEARCHES ON ATMOSPHERIC ELECTRICITY.

*[Letter from the Chairman of the Meteorological Council to the Secretary of the Royal Society.]*

Meteorological Office, January 24, 1900.

SIR,

1. In my letter of 27th June, 1899, I intimated that the Meteorological Council proposed "to apply to the Royal Society in January next [1900] for a further grant to enable them to retain the services of Mr. C. T. R. Wilson till the end of the second year, from October, 1898," and at the same time conveyed the application of the Council for a grant of £100 from the reserved funds in the hands of the Royal Society, to cover the period between October, 1899, and April, 1900, and thereby to provide for the continuance of Mr. Wilson's researches until the intended application for a grant in 1900 could be considered in due course.

2. The grant of £100 from the reserved funds was made, and I am now requested by the Meteorological Council to forward to you, for consideration by the Government Grant Committee, their application for £100 to complete the sum necessary to secure Mr. Wilson's services for the remainder of the two years at £200 per annum.

3. I enclose a further report by Mr. Wilson (in continuation of the paper read before the Royal Society on the 15th June last, and published in the Philosophical Transactions, Vol. CXCIIL., A.) upon the work in which he is engaged. The reference numbers therein are those of a preliminary programme submitted by Mr. Wilson and adopted by the Council. I enclose herewith a copy of this programme for the purposes of reference.

4. Upon Mr. Wilson's report I beg leave to remark that that part of the work proposed, which concerns the more immediate purposes of Meteorology (headings I., II., III.), cannot, probably, be carried out within the time assigned, because (1), as regards the comparison of the results of self-recording instruments at Greenwich and Kew, a preliminary inquiry has shown that the records are not properly comparable as they stand, and (2), as regards the further investigation of the electrical state of the atmosphere at different heights, Mr. Wilson has not found the mode of experimenting suggested by him in his preliminary programme to be sufficiently promising, and he is now clearly of opinion that, for a satisfactory investigation, ascents in free balloons must be employed.

5. The Council will not omit to take advantage of any opportunity that may arise of obviating these difficulties and providing the facilities required for the prosecution of these lines of research, but under existing circumstances they cannot hope to put Mr. Wilson in a position to make a satisfactory report on this side of the work within the time available.

6. But the facts referred to by Mr. Wilson as having been incidentally observed in connection with his free-air observations upon the behaviour of various "collectors" are of such interest and importance that their investigation ought certainly to be followed up. They will probably lead to a considerable increase in our knowledge of the use of instruments employed for the study of atmospheric electricity.

7. Of the original programme there remains the experimental work upon the connection between precipitation and electrification. It is in this department that important results have already been obtained and recorded in the *Philosophical Transactions*. Mr. Wilson is still engaged upon experiments in the same direction, and in the opinion of the Council it is most desirable that he should be enabled to continue them.

8. In the paper before referred to (*Philosophical Transactions*, Vol. 193, p. 307), Mr. Wilson briefly touches upon the bearings of his researches upon the phenomena of precipitation in the free atmosphere, but he has not yet fully developed this section of the work. He would, no doubt, be in a more secure position for this purpose if he could have the opportunity of making the balloon observations which he desires to make, but even if such opportunities are not available, his contribution in this department would be of substantial value to the *Physics of Meteorology*.

9. The results which, in the opinion of the Council, may be expected from the continuance of Mr. Wilson's researches to the end of the two years originally contemplated, by means of the grant now applied for, are those enumerated in paragraphs 6, 7, 8. The Council have every reason to believe that the retention of Mr. Wilson's services in experimental work will be of great advantage in the extension of our knowledge of the physical bases of *Meteorology*, a department of physics which lies somewhat outside the ordinary lines of physical research, and for which so competent an experimenter as Mr. Wilson is very rarely available.

I have the honour to be, &c.,

R. STRACHEY,  
Chairman, Meteorological Council.

NOTE.—The grants already made upon the application of the Meteorological Council in connection with this subject are :—

			£
May 28th, 1898	...	...	200
November 7th, 1899	...	...	100

The grant now applied for is £100.

Prof. A. W. Rücker, F.R.S.,  
Secretary Royal Society.

## II.

MR. WILSON'S PRELIMINARY PROGRAMME OF WORK TO BE  
DONE ON ATMOSPHERIC ELECTRICITY.

## I. Further comparison of Greenwich and Kew records :—

On certain days the similarity of the electrograph curves from the two places is very marked, even in the rapid fluctuations. The same disturbing influence has plainly in certain cases affected both places. Not only do instantaneous reversals of potential, such as might be explained by lightning flashes in the neighbourhood, take place simultaneously at the two places, but other plainly marked, rapid but not instantaneous changes appear on both curves in such a way as to suggest that the same electrified mass has passed over the two places in succession. I propose to examine such cases more closely and to obtain particulars as to the weather on such days, and especially as to the direction and velocity of the wind. Mr. Chree has kindly offered to furnish me with such information on these points as I may require.

II. Simultaneous observations of the potential gradient near the earth's surface and at such heights as it may be found possible to examine with the aid of fuses carried up by small captive balloons.

The object of these experiments would be to determine whether the air as a whole in the layers of the atmosphere accessible in this way possesses a volume electrification, positive or negative, or is uncharged; this being important in connection with questions as to the origin of atmospheric electricity (*i.e.*, whether the electrification is produced by processes taking place at the surface of the earth or in the upper regions of the atmosphere).

The measurements would, I consider, most conveniently be made by means of two Exner's electroscopes. These have the small capacity necessary for this method, and are portable and sufficiently accurate for the purpose. This is the apparatus used by Elster and Geitel, as well as by Exner himself, in measurements in atmospheric electricity. I believe the cost of the instrument is about £1 only.

Later it would be desirable to try similar experiments with a pair of recording electrometers. By this means it should be possible to decide definitely whether the rapid fluctuations of potential near the earth's surface are due to the motion of electrified masses of air at a comparatively small elevation, for any electrified body passing below the upper pair of fuses and above the lower would affect the two electrometers in the opposite sense.

To begin with I propose to make these open-air observations in a field belonging to the observatory here, of which Sir Robert Ball has kindly offered me the use.

III. I propose to leave till later the work suggested in this section of the memorandum of June 22.



IV. and V. Laboratory experiments, with the object of throwing light on the probable nature of the carriers of the electricity in the atmosphere and on the most likely sources of atmospheric electricity.

I propose beginning with experiments to determine whether electrification is likely to be produced by the precipitation of vapour from the supersaturated state in the form of rain. Certain of my recent experiments, as Professor Thomson has pointed out to me, show that such an effect is quite a likely one.

C. T. R. WILSON.

Cambridge,

October 19, 1898.

MR. WILSON'S FURTHER REPORT ON INVESTIGATIONS IN  
ATMOSPHERIC ELECTRICITY.

*I. Comparison of Electrograph Curves of Kew and Greenwich.*  
—A preliminary comparison of some of the curves from the two places seemed to indicate differences due to the methods of measuring potential not being the same. I have inspected the apparatus at work at both places. As is shown by the published accounts of the observations, there is a difference in the methods of using the electrometer at Greenwich and at Kew, the method in use at the latter place being that which is adopted in most observatories where a self-recording electrometer is at work. This, as well as other differences in the details of the methods, and the absence of any knowledge of the scale values of the instrument at Greenwich, make any very exact comparison of the curves from the two places hardly possible at present.

I am continuing the study of the Kew electrograph curves in connection with that of other meteorological records.

*II. Potential gradient at different heights above the earth's surface.*—In connection with this part of the work only preliminary experiments on the methods to be employed have been carried out. The first part of the problem was to find a satisfactory method of getting absolute measurements of the potential gradient near the ground. This was, I think, accomplished. Attempts were now made, by means of a small captive balloon, to get measurements of the gradient at an elevation, but the method did not seem promising. At present, I do not see how to solve the problem of getting trustworthy measurements of the potential gradient at any considerable elevation, so long as the observer remains at the surface of the earth. Although interesting qualitative results may perhaps be obtained under such conditions, they must, I think, remain very difficult to interpret, and in particular they are unlikely to enable us to solve the problem of finding how the potential gradient varies with the height, or in other words of testing the nature of the distribution of the volume electrification of the air. Such observations of atmospheric electricity with the aid of kites are



now, I believe, being carried on in America. Observations from the car of a captive balloon are dangerous on account of the risk of ignition of the gas by sparks, if any attempt be made to bring to the potential of the air in the neighbourhood any apparatus in the car of the balloon, while this is connected with the earth by the cable. The interpretation of the results would, moreover, be very difficult, and the same difficulty is attached to observations on high towers or on mountain summits. Information may however be obtained from such observations as to the relative extent to which diurnal or other variations of potential occur at different heights; the Eiffel Tower observations have given interesting information of this kind. An observer in a free balloon appears to be much more favourably situated for obtaining reliable measurements of potential gradient in the free air, and recent observations of several continental observers agree in showing a diminution in the potential gradient with increasing height. Further observations of the same kind are desirable. With a view to enabling such balloon observations to be more easily carried out, I have made experiments to see whether substitutes for the water-dropper or electrometer match, both of which are inconvenient in balloon work, could be found. Experiments to test the efficiency, as a collector of atmospheric electricity, of a short piece of thin platinum wire, rendered incandescent by the current from a small secondary cell, gave very promising results. Such a collector was found to compare very favourably (apart from its convenience) with the ordinary electrometer match; incidentally it was noticed that the latter, besides being much slower than the hot wire, had the serious defect of allowing positive electricity to escape many times more slowly than negative. This tends to cause the frequency of occurrence and the magnitude of negative values of potential to be underestimated, especially in cases of rapid alternation between positive and negative values. I have tried also as collectors some of the recently discovered "radio-active" substances, and am of opinion that they may be of use in balloon work.

III. *Travel of Electrical Potential changes.*—Nothing has yet been attempted in this branch of the subject.

IV. *Laboratory experiments to throw light on the connection between Precipitation and Atmospheric Electricity.*—I have, following a suggestion of Prof. J. J. Thomson, carried out a series of experiments to test whether the positively and negatively charged particles or "ions," which are present in air whenever this is capable of conducting electricity, differ in their power of acting as nuclei for the condensation of water vapour. The results of this investigation have been published in a paper, "On the Comparative Efficiency as Condensation Nuclei of Positively and Negatively charged Ions" (Phil. Trans. A. Vol. 193, pp. 289—308, 1899). These experiments prove that water condenses much more readily on negatively than on positively charged ions. We should thus expect a preponderance of negatively charged rain, positively charged ions being left behind in the atmosphere. We have in this a possible explanation of the normal excess of positive electricity in the atmosphere.

Experiments are being carried out with a view to making possible a more direct examination of the electrical effects of rainlike condensation, and also of the sudden freezing of drops.

It would be desirable to test directly, as Elster and Geitel have attempted to do, whether actual raindrops are charged with electricity, and if they are, to find the nature of the charge which they carry. It is unfortunately a matter of great difficulty to devise a trustworthy method of accomplishing this.

It is evident that before the question of the connection between atmospheric electricity and precipitation can be solved, it is necessary to know more than we do about the nature of the latter process; to know, for example, from what height the rain generally falls, from the lower clouds or from the air above them; and whether it seldom or frequently has its origin by condensation from the supersaturated condition. These and other questions could probably be solved by balloon ascents.

C. T. R. WILSON.

Cambridge,

January 16th, 1900.

## APPENDIX XVIII.

ADDITIONS TO THE LIBRARY DURING THE YEAR ENDING  
31ST MARCH, 1900.

**Aachen, Meteorologische Station.**—*Deutsches meteorologisches Jahrbuch für 1898. Meteorologische Station I. Ordnung in Aachen. Ergebnisse der meteorologischen Beobachtungen. Herausgegeben . . . von P. Polis. Jahrg. 4. la. 4°. Karlsruhe, 1899.*

——— *Ergebnisse der 1899 in Aachen von der meteorologischen Station Aachen des Königl. Preuss. Meteorologischen Instituts angestellten Beobachtungen. sm. f°. Sheet*

——— **Centralstation.**—*Uebersicht der Witterung. March, 1898–Dec. 1899. Slips.*

**Abbe, C.**—*The altitude of the aurora above the earth's surface. 8°. (Proc. Amer. Phil. Soc., 37, 1898, p. 4.)*

**Adelaide Observatory.**—*Meteorological observations made at the Adelaide Observatory, and other places in South Australia and the northern territory, during the year 1896, under the direction of C. Todd. sm. f°. Adelaide, 1899.*

**Aitken, James.**—*Meteorological table for the year 1898. Compiled from observations taken at Braemar, Aberdeenshire. oblong sm. f°. Sheets.*

|| **Albert, Ier, Prince de Monaco.**—*Exploration océanographique aux régions polaires. la. 8°. Paris, 1899. (Bull. Muséum Hist. Nat., 1899, p. 6.)*

——— *Première campagne de la Princesse Alice II°. 4°. (Compt. rend. acad. sc., Paris, 128, 1899.)*

[**Algiers, Service Météorologique du Gouvernement Général de l'Algérie.**]—*Bulletin météorologique de l'Algérie. 1899, Jan. 1–Dec. 31. sm. f°. Sheets.*

**Algué, J.**—*Las nubes en el Archipiélago Filipino.*

See MANILA, OBSERVATORIO.

[**Allahabad, Meteorological Office.**]—*Administration report of the Meteorological Reporter to Government, North-Western Provinces and Oudh, for the year 1898–99. sm. f°. Allahabad, 1899.*

——— *Brief sketch of the meteorology of the North-western Provinces and Oudh, and adjacent parts of Rajputana and the Panjab, for the year 1898. sm. f°. Allahabad, 1899.*

**Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap.**—*Tijdschrift. Tweede serie. Deel 16. 8°. Leiden, 1899.*

**Athens, Observatoire National.**—*Annales . . . publiées par D. Eginitis. Tome I. la. 4°. Athènes, 1898.*

**Azambuja, G. A. de.**—*Anuario do Estado do Rio Grande do Sul. 1900. Anno 16. sm. 8°. Porto Alegre, 1899.*

\* **Bacon, J. M.**—*Climate and the atmosphere. la. 8°. (Nineteenth Century, 1900, Jan., p. 94.)*

\* ——— *The war of winds: a commentary on weather forecasts. la. 8°. (Nat. Rev., 1900, Jan., p. 727.)*

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NOTE.—Books marked \* have been acquired by purchase; the others are donations from institutions, societies, or authors. Those marked || are excerpt papers, extra copies of which have been separately printed.

In some cases additional publications have been received besides those specified, but only completed volumes or years are given here.

**Baltimore, Maryland Weather Service.**—Maryland Weather Service. Vol. 1. 1a. 8°. Baltimore, 1899.

[**Bangalore, Mysore Government Meteorological Department.**]—Meteorology in Mysore, for 1898, being the results of observations at Bangalore, Mysore, Hassan and Chitaldrug. By John Cook. 1a. 4°. Bangalore, 1899.

——— Report on rainfall registration in Mysore, for 1898. By John Cook. 1a. 4°. Bangalore, 1899.

\* **Bartholomew, J. G., Herbertson, A. J. and Buchan, A.**—Atlas of meteorology. Bartholomew's Physical Atlas. Vol. 3. f°. Westminster, 1899.

**Batavia, Magnetical and Meteorological Observatory.**—Observations. Vol. 20, 1897. f°. Batavia, 1898.

[**Batavia, Observatorium.**]—Regenwaarnemingen in Nederlandsch Indië. 19. Jaarg, 1897. 8°. Batavia, 1898.

Title and Preface in the English language also.

**Bath, Medical Officer of Health.**—Annual report to the Bath Urban Sanitary Authority, by the Medical Officer of Health. 33rd, 1898. 8°. Bath, 1899.

|| **Bauer, L. A.**—The physical decomposition of the earth's permanent magnetic field. No. 1. The assumed normal magnetization and the characteristics of the resulting residual field. 1a. 8°. (*Terrestr. Magnetism*, 4, 1899, p. 33.)

|| ——— Is the principal source of the secular variation of the earth's magnetism within or without the earth's crust? 1a. 8°. (*Terrestr. Magnetism*, 4, 1899, p. 53.)

|| **Baxendell, J.**—A new self-recording anemoscope. 1a. 8°. (*Quart. Journ. R. Meteor. Soc.*, 25, 1899, p. 326.)

|| **Bayard, F. C.**—The Government meteorological organizations in various parts of the world. 1a. 8°. (*Quart. Journ. R. Meteor. Soc.*, 25, 1899, p. 69.)

**Belize, Public Hospital.**—Meteorological observations, 1898, Jan.—Dec. sm. f°. Sheets.

**Belize, St. Joseph's Observatory.**—Summary of meteorological observations, 1899, Jan.—Dec. 4°. Sheets. (*The Angelus, Belize*, 1899–1900.)

**B[entley], R.**—Brief chronological index to some physical phenomena which have occurred in this neighbourhood (Upton, Bucks). 8°. s.l., 1897.

——— A quarter of a century's rainfall at Upton, 1874–1899. 8°. s.l.e.a.

**Bergholz, P.**—Die Orkane des Fernen Ostens. 1a. 8°. Bremen und Schanghai, 1900.

——— Die Taifune in den ostasiatischen Gewässern, Nach Doberck: The laws of storms (Hong Kong, 1898.) sm. f°. (*Meteor. Zeitschr.*, 1898, Sept., p. 332.)

**Berlin, Königlich Preussisches Meteorologisches Institut.**—Bericht über die Internationale Meteorologische Konferenz zu Paris, 1896.

See PARIS.

——— Bericht über die Thätigkeit . . . im Jahre 1898, von W. von Bezold. 1a. 8°. Berlin, 1899.

——— Ergebnisse der meteorologischen Beobachtungen in Potsdam, 1897. 1a. 4°. Berlin, 1899.

——— Ergebnisse der Niederschlags-Beobachtungen in den Jahren 1895 und 1896. 1a. 4°. Berlin, 1899.

|| ——— Witterung nach den Beobachtungen des königlichen meteorologischen Instituts. 1899, Jan.—Dec. 1a. 4°. (*Statist. Korresp.*)

**Bermuda, Registrar General's Office.**—Report of the Registrar General for the year 1898. sm. f°. l.e.a.



**Berne, Eidgenössisches Oberbauinspectorat, Hydrometrisches Bureau.**—Graphische Darstellung der schweizerischen hydrometrischen Beobachtungen sowie der Lufttemperaturen und Niederschlagshöhen für das Jahr 1898. la. f°. Sheets.

In the French language also.

——— Wasserverhältnisse der Schweiz. Rhonegebiet von den Quellen bis zum Genfer—See. f°. Berne, 1898.

**Birmingham, Observatory of the Birmingham and Midland Institute.**—Records of meteorological observations taken at the Observatory of the Birmingham and Midland Institute. By A. Cresswell. 1899. 8°. (*Proc. Birmingham and Midland Inst. Sc. Soc.*)

|| **Boffito, G.**—Un poeta della meteorologia. Giovana Pontano. la. 8°. Napoli, 1899. (*Atti. Accad. Pontaniana*, 29.)

**Bolton.**—Annual report of the Museums and Meteorological Observatory for 1899. 8°. Bolton, 1900.

**Bombay, Government Observatory.**—Magnetical and meteorological observations made at the Government Observatory, Bombay, 1897. f°. Bombay, 1898.

(———) Report on the condition and proceedings of the Government Observatory, Colába, for the year which ended with the 31st March, 1899. f°. s.l.e.a.

[**Bombay, Meteorological Office.**]—Brief sketch of the meteorology of the Bombay Presidency for 1898–99. f°. s.l.e.a.

**Börnstein, R.**—Eine Beziehung zwischen Luftdruckverteilung und Monddeklinatation. 4°. (*Phys. Zeitschr., Göttingen*. 1. Jahrg., 1899, No. 4.)

\* **Bouttieaux Capitaine.**—La météorologie appliquée à l'aérostation. 8°. Paris, s.a.

\* **Brebner, C. W.**—New handbook for the Indian Ocean, Arabian Sea, and Bay of Bengal, with miscellaneous subjects for sail and steam. Mauritius cyclones and currents, moon observations, and sail-making. la. 8°. Bombay, 1898.

**Bremen, Meteorologisches Station I. Ordnung.**—Deutsches meteorologisches Jahrbuch. Ergebnisse der meteorologische Beobachtungen. Herausgegeben von P. Bergholz. Jahrg. 9, 1898. la. 4°. Bremen, 1899.

**Briggs, L. J.**—The mechanics of soil moisture.

See WASHINGTON, DEPARTMENT OF AGRICULTURE.

|| **Bristol.**—The International Conference on terrestrial magnetism and atmospheric electricity, held at Bristol in 1898. Proceedings, papers, and report of Permanent Committee. la. 8°. Cincinnati, 1898. (*Terrest. Magnetism*, 1898, 3, p. 93; 4, p. 139.)

|| **Brodie, F. J.**—The prolonged deficiency of rain in 1897 and 1898. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, 25, 1899, p. 181.)

**Brussels, Observatoire Royal.**—Bulletin quotidien. 1899, Jan. 1–Dec. 31. f°. Sheets.

|| ——— **Observatoire Royal de Belgique à Uccle.**—Résumé des observations météorologiques faites à l'Observatoire Royal de Belgique, à Uccle, pendant l'année 1898. sm. 8°. Bruxelles, 1899. (*Ann. Observ. R. de Belgique*, 1899.)

|| **Buchanan J. Y.**—The meteorology of Ben Nevis in clear and in foggy weather. la. 4°. Edinburgh, 1899. (*Trans. R. Soc. Edinh.*, 39, Part 3.)

**Bucharest, Institutul Meteorologic al Romaniei.**—Analele . . . de S. C. Hepites. Tom. 13, 1897. la. 4°. Bucuresti, 1899.

In the French language also.

——— Buletin meteorologic. Anul 5, 1899. Jan. 1–Dec. 31. la. 4°. Sheets.

——— Buletinul observatiunilor meteorologice din Romania de S. C. Hepites. Anul vii., 1898. sm. f°. Bucuresti, 1899.

**Budapest, Magyar Kir. Országos Meteor. Intézet.**—*Meteorologiai feljegyzések.* 1899. Jan.–Dec. and year. Oblong la. 8°. Sheets.

\* **Bull, H. J.**—The cruise of the “Antarctic” to the south polar regions. 8°. London and New York, 1896.

**Cairo, Ministère de l'Intérieur. Administration des Services Sanitaires et d'Hygiène Publique.**—*Bulletin hebdomadaire.* 14<sup>me</sup> année, 1899 Nos. 1–52. Suppl. au Journ. Officiel, 1899–1900. la. 4°.

**Calcutta, Meteorological Office, Bengal.**—Administration report of the Meteorological Reporter to the Government of Bengal for the year 1896–99. f°. s.l.e.a.

————— Bay of Bengal and Bengal daily weather report. 1899. sm. f°. Sheets.

These reports are only published during the rainy season.

[—————] Bay of Bengal weather chart. 1899. sm. f°. Sheets.

From May to October this is combined with the “Bay of Bengal and Bengal daily weather report.”

(—————) Meteorological and rainfall table of the Province of Bengal for the months of January to December, 1899, with annual tables. sm. f°. Sheets.

————— Meteorological summary for the monsoon period of 1899. sm. f°. s.l.e.a.

[—————] Summary of the meteorology of Bengal for the year 1898. sm. f°. s.l.e.a.

————— **India.** Abstract of the results of meteorological observations taken at the Alipore Observatory in the months of Jan.–Dec. 1899. sm. f°. Sheets.

————— Forecast of the cold weather rains in Northern and Central India, December 1899 to February 1900. sm. f°. (Simla, 1899.)

————— India daily weather report. 1899. Jan. 1–Dec. 31. 2 vols., f°. Simla, 1899–1900.

————— Indian meteorological memoirs. Vols. 7–10. 4 vols. sm. f°. Calcutta, 1894–99.

[—————] The India weather review for the year 1898. f°. Calcutta, 1899.

[—————] Memorandum on the snowfall in the mountain districts bordering Northern India and the abnormal features of the weather in India during the past year, with a forecast of the probable character of the south-west monsoon rains of 1899. f°. (Simla, 1899.)

————— Rainfall of India. 7th year, 1897. sm. f°. Calcutta, 1898.

(—————) Report on the administration of the Meteorological Department of the Government of India in 1898–99. f°. s.l.e.a.

————— Results of the meteorological observations taken at the Alipore Observatory, from 1st January to 30th December, 1899. sm. f°. Sheets.

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————— **E. M.**—Notes on malaria in connection with meteorological conditions at Sierra Leone. Third year. 8°. London, 1899.

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ACCOUNT of RECEIPTS and PAYMENTS for the year ending 31st March, 1900:—

† At the close of the year, £400 per annum was, with the sanction of the Treasury, assigned as a pension to the retiring Secretary, and £1,600 is required to provide superannuation allowance for a retiring Clerk in the ensuing year.

## APPENDIX XX.

LIST OF THE PRINCIPAL PAPERS PRINTED IN VARIOUS REPORTS  
ISSUED BY THE OFFICE FROM THE YEAR 1866.

## I.—DAILY WEATHER REPORT.

Year.	Page.	—
1896 (July to Dec.).	1	Mean Values of Barometric Pressure for each Month and for the Whole Year, derived from Observations made at 8 a.m. daily during the 25 Years 1871-95.
1896	2 and 3	Mean Values of the Dry Bulb and Wet Bulb Temperatures for ditto, ditto.
"	4 and 5	Mean Values of the Daily Maximum and Minimum Temperatures, and of the Maximum and Minimum combined, for the 25 Years 1871-95.
"	6 and 7	Extremes of the Daily Maximum and Minimum Temperatures for ditto, ditto.
"	8	Mean Rainfall for each Month and for the Whole Year—derived from Observations extending over the 30 Years 1866-95.
"	9	Mean Numbers of Hours of Bright Sunshine, with the Percentages of Possible Duration, derived from Observations extending over the 15 Years 1881-95.

## II.—WEEKLY WEATHER REPORT.

Year.	Page.	—
1884	V.	Table A.—Showing for each Degree of Latitude, from 49° N. to 58° N. the Total Number of Hours during which the Sun is above the Horizon, in each Month of the Four Quarters of the Year.
"	VI.	Table B.—Showing similar information for each Week of the Year.
1895	VI.-VII.	Mean Values of the Daily Maximum and Minimum Temperatures and of the Maximum and Minimum combined, for each Month and for the Whole Year, derived from Observations extending over the 25 Years 1871-95.
"	VIII.	Mean Rainfall for each Month and for the Whole Year, derived from Observations extending over the 30 Years 1866-95.

Year.	Page.	
1895	IX.	Mean Numbers of Hours of Bright Sunshine, together with the Per-centages of the Possible Duration, for each Month and the Whole Year, derived from Records extending over the 15 Years 1881-95.
"	[17]	Table I.—Showing for each District, during each of the Three Lustra, and the whole Period comprehended in the 15 Years 1881-95, the Mean Aggregate numbers of rainy days from the beginning of the Year to the end of each week in the Year.
"	[23]	Table II.—Showing in the same detail the Mean Aggregate Amounts of Rainfall.
"	[27]	Table III.—Showing in the same detail the Mean Aggregate Values for Accumulated Heat above 42° F.
"	[32]	Table IV.—Showing in the same detail the Mean Aggregate Values for Accumulated Heat below 42° F.
"	[37]	Table V.—Showing in the same detail the Mean Aggregate Numbers of Hours of Bright Sunshine.
"	[42]	Table VI.—Showing in the same detail the Mean Per-centages of the possible amount of Bright Sunshine.
"	[47]	Table showing in Degrees Fahrenheit for each District, during each of the Three Lustra, and for the whole Period comprehended in the 15 Years 1881-95, the Mean Temperature of the Air, for each week in the Year.
1899	[1-9]	Summaries of Rainfall and Mean Temperature for the First, Second, Third, and Fourth Quarters, and for the Whole Year, during the 34 Years 1866-99. [The separate Yearly Values for 1866-85 are contained in the Reports for 1890, and previous Years.]

## III.—MONTHLY WEATHER REPORT.

Year.	Page.	
1884	[iii.]	Table showing for each Month and for each Degree of Latitude from 18° N. to 49° N. the Total Number of Hours during which the Sun is above the Horizon.
"	[i.]	On London Rain. By W. J. Russell, Ph.D., F.R.S.
"	[ii.]	On the Amount of Carbonic Acid in London Air. By W. J. Russell, Ph.D., F.R.S.
1885	[i.]	On the Impurities in London Air. By W. J. Russell, Ph.D., F.R.S.
"	[ii.]	Table showing the Mean Monthly and Annual Rainfall at the Weekly and Monthly Weather Report Stations for the 20 Years 1866 to 1885.



## IV.—QUARTERLY WEATHER REPORT.

Year.	Page.	
1869	43	Factors for Calculation of Gradients.
"	[1]	Notes on Easterly Gales, by R. H. Scott.
1870	iii.	Description of Observatories, with illustrations of thermometer screens.
"	[23]	Bessel's Paper on the Determination of the Law of a Periodical Phenomenon. Translated from the <i>Astronomische Nachrichten</i> , 136, for May, 1828.
1871	[7]	Discussion of Anemometrical Results for Orkney, 1863-68.
"	[59]	Constants for the Determination of the Monthly March of Atmospheric Pressure, &c. at the Seven Observatories for 1869-70.
1872	[13]	Discussion of the Anemometrical Results at Bermuda from 1st April 1859 to 31st March 1863.
1873	[13]	Rainfall of the London District for Sixty Years, 1813-72. By G. Dines, F.M.S. [with diagram].
1874	[26]	On the Winds at Liverpool. By W. W. Rundell.
1875	[1]	Observations taken at Nine Stations of the Second Order [1875].
"	[89]	Mean Monthly Results for the Seven Observatories for the Lustrum, 1871-75.
1876	[13]	Report on the Reduction of Greenwich Curves for 1875 to a Common Standard with those of Kew [with 25 plates].
"	[20]	Results of Observations made at the Pagoda, Kew Gardens, to Determine the Influence of Height on Temperature, &c. By R. H. Scott, F.R.S. [4 plates.]
"	[39]	Comparison of Results obtained by means of the Harmonic Analyser, with similar Results got from Measurement and Numerical Calculation for the Seven Observatories.
1877	[13]	On the Diurnal Range of Rainfall at the Seven Observatories in connexion with the Meteorological Office, 1871-80. By R. H. Scott, F.R.S. [5 plates.]
"	[35]	Report on Evaporimeters. By W. N. Shaw, M.A. [2 plates.]
1878	[13]	On the Computation of the Quantity of Heat in excess of any Fixed Base Temperature, received at any place during the course of the Year, &c. By Lieut.-Gen. Strachey, R.E., F.R.S.
1879	[13]	Report on Experiments made at Strathfield Turgiss in 1869 with Thermometer Stands or Screens of various patterns, &c. By F. Gaster.
"	[41]	Report on Hygrometric Methods, &c. Part I. By W. N. Shaw, M.A.
1880	[13]	Report on Experiments made at the Kew Observatory with Thermometer Screens of different patterns during 1879, 1880 and 1881. By G. M. Whipple, Superintendent.
"	[19]	Tables and Diagrams illustrating the Diurnal Range of Barometric Pressure in the British Isles during the Years 1876-80. By F. C. Bayard, LL.M., F.R. Met. Soc. [5 plates.]

**V.—REPORT of the METEOROLOGICAL COMMITTEE of the  
ROYAL SOCIETY.**

Year.	Page.	
1867	27	A Description of the Self-recording Instruments recently erected by the Meteorological Committee of the Royal Society in various parts of the United Kingdom. [With plates.]
1869	25	Note upon a Self-registering Thermometer adapted to Deep-Sea Soundings, by W. A. Miller, M.D., Treasurer and V.P.R.S., extracted from Proceedings of Royal Society, vol. XVII., p. 482.
1869	36	Description of a Self-recording Rain-gauge, invented by Robert Beckley, of the Kew Observatory; made by James Hicks, London.
1870	25	Description of the Process by which the Traces of the Self-registering Instruments are reduced suitably for publication.
1872	27	A Summary of the Results obtained from the Discussion of the Information for Square 3, being the Region of the Doldrums in the Atlantic. By Capt. H. Toynbee, Marine Superintendent.
1874	33	The International Maritime Conference.

**VA.—REPORT of the METEOROLOGICAL COUNCIL.**

Year.	Page.	
1877-78	21	Account of the Experiments on Atmospheric Electricity conducted at Kew Observatory. By Prof. J. D. Everett.
1879-80	28	On the Effect of Sluggishness on the Readings of Marine Barometers on Shore, by Prof. Stokes.
"	43	On the Methods available for the Determination of the Humidity of the Atmosphere, by W. N. Shaw.
"	46	Memorandum as to the Employment of the Harmonic Analyser in the Meteorological Office, by Prof. Stokes.
1880-81	25	On the Working of the Harmonic Analyser. [Prof. Stokes.]
"	27	Report on Fogs. [W. J. Russell.]
"	28	" " Hygrometers and Evaporimeters, presented to the Meteorological Council. May 10, 1881. [W. N. Shaw.]
1881-82	25	On fogs. [W. J. Russell.]
"	29	Report on the Results of a Tentative Reduction of a Year's Electrograms at the Kew Observatory. [G. M. Whipple.]
1882-83	27	On the Results obtained by the use of the Harmonic Analyser.
1884-85	22	Note on Work done with the Harmonic Analyser.
1885-86	22	Memorandum on Cloud Photography, by Prof. Stokes, F.R.S.

Year.	Page.	
1886-87	21	On the Distribution of Gales round the Coasts of the British Isles [for the 15 years, 1871-85].
1887-88	22	On the History of the Severe Storms which visited the British Isles between August 1, 1882, and September 3, 1883, as traceable from the Atlantic Charts published by the Office. By Robert H. Scott, F.R.S., Secretary.
"	30	Abstract of Report on Hygrometric Methods, by W. N. Shaw, M.A., reprinted from the "Proceedings of the Royal Society," No. 262.
1888-89	22	Notes of some Results of an Examination of Atlantic Charts published by the Office, by R. H. Scott, F.R.S., Secretary.
"	27	Memorandum on the Measurement of Squalls shown on the Traces yielded by Robinson Anemometers of the "Standard" Pattern, by R. H. Curtis.
1889-90	24	Code of Regulations, &c. for conducting the work at the First Class Observatories, and the Examination thereof. [See also Report, 1868.]
"	36	Note on Experiments on Pressure of Wind made by W. H. Dines.
"	46	Experiments with Violle's Actinometer Apparatus.
"	47	On the Work done with the Harmonic Analyser at the Meteorological Office.
1890-91	22	On Mr. Dines' Anemometer Experiments.
1891-92	23	On Anemometer Comparisons carried out by the aid of a Grant from the Meteorological Council, by W. H. Dines, B.A.
1892-93	21	On the Construction of the Anemometer recently erected for trial on the roof of the Meteorological Office, by W. H. Dines, B.A.
"	27	On the Harmonic Analysis of Hourly Observations of Air Temperatures at British Observatories, by Lieut.-Gen. R. Strachey, F.R.S.
1894-95	22	Report on Weather Forecasts during the Hay Harvest of 1894, by H. N. Dickson.
"	27	Report on the Comparisons made between two Pressure Tube Anemometers on the roof of the Meteorological Office, by R. H. Curtis.
"	29	Note on the Exposure of the Robinson Anemometer at Holyhead, by R. H. Curtis.
1895-96	24	Note on Anemometer Experiments, by R. H. Curtis.
1897-98	21	Report upon Anemometer Experiments at Holyhead, by R. H. Curtis.
"	28	Description of the Bridled Anemometer designed by Sir G. G. Stokes, Bart., F.R.S., by R. H. Curtis.

VI.—HOURLY READINGS of the SELF-RECORDING INSTRUMENTS of the OBSERVATORIES in connexion with the METEOROLOGICAL OFFICE.

Year.	Page.	
1883	[1]	Constants of formulæ expressing the mean daily range of temperature obtained by the use of the Harmonic Analyser.
1884	[1]	Tables and formulæ to facilitate the computation of harmonic coefficients. By Lieut.-General Strachey, R.E.

**VII.—HOURLY MEANS of the READINGS obtained from the SELF-RECORDING INSTRUMENTS at the FIVE OBSERVATORIES under the METEOROLOGICAL COUNCIL.**

Year.	Page.	—
1891	[1]	Tables of Hourly Sunshine Values, with Plates, for the Ten Years 1881-90, for Seven Observatories.
1895	[6-80]	Mean Hourly and Extreme Values of Pressure and Temperature, and Amount and Frequency of Rainfall, for each month of the 25 years, 1871-95; also Amount and Frequency of Sunshine for each month of the 15 years, 1881-95.

**VIII.—METEOROLOGICAL OBSERVATIONS at STATIONS of the SECOND ORDER.**

Year.	Page.	—
1891	[186]	Results of Observations at Stations of the Second Order for the Fifteen years, 1876-90.



## APPENDIX XXI.

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LIST OF PUBLICATIONS ISSUED UNDER THE AUTHORITY  
OF THE METEOROLOGICAL COUNCIL.

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The list is arranged under the following headings :—

1. Periodical Publications and Reports.
  2. Occasional Publications.
  3. Instructions in the use of Instruments.
  4. Marine Meteorology.
  5. Miscellaneous Publications.
- 

1. Periodical Publications.

*Daily Weather Report.* (Issued to Subscribers only.) Subscription, £1 per annum.

*Weekly Weather Report.* With Appendices and Monthly Supplements priced separately :—

\*1888. Vol. V. (Official, No. 85.) 4*d.* per week. Annual subscription, including Supplements and Appendices, 21*s.* 2*d.*

1889–1900. Vols. VI.–XVII. (Official, Nos. 86, 87, 96, 100, 107, 111, 116, 121, 128, 133, 138, 144.) 6*d.* per week. Annual subscription, including Supplements and Appendices, 30*s.*

*Monthly Weather Reports* :—

1884. (Official, No. 62.) Jan.–March, May–Nov., 1*s.* 6*d.* each ; April (with two Appendices), 2*s.* 6*d.* ; Dec., 1*s.* 9*d.*

1885. (Official, No. 65.) Jan. to Dec., 1*s.* 6*d.* each

1886. (Official, No. 68.) Jan. to Dec., 1*s.* 6*d.* each.

†1887. (Official, No. 77.) Jan. to April, 1*s.* 6*d.* each ; May to Dec., in wrapper, 12*s.*

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\* The publication of the Weekly Weather Report began in February 1878. Annual subscription, including supplements and appendices, post paid, 1878–1883, 12*s.* 6*d.* ; 1884–1887, 21*s.* 2*d.*

† The publication of the Monthly Weather Report was continued after this date as a Supplement to the Weekly Weather Report.

1. Periodical Publications—*continued.**Quarterly Weather Reports :—*

1869. (Official, No. 7.) Parts I. to IV. 5s. each.  
 1870. (Official, No. 9.) Parts I. to IV. 5s. each.  
 1871. (Official, No. 14.) Parts I. to IV. 5s. each.  
 1872. (Official, No. 16.) Parts I. to IV. 5s. each.  
 1873. (Official, No. 19.) Parts I. to IV. 5s. each.  
 1874. (Official, No. 25.) Parts I., II., and IV., 5s. each ;  
 Part III., 5s. 9d.  
 1875. (Official, No. 30.) Parts I. to IV. 5s. each.  
 1876. (Official, No. 33.) Part I., 6s. ; Parts II., III.,  
 and IV., 5s. each.  
 1877. (Official, No. 52.) Part I., 10s. ; II., 5s. ; III., 4s. 6d. ;  
 IV., 6s. ; Appendices and Plates, 27s.  
 1878. (Official, No. 55.) Parts I. to IV., 6s. each. Appen-  
 dices and Plates, 28s.  
 1879. (Official, No. 49.) Parts I. to III., 6s. each ;  
 IV., 5s. 6d. ; Appendices and Plates, 27s.  
 1880. (Official, No. 50.) Parts I. and II., 6s. each ;  
 III., 4s. ; IV., 6s. ; Appendices and Plates, 28s.

## ANNUAL Volumes :—

## Reports of the Meteorological Committee :—

1867. (Official, No. 1.) 1s.  
 1868. (Official, No. 5.) 5d.  
 1869. (Official, No. 6.) 10d.  
 1870. (Official, No. 10.) 10d.  
 1871. (Official, No. 15.) 10d.  
 1872. (Official, No. 17.) 1s.  
 1873. (Official, No. 22.) 4d.  
 1874. (Official, No. 26.) 6d.  
 1875. (Official, No. 29.) 4d.  
 1876-77. (Official, No. 31.) 3s. 5d.

## Reports of the Meteorological Council :—

- 1877-78. (Official, No. 35.) 1s.  
 1878-79. (Official, No. 38.) 5d.  
 1879-80. (Official, No. 41.) 1s.  
 1880-81. (Official, No. 42.) 1s. 2d.  
 1881-82. (Official, No. 48.) 1s.  
 1882-83. (Official, No. 58.) 10½d.  
 1883-84. (Official, No. 64.) 1s. 2d.  
 1884-85. (Official, No. 67.) 4s. 4d.

**1. Periodical Publications—continued.****ANNUAL Volumes—continued.****Reports of the Meteorological Council—continued.**

1885-86.	(Official, No. 72.)	8 <i>d.</i>
1886-87.	(Official, No. 75.)	8 <i>d.</i>
1887-88.	(Official, No. 79.)	1 <i>s.</i>
1888-89.	(Official, No. 84.)	5½ <i>d.</i>
1889-90.	(Official, No. 91.)	7½ <i>d.</i>
1890-91.	(Official, No. 99.)	5½ <i>d.</i>
1891-92.	(Official, No. 104.)	6 <i>d.</i>
1892-93.	(Official, No. 109.)	8 <i>d.</i>
1893-94.	(Official, No. 112.)	7½ <i>d.</i>
1894-95.	(Official, No. 119.)	8½ <i>d.</i>
1895-96.	(Official, No. 122.)	8½ <i>d.</i>
1896-97.	(Official, No. 130.)	8 <i>d.</i>
1897-98.	(Official, No. 136.)	11 <i>d.</i>
1898-99.	(Official, No. 140.)	7½ <i>d.</i>

**Observatories and Stations.**

\*Hourly Readings from the Self-Recording Instruments at the  
 . . . Observatories under the Meteorological Council :—

1881.	(Official, No. 51.)	Part I., 10 <i>s.</i> 6 <i>d.</i> ; Parts II. III., and IV., 21 <i>s.</i> each.
1882.	(Official, No. 54.)	Parts I. and II., 20 <i>s.</i> each ; III., 22 <i>s.</i> 6 <i>d.</i> ; IV., 26 <i>s.</i>
1883.	(Official, No. 63.)	Parts I., II., and III., 21 <i>s.</i> each ; Part IV., 30 <i>s.</i>
1884.	(Official, No. 70.)	Part I., 12 <i>s.</i> ; II., 10 <i>s.</i> ; III., 10 <i>s.</i> 6 <i>d.</i> ; IV., 15 <i>s.</i>
1885.	(Official, No. 74.)	Parts I. and II., 11 <i>s.</i> each ; III., 10 <i>s.</i> 6 <i>d.</i> ; IV., 12 <i>s.</i>
1886.	(Official, No. 81.)	Parts I., II., and III., 10 <i>s.</i> 6 <i>d.</i> each ; Part IV., 12 <i>s.</i> 6 <i>d.</i>

Hourly Means of the Readings obtained from the Self-  
 Recording Instruments at the . . . Observatories  
 under the Meteorological Council :—

1887.	(Official, No. 94.)	16 <i>s.</i>
1888.	(Official, No. 97.)	20 <i>s.</i>
1889.	(Official, No. 103.)	15 <i>s.</i>
1890.	(Official, No. 105.)	20 <i>s.</i>
1891.	(Official, No. 113.)	32 <i>s.</i> 6 <i>d.</i>

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\* For the years 1874-1880 the Hourly Readings were issued in lithographed form. Price 20*s.* per annum.

## 1. Periodical Publications—continued.

## ANNUAL Volumes—continued.

*Observatories and Stations—continued.*

## Hourly Means, &amp;c.—continued.

1892.	(Official, No. 118.)	21s.
1893.	(Official, No. 126.)	24s.
1894.	(Official, No. 131.)	24s.
1895.	(Official, No. 135.)	38s.
1896.	(Official, No. 141.)	37s. 6d.
1897.	(Official, No. 145.)	(In the Press.)

## Meteorological Observations at Stations of the Second Order :—

*1876.	(Official, No. 33 <i>a</i> .)	
1877.	(Official, No. 33 <i>b</i> .)	
1878.	(Official, No. 39.)	20s.
1879.	(Official, No. 45.)	20s.
1880.	(Official, No. 57.)	34s. 6d.
1881.	(Official, No. 66.)	35s.
1882.	(Official, No. 69.)	35s.
1883.	(Official, No. 73.)	30s.
1884.	(Official, No. 78.)	32s.
1885.	(Official, No. 82.)	31s.
1886.	(Official, No. 88.)	25s.
1887.	(Official, No. 95.)	24s.
1888.	(Official, No. 101.)	22s.
1889.	(Official, No. 108.)	34s.
1890.	(Official, No. 110.)	34s.
1891.	(Official, No. 117.)	30s.
1892.	(Official, No. 120.)	27s.
1893.	(Official, No. 125.)	27s.
1894.	(Official, No. 129.)	27s.
1895.	(Official, No. 137.)	22s. 6d.
1896.	(Official, No. 139.)	21s.
1897.	(Official, No. 146.)	(In the Press.)

## 2. Occasional Publications and Reports.

## ATLAS.—

Meteorological Atlas of the British Isles. (Official, No. 53.)  
5s. 6d.

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\* The Observations at Stations of the Second Order for 1873-75 will be found in the Quarterly Weather Report for the respective years.



**2. Occasional Publications and Reports—continued.****CONGRESSES, CONFERENCES, &c., Reports of Proceedings :—**

- Leipzig. 1872. (Non-Official, No. 6.) 1s.  
 Vienna. 1873. (Official, No. 21.) 1s.  
 Vienna and Utrecht. 1873 and 1874. (Non-Official, No. 9.) 1s. 6d.  
 London. 1874. Maritime Meteorology. (Official, No. 23.) 2s.  
 London. 1876. With Supplement. (Non-Official, No. 11.) 2s.  
 Utrecht. 1878. (Non-Official, No. 13.) 6d.  
 Rome. 1879. (Official, No. 36.) 1s. 6d.  
 Berne. 1880. (Non-Official, No. 14.) 1s.  
 Copenhagen. 1882. (Non-Official, No. 15.) 2s. 6d.  
 Paris. 1885. (Non-Official, No. 16.) 1s.  
 Zurich. 1888. (Non-Official, No. 17.) 4d.  
 Munich. 1891. (Official, No. 102.) 1s. 6d.  
 Upsala. 1894. (Official, No. 115.) 1s.  
 Paris. 1896. (Official, No. 127.) 1s.  
 Report on Weather Telegraphy and Storm Warnings. 1873. (Non-Official, No. 8.) 6d.  
 Reports . . . on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy. 1878. (Non-Official, No. 12.) 2s.

**FOREIGN AND COLONIAL STATIONS :—**

- Contribution to the Meteorology of Japan.—By Staff-Com. Thomas H. Tizard, H.M.S. "Challenger." (Official, No. 28.) [Out of print.]  
 Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers, and the Army Medical Department, 1852–1886. (Official, No. 83.) 23s.  
 Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo, 1886–1888.—By the late W. Reid, M.D. (Official, No. 89.) 8s. 6d.  
 Report on the Meteorology of Kerguelen Island.—By Rev. S. J. Perry, S. J., F.R.S. (Official, No. 37.) 3s.

**RAINFALL :**

- Diurnal Range of Rain at the Seven Observatories in connection with the Meteorological Office, 1871–1890. (Official, No. 143.) 2s. 6d.  
 Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. (Official, No. 47.) 7s. 6d.  
 Rainfall Tables of the British Islands, 1866–90. (Official, No. 114.) 6s.

**2. Occasional Publications and Reports—continued.****SUNSHINE :—**

Sunshine Records of the United Kingdom for 1881. (Official, No. 56.) 4s.

Ten Years' Sunshine in the British Isles, 1881–90. (Official, No. 98.) 2s.

**3. Instructions in the use of Instruments, &c.**

Barometer Manual. (Official, No. 8.) [Out of print.]

Barometer Manual for the use of Seamen. With an Appendix on the Thermometer, Hygrometer, and Hydrometer. Fourth Edition, 1900, Extensively Revised. (Official, No. 61.) 3d.

Fishery Barometer Manual. New Edition. 1887. (Official, No. 3.) 6d.

Instructions for Meteorological Telegraphy. New Edition. 1891. (Official, No. 2.) Prepared for the use of observers exclusively.

Instructions in the use of Meteorological Instruments. Reprinted 1892. (Official, No. 24.) 2s. 6d.

**FORECASTING :—**

Aids to the Study and Forecast of Weather.—By. W. Clement Ley, M.A. (Official, No. 40.) 1s.

Principles of Forecasting by means of Weather Charts.—By the Hon. Ralph Abercromby, F.R.Met.Soc. Second Edition, Revised. (Official, No. 60.) [Out of print.]

**4. Marine Meteorology.****CHARTS.—*****Arabian Sea :—***

Daily Weather Charts for the period of six weeks ending June 25, 1885, to illustrate the tracks of two cyclones in the Arabian Sea. (Official, No. 80.) 10s.

***Atlantic :—***

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. (Official, No. 27.) 24s.

Monthly Current Charts for the Atlantic Ocean. From Information collated and prepared in the Meteorological Office. Published by the Admiralty. (Official, No. 132.) 7s.

**4. Marine Meteorology—continued.****CHARTS—continued.***Atlantic (North):—*

Charts of Meteorological Data for Square 3. Lat.  $0^{\circ}$ – $10^{\circ}$  N., Long.  $20^{\circ}$ – $30^{\circ}$  W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. (Official, No. 20.) 20s.

Charts of North Atlantic Weather for the Winter of 1898–99. (Official, No. 142.) (In the Press.)

Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Latitude  $40^{\circ}$  N., for each Month of the Year. With a General Current Chart. (Official, No. 12.) 2s. 6d.

Discussion of the Meteorology of that Part of the Atlantic lying North of  $30^{\circ}$  N., for the eleven days ending 8th February 1870. With Charts. (Official, No. 13.) 5s.

Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. (Official, No. 32.) With Book of Charts. 15s.

Synchronous Weather Charts of the North Atlantic and the adjacent Continents, 1st August, 1882, to 3rd September, 1883. Parts I. to IV. (33 sheets each). (Official, No. 71.) 17s. each part.

*Atlantic (South):—*

Charts showing the Surface Temperature of the South Atlantic Ocean in each month of the year. (Official, No. 4.) 2s. 6d.

*Atlantic, Indian, and Pacific Oceans:—*

Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. (Official, No. 76.) 10s. 6d. Supplementary Chart, 6d.

Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. (Official, No. 59.) 21s.

*Indian Ocean:—*

Monthly Current Charts for the Indian Ocean. From Information collated and prepared in the Meteorological Office. Published by the Admiralty. (Official, No. 124.) 7s.

*Indian Ocean (North):—*

Meteorological Charts of the Portion of the Indian Ocean adjacent to Cape Guardafui and Ras-Hafun. (Official, No. 92.) 6s.

## 4. Marine Meteorology—continued.

## CHARTS—continued.

*Indian Ocean (South):—*

Cyclone Tracks in the South Indian Ocean. From information compiled by Dr. Meldrum, C.M.G., F.R.S. (Official, No. 90.) 7s.

Meteorological Charts for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. (Official, No. 43.) Charts, 25s.; Remarks, 7s.

*Pacific Ocean:—*

Quarterly Current Charts for the Pacific Ocean. From Information collated and prepared in the Meteorological Office. Published by the Admiralty. (Official, No. 134.) 5s.

*Red Sea:—*

Meteorological Charts of the Red Sea. (Official, No. 106.) 21s.

*Southern Ocean:—*

Meteorological Charts of the Southern Ocean between the Cape of Good Hope and New Zealand. (Official, No. 123.) 12s.

## OTHER PUBLICATIONS ON MARINE METEOROLOGY:—

Contributions to our Knowledge of the Meteorology of the Antarctic Regions. (Official, No. 18.) 2s.

Contributions to our Knowledge of the Meteorology of the Arctic Regions. (Official, No. 34.) Vol. 1.: Part I., 2s.; II., 10s.; III. and V., 6s. each; IV., 5s.

Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. (Official, No. 11.) 2s. 6d.

Notes on the Form of Cyclones in the Southern Indian Ocean.—By C. Meldrum, M.A., F.R.S. (Non-Official, No. 7.) [Out of print.]

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. H. Toynbee, F.R.A.S. (Non-Official, No. 10.) [Out of print.]

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. (Non-Official, No. 5.) 6d.

Report to the Committee of the Meteorological Office on the Meteorology of the North Atlantic.—By Captain H. Toynbee, F.R.A.S. (Non-Official, No. 2.) 1s.



**4. Marine Meteorology—continued.****OTHER PUBLICATIONS ON MARINE METEOROLOGY—continued.**

Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope between Lat. 30° and 50° S., and Long. 10° and 40° E.—By Capt. H. Toynbee, F.R.A.S. (Official, No. 44.) 7s. 6d.

Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the R. Meteor. Inst. of the Netherlands. (Non-Official, No. 4.) 6d.

**5. Miscellaneous Publications.**

Harmonic Analysis of Hourly Observations of Air Temperature and of Pressure at British Observatories. (Official, No. 93.) 12s.

Report of an Inquiry into the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott. (Non-Official, No. 1.) 6d.

Report on the Storm of October 13–14, 1881.—By Robert H. Scott, F.R.S. (Official, No. 46.) 1s. 6d.

Report to the Committee of the Meteorological Office on the Use of Isobaric Curves.—By Captain H. Toynbee, F.R.A.S. (Non-Official, No. 3.) [Out of print.]

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