

R E P O R T
OF THE
METEOROLOGICAL COUNCIL

For the Year ending 31st of March 1898,

TO THE
PRESIDENT AND COUNCIL

OF THE
ROYAL SOCIETY.

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



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



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For details of Information Received. - See Appendix XI.

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THE METEOROLOGICAL COUNCIL,

1897-98.

Lieutenant-General SIR RICHARD STRACHEY, R.E., G.C.S.I.,
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Hydrographer of the Admiralty.

R E P O R T
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For the Year ending 31st of March 1898,
TO THE
PRESIDENT AND COUNCIL
OF THE
ROYAL SOCIETY.

The Council has sustained a serious loss during the year in the death of Mr. Edward J. Stone, the Radcliffe Observer, which occurred on the 9th of May, 1897, after a short illness. Mr. Stone was appointed a member of the Council on the death of Professor H. J. S. Smith in 1883, and he was throughout a constant attendant at its meetings. Introductory

The Council desires to record its high sense of the value of Mr. Stone's services during the long period of his membership. As Radcliffe Observer at Oxford, he had charge of the self-recording meteorological instruments which have been maintained there since 1879. These had been supplied to him to replace the self-recording apparatus erected in 1854, by the late Mr. Manuel Johnson, which were in need of renewal.

The vacancy in the Council has been filled by the appointment of Mr. William Napier Shaw, F.R.S., Fellow of Emmanuel College, Cambridge. Mr. Shaw took his seat at the Council on the 27th of May, 1897.

The executive of the Office is the same as before, Mr. R. H. Scott, M.A., D.Sc., F.R.S., being the Secretary, and Nav.-Lieut. C. W. Baillie, R.N., F.R.A.S., the Marine Superintendent.

The work of the Office may be conveniently considered under four heads, namely:

- I. OCEAN METEOROLOGY.
- II. WEATHER TELEGRAPHY.
- III. CLIMATOLOGY.
- IV. MISCELLANEOUS INVESTIGATIONS, AND ADMINISTRATION.

PART I.

OCEAN METEOROLOGY.

Collection of Information.—The Office continues, as in the past, to collect data with respect to the meteorology of the ocean, and to carry out this object complete outfits of meteorological instruments are supplied to officers of merchant ships who are willing to make observations at sea. Collection of information.

Collection of
Information.

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 these agents:—

Cardiff, T. L. Ainsley, Bute Docks.

Dundee, Capt. A. Wood, Navigation School.

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

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

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

Liverpool, J. Gill, Nautical College.

Southampton, Capt. D. Forbes, High Street.

The number of merchant ships supplied with instruments and log books during the year has been 127.

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 both from the Office and from the several agencies.

Recognition
of "excellent"
observers.

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 XVI., p. 128.

Appendix I. (p. 31) contains a list of the observers who have, during the past year, contributed logs classed as "excellent." The Council takes this opportunity of expressing its 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.
Barber, J.	S.S. "Oanfa."
Constantine, T.	S.S. "Don."
Crewe, E.	S.S. "Victoria."
Davies, E. H.	S.S. "Heraclides."
Dawson, Lieut. and Commr. W. P., R.N.	H.M.S. "Waterwitch."
De la Garde, P., R.N. (Assistant Paymaster).	H.M.S. "Waterwitch."
Dickinson, L. R.	S.S. "Danube."
Gibson, J.	S.S. "Amber."
Greay, R., R.N.R.	S.S. "Amber."

Observer's Name.	Ship.	Recognition of "excellent" observers.
Hague, J. W.	S.S. "Pretoria" and S.S. "Spartan."	
Jaggard, R.	S.S. "Waimate."	
Johnston, J.... ..	Barque "Blengfell."	
Lewis, Lieut. A. W., R.N. ...	H.M.S. "Penguin."	
MacDonald, J.	Barque "Marion Frazer."	
Nares, Lieut. G. E., R.N. ...	H.M.S. "Penguin."	
Pascoe, Lieut. F. C., R.N. ...	H.M.S. "Penguin."	
Roberts, R.	S.S. "Cabenda."	
Ross, J.	Barque "Alcides."	
Shanklin, J. W.	S.S. "Ethiopia."	
Title, F.	"Falls of Foyers."	
Turner, A. C., R.N.R.	S.S. "Britannia."	
Veale, E. A.	S.S. "Ormuz" and S.S. "Lusitania."	
Ward, W.	S.S. "Argyle."	
Watson, Sub-Lieut. H. C., R.N. ...	H.M.S. "Egeria."	
Waugh, Lieut. A., R.N.	H.M.S. "Penguin."	
Webster, T.	"Centesima."	

The Council note with regret the death of one of their observers, Capt. G. B. Armstrong, of the Royal Mail Steam Packet Company, who had kept ten logs, many of them being "excellent."

The meteorological logs received during the year numbered 146, of which 134 were either "excellent" or "very good." Character of logs received.

The Council has 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, *viâ* Suez.

A list of the meteorological logs received at the Office from ships during the year is given in Appendix II. (p. 33). It may be summarised as follows:—

North Atlantic	450	Pacific Ocean, South	95	Districts from which observations are obtained.
South "	136	Mediterranean	79	
Indian Ocean	117	Red Sea	58	
Pacific Ocean, North	48	Arctic Ocean	4	

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

Current Charts for all Oceans.—This work is now completed, and is in the hands of the public. Current Charts.

In the case of the Pacific, a chart for every third month only has been engraved, as material was lacking to produce reliable monthly charts. These have been supplemented by generalized observations from the month on either side, and yet large areas are left for which no certain information can be given. As the information for this ocean continues to be received, it is proposed to plot it in such a manner that the generalized charts may be gradually improved.

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. As no charts for this area have been previously published, the work will probably be of much value.

The charts are now nearly all engraved. They consist of wind, current, and sea temperature charts, and as each series contains twelve monthly charts, there will be 36 in all.

The wind charts are partitioned into areas bounded by parallels of latitude 3° apart, and meridians of longitude 10° apart. The prevalent winds are indicated by the same form of wind-rose as that adopted in the Red Sea charts (see the Report for 1892, p. 7). Isobars of mean barometric pressure are drawn on the maps, to show the relationship between mean pressure and prevalent winds. The per-centage of observations, when fog was met with, is noted in the corner of each area. A small chart of the whole area is placed in the corner for the purpose of showing the mean air temperature by isotherms, and the occurrence of fog. This method was adopted because it was found that if the isotherms and fog lines were drawn on the large charts there was danger of confusion.

The sea temperature charts show, by shading, the areas over which the range of temperature exceeds 20° .

The current charts are copied from the charts of the Pacific and Indian Oceans.

South
Atlantic.

The Meteorology of the South Atlantic and of the West Coast of South America.—The logs in the Office, which relate to this region, have been analysed; the data for those regions which are rarely visited by merchant shipping are supplied chiefly from the logs of the Royal Navy.

The extraction of the data for several months of the year is now practically complete, and the whole collation of data from the above sources will be shortly brought to a close.

Observations from the Pacific Ocean.—As our knowledge of the meteorology of the Pacific Ocean is very imperfect, the Council have made arrangements with Mr. H. C. Russell, F.R.S., C.M.G., Director of the Sydney Observatory, which will, they hope, lead to the acquisition of further information. They have obtained permission from the Admiralty to supply instruments from the store at the Dockyard at Sydney to merchant ships which cross the Pacific.

Instruments
for distant
stations.

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. the observers undertaking to send in copies of their observations.

A list of the documents received during the year from such foreign land stations is given in Appendix XII. (p. 94).

The only new station of this class supplied with instruments on loan during the past year was Colon.

A set of meteorological instruments was lent to the Exhibition of the Shipmasters' Society, held at the Fishmongers' Hall in July, 1897.

Information
supplied for
the
Admiralty.

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 and

of correspondence with foreign meteorological Institutes has been required to supply the necessary information.

Supply and Stock of Instruments.—In Appendix III. (p. 42) a list 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 standing on the books to the account of the Admiralty on the 31st March, 1898.

Stock of instruments belonging to the Office.

Appendix IV. (p. 43) 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, and 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 XI. (p. 88), and the same Appendix contains at p. 93 a list of the Foreign Stations which send daily telegrams to the Office.

The staff of observers has remained unchanged during the year, except that at North Shields Mr. Clark has succeeded Mr. Irvine, who has left North Shields, after 28 years' service, during which he has furnished careful observations to the Office.

There has been no serious interruption of telegraphic communication during the year.

The Office receives an increasing number of inquiries concerning the weather, and a considerable amount of investigation and correspondence is required to obtain the needed information.

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

Inspection of the Stations.

The reports of the Inspectors are printed in Appendix V. (p. 44), and they show that efficiency has been maintained.

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. Certain copies of the Daily Weather Report are distributed without charge, namely, 7 to newspapers, 71 for public exhibition at seaports, 80 to Government Offices and public institutions, 61 to correspondents of the Office, and 35 to foreign meteorological institutions. The issue to paying subscribers amounted to nearly 200 copies.

Discussion of the reports.

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., pp. 17, 18, and in Appendix VI., p. 75.

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, Dungeness, the Needles (Hurst Castle), 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. The Council have reason to believe that the public appreciates the opportunity thus afforded them of learning the state of the weather on the coasts.

Forecasts
for the
Admiralty.

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.

Weather Forecasts.—Forecasts are made three times a day, namely, at 11 a.m., at 3.30 p.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 issued at 3.30 p.m. are of especial value in relation to storm warnings. They are also of service in the special series of Hay Harvest Forecasts referred to on p. 11. The forecasts at 8.30 p.m. are prepared for the next morning's newspapers. Each of the three forecasts has its special applicability, and all of them are available to the public on inquiry at the Office either by letter, by telegram, or in person.

Inquiries at
the Office.

The inquiries received by telegram through the Post Office for special forecasts amounted during the year to 106, and the personal applications to 73. The rules of the Office relating to such inquiries are stated in Appendix VI., p. 77.

Results of
Forecasts.

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 VII., p. 80.

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.

It will here suffice to state that partial success means that the Forecast was correct at more than half 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.

* Namely, 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 Messrs. Pastorelli's, New Bond Street; and at the Office, 63, Victoria Street.

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, 1897-98.

Districts.	Per-centages.				
	Complete Success.	Partial Success.	Partial Failure.	Complete Failure.	Sum of Successes, Complete and Partial.
SCOTLAND, N. ...	50	31	13	6	81
" E. ...	55	24	16	5	79
ENGLAND, N.E. ...	54	30	12	4	84
" E. ...	57	27	12	4	84
MIDLAND COUNTIES...	58	27	11	4	85
ENGLAND, S. ...	60	27	10	3	87
SCOTLAND, W. ...	53	22	16	9	75
ENGLAND, N.W. ...	55	26	13	6	81
" S.W. ...	58	26	10	6	84
IRELAND, N. ...	54	24	15	7	78
" S. ...	52	25	15	8	77
Summary ...	55	26	13	6	81

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 1888-97 the per-centages 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.

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.
1888	51	31	82
1889	49	32	81
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
Average	52.5	28.8	81.3

Hay Harvest Forecasts.—As in previous years the Council has during the hay harvest sent Daily Forecasts, without charge, to certain observers selected by the Royal Agricultural Society, the Royal Dublin Society, and the Highland and Agricultural Society. The Council makes it a condition for the supply of these forecasts, that the information shall be disseminated by the recipients as widely as possible, and that a record of the weather actually experienced shall be sent weekly to the Office.

Hay Harvest Forecasts.

Hay Harvest
Forecasts.

LIST of RECIPIENTS of the HAY HARVEST FORECASTS in 1897.

Districts.	Recipients.	Address.
0. SCOTLAND, N. ...	Rev. Dr. Joass ...	Golspie.
	Major Smith ...	Munlochy, Inverness.
1. SCOTLAND, E. ...	T. Wilson ...	Glamis Castle, by Forfar.
	C. Pirrie ...	Rothiemay, Huntly.
	T. Bett ...	Dalnaline, Aberfeldy.
2. ENGLAND, N.E. ...	Sir J. Wilson... ..	Chillingham Barns, Belford, Northumberland.
	J. Smith ...	The Ferneries, Ulceby.
3. ENGLAND, E. ...	W. Birkbeck ...	High House, Thorpe, Norwich.
	Sir J. B. Lawes, Bt., and Sir J. H. Gilbert.	Rothamsted, Harpenden.
4. MIDLAND COUNTIES ...	Royal Agricultural College.	Cirencester.
	Major Fosbery ...	Warwick.
	T. H. Thursfield ...	The Grange, Much Wenlock.
	E. E. Harcourt-Vernon	Grove Hall, East Retford.
5. ENGLAND, S. ...	The South - Eastern Agricultural College.	Wye, near Ashford, Kent.
	C. Whitehead ...	Barming House, Maidstone.
	E. P. Squarey ...	The Moot, Downton, Wilts.
	M. J. Sutton ...	Kidmore Grange, Caversham.
6. SCOTLAND, W. ...	W. Calder ...	Castle Hill, Dalreoch, Dum- barton.
	Sir M. J. Stewart, Bt., M.P.	Ardwell, Stranraer.
	J. Loughton ...	Eallabus House, Islay.
7. ENGLAND, N.W. ...	Lord Egerton of Tatton	Tatton Park, Knutsford.
	R. Metcalfe, M.D. ...	Leyburn, Yorkshire.
8. ENGLAND, S.W. ...	The Earl of Ducie ...	Tortworth, Gloucestershire.
	T. Dyke ...	Long Ashton, Clifton, Bristol
	R. Neville Grenville	Butleigh Court, Glastonbury.
9. IRELAND, N. ...	E. F. Farrell ...	Moynalty, Co. Meath.
	J. M. Wilson ...	Currygrane, Edgeworthstown.
10. IRELAND, S. ...	D. A. Milward ...	Lavistown, Kilkenny.
	W. Talbot Crosbie ...	Ardfert Abbey, Tralee, Co. Kerry.

The telegrams were sent daily for the period of about five weeks, commencing in some districts on June 1st. In certain cases, by special request, they were continued for a longer period. There were besides four who subscribed for the Hay Harvest Forecasts.

The information from which the degree of success of the Forecasts has been estimated was furnished by the recipients themselves. The following table, compiled from these estimates, contains a summary of the independent judgments of those to whom the telegrams were sent.

SUMMARY OF RESULTS.—HAY HARVEST FORECASTS, 1897.

Districts.	Names of Stations.	Per-centages.				Sum of Successes, Complete and Partial.
		Complete Success.	Partial Success.	Partial Failure.	Complete Failure.	
SCOTLAND, N. ..	Munlochy and Golspie	80	12	8	—	92
" E. ..	Aberfeldy, Glamis, and Rothiemay ..	68	25	7	—	93
ENGLAND, N.E. ..	Belford and Ulceby	67	26	7	—	93
" E. ..	Rothamsted and Thorpe	78	15	5	—	93
MIDLAND COUNTIES	Cirencester, East Retford, Warwick, Much Wenlock.	69	20	9	—	89
ENGLAND, S. ..	Maidstone, Downton, Caversham, and Wye.	78	20	2	—	98
SCOTLAND, W. ..	Ardwell, Islay, and Dumbarton ..	63	22	7	5	90
ENGLAND, N.W. ..	Leyburn and Knutsford	63	22	13	—	85
" S.W. ..	Tortworth, Clifton, and Glastonbury	62	24	11	—	86
IRELAND, N. ..	Moynalty and Edgeworthstown ..	59	24	11	—	83
" S. ..	Tralee and Kilkenny	62	28	8	—	90
Mean for all districts		68	22	8	2	90

These figures show that 90 per cent. of the Forecasts were useful ; the corresponding per-centage in 1896 was 88. Several of the recipients expressed in writing their satisfaction with the accuracy of the Forecasts.

Storm Warnings for the Coasts of the United Kingdom.— Storm Warnings of coming storms are despatched 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 VIII., p. 81. At the end of March, 1898, there were 215, of which 117 were in England and Wales, 63 in Scotland, 28 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 experi-

Storm
Warnings.

enced. The method of comparison is explained in Appendix VI., p. 75, and the results are exhibited in the following table:—

COMPARISON between the WARNINGS and the subsequent
WEATHER in 1897.

Coasts.	Total No. of Warnings.	Warnings justified by subsequent Gales. Force 8 and upwards.	Warnings justified by subsequent strong Winds. Forces 6 & 7.	Warnings not justified by subsequent Weather.	Warnings late. Force 9 reached at two Stations before issue.	Warnings partially late. Force 9 reached at one Station before issue.	Storms for which no Warning was issued.
Scotland, N.E.	57	36	13	4	1	3	March 28, May 8-9, May 11, Sept. 4.
" E.	44	20	18	6	—	—	Jan. 22.
" N.W.	54	33	17	2	—	2	—
" W.	55	29	22	4	—	—	—
Ireland, S.W.	52	31	15	4	—	2	—
" N.W.	55	30	18	3	1	3	June 16, Dec. 6.
Irish Sea	52	34	10	2	1	5	May 11 June 16 Sept. 4.
St. George's Channel	43	24	17	1	—	1	—
Bristol Channel	42	33	9	—	—	—	—
England, S.W.	39	31	8	—	—	—	—
" S.	25	12	13	—	—	—	Nov. 29.
" S.E.	24	12	11	1	—	—	Sept. 5, Nov. 29.
" E.	22	15	6	—	—	1	Nov. 29.
" N.E.	32	18	12	—	—	2	—
Totals	596	358	189	27	3	19	
Percentages... ..		60·1	31·7	4·5	0·5	3·2	

NOTES as to GALES EXPERIENCED in 1897, but for which no
WARNING was issued.

January 22nd., Scotland East.—At 6 p.m. on January 21st a depression of moderate depth lay over Denmark, and light to moderate Northerly and North-westerly winds prevailed over our Islands. Forecast was for "very strong" and "squally" winds, but the barometer rose so quickly in the north of Scandinavia that a North-easterly gale resulted on this coast.

March 28th., Scotland North-east.—At 8 a.m. on 28th (Sunday) there were two depressions—one over the Shetlands, the other over the North Sea—neither of them very deep. At 6 p.m. (there are no 2 p.m. observations on Sundays) it was already too late to warn this district, but our north-west and west coasts were warned successfully. The gale was due to a rapid increase of pressure over the Atlantic, in the rear of the depression.

May 8th-9th., Scotland North-east.—There was a depression over the Shetlands at 8 a.m., 8th, which moved to Norway by 6 p.m. In its rear the barometer rose with unexpected rapidity, and a gale ensued.

May 11th., Scotland North-east and Irish Sea.—At 8 a.m. on May 10th there was an apparently unimportant depression over Scandinavia. This moved southwards, and its secondaries swept down our north-east coasts, causing gales in many places. The north-east and east coasts of England were duly warned. Storm Warnings.

June 16th.—Ireland North-west and Irish Sea.—On June 15th the appearance was very quiet till evening, the barometer then fell fast in the extreme north-west, but at 6 p.m. it had not fallen below 29·75 inches, even at Belmullet. The depression subsequently passed eastwards across the north of Ireland and the south of Scotland; and gales from the North-west were experienced.

September 4th.—Scotland North-east and Irish Sea. At 8 a.m. on September 3rd a depression lay over Scandinavia and was passing off; at 6 p.m. a new secondary system was approaching Scotland from the westward, and the wind had fallen light. The general appearance did not justify the issue of warnings, but a North-westerly gale, although not a severe one, followed in the south-east of England on 5th. Strong winds had been predicted, but not gales.

November 29th., England South, South-east and East.—All our other coasts had been warned, but at 6 p.m. on Sunday, 28th, it was too late to warn these coasts, as a gale from the North-west and North had already set in.

December 6th.—Ireland North-west. At 8 a.m., 6th., there was a depression of no great depth off our north-west coasts moving north-eastwards, with nothing to indicate a gale. Later on the disturbance grew deeper and gales from South-west and West set in.

Almost all of these gales were caused by the sudden and unexpected increase of pressure in the rear of disturbances, of which the front did not present threatening appearances. This fact points to the existence of an area of unusually high pressure over the Atlantic during this year, which, though occasionally indistinct, rapidly re-appeared and caused the North-westerly gales enumerated above.

It is obvious that telegraphic information cannot be received from the Atlantic, and thus the means of forecasting disturbances of this kind are necessarily wanting.

The following table contains a statement of the amount of success of storm warnings in the decade 1888-97. It will be seen that the warnings were very successful, although slightly less so than in 1894.

Comparison of results for 1897 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.
1888	539	55·3	28·6	83·9	14·3
1889	373	47·7	33·5	81·2	16·9
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

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 IX., p. 83. There are 215 stations of this kind, of which 67 are in England, 7 in Wales, 61 in Ireland, 75 in Scotland, 4 in the Isle of Man, and 1 in Jersey.

PART III.

CLIMATOLOGY.

I.—BRITISH ISLES.

Climatology.

Meteorological observations of the highest refinement and completeness entail considerable expense, and the service of highly trained observers. It has, therefore, been the policy of the Office to subsidise and to maintain an intimate relationship with a small number of observatories of the highest class. The data derived from these stations are suited for such investigations as require minute and continuous knowledge of the several meteorological elements. These stations are, however, too few and too widely scattered to afford a good general representation of the conditions of climate, the winds, barometric pressure, temperature, and sunshine, and it has accordingly been found necessary to supplement them by certain other "anemographic," "barographic," and "sunshine" stations.

The distribution of stations required for representing the climate of these islands likewise differs from that needed for the forecasting of the weather. For the latter purpose the Office relies only on the "Telegraphic Reporting Stations" referred to in Part II.

The climate of different parts of Great Britain and Ireland is very diverse, and fortunately there are throughout the country many stations where good meteorological observations are made by volunteer observers. Such of these stations as furnish the Office with observations are classed as stations of the second and third order respectively according to the amount of information furnished by each. Thus the Observatory at Bidston, Liverpool, and the Radcliffe Observatory at Oxford are ranked as of the second order, although their equipment and the quality of their work are of the first order.

A list of all the stations is given in Appendix XI. (p. 88). Certain letters are attached to each station, which indicate the nature of the information supplied to the Office. From what has been just stated it will have appeared that the stations may be classified in seven categories; but an examination of the list in Appendix XI. will show that the categories to a certain extent over-lap, so that the same station may occur in two of them.

The seven categories are as follows:—

Observatories
of first order

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 sunshine with frequent eye observations of the weather, and of the kind and amount of cloud.

2. *Anemographic Stations* which furnish continuous records of the direction and force of the wind. These records are often of use in affording evidence in courts of law; they are regularly employed in checking the accuracy of the storm warnings. Anemographic 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 most 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.

The stations of the categories 2, 3, and 4 are of especial service in matters which relate to the weather, as distinguished from climate.

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, and the observers are volunteers and unpaid. 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.

An account of the methods employed by the Office in dealing with all these records is given in Appendix X., p. 84.

The stations may be summarised as follows:—

Class.	Description.	Number.
1	Observatories	7
2	Anemographic stations	15
3	Barographic (Aneroid) stations	15
4	Sunshine stations	65
5	Telegraphic stations	30
6	Second Order stations	83
7	Third Order stations	66

Inspection of the Stations.—The stations classified under the heads 1 to 5 are visited regularly by the Inspectors of the Office. The stations of Class 7 are inspected as opportunity offers. Some of the stations of Class 6 belong to the Royal Meteorological Society, and 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 seven principal observatories and of some of the anemographic stations was carried out by Messrs. T. W. Baker and E. G. Constable, of the Kew Observatory. Inspection of Stations.

Extracts from the reports of the Inspectors are given in Appendix V., p. 44.

Information supplied to the General Register Office, Dublin.—Reports from the Irish stations have been supplied regularly to the Registrar General for Ireland, for his Weekly and Quarterly Returns. Reports supplied to Registrar-General for Ireland.

Details as to the Weekly Weather Report, which is prepared in the Telegraphic Branch of the Office, are given in Appendix VI. It supplies, by its synchronous daily charts and Monthly Summaries, an Publications. Weekly.

Publications, Weekly. instructive view of the meteorological changes, day by day, over the greater part of Europe.

Appendix I. of the Weekly Weather Report for 1897 gives a summary for each quarter, and for the whole year, of the Rainfall and Temperature in each district, for the 32 years, 1866-1897, and also the Monthly and Progressive values of "Accumulated Heat," Rainfall, and Bright Sunshine for all the districts in each month of 1897.

Appendix II. to the same Report, gives, in continuation of the similar Appendices for 1896, the Weekly and Progressive values of the same elements during the year 1897.

Hourly Means of Meteorological Observations.

Hourly Means of Meteorological Observations.—Commencing with the year 1887, the Office has prepared and published for each year mean values obtained from the hourly readings yielded by the continuously self-recording instruments at their five first-class observatories. These means are for pressure, temperature and the hygrometric condition of the air, the force and direction of the wind, and the amounts of rainfall and sunshine. They are obtained for each hour of the day for periods of five days, for the calendar months, and for the year, and they supply a complete synopsis of the march of the different elements at the several observatories.

Recently, however, it was represented to the Council, by the Meteorological Conference which met at Paris in the autumn of 1896, that for certain investigations these mean values are insufficient, and that for some of the elements at least, and for a few observatories, it is desirable to publish the original hourly readings as derived from the records of the self-registering instruments; the Council have therefore arranged that, commencing with the year 1895, they will add to the volume of *Hourly Means* the hourly readings of pressure, temperature, and rainfall for the observatories of Valencia and Kew, as typical of the conditions prevailing respectively at a coast and at an inland station of the British Isles.

The volume of *Hourly Means* for 1894 was published during the year. A portion of the volume for 1895 is now in the press; its publication will, however, be somewhat delayed, because it is to include in it the mean values for the lustrum terminating with 1895.

The computation of the harmonic components of the diurnal variations of pressure and temperature, referred to in the last Annual Report, was commenced during the year, and has been completed for the period 1883-1892. It may be well to remark that the components for the years 1869-1882 have been already obtained.

Publication of Climatological Observations.

Observations at Stations of the Second Order.—The volume for 1894 is now issued, and that for 1895 is far advanced.

The form of this publication remains unchanged. It comprises, first, the actual observations at 9 a.m. and 9 p.m. at 21 stations, printed on a modification of the form, A., adopted for International use by the Meteorological Congress at Rome, 1879—and, secondly, the Monthly Means and Summaries at stations printed in the form B. also adopted by the same Congress, together with an Annual Summary for all stations, and a Return of Bright Sunshine.

As stated in last Report, the volume for 1894 differs from that for 1893, in that Carmarthen disappears from the form A. list, and is replaced by St. David's. Carmarthen also disappears from the form B. list, while Ben Nevis, Heysham Hall (Morecambe Bay), and Bramley, Surrey, are added to it.

The only change in the volume for 1895, as compared with that for 1894, is that Edgeworthstown is replaced by Tavistock, where Mr E. E. Glyde, F. R. Met. Soc., formerly of Babbacombe, Devon, has now resumed observations.

II.—FOREIGN AND COLONIAL STATIONS.

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

During the year 40 such returns have come in, and a list of them is contained in Appendix XII., p. 94.

In most cases the observations were taken twice a day, and the results are dealt with in the same way as those from Stations of the Second Order, in Class 6 above. Continuous records of bright sunshine were received from Georgetown (Demerara) and from Trinidad.

The meteorological results given in the Cyprus Blue-Book, refer to six stations in the island. The tables continue to be compiled in the Office.

Returns from foreign and colonial stations have been published from time to time, but the Council has now determined upon a systematic publication of them. It is hoped that the first of these volumes will appear in the course of the year 1898-9. It will contain the available data up to, and inclusive of, 1895.

PART IV.

MISCELLANEOUS INVESTIGATIONS AND ADMINISTRATION.

Anemometer Experiments.—A pressure plate anemometer has been set up at Holyhead, alongside of the pressure tube anemometer, and observations have been made with the new instrument since the beginning of September. An account of the apparatus and of the results of the observations, as far as they have gone, will be found in Note A. Anemometer
Experiments

The records derived from a pressure tube anemometer and from a bridled anemometer have been found to be so closely similar that the Council saw reason to doubt the necessity of maintaining both of these at the station. The former instrument is simple and gives a continuous record; it thus has some advantage over the bridled anemometer. But before taking any steps in the matter it appeared to them advisable to consult Sir G. G. Stokes, at whose suggestion the bridled anemometer was originally constructed. With his approval it has been determined to dismount the bridled anemometer at Holyhead.

To ensure the greater safety of these anemometers, a wall has been erected, by permission of the Board of Trade, round the small building with which they are connected.

Rainfall Means for the British Islands.—This work has now appeared. Rainfall
Means.

Atmospheric Electricity.—The subject of atmospheric electricity has again been brought under consideration, with a view to utilize the records that have been made at Kew for many years past. An application has been made to the Royal Society for a grant in support of a special research regarding the causes of variations of potential. It is hoped that one of the results of this investigation may be uniformity Atmospheric
Electricity.

in the records and improvement in the methods of observing atmospheric electricity.

THE LIBRARY, &c.

Library.

The library contains standard works and serial publications on Meteorology and the allied sciences. It consists at present of about 14,500 volumes and pamphlets, there are besides many charts and MS. records of observations. The library at the Office is accessible to students engaged in meteorological investigations.

The catalogue is arranged both under authors' names and subjects, and each work is now entered on a card as soon as received.

Appendix XIII., p. 96, contains a list of the additions to the library during the year.

Appendix XV., p. 123, gives a list of the important contributions to meteorology which have appeared in the various reports issued by the Office since 1866.

Appendix XVI., p. 128, gives a catalogue of publications issuing from the Office.

EXPENDITURE.

Financial.

Appendix XIV., p. 122, shows the receipts and payments during the year ending 31st March, 1898. The amount voted by Parliament was 15,300*l.*, as in the previous year, and the miscellaneous receipts amounted to £938 13*s.* 8*d.*

The following abstract of expenditure shows the true charge against the Parliamentary grant of this and the preceding year, together with the increase or decrease in 1897-98, as compared with the previous year:—

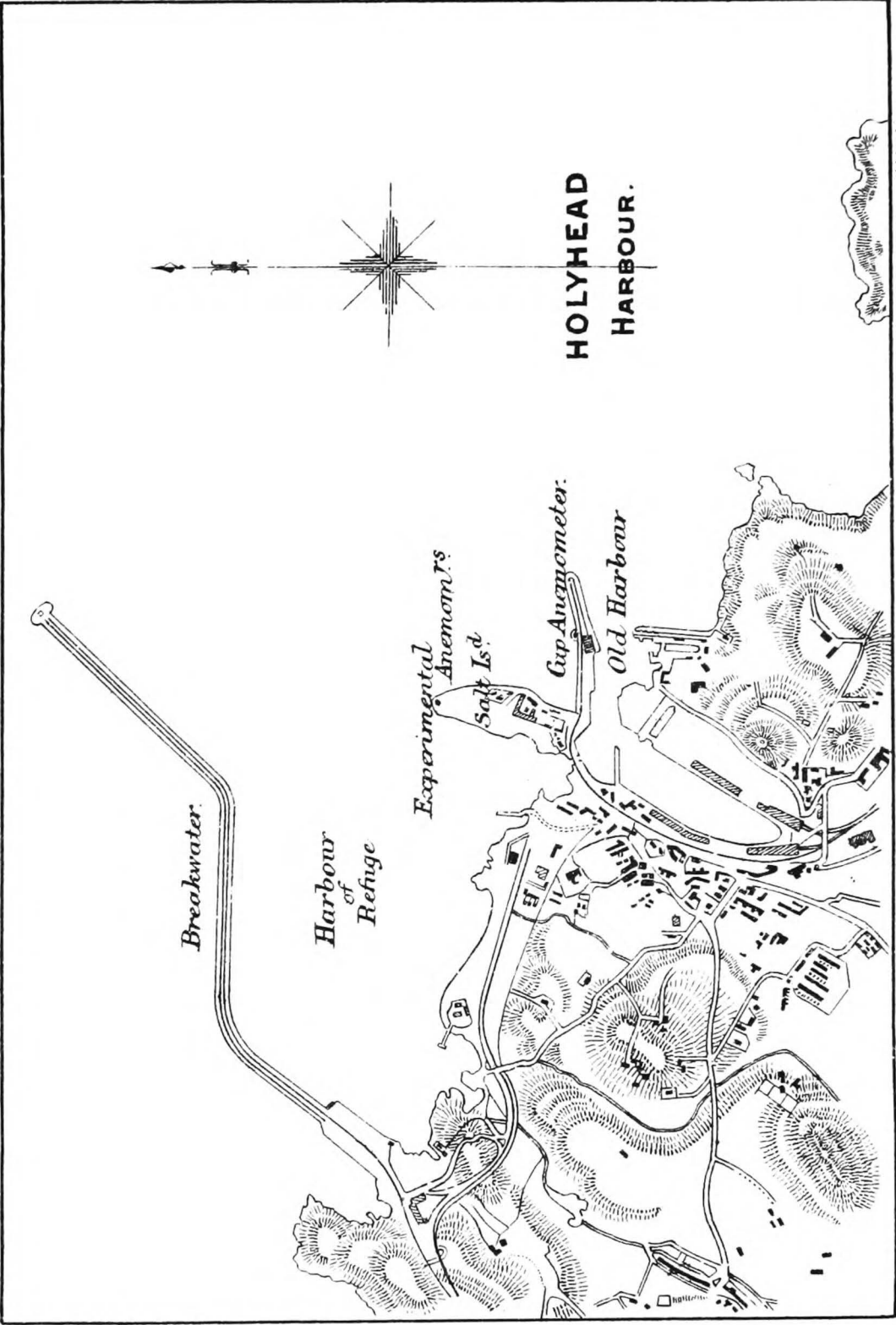
NET EXPENDITURE.	1896-97.	1897-98.	Increase.	Decrease.
GENERAL ADMINISTRATION:				
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
<i>Payment of Council</i> ...	991 5 0	968 9 5	—	22 15 7
<i>Secretary</i> ...	800 0 0	800 0 0	—	—
<i>Office</i> ...	945 8 0	990 1 3	44 13 3	—
<i>Rent, Fuel, and Lighting</i>	714 12 11	721 13 7	7 0 8	—
<i>Alterations to premises and contingencies</i> ...	273 15 8	313 11 8	39 16 0	—
<i>Expenses incidental to International Meteorological Congress</i> ...	23 10 8	—	—	23 10 8
<i>Pensions</i> ...	144 0 0	144 0 0	—	—
SPECIAL RESEARCHES ...	752 3 5	782 17 3	30 13 10	—
LAND METEOROLOGY ...	3,572 7 6	3,596 4 5	23 16 11	—
WEATHER INFORMATION ...	3,775 9 1	3,913 8 7	137 19 6	—
INSPECTIONS ...	445 17 0	403 5 11	—	42 11 1
OCEAN METEOROLOGY ...	2,396 17 11	2,350 12 1	—	46 5 10
Total ...	£ 14,835 7 2	14,984 4 2	284 0 2	135 3 2

In the year 1897-98 the sum of £1,613 10*s.* 6*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, 1898.

Fig. I.



NOTE A.

REPORT UPON ANEMOMETER EXPERIMENTS AT HOLYHEAD.

By Mr. R. H. Curtis.

The Council have, for some time past, had in operation at Holyhead four separate anemometers for recording the force or velocity of the wind, each acting upon a different principle, the object being to obtain the necessary data for instituting a comparison between their records.

Three of these instruments, namely, a pressure-tube anemometer, a "bridled" anemometer, and a pressure-plate anemometer, are erected at the extreme northern end of Salt Island, which is an open space, fairly level, about fifteen feet above the sea, and about a hundred and thirty yards wide, and projects about five hundred yards into the sea, on the eastern side of the Harbour of Refuge. Except for a few small houses at its southern end there are no buildings upon the island, and it therefore offers an excellent position for securing what is a condition of primary importance in carrying out any anemometrical investigation, namely, a perfectly free and uninterrupted exposure to the wind of the instruments to be experimented with.

The fourth anemometer is a Robinson cup instrument of the "standard" type, *i.e.*, with cups nine inches in diameter, carried upon arms two feet long, and this has not been removed from the position it has occupied for many years, above the disused lantern of the lighthouse on the pier at the entrance to the Old Harbour; in this position it is distant from the other anemometers on Salt Island a little more than 600 yards in a south-south-east direction. The positions of the anemometers relative to each other, and also to the town of Holyhead, will be seen from the subjoined sketch-plan (Fig. I) of the harbour and its neighbourhood.

Comparison of the Pressure-Tube and Robinson Cup Anemometers.

In the Report of the Office for the year 1896 an account was given of a comparison which had then recently been carried out between the records of the cup anemometer and the corresponding records of the pressure-tube anemometer on Salt Island, the result of which was to show: first, that upon the average wind velocities recorded by the cup anemometer were about 27 per cent. higher than the records of the same winds as obtained from the pressure-tube, thus pointing to the necessity for a modification of the factor employed for converting the movement of the cups into equivalent wind-velocities; and, secondly, that in addition to this, the indications of the cup instrument were further greatly influenced by the railway sheds, grouped around the base of the lighthouse, on the top of which this particular anemometer is placed. A plan of the pier and sheds had been given in the Report for 1895, and, briefly stated, it was now shown that when the direction of the wind was such as to cause it to blow *through* the sheds, from end to end, the result was to suck down air from the anemometer, whose record was

in consequence decreased and brought below that of the pressure-tube; whilst when the wind blew *against* the closed sides of the sheds it was deflected upwards, over their roofs, causing more than the normal amount of air to pass over the cups, with the result that their record became correspondingly increased beyond that of the pressure-tube; it was only when the direction of the wind was such that the current of air neither blew directly through, nor against, the sides of the sheds, but in such a way as to slip past them, that the records of the two anemometers agreed.

This result was of considerable practical importance, as it proved the absolute necessity for securing a perfectly free and uninfluenced exposure for anemometers, in order to obtain from them a true record of the strength of the wind, and at the same time showed that causes hitherto quite unsuspected were capable of affecting their records in a very marked degree.

The consistent character of the results obtained left very little doubt as to their accuracy, although the number of observations available for the comparison was not so large as could have been wished, owing to the pressure-tube anemometer having been at work for a few months only. Now, however, there is a fairly large mass of data available for further testing the conclusions arrived at in 1896, and therefore it has been thought desirable to repeat the comparison with observations made subsequent to the publication of the previous report. Of course the question of the proper factor for the cup anemometer is to some extent involved in the investigation, and the wind velocities by that instrument have all been dealt with upon the assumption that its true factor is not 3·0 but 2·2; but it has not been thought necessary to re-open the question further as regards this particular instrument, because if the conclusions already arrived at respecting the effect of the sheds upon it are confirmed, it follows that its exposure at Holyhead is not sufficiently good to admit of its giving a satisfactory answer upon the point.*

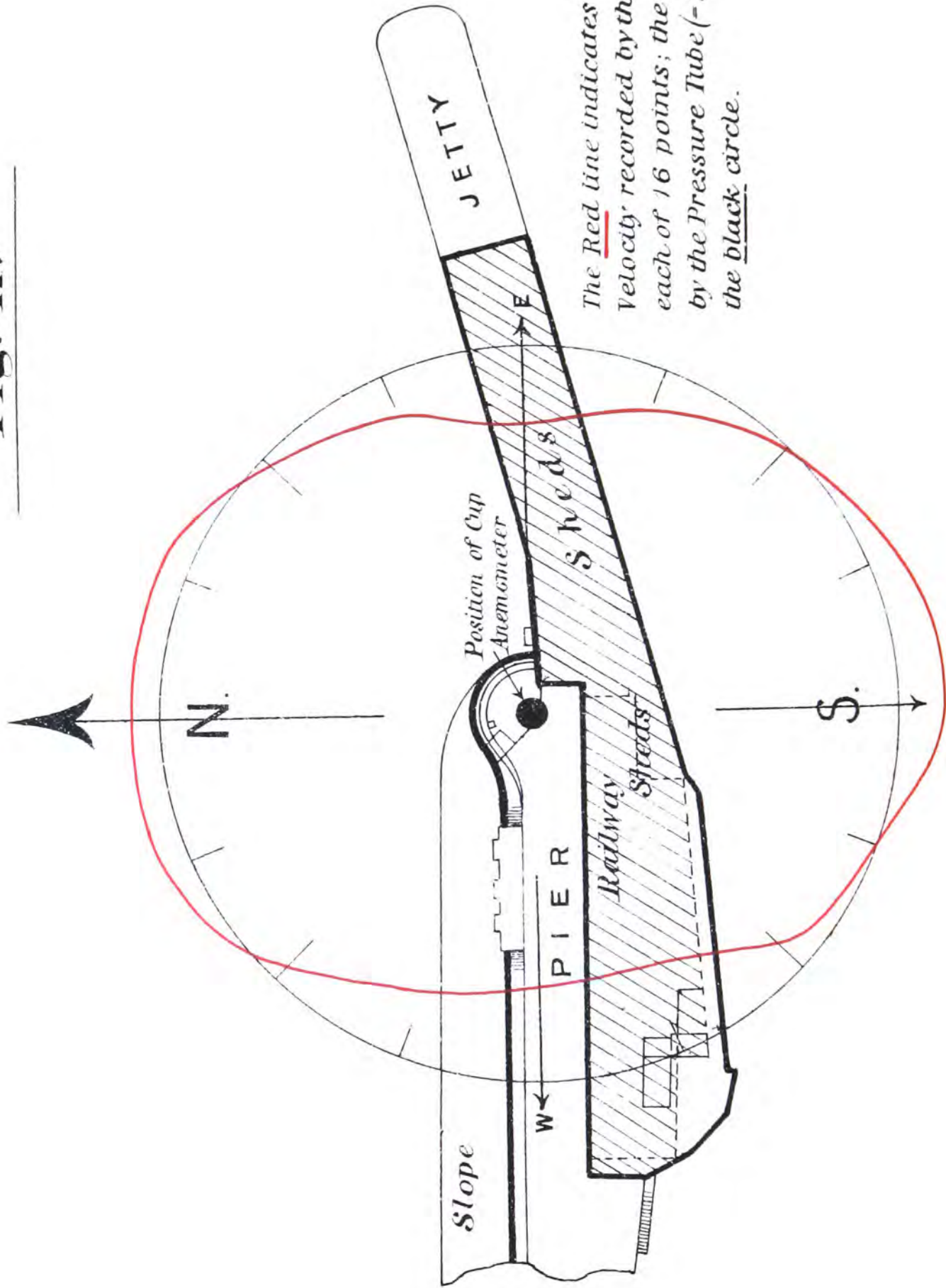
In the present instance one hundred observations of moderate or fresh winds were taken under each of the 16 points of the compass,† and the mean velocity as given by the two instruments, was determined for each point. The results are given in the following Table I., and are also shown graphically in Fig. II.

The results now obtained fully confirm those got by the previous comparison, the only differences worthy of note being:—

* Various attempts have been made to obtain the factor of the Robinson cup anemometer by comparing its records with those of a pressure-tube anemometer placed by its side, and run under exactly similar conditions. Such a comparison, extending over three years, has been carried out at Rousdon Observatory, in South Devon; and another, covering a period of eight months, at the Colaba Observatory, Bombay. In both these instances the cup anemometer was similar to the one in use at Holyhead. The Rousdon comparison gave as the mean factor (2·2), and the Colaba comparison (2·1). The Rousdon observations covered a much larger range of wind-force than did those at Bombay, and it is probable that the relation between the speed of the cups and that of the wind is affected both by the force of the wind, and by its steadiness or otherwise; and also by the conditions attaching to each instrument *in situ* so far as they affect the question of friction and the amount of work required to be done by the cups in registration.

† So many as 100 observations could not be obtained with winds from E.S.E. and S.E.

Fig. II.



(1) That the maximum *plus* difference is shown under South, instead of South-south-east, and that it amounts to only 15 per cent. instead of 22 per cent.; and

(2) That the *minus* difference under East is increased to 20 per cent. instead of 13 per cent. Generally, the differences, if put in the form of a curve, are seen to be more symmetrical than before, and those for opposite points, as North and South, and East and West, which are due to a similar kind of action, now approximate more closely to each other as regards amount; these changes are doubtless due to the smoothing effect of the larger number of observations it has been possible to use on the present occasion.

TABLE 1.

MEAN DIFFERENCE between the Robinson and the Pressure Tube Anemometers shown by (about) One hundred Observations of Winds, with Velocity between 11 and 25 miles per hour, from each of Sixteen Points.

Direction of Wind.	Number of Observations.	Mean Velocity by		Difference in Miles R - P. T.	Percentage of Difference to Mean by P.-Tube.
		Robinson (Factor 2.2).	Pressure-Tube.		
		Miles.	Miles.	Miles.	%
North.	100	19.7	18.0	+ 1.7	+ 9.4
N.N.E.	100	20.7	18.9	+ 1.8	+ 9.5
N.E.	100	17.0	17.1	- 0.1	- 0.6
E.N.E.	100	16.3	18.2	- 1.9	- 10.4
East.	100	12.9	16.0	- 3.1	- 10.4
E.S.E.	*65	14.1	15.7	- 1.6	- 10.2
S.E.	*56	14.4	14.4	0.0	0.0
S.S.E.	100	17.5	16.2	+ 1.3	+ 8.0
South.	100	19.4	16.9	+ 2.5	+ 14.8
S.S.W.	100	17.1	17.2	- 0.1	- 0.6
S.W.	100	15.6	17.5	- 1.9	- 10.9
W.S.W.	100	13.9	18.7	- 4.8	- 25.7
West.	100	13.7	18.5	- 4.8	- 25.9
W.N.W.	100	14.8	18.5	- 3.7	- 20.0
N.W.	100	17.8	18.4	- 0.6	- 3.3
N.N.W.	100	19.9	18.2	+ 1.7	+ 9.3

* In these cases so many as one hundred observations were not available.

The figures in this table demonstrate very clearly the necessity there is for having a perfectly free exposure for anemometers, in order to get from them the true velocity of the wind. With instruments which require a mechanical connection between the recording apparatus and the parts acted upon by the wind, this is frequently a difficult condition to secure, and the question is opened up as to how far, and in what way, existing anemometrical records derived from instruments placed on buildings, as all large-sized cup-anemometers are, have been affected by the obstruction offered by those buildings to the free passage of the wind. The conditions at Holyhead are no doubt exceptional, and their effect, as shown by the diagram, is of course peculiar to that place; but it is to be feared

(1) That the maximum *plus* difference is shown under South, instead of South-south-east, and that it amounts to only 15 per cent. instead of 22 per cent.; and

(2) That the *minus* difference under East is increased to 20 per cent. instead of 13 per cent. Generally, the differences, if put in the form of a curve, are seen to be more symmetrical than before, and those for opposite points, as North and South, and East and West, which are due to a similar kind of action, now approximate more closely to each other as regards amount; these changes are doubtless due to the smoothing effect of the larger number of observations it has been possible to use on the present occasion.

TABLE I.

MEAN DIFFERENCE between the Robinson and the Pressure Tube Anemometers shown by (about) One hundred Observations of Winds, with Velocity between 11 and 25 miles per hour, from each of Sixteen Points.

Direction of Wind.	Number of Observations.	Mean Velocity by		Difference in Miles R — P. T.	Percentage of Difference to Mean by P.-Tube.
		Robinson (Factor 2·2).	Pressure-Tube.		
		Miles.	Miles.	Miles.	%
North.	100	19·7	18·0	+ 1·7	+ 9·4
N.N.E.	100	20·7	18·9	+ 1·8	+ 9·5
N.E.	100	17·0	17·1	— 0·1	— 0·6
E.N.E.	100	16·3	18·2	— 1·9	— 10·4
East.	100	12·9	16·0	— 3·1	— 10·4
E.S.E.	*65	14·1	15·7	— 1·6	— 10·2
S.E.	*56	14·4	14·4	0·0	0·0
S.S.E.	100	17·5	16·2	+ 1·3	+ 8·0
South.	100	19·4	16·9	+ 2·5	+ 14·8
S.S.W.	100	17·1	17·2	— 0·1	— 0·6
S.W.	100	15·6	17·5	— 1·9	— 10·9
W.S.W.	100	13·9	18·7	— 4·8	— 25·7
West.	100	13·7	18·5	— 4·8	— 25·9
W.N.W.	100	14·8	18·5	— 3·7	— 20·0
N.W.	100	17·8	18·4	— 0·6	— 3·3
N.N.W.	100	19·9	18·2	+ 1·7	+ 9·3

* In these cases so many as one hundred observations were not available.

The figures in this table demonstrate very clearly the necessity there is for having a perfectly free exposure for anemometers, in order to get from them the true velocity of the wind. With instruments which require a mechanical connection between the recording apparatus and the parts acted upon by the wind, this is frequently a difficult condition to secure, and the question is opened up as to how far, and in what way, existing anemometrical records derived from instruments placed on buildings, as all large-sized cup-anemometers are, have been affected by the obstruction offered by those buildings to the free passage of the wind. The conditions at Holyhead are no doubt exceptional, and their effect, as shown by the diagram, is of course peculiar to that place; but it is to be feared

that in other instances also the buildings, or other objects, in the close neighbourhood of the anemometers, are such as to affect their records prejudicially.

*Comparison of the Pressure-Tube and the "Bridled"
Anemometers.*

These two instruments have now been at work side by side for nearly three years, and although during that time they have not experienced any gale of exceptional violence, yet they have afforded a good deal of material for making a comparison between their records.

A description of the bridled anemometer will be found on p. 28, and therefore it will suffice to say here that it measures the force of the wind through the resistance offered, by some weights, to the turning of a set of five cups, arranged spirally upon a vertical spindle, and exposed to the wind. The pressure-tube anemometer, on the other hand, achieves the same end by the displacement of a specially-shaped float, contained in a closed vessel of water, but communicating with the air by means of a tube, leading to a vane which is kept constantly facing the wind.*

The bridled anemometer was not designed to register light winds, and therefore it is unaffected by any wind of lower velocity than 20 miles per hour, and the inertia of the instrument is not entirely overcome until the velocity has risen to fully 30 miles per hour; but with stronger winds than this its indications are found to agree very closely with those of the pressure-tube. It sometimes happens, in sudden and transient squalls, that the gust begins to abate before the float of the pressure-tube has had time to fill and rise to its proper height, in which case that instrument fails to record the maximum force which is shown by the bridled anemometer, whose cups respond at once to the wind, and indeed may occasionally, as a result of their inertia, be carried somewhat beyond the proper point. Such differences, however, seldom exceed a rate of two or three miles per hour, and only occur with very transient gusts of wind; if the gust lasts for but a few seconds, or if it is at once followed by another of equal force, as not infrequently happens, then the float has time to fill, and the two records agree.

It may therefore be said that, as regards the range of wind-force which has been covered by the observations made in this comparison, the indications of the two instruments are practically identical.

The value of the comparison lies very much in the mutual support which the records of the two instruments—each obtained in a different way, although by the application of a similar principle,—afford to each other, and in the confidence in their accuracy which their agreement supplies.

*Comparison of the Pressure-Tube and the new Pressure-Plate
Anemometers.*

The most recently erected anemometer at Holyhead is a pressure-plate, the recording portion of which has been arranged upon a somewhat novel plan.

* For fuller descriptions of both these instruments see Report of the Council for the year ending March 31, 1893, and Note B. p. 21, in this Report.

The plate itself is a thin circular disc of aluminium, of one square foot area, and is supported, at the height of 26 feet above the ground, upon an iron column, which stands only a few feet away from the pressure-tube and the bridled instruments. The plate turns freely in azimuth, and is kept facing the wind by a fin-shaped vane, which is placed about two feet in the rear of the plate and rises a little above its top edge; by this arrangement not only is the vane not sheltered by the plate, but any interference with the free movement of the air flowing around the edges of the plate is avoided.

The apparatus is designed to register only the *maximum* pressure exerted by the wind upon the plate since the last observation, and after every reading of the scale the index requires to be reset. Readings are therefore made only at definite times, usually once a day, except in stormy weather, when they would be made as frequently as possible; but owing to the remote position of the instrument the number of observations is necessarily restricted.

The action of the instrument will be best understood by the aid of the accompanying diagrams, figures III and IV. Figure III. shows

Fig. III.

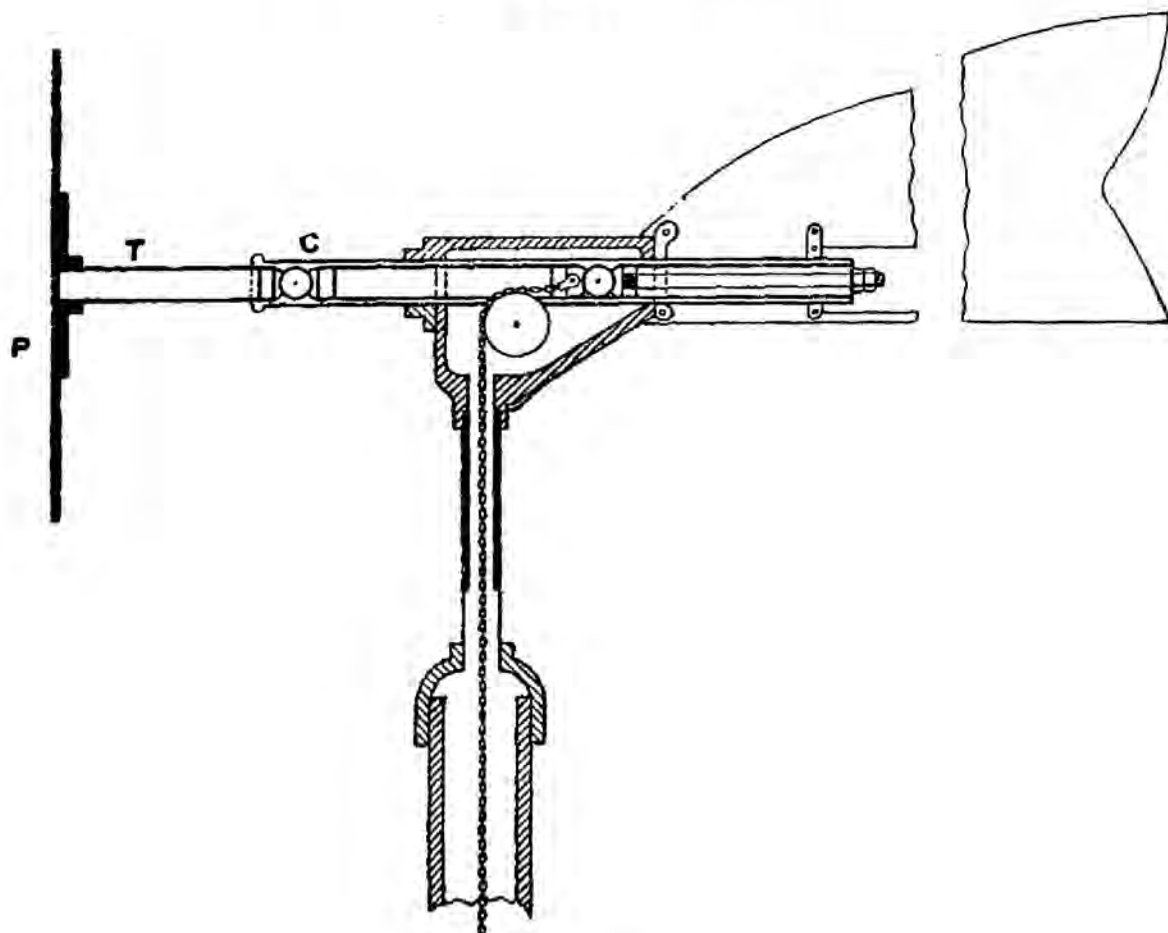
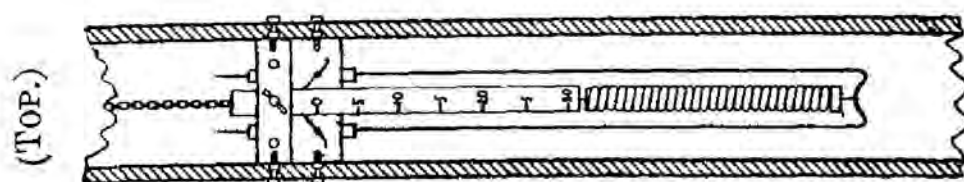


Fig. IV.



(TOP.)

a section of the plate (P.), to the back of which is fastened a tube (T.), which, by means of friction rollers, slides easily to and fro in the slightly larger tube C. To this sliding tube a chain is attached, and as the plate and tube are together driven back by the wind this chain pulls upon the spring shown in figure IV., p. 25, which is securely fastened inside the column at a point where it can be easily seen by the observer. The extension of the spring which is thus effected is shown by a brass bar graduated to indicate pounds, and having on each edge a ratchet and pawl, so arranged that after the spring has been extended it cannot go back again, but must remain extended until the pawl is released by the observer. By this arrangement the maximum pressure is reached gradually, pound by pound, and any error in the record due to the momentum of the plate, acting under the influence of sudden sharp gusts, is avoided.

In pressure-plates which are free to oscillate to and fro with each gust of wind, as is usually the case, the chance of error from the momentum of the plate is very great, and there is little doubt that from this cause such plates in gusty winds often travel a considerable distance in excess of the proper amount, giving rise to records of wind-pressures which are not really experienced.

Owing to a fault which became developed in the bearing of the vane, soon after its erection, the instrument had to be dismounted again, and it was not until the end of January 1898 that it came regularly into work. The number of observations at present available is therefore not very large, and as the strongest winds of the year were experienced whilst the instrument was out of action the number does not include any very high pressures; but the results of the comparison, so far as it has gone, are very interesting.

The method adopted has been to compare with each reading of the pressure-plate the maximum pressure indicated by the pressure-tube during the interval covered by the reading. These observations were then grouped according to the pressure-plate readings, and the mean equivalent by the tube found for each pound of pressure recorded by the plate; these equivalent pressures, together with the number of observations from which they were determined, are shown in the following table II.

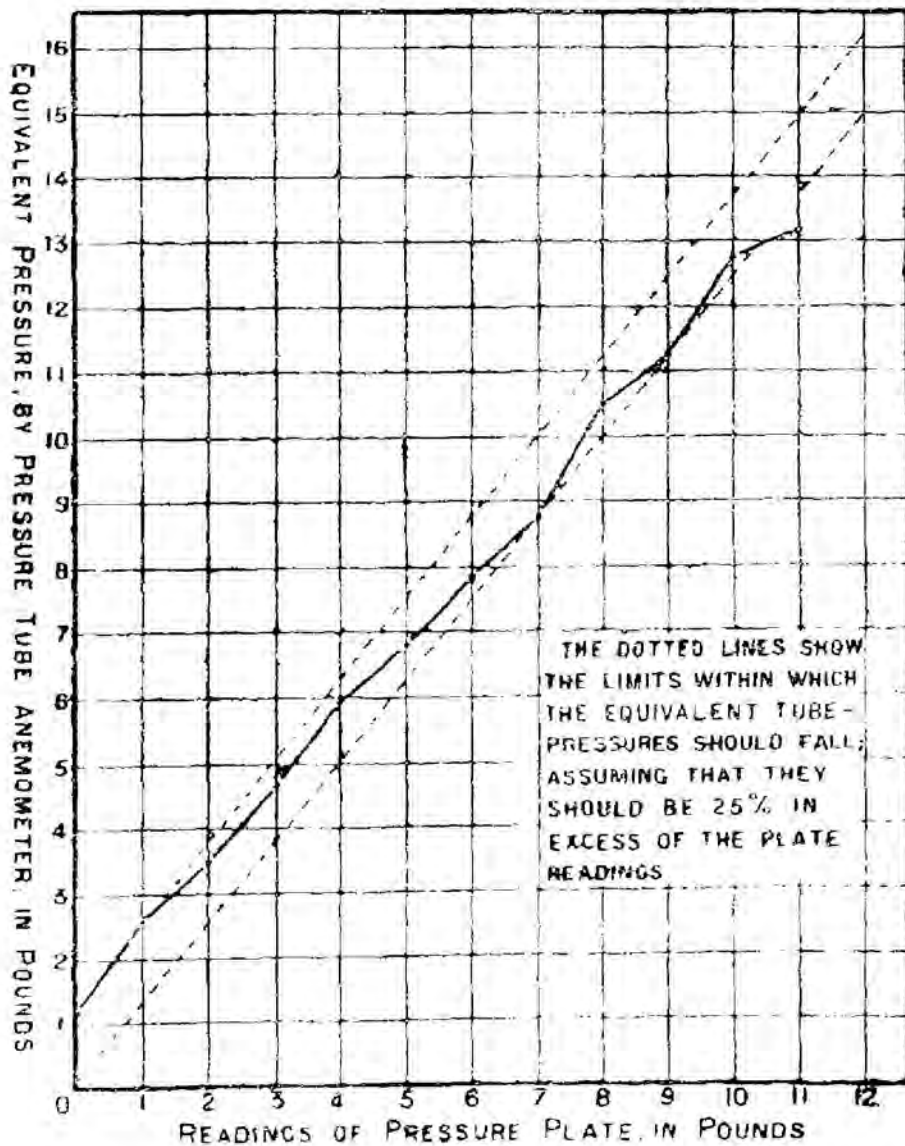
TABLE II.

SHOWING for each pound of Maximum Pressure recorded by the Pressure-Plate Anemometer, the corresponding Mean Maximum Pressure recorded by the Pressure-Tube Anemometer.

	Reading of the pressure-plate, in pounds per square foot.												
	0	1	2	3	4	5	6	7	8	9	10	11	12
Meanequivalent pressure by pressure-tube.	1.16	2.57	3.44	4.69	5.93	6.76	7.84	8.73	10.55	11.23	12.7	13.1	—
No. of observa- tions.	61	36	30	28	15	8	7	3	4	3	1	1	—

Speaking generally, it may be said that these equivalent tube values are all about 25 per cent. *above* the values actually recorded by the plate. It will be remembered that, from the construction of the instrument, increments of pressure of less than a pound are not registered; and therefore a given reading may always have been exceeded by any amount short of another pound, without such excess being registered. For example, a recorded pressure of 4 pounds must be taken as indicating that the effective pressure of the wind upon the plate not only reached that amount but may have been anything between it and 5 pounds. Bearing this in mind it will be seen from the diagram, Fig. V., that the equivalent pressures obtained by the comparison, so far as it has gone, fall very well between the limits above stated, after adding 25 per cent. to the actual readings of the spring. The friction of the moving parts, although very slight, is probably the cause of the rather higher equivalents obtained for the lowest pressures.

Fig. V.



The wind on striking a plane surface, such as the pressure-plate now used, does not exert all over it a uniform pressure, but a pressure

which diminishes from the centre to the edge, in a ratio determined by the size and shape of the surface, and probably by the strength of the air current also.* By placing a rim round the edge of the plate, so as to stop the ready outflow of air from its surface, the pressures recorded would be considerably increased for all winds; the conditions would then approximate closely with those which exist in the pressure-tube, and it is probable that the records of the two instruments would under those conditions nearly agree.

The number of observations with strong winds is as yet far too small to warrant the drawing of any final conclusions; but so far as the results of this comparison go at present, it seems pretty clear that with pressure-plate anemometers of the ordinary construction, the momentum of the plate has been the cause of some misconception as to the frequency with which high pressures are reached; and secondly, that, even when this source of error is guarded against, it is not safe to accept the records of anemometers of that type, as being reliable records of the wind-pressures actually experienced, until they have been corrected for the effect of the slipping of the air over their surfaces and past their edges. In the case of a circular plate of one square foot area there is reason to suppose that the loss of effective pressure upon the plate from this cause is equal to about 25 per cent. of the actual pressure the wind current is capable of exerting, but at present there are no data to show how this may be modified in the case of larger plates, or of plates of other shapes.

NOTE B.

DESCRIPTION OF THE BRIDLED ANEMOMETER DESIGNED BY SIR G. G. STOKES, BART., F.R.S.

By Mr. R. H. Curtis.

Although the bridled anemometer has been at work ever since the year 1880 it does not appear that any detailed description of it has yet been published, the references to it which have been made from time to time in the publications of the Office having usually been very brief and general in character.

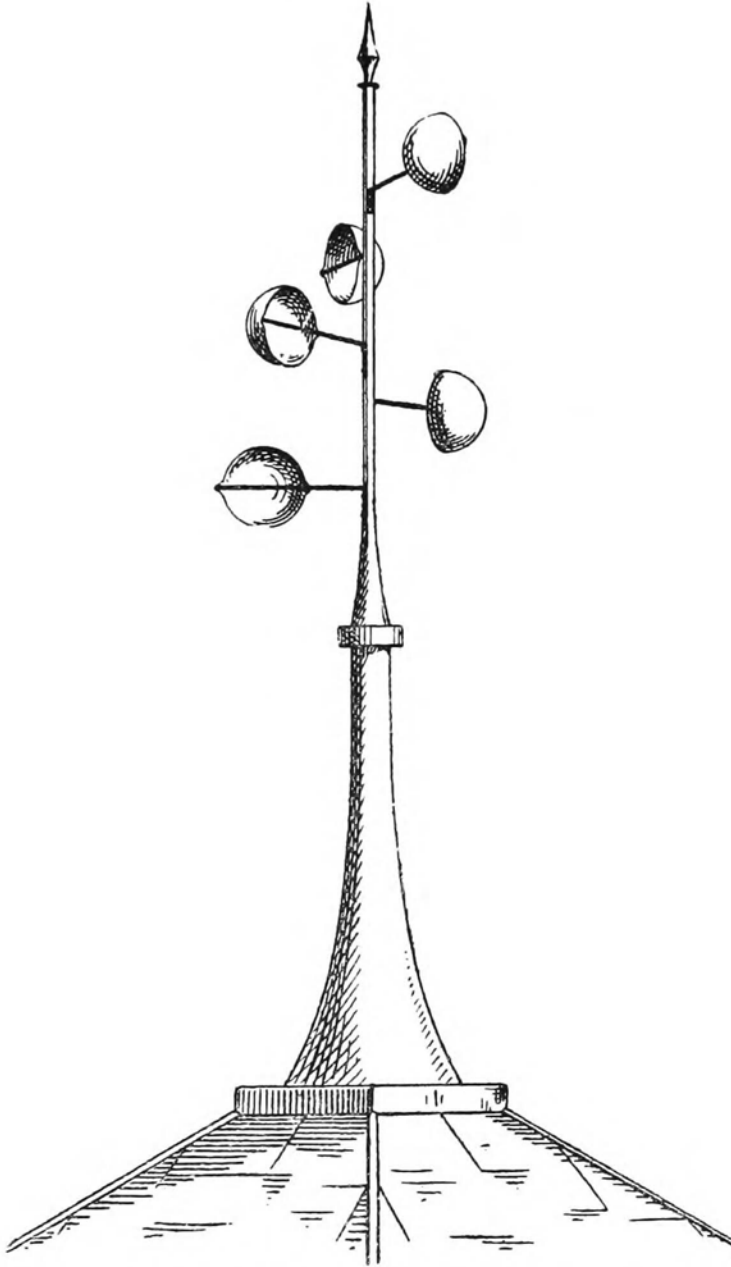
The portion of the instrument which is acted upon by the wind consists of five hemispherical copper cups, each of which is fixed by a short strong arm to a vertical spindle, around which they were originally placed equidistantly and in the same horizontal plane; after a time, however (in the year 1890), the cups were re-arranged spirally, so as to prevent any possibility of one cup sheltering another.

The special aim of Sir G. Stokes was to get a measure of the strength of the wind in gusts; and this he sought to do by attaching to the spindle a weight, which would have to be lifted as the spindle turned under the influence of the wind acting upon the cups, the weight being sufficiently heavy to prevent the cups from making a

* See Quarterly Journal Royal Meteorological Society. Vols. VIII. and IX.

complete revolution in the strongest gust they would be likely to experience.

Fig. VI.



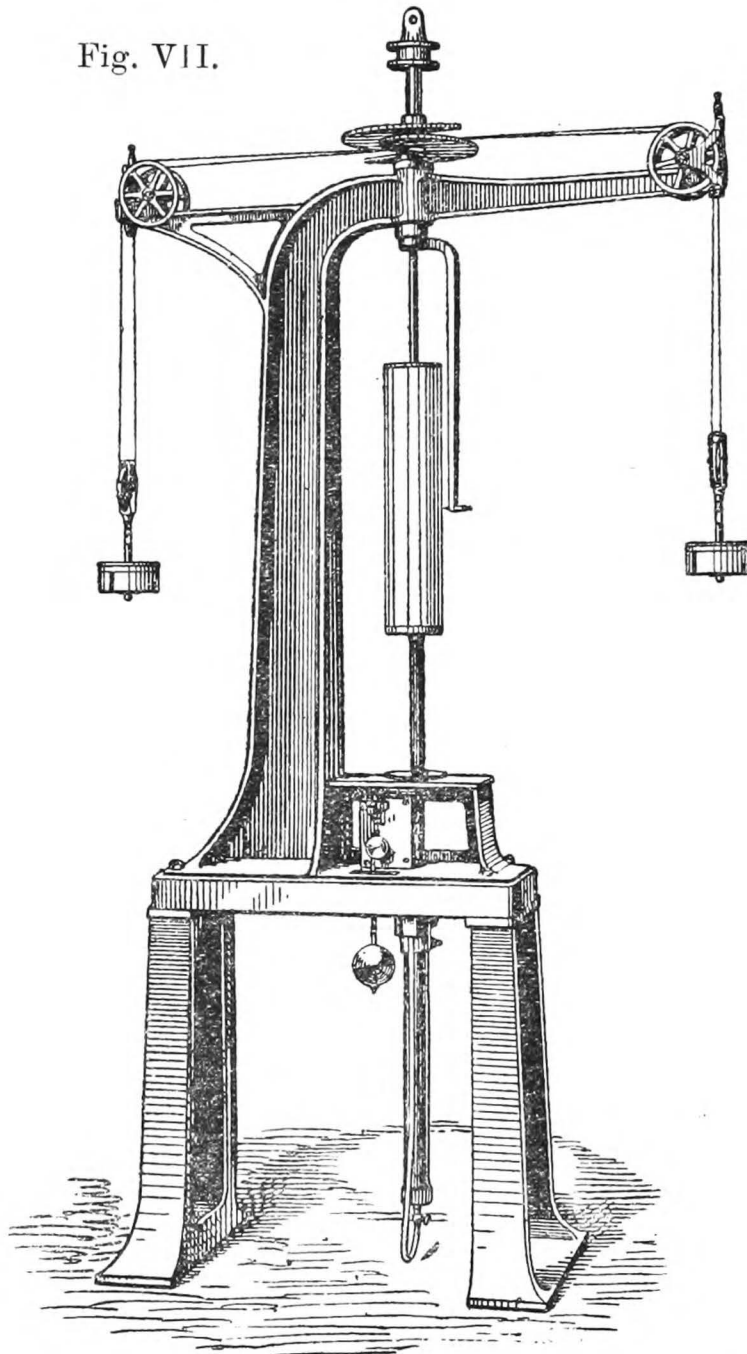
Exterior portion of the Bridled Anemometer showing the arrangement of the Cups.

To achieve this the spindle is brought, through bearings fitted with friction rollers, into the room in which the recording apparatus is placed, and its lower end is fitted with a pair of snails. The load to be lifted by the cups is divided into two equal parts, and is suspended on each side of the spindle by flexible cords, which pass from the spindle over a pulley to the weight, and back over another pulley to the spindle again, where each is fastened to the root of one of the snails. As the cups turn the weight is lifted, and the cord in each case is wound upon the periphery of the snail, the extra resistance thus gained being in accordance with the well-ascertained fact that the pressure of the wind varies with the square of the velocity; the record obtained is therefore one of velocity, and its scale is an uniform one throughout.

The record is secured in a very simple manner. Immediately below the spindle, and co-axial with it, is a cylinder, upon which a sheet of paper can be placed; and to the bottom of the spindle itself is fixed an arm, bent so as to allow it to sweep around the cylinder as the spindle turns, and having at its lower end a pen which can be kept in contact with the paper; the amplitude of every turn of the spindle is therefore shown by the length of the corresponding line the pen leaves upon the paper.

The cylinder forms the driving weight of the clock by which its descent is regulated, and the abscissæ of the trace thus become the time-scale, while the horizontal ordinates give the force of the wind. By a simple arrangement the rate of descent of the cylinder can, if desired, be doubled, and the time-scale correspondingly opened, and this enlarged scale is generally employed in strong gales; there is also an arrangement by means of which the time-scale can be still further enlarged by substituting a hydraulic arrangement for the clock, but this is very rarely used.

Fig. VII.



Interior portion of the Bridled Anemometer showing the recording apparatus.

APPENDIX.

APPENDIX I.

LIST of CAPTAINS and OFFICERS who have sent in Logs classed as "Excellent" during the year ending March 31, 1898. 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.
Alford, F.	5	S.S. Monarch.
Andersen, O. E.... ..	17	S.S. Longhirst.
Angus, T. S.	17	S.S. Ballaarat and S.S. Britannia.
Barber, J.	1	S.S. Oanfa.
Beeching, C.	2	Barque Ellesmere.
Bolton, S. H.	23	S.S. Britannic.
Brewis, Sub-Lieut. C. R. W., R.N.	5	H.M.S. Penguin.
Constantine, T.	1	S.S. Don.
Crewe, E.	1	S.S. Victoria.
Dart, L. C.	17	Barque Alcides.
Davies, E. H.	2	S.S. Heracles.
Dawson, Lieut. and Comr. W. P., R.N.	2	H.M.S. Waterwitch.
De la Garde, P., R.N. (Assist- ant Paymaster).	2	H.M.S. Waterwitch.
Dickinson, L. R.	1	S.S. Danube.
Dupen, P. P.	6	S.S. Cabenda.
England, T.	20	Barque Glen Grant.
Field, A. M., R.N.	20	H.M.S. Penguin.
Fraser, W. D.	9	Corolla.
Free T., R.N.R.... ..	5	S.S. Cornwall.
Gibson, J.	1	S.S. Amber.
Glossop, Lieut. H. A. P., R.N.	9	H.M.S. Rambler.
Goodrham, H.	5	S.S. Woolloomooloo.
Greedy, R., R.N.R.	3	S.S. Amber.
Hague, J. W.	1	S.S. Pretoria and S.S. Spartan.
Hepworth, M. W. C., R.N.R. ...	16	S.S. Aorangi.
Howard, Lieut. and Comr. W. V. S., R.N.	6	H.M.S. Dart.
Jaggard, R.	1	S.S. Waimate.
Jamieson, D. E.	5	S.S. Port Chalmers.
Johnston, J.	1	Barque Blengfell.
Lewis, Lieut. A. W., R.N. ...	2	H.M.S. Penguin.
Lobb, Comr. F. J., R.N. ...	4	L.H. Tender Richmond.

Name of Captain or Officer.	Number of "Ex- cellent" Logs.	Ship.
MacDonald, J.	1	Barque Marion Frazer.
May, Sub-Lieut. F., R.N. ...	2	H.M.S. Dart.
Millican, J. W.	14	S.S. Loughrigg Holme.
Milne, W. F.	13	S.S. Eclipse.
Milner, W. H.	26	S.S. Pará and S.S. Medway.
Moignard, P.	10	Garsdale.
Mullan, F. C., F.R.G.S. ...	3	S.S. Romney.
Nares, Lieut. G. E., R.N. ...	2	H.M.S. Penguin.
Nedden, H. zur	8	S.S. Madeline.
Norman, F.	10	Milton Stuart.
Pascoc, Lieut. F. C., R.N. ...	2	H.M.S. Penguin.
Peebles, R.	22	S.S. Breconshire.
Richards, Capt. G. E., R.N. ...	9	H.M.S. Rambler.
Roberts, R.	1	S.S. Cabenda.
Ross, J.	1	Barque Alcides.
Sargent, A. H.	11	Pleione.
Scott, G., F.R.Met.Soc. ...	13	Buckingham.
Shanklin, J. W.	1	S.S. Ethiopia.
Simpson, Alexander	26	S.S. Thermopylæ.
— Alexander	28	S.S. Traveller.
Smyth, Comr. M. H., R.N. ...	6	H.M.S. Egeria.
Thomas, H. G., R.N.R. ...	7	S.S. Yarrawonga.
Title, F.	1	Falls of Foyers.
Trott, S., F.R.Met.Soc. ...	35	S.S. Minia.
Turner, A. C., R.N.R. ...	1	S.S. Britannia.
Veale, E. A.	2	S.S. Ormuz and S.S. Lusitania.
Walker, H., R.N.R.	21	S.S. Campania.
Ward, W.	1	S.S. Argyll.
Watson, Sub-Lieut. H. C., R.N.	3	H.M.S. Egeria.
Waugh, Lieut. A., R.N. ...	2	H.M.S. Penguin.
Webster, T.	1	Centesima.
Wilson, J., R.N.R.	16	S.S. Anchoria.
Worcester, W. D. G., R.N.R. ...	9	S.S. Victoria and S.S. India.

APPENDIX II.

LIST of METEOROLOGICAL LOGS and DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Voyage.	Year.	Officers who have assisted in keeping the Meteorological Log.
Alford, F. ... Andersen, O. E. ...	H.M.T.S. Monarch ... S.S. Longhirst ...	Off coasts of British Isles ... Mediterranean Ports, Quebec, and Barcelona.	1896-97 1897	Messrs. Hart, Broadbridge, and Bordeaux. C. Peterson, 1st Mate, and James Durham, 2nd Mate.
Angus, T. S. ... " " ...	S.S. Ballaarat ... " " ...	Continental Ports ... Sydney, via Suez ...	1897 1897	F. C. Hopkins, 4th Officer, W. Faulkener, 5th Officer, and H. J. Feaks, 6th Officer.
" " ... " " ...	" " ... S.S. Britannia ...	" " ... " " ...	1897 1897-98	F. S. Murray, 4th Officer, W. A. Faulkener, 5th Officer, and C. E. V. Shield, 6th Officer. W. F. Cossey, 3rd Officer, M. B. Taylor, 4th Officer, and A. G. Mead, 5th Officer.
Barber, J. ...	S.S. Oaufa ...	China and Japan, via Suez	1897	Wm. C. Davison, Chief Officer, R. Munro, 2nd Officer, and R. J. Woodget, 3rd Officer.
Barker, D. W., R.N.R. ... Beeching, Charles ...	School Ship Worcester ... Barque Ellesmere ...	Off Greenhithe ... Sydney and San Francisco ...	1897 1896-97	The Cadets. Messrs. Stewart and Labatt, 1st and 2nd Officers.
Bolton, S. H. ... Bulkeley, T. D. ...	S.S. Britannic ... S.S. Atrato ...	Continental Ports and New York West Indies ...	1897-98 1897	W. S. Ireland, Chief Officer. D. Findlay, 4th Officer, assisted by J. Bartlett, 3rd Officer, C. Garden, 4th Officer, C. K. Borisson, 5th Officer, and E. Seager, 5th Officer.
Burton, G. " ... " Thomas ...	S.S. Rangatira ... Ship Crusader ...	West Indies ... Wellington ... New Zealand ...	1897 1896-97 1896-97	Messrs. Granquest and Musters.

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.
Carey, F.	S.S. Lake Huron	Quebec	1897	Charles Parks.
Clarke, W. H.	S.S. Nomadic	New York	1897	F. W. Mace, 2nd Officer.
"	"	"	1897-98	F. W. Mace, 2nd Officer, and L. Thomson, 2nd Officer.
Clinock, T. C.	S.S. Harlech Castle	Cape Ports, Madagascar, and Mauritius	1897	—
"	"	Cape Ports	1897	—
"	"	"	1897	—
Cloke, J. F.	Barque Glenmark	Cape Town	1896	—
Combe, Comr. J. W., R.N.	H.M.S. Waterwitch	Sydney, Fiji, and Albany	1896-97	Lieut. W. T. P. Wilson, R.N., and Sub-Lieut. B. O. M. Davy, R.N.
Constantine, Thomas	S.S. Don	West Indies	1897	J. Gavi, 3rd Officer, J. Watts, 4th Officer, and J. W. Matley, 5th Officer.
Crewe, E.	S.S. Victoria	Melbourne, via Suez	1897	J. C. Gibbons, 4th Officer, H. C. Pollitt, 3rd Officer, W. H. T. Warren, 5th Officer, W. Hayward, Chief Officer, H. G. Evans, 2nd Officer, S. Finch, Sup. 2nd Officer.
Dannreuther, Lieut.	H.M.S. Melita	Suakim, Port Said, Malta, and Constantinople.	1896	—
Dart, L. C.	Barque Alcides	New York, Yokohama, and San Francisco	1896	John Ross, Chief Officer, and J. V. Evans, 2nd Officer.
Davies, E. H.	S.S. Heracles	River Plate	1896-97	J. P. Hall, 2nd Officer, assisted by G. Back, 3rd Officer, and W. Fry, 3rd Officer.
"	"	"	1897	J. P. Hall, assisted by W. MacMillan.
" J. A.	S.S. Oanfa	China and Japan, via Suez	1897	W. C. Davidson, 1st Officer, J. Metcalfe, 2nd Officer, and W. E. Searle, 3rd Officer.
Dawson, Lieut. and Comr. W. P., R.N.	H.M.S. Waterwitch	Off North Queensland	1897	Philip de la Garde, Assistant Paymaster.

Dawson, Lieut. and Comr. W. P., R.N.	H.M.S. Waterwitch ...	Surveying off North Coast of Queensland and to Sydney.	1897	P. de la Garde, Assistant Paymaster, J. Taylor, J. Featherstone, J. R. Bowering, P.O.'s 1st Class, J. H. Black, P.O. 2nd Class, Quartermaster.
Dickinson, L. R.	R.M.S. Danube ...	River Plate ...	1897-98	3rd, 4th, and 5th Officers.
Dupen, P. P.	S.S. Cabenda ...	West Coast of Africa ...	1897	John Lennox, 2nd Officer.
" " "	" " "	" " "	1897	W. F. Wood, 2nd Officer.
Dyer, E. ...	S.S. Lucerna ...	Batoum ...	1896-97	H. A. White, 2nd Mate.
England, Thomas	Barque Glen Grant ...	Quebec and Rio Janeiro ...	1896	—
" "	" "	Rio Janeiro, Apalachicola, and Quebec ...	1896-97	—
Field, Capt. A. M., R.N.	H.M.S. Penguin ...	At Australian Station ...	1896-97	Lieut. C. R. W. Brewis, R.N.
" "	" "	Sydney, Suva, Fanning Island, &c. ...	1897	Lieuts. F. C. Pasco, A. Waugh, G. E. Nares, A. W. Lewis, C. Brewis; Mr. F. Payne, Boatswain; P.O.'s 1st Class T. Dinham, G. Tye, A. Lutchford, and G. Bailey.
" "	" "	At Fanning Island, Honolulu, and Suva	1897	Lieuts. C. Brewis, F. C. Pasco, A. Waugh, G. Nares, A. Lewis; Mr. F. Payne. Boatswain; T. Dinham, A. Lutchford, G. Tye, G. Bailey, and C. Day, P.O.'s 1st Class.
Forbes, D. S.	Ship Dunfermline ...	San Francisco, Philadelphia, Calcutta, and New York.	1891-95	—
Fraser, W. D.	Ship Corolla ...	Cape Town, Newcastle (N.S.W.), Honolulu, Port Townsend, and Fremantle.	1895-97	W. E. Gardiner.
Free, Thomas, R.N.R.	S.S. Cornwall ...	Albany, via Cape Good Hope, and Monte Video.	1897	G. Reginald Barter, 1st Mate, T. E. Cutter, 2nd Officer, Percy Spray, 3rd Officer, and W. Howell, 4th Officer.
Gadd, C. ...	S.S. Valetta ...	Sydney, via Suez ...	1897	C. Talbot, W. G. Baker, R. P. Dalton, H. Walpole, E. H. Orchard, and A. Bramwell.
Gibson, James ...	S.S. Amber ...	Red Sea and at Bombay ...	1897	G. C. Hogg, 1st Officer, D. P. Morrell, 2nd Officer, and W. F. R. Mist, 3rd 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.
Goodrham, Henry	S.S. Woolloomooloo	Adelaide, via Cape Good Hope	1897	Henry Reay, 2nd Officer, C. Phillips, 3rd Officer, and A. C. Godley, 4th Officer.
"	"	"	1897	Alfred Rogers, Chief Officer, H. Reay, 2nd Officer, E. Tucker, 3rd Officer, and C. Trumper, 4th Officer.
Greay, Robert, R.N.R.	S.S. Amber	Suez, Suakim, Aden, and Perim	1896-97	J. Gibson, G. C. G. Hogg, H. Delves Clough, and W. F. B. Mist.
"	"	In Red Sea	1897	J. Gibson, 1st Officer, G. C. G. Hogg, 2nd Officer, W. F. B. Mist, 3rd Officer, and H. D. Clough, 3rd Officer.
"	"	Red Sea and at Bombay	1897	Gilbert C. Hogg, 1st Officer, D. P. Morrell, 2nd Officer, and Wm. F. R. Mist, 3rd Officer.
Griffin, E. J., R.N.R.	S.S. Moor	Cape Town	1897	H. D. Watts Russell, 4th Officer.
"	"	"	1897	H. B. Rake, 4th Officer.
Haddock, H. J., R.N.R.	R.M.S. Britannic	New York	1897	A. Williams, R.N.R., 2nd Officer, F. Girdler Browne, 3rd Officer, and G. Weigall, 4th Officer.
Hague, J. W., R.N.R.	S.S. Mexican	Cape Town	1897	E. G. Leader, Chief Officer, assisted by G. Grogan, 2nd Officer, S. M. Day, 3rd Officer, W. H. Cooper, 4th Officer, and F. O'Sullivan, Captain's Clerk.
"	S.S. Pretoria	"	1896-97	do.
"	S.S. Spartan	Cape Town, Sydney, Vancouver, and Honolulu.	1897	J. W. Lawrence, S. Phillips, R. M. Reader, G. M. Hammon, F. J. Bayldon, and S. Pearson.
Hepworth, M. W. C., R.N.R.	S.S. Aorangi	"	1897	S. Phillips, Chief Officer, R. M. Reader, 2nd Officer, F. G. Bayldon, 3rd Officer, and S. Pearson, 4th Officer.
"	"	Honolulu, Vancouver, Suva, Wellington, and Sydney.	1897-98	

Hogan, J.	...	Ship Chrysomene	Melbourne, Newcastle (N.S.W.), and San Francisco.	1896-97	W. H. Jackson, 2nd Officer.
Howard, Lieut. and Comr. W. V. S., R.N.	...	H.M.S. Dart	Surveying off Queensland	1897	Lieut. Francis May, R.N., assisted by Wm. Winsor, Wm. Foster, H. Burton, and T. Miller, Quartermasters.
Jaggard, Russell	...	S.S. Waimate	New Zealand, via Cape, and Pernambuco	1896-97	B. D. Parnell, 4th Officer.
Jamieson, D. E.	...	S.S. Port Chalmers	Wellington, via Cape Good Hope	1897-98	W. K. McAlpine.
"	...	"	Melbourne, via Cape, and home, via Suez	1896-97	Frederick Tunbridge, assisted by W. Plugge and H. R. Lesslie.
"	...	"	Adelaide, via Cape Good Hope, and home, via Suez.	1897	W. Plugge, T. F. Dixon, and R. Bailey.
Johnston, John	...	Barque Blengfell	Brisbane, Valparaiso, and New York	1895-97	Henry Fisher.
Jones, Evan	...	Barque Moel Tryvan	Melbourne	1896-97	
" R. O.	...	S.S. Vancouver	Quebec	1897	J. V. Mathias and John Davies.
"	...	"	Portland	1897-98	John Davies, 4th Officer.
" T. I., R.N.R.	...	S.S. Bovic	New York	1897-98	E. Kemp, J. C. Hamilton, R.N.R., and James McGiffin.
Kelly, —	...	Barque Lutterworth	Wellington	1895-97	Mr. Blanchard, Chief Officer.
" R.	...	Ship Westland	"	1896-97	
Lawson, —	...	S.S. Lisnacrieve	Newport News	1897	H. A. White, 2nd Mate.
Lindsay, H. K.	...	Barque Laurelbank	Sydney and San Francisco	1895-97	
Lobb, Commr. F. J., R.N.	...	L.H. Tender Richmond	At Bahamas	1896-97	F. W. Holden, Chief Officer.
"	...	"	"	1897	
Lowe, James	...	S.S. Duffield	Philadelphia and New York	1897	F. A. White, 2nd Officer.
MacDonald, J.	...	Barque Marion Frazer	Iquique	1896-97	J. C. Wallace, Chief Officer.
Martin, T. C.	...	Ship Loch Tay	Adelaide	1896-97	
Martyr, J. W. C.	...	S.S. Europa	Colon, and Newport News	1896-97	H. T. Wilde, 3rd Officer.
"	...	"	La Plata	1897	Percy Brining, 3rd Officer.
Miller, Lieut. A. T., R.N.	...	School Ship Conway	Off Birkenhead	1897	The Cadets.
Millican, J. W.	...	S.S. Loughrigg Holme	Alexandria and Canada	1897	S. J. Holme, J. Eland, E. Russell, and E. Gibson.

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.
Milne, W. F. ...	S.S. Eclipse ...	Davis Straits ...	1897	—
Milner, W. H. ...	S.S. Para ...	West Indies ...	1897	J. Watts, 5th Officer.
" " " " ...	S.S. Medway ...	West Indies and Colon ...	1897	—
Mitchell, George ...	S.S. California ...	Mediterranean and New York ...	1896-97	—
" " " " ...	Ship Garsdale ...	Cape Town, Newcastle (N.S.W.), Anta- fogasta (Chile).	1897	—
Moignard, Phillip ...	S.S. Trojan ...	Cape Town ...	1896-97	Mr. King, Chief Officer.
Mosely, F. J., R.N.R. ...	S.S. Romney ...	China and Japan, via Suez ...	1897	F. G. Brown, 4th Officer.
Mullan, F. C. ...	S.S. Elphinstone ...	Borneo, via Suez ...	1896-97	John Hunter, W. H. Davies, and Enoch Jones.
Nasbet, J. R., R.N.R. ...	S.S. Madeline ...	Newport News and West Bay (U.S.) ...	1897	W. W. Sharpley, 1st Officer, D. G. Taylor, 2nd Officer, and A. Dransfield, 3rd Officer.
Nedden, H. zur ...	S.S. Guelph ...	Quebec ...	1897	N. Traill, 2nd Mate.
" " " " ...	Barque Milton Stuart ...	Cape Town ...	1897	H. Duncan, 2nd Mate.
Neilson, N. R. ...	S.S. Larne ...	New York and Calcutta ...	1897	Messrs. Kerbey, Grogan, and Campos.
Norman, F. ...	S.S. Dunstaffnage ...	Philadelpia and Calcutta ...	1896-97	R. Cole Baker, 3rd Officer, and Stuart Matthews.
Owen, Hugh, R.N.R. ...	Barque Loch Torridon ...	Newcastle, N.S.W. ...	1898	—
Patterson, J. A. ...	S.S. Breconshire ...	China and New York, via Suez ...	1895-97	G. Kell, 2nd Mate.
Pattman, R. ...	" " " " ...	New York, China, Japan, via Suez, and Calcutta.	1896-97	J. G. Minnis, 1st Mate, and David Forrest, 2nd Mate.
Peebles, R. ...	H.M.S. Rambler ...	Halifax and Bermuda ...	1896-97	G. Elliott and W. Matthews.
" " " " ...	" " " " ...	Belize, Bermuda, and Halifax ...	1897-98	Do.
Richards, Comr. G. E., R.N. ...	" " " " ...	" " " " ...	1897	Lieut. H. A. P. Glossop, R.N.
" " " " ...	" " " " ...	" " " " ...	1897	" " " "

Richards, Comr. G. E., R.N.	H.M.S. Rambler	...	Halifax and Straits of Belle Isle ...	...	1897	Lieut. H. A. P. Glossop, R.N.
Roberts, R.	S.S. Cabenda...	...	West Coast of Africa	...	1897	W. F. Wood and J. G. J. Ross.
Rogers, W. B.	Barque Routenbeck...	...	Honolulu and Lobos de Afuera	...	1896-97	F. Catlow.
Ross, John	Barque Alcides	...	San Francisco	...	1897	W. H. Halliday, Chief Officer, and Frank F. Lurcock, 2nd Officer.
Russell, J.	S.S. Chaucer	...	West Coast of South America	...	1897-98	Alfred Gittins, 2nd Officer.
Sampson, Comr. L. D., R.N.	H.M.S. Swallow	...	At Zanzibar, Simon's Bay, and Mombasa	...	1893	Surgeon W. E. Home, R.N.
Sargent, A. H.	Ship Pleione	...	New Zealand...	...	1896-97	G. H. B. Wood, Chief Officer, and F. Powell, 2nd Officer.
Scott, George, F.R. Met. Soc.	Ship Buckingham	...	Sydney	...	1896-97	W. Bourke, Chief Officer, and J. Maudsley, 2nd Officer.
Shanklin, J. W.	S.S. Ethiopia...	...	New York	...	1896-97	F. Jackson.
Shepherd, D.	Ship Frankistan	...	San Francisco	...	1896-97	W. Douglas, Chief Officer, J. Paterson, 2nd Officer, and W. Jermyn, 3rd Officer.
Simpson, Alexander	S.S. Thermopyloe	...	Sydney, via Cape Town	...	1897	Do.
"	"	...	"	...	1897	Do.
"	"	...	"	...	1897-98	Do.
Simpson, Alexander	Barquentine Traveller	...	Ivigtut	...	1897	F. Woollcott, 3rd Officer.
Singer, P. R.	S.S. Den of Airlie	...	Calcutta, via Suez	...	1897	Sub-Lieut. H. C. Watson, R.N.
Smyth, Comr. M. H., R.N.	H.M.S. Egeria	...	Bahia, Monte Video, and Puerto Bueno (Sarmieño Channel).	...	1897	Sub-Lieut. H. C. Watson, R.N., and the Quartermasters.
"	"	...	West Coast of South America	...	1897	Do.
"	"	...	Off West Coast of South America, Central America, and San Francisco.	...	1897-98	do.
Stephens, T.	S.S. Catalonia	...	Boston	...	1897	E. A. C. Johnson, Murdoch Cunningham, and Ward, 3rd and 4th Officers.
Steven, G. H.	Ship Dharwar	...	Melbourne	...	1895-96	Chief Officer.
Suffern, R.	Barque Craigerne	...	Cape Town, Newcastle (N.S.W.), and Portland (Oregon).	...	1896-98	G. M. Collie, 1st Officer, and R. Gregson, 2nd 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.
Thomas, H. G., R.N.R....	S.S. Yarrowonga ...	Adelaide, via Cape Good Hope ...	1897	L. Gibbs, 2nd Officer, Free, 3rd Officer, and H. Sandeman, 4th Officer.
" " Wm. ...	" " ...	Batavia and Cookstown, via Suez ...	1897-98	do.
" " ...	S.S. Templemore ...	Baltimore ...	1897-98	H. P. Harris, 1st Officer, A. W. McKenny, 2nd Officer, and G. Greig, 3rd Officer.
Thomson, W. S. ...	S.S. Macduff ...	China, Japan, and New York, via Suez ...	1897-98	—
Title, F. ...	Ship Falls of Foyers (N.S.W.), and San Francisco.	New York, Melbourne, Newcastle	1896-97	J. W. Read, Chief Officer.
Trenaman, R. W. ...	S.S. Lassell ...	Bahia and New York ...	1897	Alfred Gittins, 2nd Officer.
" " ...	" " ...	Rio Janeiro and New York ...	1897-98	R. J. Kite, 2nd Officer.
Trott, Samuel F.R. Met. Soc.	S.S. Minia ...	In the North Atlantic ..	1897	W. G. Squares, Chief Officer, J. Adams, Navigating Officer, E. R. Williams, 2nd Officer, and F. C. Jeffries, 3rd Officer.
" " ...	" " ...	Halifax and North Atlantic ...	1897-98	do.
Turner, A. C., R.N.R. ...	S.S. Britannia ...	Calcutta, via Suez ...	1897	James Young, 3rd Officer.
" " ...	" " ...	Bombay and New York, via Suez ...	1897	A. W. Thomson.
" " ...	" " ...	Bombay, via Suez ...	1897-98	James Young, 3rd Officer.
Tyson, John ...	S.S. Guelph ...	Cape Town ...	1896-97	—
" " ...	S.S. Tartar ...	" " ...	1897	—
Vaughan, James ...	Barque Sokoto ...	San Francisco ...	1896-97	Richard Jones, Chief Officer, and Geo. B. Durrant, 2nd Officer.
Veale, E. A. ...	S.S. Lusitania ...	Sydney, via Suez ...	1897	B. L. Gace, Chief Officer, W. L. Shelford, 2nd Officer, O. Lockyer, 3rd Officer, and C. Cullimore, 4th Officer.
" " ...	S.S. Ormuz ...	" " ...	1897	E. J. Tayler, assisted by F. W. Kershaw and G. H. Jones.

Appendix II.—List of Meteorological Logs.

Wadsworth, F. H.	...	S.S. Ethiopia...	...	New York	...	...	...	1897-98	W. B. Rome, 4th Officer.
Walker, H., R.N.R.	...	R.M.S. Campania	...	"	...	...	...	1897-98	C. A. Smith, W. Irvine, W. Hankinson, E. H. Penticost, C. Nelson, C. Unwin, and Wm. McMickan.
Ward, W.	...	S.S. Argyll	...	China and New York, via Suez	...	...	...	1897	S. L. Saxby, Chief Officer, J. Elliott, 2nd Officer, and C. Gumley, 3rd Officer.
Watt, H. F.	...	Barque Elissa	...	Laguna (Mexico) and Key West	...	...	...	1895-97	—
Webster, T.	...	Ship Centesima	...	San Francisco	...	...	...	1896-98	—
Williams, J. O.	...	S.S. Norseman	...	Boston	...	...	...	1897	Thomas James, 2nd Officer.
Williamson, J. C.	...	S.S. Lennox	...	China and Japan, via Suez, New York, and San Francisco.	...	...	...	1895-96	James Elliott, 3rd Officer.
Wilson, John, R.N.R.	...	S.S. Anchoria	...	New York	...	...	...	1896-97	W. M. Shannon and D. Skinner, 3rd Officers.
"	...	"	...	"	...	...	...	1897	David Kinnear, 3rd Officer.
"	...	"	...	"	...	...	...	1897-98	"
Worcester, W. D. G., R.N.R.	...	S.S. Victoria	...	Bombay, via Suez	...	...	...	1896-97	"
"	...	"	...	Adelaide, via Suez	...	...	...	1897	W. H. Sweny, 2nd Officer, W. Hayward, Chief Officer, M. Burne, 3rd Officer, and T. H. Hodson, 5th Officer.
"	...	S.S. India	...	Bombay, via Suez	...	...	...	1897	R. Stevenson, Sup. 2nd Officer, assisted by A. W. Symes, Chief Officer, E. B. Bartlett, 2nd Officer, L. M. Gordon, 4th Officer, and W. Hallam, Sup. 4th Officer.
"	...	"	...	"	...	...	...	1897-98	H. W. M. Atkinson, Super. 2nd Officer, assisted by A. W. Symes, R.N.R., Chief Officer, E. B. Bartlett, R.N.R., 2nd Officer, C. N. Redhead, R.N.R., 3rd Officer, S. Stroud, R.N.R., 4th Officer, and R. T. Hodgson, Super. 4th Officer.

APPENDIX III.

INSTRUMENTS supplied, &c., to the Royal Navy.

Per Account.	Baro- meters.	Ane- roids.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1897, afloat ...	239	622	1,459	392	397	237	47
Issued since	101	200	465	99	92	37	16
	340	822	1,924	491	489	274	63
Returned since	105	207	462	102	93	36	—
April 1st, 1898, afloat ...	235	615	1,462	389	391	238	63

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

April 1st, 1897, in use ...	74	74	242	33	47	10	11
Issued since	6	10	45	2	—	1	4
	80	84	287	35	47	11	15
Returned since	6	5	40	1	1	1	4
April 1st, 1898, in use ...	74	79	247	34	46	10	11

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1898.

Afloat in Royal Navy ...	235	615	1,462	389	391	238	63
In use at stations	74	79	247	34	46	10	11
In store at M.O.	67	126	89	104	115	34	31
" Chatham	17	48	106	29	34	24	15
" Sheerness	3	17	32	12	12	8	6
" Portsmouth	22	50	139	48	51	24	4
" Devonport	16	35	127	34	35	17	16
" Queenstown	3	2	11	3	3	—	4
" Gibraltar	3	2	7	3	3	—	4
" Malta	10	17	51	12	8	5	6
" Bombay	3	2	15	3	4	2	4
" Halifax	6	6	22	4	4	2	7
" Bermuda	7	16	21	5	9	2	—
" Jamaica	2	3	19	2	2	1	3
" Cape of Good Hope ...	7	5	25	5	4	3	4
" Trincomalee	4	6	4	2	3	1	4
" Hong Kong	19	16	53	20	21	3	21
" Coquimbo	3	5	8	4	3	1	19
" Sydney	4	8	18	4	—	3	23
" Esquimalt	4	6	17	3	6	2	4
Total April 1st, 1898 ...	509	1064	2473	720	754	380	249
Lost, &c., since April 1st, 1897	—	4	295	38	33	25	—
Under repair, April 1st, 1898	7	—	—	—	—	—	—

APPENDIX IV.

INSTRUMENTS supplied, &c., to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1897, afloat ...	108	—	642	—	1	100	356
Issued since ...	69	—	434	—	—	54	229
Returned since ...	177	—	1,076	—	1	154	585
	59	—	361	—	—	47	185
April 1st, 1898, afloat ...	118	—	715	—	1	107	400

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

April 1st, 1897, in use ...	299	2	292	62	73	58	13
Issued since ...	18	1	18	6	5	4	5
Returned since ...	317	3	310	68	78	62	18
	15	1	18	4	10	4	8
April 1st, 1898, in use ...	302*	2	292	64	68	58	10

DISPOSITION of INSTRUMENTS on April 1st, 1898.

In merchant ships ...	118	—	715	—	1	107	406
„ use at stations ...	302	2	292	64	68	58	10
„ store at M.O. ...	39	3	227	38	57	65	94
At Liverpool Agency ...	8	—	27	—	—	8	14
„ Glasgow ...	4	—	38	—	—	4	12
„ Dundee ...	3	—	14	—	—	5	14
„ Hull ...	2	—	12	—	—	2	7
„ Cardiff ...	6	—	12	—	—	4	30
„ Southampton ...	6	—	28	—	—	8	25
Total, April 1st, 1898 ...	488	5	1,365	102	126	261	612
Lost, &c., since April 1st, 1897	4	—	98	3	7	12	33
Under repair, April 1st, 1898	7	—	—	—	—	—	—

* Of these barometers 215 are lent for use of seafaring communities at fishing villages and ports.

APPENDIX V.

REPORT OF INSPECTION OF STATIONS IN IRELAND AND SOUTH WALES, 1897.

I have to report that I have completed my tour over these districts, omitting only such stations (Valencia excepted) as were visited by Mr. Baker from Kew, and in addition Dublin (Fitz William Square), Currygrane (Co. Longford), Killarney, Edenfel (Omagh), and St. David's. I was also unable to visit Cavan, where Lord Farnham is about to establish a station. This last omission was owing to a fatal accident which occurred to his son two days before my intended visit.

Donaghadee, visited September 16th.—This station calls for no particular remark. The observer may possibly give up the postmaster-ship, but would be ready to continue the duties of reporting to the Office.

Lissan, visited September 17th.—This station is in good order. The observer is the coachman, who is very careful and attentive, but cannot be expected to keep a very close watch on the instrument all day.

Londonderry, visited September 20th.—The defects as to the exposure of thermometers and rain gauge still exist, and I see no prospects of their being diminished. The observer is, however, careful; he is an ex-sergeant Royal Engineers.

Malin Head, visited September 21st.—The observer is Lloyds reporter, J. Williams. I found all instruments in good order. I paid special attention to the barometer, having taken with me a barometer, M.O. 579, with tube practically uncontracted. I found the two barometers at the station to read as follows:—

	Scott.		Williams.	
Reporting instrument 68	29.626	59	29.626	59
Check 592	29.610	59	29.610	59

I then dismounted No. 592 and hung No. 579 in its place, and left it for two hours to take the temperature of the room.

At the expiration of that time readings were taken as follows:—

	Scott.		Williams.	
No. 68	29.628	57.2	29.630	57.2
No. 579	29.630	57.2	29.624	57.2
No. 68	29.628	57.2	29.630	57.2
No. 579	29.626	57.2	29.624	57.2

These readings appear to show that the Malin Head barometer, at noon, does not read too low when compared with an uncontracted tube.

Markree, visited September 23rd.—Dr. Marth, the observer at this station, died in August; the observations for the present are taken by Miss Ellen Reynolds, who has for some years acted as Dr. Marth's assistant. The future of the observatory is not yet settled, but I hope

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the meteorological observations will not be dropped. The instruments were clean and in good order.

Belmullet, visited September 25th.—The duty of reporting at this station has not been satisfactorily performed, and I therefore, with consent of the Admiral Superintendent of Naval Reserves, and after conversation with Mr. Hudson, the Inspecting-Officer of Coast Guard for the district, drove down on the 27th to Blacksod, 12 miles from Belmullet. The coastguard station is not exposed to the Atlantic, being round the point and in the bay; however, there is no high land about except a hill to the WNW., and the winds felt would be fairly true. There is a good expanse of water in sight to show sea disturbance. I saw Mr. Jones, the chief officer at Blacksod. He expressed his readiness to undertake the work, if the observer at Belmullet did not show more zeal and attention than has hitherto been exhibited.

The instruments at Belmullet were fairly clean.

Glasnevin, visited September 30th.—This station calls for no special remark.

Newcastle (Co. Wicklow), visited October 2nd.—This is the Consumption Hospital for Ireland. I had visited it last year.—Dr. Steede, the resident physician, had received the instruments, but had not as yet received full instructions in their use, but I have every hope that now the records will be started on a proper basis. The site is very good, except that the Wicklow Hills will intercept evening sunshine.

Valencia, visited October 5th.—The instruments are in good order, as usual. The only matter to which I have to call the attention of the Council is the state of the outside fence along the road, as this is only of clay, cattle break it down, and "pitching" with stones on top is not effectual. Persons sending in cattle for grazing complain of this.

Roche's Point, visited October 6th.—I found that the maximum thermometer had been recently broken and had not been replaced prior to my visit, and the rain-gauge was nearly worn out.

Mount Trenchard, visited October 7th.—This is a station for the Weekly Weather Report. The rain-gauge was rather sheltered by long grass. The thermometers were in good order.

Parsonstown, visited October 8th.—The two observers at this station at present are very careful and dependable. The instruments are in good order.

Kilkenny, visited October 9th.—A considerable improvement has been carried out at this Weekly Weather Report station, as Lord Ormonde has allowed the removal of the thermometer screen to a much more open site than was formerly available.

St. Anne's Head, visited October 11th.—This station calls for no special remark, the observations continue to be satisfactory.

Llandoverly, visited October 13.—At this Weekly Weather Report station I have succeeded in getting improved instruments taken into use, with a promise of the erection of a better class of thermometer screen.

I also visited certain towns where the sanitary authorities contemplate the establishment of stations.

Belfast, visited September 16th.—I saw Mr. James O'Neill, who takes a great interest in the subject. The observations are to be

carried out by the staff of the Linen Hall Library, and the thermometer screen and rain-gauge erected in the open space formerly enclosed by the Linen Hall, now removed. There are some very good instruments, particularly a standard barometer, and observations exist for about 100 years, but the conditions were not satisfactory throughout.

Kingstown, visited September 30th.—I met Dr. Byrne Power and Colonel Blood, the chairman of the Sanitary Committee of the Town Council. It is proposed to establish a station in the People's Park at Glasthule near Kingstown. I was unable to see the instruments as the man who had charge of them was on leave.

Tenby, visited October 12th.—I saw Mr. Balmer, head master of the Wesleyan School, and Dr. Reid, chairman of the Meteorological Committee of the Town Council. When I visited this station in 1891 the arrangements for thermometer exposure were not satisfactory, and the station was not then accepted. Now a fresh site, in a garden, has been obtained for the thermometers and rain-gauge, and an improvement will be made in the arrangements for the sunshine record. Mr. Balmer has zeal but as yet little experience. I think that the station promises well for a time. The Town Council are very anxious that it should be permanent.

(Signed) ROBERT H. SCOTT.

I append a note of the thermometer comparisons.

IRISH and WELSH INSPECTIONS, 1897.

CORRECTIONS NECESSARY FOR THERMOMETERS.

STATIONS.	Inspector's Standard.	Dry Bulb.	Wet Bulb.	Spare Thermometer.	Max. Thermometer.	Min. Thermometer.	Gross Min.	REMARKS.
Malin Head ..	53.6	-0.5	-0.4	-1.0	-0.6	-0.3	—	
Londonderry ..	55.1	-0.2	-0.1	—	-0.9	+0.2	—	
Markree Castle ..	56.5	-0.4	-0.3	—	-0.7	+0.3	—	
Belmullet	54.2	-0.6	-0.7	—	-0.6	+0.8	—	
Donaghadee ..	67.6	-0.5	-0.5	—	-0.2	-0.4	-0.4	
Lissan	57.8	-0.4	-0.4	—	-0.2	+0.6	—	
Parsonstown ..	56.8	-0.5	0.0	—	-0.2	0.0	—	
Glasnevin	57.0	-0.3	-0.2	-0.4	-0.0	+0.4	+0.2	
Valencia (Cahiriveen).	55.1	-0.9	-0.9	—	-0.8	+0.1	—	
Foynes	—	—	—	—	-0.2	+0.5	—	
Kilkenny	—	—	—	—	-0.1	0.0	—	
Roches Point ..	54.0	-0.8	-0.8	—	Broken	0.0	-0.7	
St. Ann's Head ..	54.0	-0.4	0.0	-0.2	0.0	-0.1	—	
Tenby	54.2	-0.6	-0.6	—	-0.3	0.0	+1.2	
Llandovery ..	46.2	-1.0	+1.0	—	0.0	+0.2	—	Instruments to be all changed.

REPORT OF INSPECTION OF SCOTTISH STATIONS FOR THE YEAR 1897.

BAROMETERS.

The barometers at all the stations were compared with inspector's standard barometer, No. 690, which was in good order throughout the inspection. The station barometers were found to be correct and in good order. Table I. gives the comparisons with No. 690, the readings of the station barometers not being corrected, except for differences of the readings of the attached thermometers.

TABLE I.

STATIONS.	Inspector's Standard No. 690 corrected.	Reporting Barometer uncorrected	Check Barometer uncorrected.	REMARKS.
	Inches.	Inches.	Inches.	
Ochertyre	29.719	29.707	—	
Edinburgh	29.855	29.876	—	
Glencarron	29.442	29.442	—	
Stornoway	29.688	29.690	—	
Lairg	29.216	29.210	—	
Wick	29.548	29.550	29.600	Spare barometer in shop; St. B. 29.603.
Dunrobin	29.203	29.202	—	
Nairn	29.584	29.585	29.574	
Gordon Castle	29.540	29.575	—	
Aberdeen	29.838	29.842	29.838	
Braemar	28.555	28.582	—	
Lednathie	28.948	28.952	—	
Dundee	29.522	29.520	—	
Leith	29.397	29.395	29.396	
Pinmore	30.140	30.140	—	
Ardrossan	30.384	30.384	—	
Glasgow Observatory	29.787	29.790	—	

THERMOMETERS.

The thermometers were, as in previous years, read twice, first by the observer as they hung in the thermometer screen, and then by the inspector after they had been in water along with the standard thermometer for the times specified in the table. Special attention was given to the action of the maximum thermometers; and also to the state of the minimum thermometers. As regards the latter, about a degree of the spirit was lodged near the top of the tube of the thermometers at Nairn and Gordon Castle. These were rectified.

TABLE II.

STATIONS.	Inspector's Standard Thermometer, No. 433.	Dry Bulb.	Wet Bulb.	Max. Ther- mometer.	Min. Ther- mometer.	Spare Ther- mometer.	Time in Water, in Minutes.	Change of Temperature.	REMARKS.
Ochertyre ..	80.6	0.0	-0.1	0.0	-0.1	—	120	Uniform	B. B. Min. - 0.1
Edinburgh ..	60.5	+0.2	+0.1	0.0	-0.2	—	90	+0.3	0.0
Glencarron ..	56.9	+0.1	+0.1	+0.1	+0.1	—	90	+0.3	
Stornoway ..	60.8	+0.7	+0.6	-0.2	0.0	—	135	+0.2	
Lairg ..	57.2	+0.1	0.0	-0.1	+0.1	—	105	+0.3	
Wick ..	60.8	+0.4	+0.4	0.0	-0.1	—	85	Uniform	
Dunrobin ..	63.7	+0.1	+0.1	+0.2	+0.1	—	135	+0.5	
Nairn ..	59.9	+0.8	+0.9	+0.2	0.0	+0.2	75	Uniform	
Gordon Castle..	58.1	0.0	-0.1	0.0	+0.1	+0.5	110	+0.4	
Aberdeen ..	60.0	+0.1	+0.1	+0.1	+0.1	—	90	Uniform	
Braemar ..	56.0	+0.4	+0.5	-0.1	-0.3	—	110	+0.2	
Lednathie ..	58.6	+0.3	+0.2	+0.2	-0.4	—	135	+0.4	
Dundee ..	60.8	-0.6	-0.5	+1.4	-0.2	—	70	+0.2	
Leith ..	61.2	+0.1	+0.2	-0.2	-0.4	—	70	Uniform	
Pinmore ..	51.5	+0.1	+0.0	-0.1	0.0	—	65	"	
Ardrossan ..	62.7	+0.3	+0.4	+0.1	-0.1	—	105	"	
Glasgow Obser.	52.6	—	—	0.0	0.0	—	95	+0.2	

HYGROMETERS.

Particular attention was given to the readings of the dry and wet bulb thermometers, as they hung in the thermometer screen, immediately when the screen was opened, with the result that at all the stations these thermometers were found in good order for hygrometrical observations.

NOTES OF INSPECTIONS OF THE STATIONS.

Edinburgh, July 1st, 1897.—Everything at this station continues in admirable order, and the observations are thoroughly well attended to.

Ochertyre, July 28th.—The instruments were in excellent condition, and the observations leave nothing to be desired. Underground temperatures at depths of 3, 12, 22, 36, and 48 inches will, in future, be added to the monthly schedule of observations.

Glencarron, August 12th.—Everything was in particularly good order, and the observations are made with punctuality and accuracy.

Stornoway, August 13th.—Except the barometer, which has been removed to Mr. Mackenzie's house, the instruments are in the same positions they were in at the previous inspection. They were all in excellent order, and the observations, in the absence of Mr. Mackenzie, who was in Edinburgh at the time of inspection, were made correctly by Mrs. Mackenzie and the assistant clerk. The faults in the curves of the barograph were inquired into and it was stated that they have

occurred only since using the thinner paper supplied some time ago. Special care will be given in future in fitting the papers to the drum.

Lairg, August 16th.—The instruments are remarkably well kept, and the observations are made with intelligence and scrupulous fidelity.

Wick, August 16th.—The instruments are kept in excellent order, and much intelligence is manifested in making the observations. Mr. Sinclair had a slight shock of paralysis some time ago, which probably accounted for some of the readings at the time.

Dunrobin, August 17th.—The instruments were in good order, and the observations continue to be made with much intelligence. The index of the maximum thermometer (a Phillips'), being too long, is to be altered; and in the meantime another maximum, which is correct, will be used.

Nairn, August 18th.—Four new posts were ordered for the thermometer screen. A new bottom was soldered to the receiver of the rain-gauge in June. About a degree of spirit was found lodged near the top of the tube of the minimum thermometer, which was rectified by Miss Penny at the time of inspection.

Otherwise the instruments were in excellent order, and the work of the station well attended to. I removed the reporting barometer from the lobby to the dining room of the house, with a view of securing for the instrument and its attached thermometer a more equable temperature.

Gordon Castle, August 19th.—About a degree of spirit was lodged near the top of the tube of the minimum thermometer, which Mr. Webster, under my direction, rectified at the time of the inspection.

The instruments were in good order, and the observations carefully and correctly made.

Aberdeen, August 25th.—The instruments continue to be kept in excellent order and the observations made with care and exactness.

As requested, I made inquiry as to the occasional late arrivals of the Daily Weather Telegrams at the Meteorological Office. Several causes were assigned for these delays, but after some conversation with Mr. Spenceley and Mr. Shepherd of the Aberdeen General Post Office, it is expected that delays in the despatch of the telegrams from Aberdeen will not recur.

Braemar, August 24th.—The instruments are in very good order and much care and intelligence are manifested in making the observations.

Lednathie, August 26th.—The instruments at this station continue to be well kept and much care is given to secure accuracy and punctuality in making the observations. The anemometer is in excellent order, and is well placed so as to give a close approximation to the velocity of the wind in the Lednathie Valley.

Dundee, August 27th.—All the instruments are in very good order and the observations carefully and correctly made. A slight change was ordered for the purpose of giving a better exposure to the two bulbs of the hygrometer.

Leith, August 30th.—The instruments are all in very good order, and the observations well attended to by the three observers.

A new position which has been proposed for the instruments was inspected, and further action will be taken in November to carry out the much needed change from the present position.

Ardrossan, October 6th.—Repainting, a new ventilator, and the repair of a few laths of the thermometer screen are required. The instruments were otherwise in very good order and the observer is very conscientious. Extensive additions were being made to the building of the post office, during which the barometer had been removed to a temporary position. The removal had been made with great care.

Pinmore, October 7th.—The instruments were all in remarkably good order, and the observations continue to be made with intelligence and enthusiasm.

Glasgow Observatory, October 8th.—Everything here was found to be in excellent order and the observations are made with the greatest care and skill.

(Signed) ALEXANDER BUCHAN,
Inspector of Scottish Stations.

REPORT OF INSPECTIONS, 1897.

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

SIR,

I BEG to hand you the following Report of Inspections of several English stations carried out by me at various times during the year 1897.

Hollesley Bay.—Colonial College.—Visited on July 30th.—The objects of this visit were (1) to take the instruments down to the station and to explain the method of dealing with them; (2) to select a position for the exposure of the out-door instruments; and (3) to see that the position of the barometer should be as satisfactory as possible.

All these points were arranged, and I had reason to be greatly pleased with the zeal and readiness shown both by the manager, and the science master (Mr. Pile), in their efforts to make the station a really good one. The instruments arrived safely, the position for the thermometers and rain-gauge is an excellent one, quite away from the influence of buildings or high trees, and a brick tower is to be built for the sunshine recorder, so that its exposure may be perfect. I spent several hours in giving instructions, and pointing out all the little errors which may easily occur in taking and reducing the readings. I regret that Mr. Pile is about to leave the college, and that I could not see his successor, as he had not then been appointed.

North Foreland.—I visited this (telegraphic reporting) station on two occasions—viz., on September 7th and 14th. The instruments were in fairly good condition, but the indications of the dry and wet bulb thermometers were higher than they should be, and the scale of the maximum thermometer was broken. The door of the thermometer screen was broken and off its hinges. On the 14th I took a

new maximum thermometer to the station, and found that the screen had been thoroughly repaired and painted in accordance with the instructions given on the 7th.

The observer (Mr. Jenkins, junior) is really too young for such responsible work, and were it not that the assistant observer (Coast-guardsman A. Heighton) is a very competent man, I should advise that some steps be taken to get a better observer. As it is, however, things work fairly well.

St. Leonards.—Visited on September 9th and 11th, there was constant heavy rain till noon 9th.—The barometer read too low, and the dry and wet bulb thermometers much too high when compared with the standard I had with me, and also with a Kew standard belonging to Mr. Colborne. The wet-bulb needed some repairs to its scale, and these were done. The sunshine recorder I shifted to a new position on a tower built for the purpose by the town council and affording an excellent exposure all round. It was in order to make the final adjustments in this new position that I visited the station a second time on September 11th. Observations on the Marina are now being made by a careful observer.

Dungeness.—Visited on September 10th.—Instruments all in excellent order and observations well made. The new arrangement for sending the observations to London over the Admiralty wire is working very satisfactorily.

Eastbourne (Second Order Station).—Inspected on September 13th.—Instruments in this station all in good order excepting the barometer. This has been shifted to another room, but the altitude above sea was not changed. The rack and pinion, to the vernier, were again defective, and I asked observer to get them put right. The thermometers are very good instruments. Sunshine lens was *slightly* out of adjustment, but observer undertook to put it right in a few days, when a new (crown glass) lens was expected.

Cuckfield (Rainfall Station).—Inspected on September 14th. The rain-gauge was in good order, and had been properly placed in the new position selected by Mr. J. Curtis a year ago.

Rochester (Rede Court), Second Order Station.—Primary Inspection.—Inspected September 15th. This is a most satisfactory station. The instruments are good, their exposure is good, and the observations are made with accuracy by Mr. W. H. Tingey, B.A.

Chatham (Second Order Station).—School of Engineering, Royal Engineers.—Inspected on September 16th. Quarter-master Sergeant McCudden in charge. Instruments as a whole, and exposure, very good, but barometer is still in a defective position, owing to want of light; solar radiation thermometer indicates too high. Wind force is not good, owing to its being obtained from a small anemometer which is not well placed.

Epsom, Royal Medical College.—Inspected on November 17th.—A station (Second Order) with a very good equipment of instruments, all of them very well exposed. The observations, however, were being

made in a very unsatisfactory manner and cannot be relied on for any purpose. I failed to obtain any promise of improvement.*

Bramley.—Inspected on November 18th.—The instruments at this station are good and are well exposed, excepting the important fact that the thermometer screen is not a "Stevenson," though resembling it in outward appearance. It is only a single-louvred screen, of home make, and the effect of this on maximum and minimum temperatures in clear bright weather is most serious. The position of the station between two ranges of hills makes it certain that the wind direction is often purely local. Observer could not promise any change as the instruments are only on loan. The wet-bulb was in very good order, all the instruments were clean, and the observer was very desirous of doing good work.

Meteorological Office, 28th March, 1898.

(Signed) FREDC. GASTER.

October 12, 1897.

Sir,

I HAVE the honour to submit herewith the following reports upon the inspection of the stations visited by me this year.

I am, &c.

(Signed) R. H. CURTIS.

R. H. Scott, Esq., F.R.S.

SUNSHINE STATIONS.

Colwyn Bay, visited August 28th.—The exposure of the sunshine recorder at this station leaves a good deal to be desired, but at present it does not appear to be possible to obtain a better site. Dr. Lord told me that his tenure of the field where the instrument now stands is uncertain, and that if a better site becomes available he will endeavour to secure it.

Llandudno, August 28th.—I visited the proposed site for the sunshine recorder at the Infectious Diseases Hospital, but did not consider it the best to be obtained, and eventually a much better position for it was found close to where it formerly stood. The erection of the instrument will be proceeded with at once.

Southport, September 8th.—The instruments here are very well exposed and are most carefully attended to. I tested the instrument and found its adjustments were all satisfactory.

Blackpool, September 9th.—The management of this instrument has for a long time been very unsatisfactory. Unfortunately Dr. Anderson was away from home, but I pointed out to the lad who attends to the recorder the points which required improvement, and Dr. Anderson has since promised that they shall be attended to. I found the adjustment of the instrument faulty, and before leaving set it correctly.

*Since then a promise of improvement has been made by the observer,

SECOND ORDER STATIONS.

Chester, September 6th.—The instruments were all in good order and carefully read, but the site is a small one, and the instruments are necessarily a good deal crowded. The sunshine recorder is especially affected by trees, and by a large building close at hand.

St. Helen's, September 8th.—The present observer, Dr. Harris, has only recently succeeded to the work, but he has taken it up enthusiastically, and is endeavouring to add a sunshine recorder, and an anemometer, to the present stock of instruments. The position of the station is most satisfactory, and the readings are very carefully taken.

Heysham, September 10th.—Everything at this station was in excellent order and much care is bestowed upon the observations. The observer now sets and reads his barometer very correctly.

Gilcrux, September 11th.—The grass minimum at this station had an unusually large amount of spirit at the top of the tube, and the error had not been detected; in every other respect the instruments were in good order, and they are very carefully read. The practice of removing the sunshine recorder indoors each evening is not a satisfactory one, but the observer says it would be unsafe to leave it out all night.

Marton (Skipton), September 14th.—The instruments here were all in very good order and the observations are carefully made. I spoke about the desirability of getting 9 p.m. observations taken, but at present it is not easy to overcome the difficulties in the way.

Manchester, September 15th and 16th.—The sunshine recorder at this station was entirely out of adjustment, and apparently the observer, Mr. Hazzlewood, has for a long time past failed to obtain observations of any value. Dr. Niven was away from home, but he has since promised to have the instrument readjusted. In every other respect the station was in good order and the instruments were accurately read.

Prestwich, September 15th.—The situation of all the instruments here is excellent, and they are very carefully attended to and accurately read. The observer had misunderstood the instructions as to the entry of preceding weather, but this will be set right in future.

TELEGRAPHIC REPORTING STATIONS.

Holyhead, September 3rd and 4th.—The instruments were correctly read and the observer is careful in making his observations. The position of the rain-gauge is unsatisfactory.

Bidston, September 7th.—The thermometer screen had been removed to a very good position to the north of the observatory, where it cannot be affected by radiation from the walls of the building, as may possibly have been the case before. Everything was in excellent order at this station.

Hawes Junction, September 13th.—This station has not been inspected for some time. The instruments were all in good order, and are apparently read both regularly and carefully.

ANEMOGRAPHIC STATION. See separate Report.

BAROMETERS.

STATIONS.	Inspector's Standard corrected.	Reporting Barometer uncorrected.	Check Barometer uncorrected.	REMARKS.
	Inches.	Inches.	Inches.	
Holyhead	30.020	30.024	30.020	
Chester	29.789	29.764	—	
St. Helens	29.864	29.868	—	
Heysham	30.380	30.380	—	
Gilerux	30.250	30.238	30.244	
Hawes Junction..	29.417	29.407	—	
Marton	29.955	29.955	—	
Manchester	30.215	30.204	—	
Prestwich	30.010	29.996	—	The observer set the vernier too low.

THERMOMETERS.

STATIONS.	Reading of Standard.	Corrections to be applied to the Readings of the—						NOTES.
		Dry Bulb.	Wet Bulb.	Spare Therm.	Max. Therm.	Min. Therm.	Glass Therm.	
Holyhead ..	55.0	-0.5	-0.4	-0.3	-0.3	0.0	0	
Chester ..	64.1	-0.2	0.0	—	-0.3	+0.2	+0.2	
Bidston ..	57.0	0.0	-0.1	—	{ +0.2 -0.2 }	{ +1.0 +0.7 }	—	{ There are two max. and min. thers, here.
St. Helens ..	53.7	-0.2	-0.2	—	-0.1	+0.2	+0.7	
Heysham ..	57.0	-0.4	-0.6	—	-0.6	-0.2	-0.3	{ * When first tested nearly 14 degrees of spirit were found at top of tube.
Gilerux ..	50.0	-0.3	-0.2	-0.2	-0.3	-0.2	* -0.1	
Hawes Junction.	60.1	-0.5	-0.8	—	-0.5	0.0	—	
Marton ..	57.2	-0.4	-0.5	—	-0.3	-0.2	+0.2	
Manchester ..	61.4	-0.4	-0.4	—	+0.1	+0.1	-0.1	
Prestwich ..	62.0	-0.5	-0.6	—	0.0	-0.3	+0.1	

Meteorological Office, London, S.W.,
October 26, 1897.

Sir,

I BEG to submit, herewith, my report on the recent inspection by me of certain of the English stations in connexion with the Office.

I am, &c.

(Signed) JOHN A. CURTIS.

R. H. Scott, Esq., M.A., F.R.S.

TELEGRAPHIC REPORTING STATIONS.

Hurst Castle, September 22nd.—I found everything in good order at this station, except that the rain-gauge was loose. This the observer promised to rectify at once. I tested the observer's setting and reading of the barometer several times, and found him to be correct in each case.

Jersey, St. Aubin's, September 17th.—This station was in good order, except that the thermometer screen needed repairs, which I directed should be carried out at once. Mr. Fisher seems very careful and accurate, but his son, who occasionally takes the observations, while setting and reading the barometer quite correctly, is rather apt to be a degree or so in error with the thermometers.

Prawle Point, September 15th.—The instruments were all clean and in good order, and the observer is careful and intelligent. The thermometer screen needed some slight repairs, which I effected. The work at this station is, I think, very well done.

STATIONS OF THE SECOND ORDER.

Edgbaston, September 7th.—This is a station newly established under the auspices of the Midland Institute. The observer, Mr. A. Cresswell, struck me as being most competent and careful. The outfit and exposure of instruments are alike excellent, and the station will, I think, prove to be a very valuable one. In addition to the ordinary instruments there are in use a "King" barograph and an "Osler" self-recording rain-gauge.

Plymouth, September 14th.—Everything was in excellent order at this station, and the observations are taken with great care and intelligence. Mr. Prigg has recently got the Corporation to agree to build a computation room for the station. When this building (which will be a great convenience) is erected, the thermometer screen and rain-gauge will be removed a short distance. The exposure will then be, if anything, better than at present.

The Corporation has also sanctioned the purchase of a "Dines" anemometer, a "Beckley" self-recording rain-gauge, and a "Bailey" wind-direction recorder. I spent some time advising as to the positions of these instruments.

Rugby, September 6th.—Mr. Kitchener, the master who superintends the work, was absent at the time of my visit; but I saw Mr. Kirk, who takes most of the observations, and spent a good deal of time with him going over the details of the work. The thermometers were dirty, and I found that of late town water had been used for the wet-bulb. I cleaned the instruments and gave proper directions for the future.

The barometer is exposed to the morning sun and I think a new position should be sought for it. It was too high for the observer to read properly, and I therefore lowered it by two inches. The observer over estimated the amount of cloud. The rain-gauge is a good deal rusted and will soon want renewal.

Southampton, September 16th.—Everything was, as usual, in excellent order at this station, and the observations continue to be made with the greatest care. The deputy-observer at first set the barometer rather high, but at a second attempt set it and read it correctly.

The thermometer screen has had an addition made to it, intended to shelter the observer while reading the instruments, and as I do not think the readings will be affected by it, I decided that this might remain.

SUNSHINE STATIONS.

Cirencester, September 10th.—The instrument was in very good order. It was also in good focus and burning well at the time of my visit, and it appeared to be carefully attended to.

Guernsey, September 20th.—This is a "Jordan" photographic instrument, and is admirably exposed on the roof of Dr. Carey's house in St. Peter's Port. Dr. Carey now fixes the curves before measuring them, in accordance with the recommendation of the inspector last year. The instrument is, I think, carefully attended to.

Jersey (St. Heliers), September 18th.—I could detect no fault in this instrument, or in the fixing of it, while its exposure is as nearly perfect as is likely to be obtained anywhere. The gunner who has charge of the recorder is in the habit of supplying the daily duration of sunshine to the local newspapers, but he has no scale for this purpose, and, as was to be expected, in several cases where I tested his estimates I found him to be in error.

I was informed that the instrument is sometimes interfered with by soldiers of the garrison or their visitors, and I recommend that to prevent this a light iron railing be fixed around it with a gate that can be locked.

Plymouth, September 14th.—This instrument was in admirable order and very carefully attended to. The new position, see p. 55, will be about 20 yards from the present position, and about 4 feet higher. The recorder will then rest upon a brick pillar instead of, as now, on a wooden stand, and the change will be in every way an improvement.

Southampton, September 16th.—Instrument in excellent order, and very carefully attended to.

Ventnor, September 24th.—The recorder is fixed on a brick pillar in the grounds of the National Hospital for Consumption. It has been very carefully adjusted, and is exceptionally well attended to. The exposure is perfect at the winter solstice. At the equinoxes and in the summer a little sunshine will be lost in the early morning and late evening. Dr. Lewis has no glass tabulating scale.

WEEKLY WEATHER REPORT STATIONS.

Bristol (Clifton College), September 11th.—All was in good order at this station except the rain-gauge which was loose and not quite level. These defects I corrected.

The thermometer screen is somewhat overshadowed by a thorn tree growing near, but no better position is available. The observations are carefully attended to.

Cirencester, September 10th.—All the instruments were in excellent order at this station. The deputy observer read the maximum thermometer at first 5° in error but otherwise his readings were careful and accurate. As desired, I paid special attention to the thermometers, and found them to be good instruments, and the screen well placed. The instruments were not firmly fixed in their places, however, and while I made the dry bulb and wet bulb secure, it was promised the carpenter should at once attend to the others. The maximum and minimum at present are hung too near to the door, and it is very probable that the abnormal readings sometimes noticed are due to this cause. I think both these instruments should be set back by an inch and a half.

The rain-gauge measuring glass did not agree with that supplied to me as a standard.

Plymouth, September 14th.—All in excellent order; see report under Stations of the Second Order.

Shirley, September 8th.—The maximum thermometer had recently been broken, and had been sent to Birmingham for repair, the instrument maker meanwhile lending another maximum for use. This latter is a Kew verified instrument, and it agreed with my standard.

The rain-gauge has been removed from the enclosure in which it was formerly placed and now stands in the open field, very well exposed, but liable to be interfered with by the poultry and cattle. I recommend that Mr. Boothroyd be asked to place a suitable guard around the gauge.

STATIONS OF THE THIRD ORDER.

Campden, Gloucestershire, September 9th.—This is a new rainfall station, never before inspected. The observer, Captain Wright, R.A., was from home at the time of my visit, but he had arranged with Mr. Walter Tucker, the deputy observer, to meet me and give me every information. I found the gauge exposed in a kitchen garden, on sloping ground, and much sheltered by trees and shrubs. Captain Wright had left instructions that if I was dissatisfied with the present position, the gauge should be removed to any other I might select. Accordingly I chose a position on the lawn at the back of the house, and had the instrument carefully levelled and fixed there. The exposure is now very good.

Plymouth (Freedom Park), September 14th.—This is a rain-gauge station on the high ground at the back of the town; perhaps two miles from The Hoe. I found the gauge in good order, and carefully attended to. The arrears, it was promised, should shortly be cleared off.

Totland Bay (Isle of Wight), September 23rd.—Unfortunately the observer, Mr. John Dover, B.A., was from home on the day of my visit.

I found the instruments in good order, but that the rain-gauge had been removed during the last two months to a position nearer the edge of the lawn, where it would certainly be sheltered by the trees. I replaced it in its old position which is decidedly better.

I was not able to learn anything as to the probability or otherwise of getting 9 p.m. observations in the future, thus bringing the station up to the Second Order.

I append the usual tables showing the results of the comparison of the instruments at the various stations.

BAROMETERS.

RESULTS of COMPARISONS with the INSPECTOR'S STANDARD, Adie B.T. No. 71.

STATIONS.	Inspector's Standard corrected.	Reporting Barometer uncorrected.	Check Barometer uncorrected.	REMARKS.
TELEGRAPHIC REPORTING STATIONS.				
	in.	in.	in.	
Hurst Castle	29.925	29.904	29.904	
Jersey (St. Aubin's) ..	29.905	29.907	29.902	
Prawle Point	30.060	30.052	30.054	

SECOND ORDER, AND WEEKLY WEATHER REPORT STATIONS.

Bristol (Clifton College)	30.202	30.220	--	
Cirencester	29.928	29.928	—	
Edgbaston	29.480	29.488	—	
Plymouth	30.416	30.418	—	
Rugby	29.435	29.428	—	
Southampton	30.020	30.020	—	
Totland Bay	29.820	29.783	—	

THERMOMETERS.

RESULTS of COMPARISONS with the INSPECTOR'S STANDARD No. 5477.

Standard corrected. No. 5477.	STATIONS.	Correction to be applied to the readings of						REMARKS.
		Dry Bulb.	Wet Bulb.	Maxi- mum.	Mini- mum.	Grass.	Spare.	
	TELEGRAPHIC REPORTING STATIONS.							
58.9	Hurst Castle ..	-0.6	-0.1	-0.4	-0.2	—	—	
62.9	Jersey (St. Aubin's)	-1.0	-1.1	-0.6	-0.1	—	-0.2	
60.6	Prawle Point ..	-0.5	-0.2	-0.2	-0.4	—	-0.8	
	SECOND ORDER, AND WEEKLY WEATHER REPORT STATIONS.							
54.2	Bristol (Clifton College).	-0.7	-0.6	-0.6	-0.4	-0.8	—	
56.9	Cirencester ..	-0.1	-0.1	-0.3	-0.2	-0.1	—	
58.0	Edgbaston (Birmingham).	-1.0	-1.0	-0.2	0.0	+2.1	—	
63.1	Plymouth ..	-0.1	+0.1	0.0	+0.0	+0.3	—	Earth therm No. 5481+0.6
58.3	Rugby	-0.4	-0.3	-0.6	+0.1	+0.1	—	
56.7	Shirley	-0.1	+0.1	-0.1	+0.2	—	+0.6	
62.9	Southampton ..	-0.4	-0.4	-1.1	-0.1	-0.1	—	
62.8	Totland Bay ..	-0.1	+0.3	-0.1	+0.4	—	—	

INSPECTION OF STATIONS—1897.

SIR,

I BEG to submit report of my inspection this year of various stations in the north and north-east of England.

I am, &c.

(Signed) FREDK. J. BRODIE.

R. H. Scott, Esq., M.A., &c., &c.

TELEGRAPHIC REPORTING STATIONS.

York, September 23rd.—The instruments were in very fair condition, but the dry-bulb thermometer, stolen from the screen last winter, had not been replaced by a new one, and readings were taken from the dry bulb thermometer used for the 9 a.m. readings. The repainting of the screen, ordered last year, had not been carried out. The screen was extremely dirty, and I requested Mr. Platnauer to have it seen to at once.

Spurn Head, September 22nd.—Since last year, the rain-gauge has been raised on a substantial wooden pedestal to a height of about 3 feet; the difficulty hitherto arising from the drifting of sand into the gauge has thus been almost entirely overcome. All the instruments were in excellent condition, but the wooden railings surrounding the screen and rain-gauge were greatly in need of repair. The wet-bulb thermometer read nearly a degree higher than the dry. I instructed the observer to deduct, provisionally, one degree from all wet-bulb readings.

2. SECOND ORDER STATIONS.

Morpeth, September 27th.—This is quite a new station, and none of the instruments were in position. I endeavoured to get the services of a carpenter for this purpose, but learnt that it would be impossible for him to attend within at least four days of my visit. Beyond fixing the barometer and inspecting the proposed site for the screen and rain-gauge, I could do very little, but before leaving, I gave observer careful and detailed instructions with regard to the placing of the various instruments. The station is on a large plateau, more than 300 feet above mean sea level, and the outdoor instruments are to be fixed in a railed enclosure in an open field, the nearest obstruction being a belt of trees about 60 yards to the north-eastward. The future observer, Mr. G. P. Berry, has already had considerable experience in observing at some of the stations of the Scottish Meteorological Society. He appeared to understand fully the requirements of the various instruments as regards exposure. The station promises to be a very valuable one.

Newcastle-on-Tyne, September 25th.—This is essentially a town station, and the outdoor instruments are set up on a concrete roof. It is, however, proposed shortly to start a small grass plot for a terrestrial radiation thermometer, and I advised that if possible the plot should be made of sufficient size to enable the thermometer screen to be set over it. The surrounding atmosphere is smoky, and at the time of my visit the thermometers were somewhat dirty. In view of the locality the observer was requested to change the muslin of the wet-bulb

more frequently. Owing to the closing of the works it is impossible to take evening observations later than 6 p.m. on ordinary week-days, and 2.30 p.m. on Saturdays; on Sundays they are not made at all. The sunshine recorder was firmly fixed and accurately adjusted.

Barnard Castle (North-Eastern County School), September 28th.—This is at present only a projected station, no instruments having yet been procured. The headmaster of the school (the Rev. F. L. Brereton) appeared very desirous of starting as soon as he could obtain sanction for the necessary expenditure. The school stands on high ground, and the position is very open. I selected a good site for the rain-gauge and thermometer screen, and supplied a rough estimate as to the cost of the outfit necessary for a second order station. Mr. Brereton appears to take much interest in meteorological work.

York, September 23rd.—A new thermometer screen was erected last January, the double set of instruments used for telegraphic and second order observations having been hitherto crowded together in the old one. The screen is in an excellent position, and the instruments were clean and in good order. The acting observer (Mr. J. Wright) is, however, somewhat careless. I requested him to give fuller remarks as to the general character of the weather each day, and also of any exceptional phenomena. Mr. J. Erskine Clark, formerly in connexion with the Friend's School, had left the sunshine recorder temporarily in care of one of the boys. The headmaster trusted that Mr. Clark's successor, the new science master, who had only just been appointed, would be induced to take charge of the instrument.

Tealby, September 21st.—The instruments were in good order, but the screen and rain-gauge were both somewhat insecurely fixed. Observer's attention was drawn to this, and also to the necessity for sending in his returns with greater regularity. Instructions were given as to the management of the wet-bulb in frosty weather—a point hitherto neglected at this station.

Fulbeck, September 30th.—The instruments here were in excellent condition, but some rather serious errors were detected, both in the methods of observing and in the manner of filling up the returns. These will, I think, be remedied in future. The thermometer screen is at present somewhat close to the house, and it was suggested that it be removed to a more open situation near the edge of the lawn.

Belvoir Castle, October 1st.—The screen in use here is a Glaisher's, and is fixed over bare garden soil. I suggested strongly the advisability of getting a Stevenson screen, the observer promising to bring the matter to the notice of the Duke of Rutland on his return from the Continent. The instruments were all in good order, and the observer, Mr. Divers, seemed careful and intelligent. He has no time to work out the observations in any great detail.

3. STATIONS OF THE THIRD ORDER.

Bawtry (Hesley Hall).—There was nothing here worthy of special note but the mounting of the wet-bulb was not quite satisfactory. Mr. Whitaker expressed some intention of purchasing a Campbell-Stokes sunshine recorder.

Market Rasen.—This is a rainfall station only. Observer had run out of forms, and had not sent in any returns for three years. He cannot undertake to supply arrears beyond the commencement of the present year, as his previous records have not been kept.

Appended are tables showing the results of the comparisons of barometers and thermometers.

BAROMETER COMPARISONS, 1897.

STATIONS.	Inspector's Standard corrected. (M.O. 386.)	Reporting Barometer un- corrected.	Check Barometer un- corrected.	Reporting Barometer. Correction required to reduce to Inspector's Standard.	REMARKS.
York	ins. 29.570	ins. 29.564	ins. —	ins. +0.06	There is no check barometer at this station.
Spurn Head ..	29.737	29.732	29.726	+0.05	
Morpeth ..	29.950	29.950	—	.000	
Newcastle-on-Tyne.	30.004	29.990	—	+0.014	Reporting barometer is a Fortin.
Tealby	29.411	29.408	—	+0.003	
Fulbeck	29.665	29.662	—	+0.003	
Belvoir Castle..	29.857	29.828	—	+0.029	

THERMOMETER COMPARISONS.

STATIONS.	Standard corrected. No. 5475.	Corrections to be applied to the readings of:—						REMARKS.
		Dry Bulb.	Wet Bulb.	Spare Ther.	Max.	Min.	Gross Min.	
York	{ 56.1 56.1	— -0.8	-0.6 -0.6	— —	-0.4 -0.7	+0.6 -0.4	— —	Tel. reporting instruments.
Spurn Head ..	58.0	-0.1	-0.9	-1.0	-0.2	0.0	—	
Morpeth ..	54.0	+0.1	0.0	—	+0.1	+0.8	-0.5	
Newcastle-on-Tyne.	57.0	0.0	0.0	—	0.0	0.0	—	
Tealby ..	55.0	-0.2	-0.2	-0.1	-1.2	0.0	—	
Fulbeck ..	58.0	+0.1	-0.1	—	-0.1	+0.8	—	
Belvoir Castle	55.0	-0.1	-0.3	—	-0.1	-0.2	-0.2	
Bawtry ..	61.0	-0.1	-0.2	—	-0.2	0.0	—	

REPORTS ON OBSERVATORIES.

Kew Observatory, November 9, 1897.

DEAR SIR,

I BEG to forward herewith my report and inspection notes regarding the self-recording instruments at the observatories, anemograph stations, &c. inspected on the following dates:—

Scilly (St. Mary's), September 22nd-24th.—At this station the instruments were in good order and appear to be carefully attended to.

On dismantling the Robinson anemometer I found the sperm oil in the bearings in a satisfactory condition, all parts, however, were cleaned and fresh sperm oil applied. As the clock had only been cleaned a week or two prior to my visit I did not take it to pieces, and merely oiled the pivots and escapement.

The orientation was duly tested and found accurate; and Mr. Hicks was instructed to send to the Meteorological Office an orientation paper once a month.

The Dines' anemometer was working well, excepting that the gearing wheel at the bottom of the clock spindle was found to be slightly loose, which would reasonably account for any differences previously shown between the curve and clock times. I corrected this by pinching up the collar, but it would be an improvement and safeguard for future instruments to have the wheel secured to the spindle by a pin instead of being held on by a friction collar only.

The water in the main reservoir was quite clear, and in consequence I merely added a small quantity of water in order to bring the level up to the mark on the glass tube, after which the pen was adjusted to the zero line.

The thermometers were all tested, and the sunshine recorder found to be in accurate adjustment.

Falmouth, 27th-30th.—Here all the instruments were in good working order.

Both the barograph and thermograph clocks were cleaned, and the lenses and fittings duly attended to. The thermograph clock needed a new cord, and a small weight was fitted to the lever to improve the action of the light shutter.

The various thermometers were compared by means of Kew Standard No. 720, and found to have the following corrections:—

					°
Dry standard, 383	...	...	...	...	−0·5
Wet „ 738	...	...	...	...	0·0
Maximum, M.O. 104	...	...	...	...	−0·5
Minimum, M.O. 308	...	...	...	...	0·0
Barograph thermometer (no number)...	...	...	...	...	−0·9
Standard barometer, attached thermometer (no number)	...	...	...	...	−0·8

On dismantling the anemometer the oil in the direction well was found quite limpid. I had all parts cleaned, and supplied the bearings with fresh asbestos lubricant.

The clock and recording parts were also examined and the orientation tested and found correct.

The self-recording rain-gauge was working quite satisfactorily, but the spare gauge I found slightly out of level and the funnel not quite circular. These defects were put right and "squeezes" obtained of both funnels. As regards the sun recorder, this instrument was found to be in accurate adjustment.

Phoenix Park, Dublin, October 4th-5th.—The anemograph here was going well, and the clock did not require special attention, having, shortly before my visit, been cleaned by a local optician.

The new silver pencils fitted to the instrument at the beginning of the year appear to mark the sheets very satisfactorily. The external parts of the anemometer were dismantled, and I found that all the

bearings were well lubricated. After cleaning, fresh sperm oil was added, and the orientation tested as usual.

The observer was instructed to send an orientation paper once a month to the Meteorological Office.

The examination of the sunshine recorder was carried out.

Valencia, October 7th-9th.—The instruments at this observatory were all in good order, and the photography was excellent at the time of my visit, the traces being quite uniform in intensity throughout the 24 hours. Mr. Cullum attributes this improvement to the use of a new brand of lamp oil, which gives a much steadier and more equable light than was the case with the oil previously in use. I dismantled the thermograph, cleaned the lenses and clock, and attached a new winding cord to the barrel.

The barograph was also examined, and a small weight fitted to the lever of the light shutter to endeavour to improve its action, which at times is a little uncertain.

The zero dots of the thermograph were changed from the summer to the winter position, and the various thermometers compared in water with the Kew Standard No. 720 at 55° Fahr., and their corrections found as follows:—

						°
Dry standard,	399	...	...	...	...	−0·7
Wet	473	...	...	...	...	−0·3
Maximum M.O.	1003	...	...	...	...	0·0
Minimum, M.O.	2497	...	...	...	...	+0·2
Barograph thermometer (no number)		...	...	...	...	−1·9
Attached thermometer to the standard barometer,	71,062					0·0

All parts of the anemometer were found to be well lubricated, and the asbestos oil in the direction well was in such excellent condition that I determined to let it remain for another year.

Armagh, October 13th-14th.—The anemometer at this observatory was in excellent order and is well attended to. I entirely dismantled the instrument and found the oil in the direction well quite good, though discoloured. After cleaning, fresh asbestos oil was applied to the various bearings.

The clock was taken to pieces and cleaned, and a new line attached to the weight. After starting the instrument the orientation was examined and found correct. The rain-gauge was also generally cleaned, and "squeezes" were taken of both the self-recording and spare funnels. I found the sun recorder in accurate adjustment.

Fleetwood, October 15th-16th.—Although the weather was boisterous and rainy on the first day of my visit, I managed, with the aid of Mr. Gaulter's men, to dismount the outside portions of the anemometer.

The fans, cup-arms, and stays were in a satisfactory state, but one of the cups was dented by a stone which had been thrown at it; this I had put right.

The bearings were all well lubricated, and the oil in the direction well was fairly limpid, though a good deal of brownish sediment was at the bottom of the well. I cleaned this out, and replenished all parts with fresh sperm oil. When examining the clock, and cleaning the recording

apparatus, it was noticed that the clamp of the velocity shafting was not very tightly screwed up, and it is just possible that this may account for the irregularity shown on one of the sheets prior to my visit, but Mr. Gaulter was unable to show me the actual record as it had already been sent in to the Meteorological Office. After re-mounting the instrument, the orientation was examined and found correct. Before leaving I drew the attention of the observer to the non-agreement of the times entered on the sheets as compared with the time shown by the curves; Mr. Gaulter promised to have this attended to more closely.

Stonyhurst, October 18th-19th.—The barograph and the thermograph were examined and found in good order. I oiled the clocks and generally cleaned the other parts of the instruments, after which the zero lines of the thermograph were changed to the winter position. With regard to the irregularity in the intensity of the photographic curves the observer informed me that this was due to a defective flow of gas. For a long time past a good deal of trouble has been experienced, owing to alterations at the gas works, but it is hoped that this difficulty has now been in a great measure overcome. The thermometers were compared at 55° Fahr., by means of Kew Standard 720, and the following corrections determined:—

					°
Dry standard, 619	...	...	...	...	-0.1
Wet „ 382	...	...	...	...	-0.4
Maximum, M.O. 1525	...	...	...	...	0.0
Minimum, B.T. 501	...	...	...	...	+0.3
Grass minimum, 81,514	...	...	...	...	+0.3
Attached thermometer to the Standard Barometer, No. 696	...	...	...	...	-0.8
Barograph thermometer, 339	...	...	...	...	-0.5

Note.—The correction employed at Stonyhurst to the attached thermometer of the standard barometer is $+1^{\circ} \cdot 3$, which is half a degree higher than the correction found above.

The weather being favourable at the time of my visit, I was enabled to take down entirely the external portions of the anemometer and thoroughly clean all the parts. The oil in the direction well was in fairly good condition. This was sperm oil obtained locally with a little paraffin added; this, however, was removed and the various bearings replenished with the asbestos oil which had been sent from Kew. The orientation was duly tested and found correct.

With regard to the rain-gauge, this instrument was going well, and "squeezes" of both the self-recording and spare funnels were taken and are sent in with this report.

The sunshine recorder I found in accurate adjustment.

TELEGRAPHIC REPORTING STATION.

Scilly, September 23rd-24th.—At this station all the instruments were found in good order, and appear to be carefully attended to. I particularly drew the observer's attention to the very great importance,

when making up the weather telegrams, of including the extreme barometer reading as shown by the self-recording aneroid.

Mr. Hicks and I agreed very well in reading off the barometer and thermometers.

SECOND ORDER STATIONS.

Phoenix Park, Dublin, October 4th-5th.—The observer at this station has been changed, and Corporal Blackmore now takes the observations. He seems very anxious to do the work well, and showed great interest in the cleaning of the anemometer.

The thermometers were all in good order, but the screen was in a very shaky condition, the supports being quite rotten in the ground, and the screen itself coming to pieces. This I reported to the Office.

When testing the thermometers I regret to say that I had the misfortune to break the grass minimum. Corporal Blackmore reads the thermometers correctly, but his barometer readings are somewhat lower than mine.

Armagh, October 13th.—I found that all the instruments here were in excellent order.

Stonyhurst, October 19th.—All the instruments at this observatory were, as usual, in good order.

Falmouth, September 27th.—Here the thermometers, &c. were all in good order, excepting that the spare rain-gauge was found to be slightly out of level, and the funnel not quite circular. These small defects were put right, and the gauge more securely fixed.

(Signed) T. W. BAKER.

R. H. Scott, Esq., F.R.S.

Kew Observatory (Old Deer Park), Richmond Surrey,
November 16, 1897.

SIR,

I HAVE the honour to forward you herewith my notes on the inspection of various stations this year, and particulars of the comparison of the Kew and Oxford (Radcliffe) standard barometers.

Yours, &c.

(Signed) E. G. CONSTABLE.

R. H. Scott, Esq., F.R.S., &c.

OBSERVATORIES AND ANEMOGRAPH STATIONS.

Aberdeen, August 6th-9th.—*Anemograph.*—This instrument was in good order, and its lubrication well looked after.

It was dismantled and thoroughly cleaned.

The old sperm oil (procured locally) was fluid, but very discoloured; it was removed and replaced by the sperm oil recently supplied by the Office.

The cups, spindle, and fans are in good condition, but the stays to the cup-arms are corroded and becoming thin in places.

The clock was taken down and cleaned, and I found that the gut line, which has been in use for many years, was perishing and becoming much worn. I removed it from the barrel, but had rather a difficulty in fitting new gut, owing to the very small size of the barrel eyes, so the clock was not restarted till 8 p.m. It stopped later on, and examination showed that the ratchet spring had worked up a little; this was rectified, and it is now going well.

The orientation was tested both before and after dismounting instrument, and was good in both instances, and the markings will be found on anemograph curve No. 220.

Barograph.—This was in good condition.

Clock was cleaned and oiled, lenses and condenser were polished, and slit removed from tube and latter cleaned.

Thermograph.—Owing to the difference in the scale values of the dry and wet thermometers there is overlapping and confusion of traces at very low temperatures.

I endeavoured to rectify this by altering the "wet" thermometer, but the screws holding the arm-plates together had become so fixed, through burring or corrosion, that it was found impossible to move them by any ordinary means, and indeed any effort to do so was attended with considerable risk of breaking the tube.

The difficulty was overcome by altering the clamping pieces of the dry thermograph tube and carefully shifting the tube little by little in its frame, and by this means I was able to alter the distance sufficiently to give an additional five degrees between the two zero lines, and this should prevent any considerable merging of the traces in future.

The clock, lenses, and mirrors received the customary attention.

Rain-gauge.—This was performing satisfactorily. The clock, &c. was cleaned and left in good order. The enamelled surface of the receiver is becoming badly damaged by frost and exposure, leaving bare large patches, and it is quite gone round the rim.

Since I was last here, the ash tree mentioned in my report for 1895 has grown rapidly, and some of the branches are now only about six feet distant.

Another "Richard" pen, with holder, is wanted at this station.

The thermometers were compared with the Kew Standard Thermometer No. 720 at a temperature of 52° Fahr., and found to require the following corrections:—

					°
Dry bulb, No. 397	...	...	...	...	−0.1
Wet „ „ 395	...	...	...	...	−0.6
Maximum „ 1002	...	...	...	...	−0.0
Minimum „ 89	...	...	...	...	+0.3
Thermometer attached to standard barometer...	...	...	...	...	−0.1

Deerness.—August 11th-12th.—During a severe snowstorm last January, one of the stays to the cup-arms of the anemometer here was broken off, and the arm has since been supported by wire. On examining the upper portion of the instrument I found it badly

corroded in places, and two of the three remaining stays snapped with very slight pressure. Under these circumstances I thought it best to entirely remove them, as they were quite useless. I was fortunately able to obtain at Kirkwall some iron wire of the necessary strength, and had four new stays made and fitted with nuts and bolts.

The smith made a good job of it, and the exterior portion is now in good working order again, but requires painting—as does also the shed, both inside and outside—and Mr. Spence agreed to see to this before the winter.

The sperm oil was fluid, but discoloured; it was removed and fresh asbestos lubricant used.

The recording part was dismantled, and I gave extra time and attention to the adjustment of the velocity spiral, endeavouring to correct (1) the marking considerably above the 0 line at commencement of curves, and (2) the verticality of trace at the conclusion of a revolution.

I think the latter is now very much better, but although (1) is considerably improved I was not able to correct it entirely.

The gut winding line of the clock broke last autumn and was then spliced, and I found that the driving cord was also nearly cut through at the barrel-eye, so I fitted two new lines, and thoroughly cleaned clock, &c. The orientation—which was satisfactory—was tested before touching vane (*see* anemograph curve No. 224) and again after re-starting the anemometer, and the lines for the latter trial are shown on the sheet sent with this report, which also bears several traces made by revolving the velocity pencil after the corrections referred to above.

Mr. Spence states that he experiences trouble during severe snow storms owing to snow, driven on to the pencils and cylinder and wetting the sheet, and he would much like to have a cover for the recording part.

Fort William.—August 16th-18th.—The winding cord of the thermograph clock at this observatory broke the day before my visit, so I fitted a new line and thoroughly cleaned the clock. The action of the light shutter had been rather erratic. I gave attention to this and by altering the lifting and increasing the load on the locking arm the working was much improved, and when I left the observatory the shutter was running freely.

The barograph clock also needed looking to and oiling, and the pendulum beat was improved.

The lenses, mirrors, and condensers of both instruments were carefully cleaned.

August 17th proved to be stormy, with high wind and rain, and it was not possible to do anything outdoors, either to the rain-gauge or to the sunshine recorder, but I had a holder fitted to the spare rain-gauge pen, and also tested the various thermometers.

The action of the Beckley rain-gauge had been somewhat unsatisfactory at times during the previous winter, so on the next day I thoroughly overhauled it. There was—as far as I could ascertain—nothing radically wrong with the instrument; but I found that the observer who changed the sheets had been in the habit of setting the pen to the datum line by lifting the *cylinder* on its spindle instead of altering the height of the pen, which is the correct way. This, I

understood had been done because they could not drop the pen low enough to bring it down to the bottom scale line of the printed sheet.

I was able to correct this defect with the pen, and there is now a fair working margin for "setting" the pen, so the observer was instructed to discontinue raising the cylinder and to have it always hard down on its platform, and to make the necessary alteration for the datum line by raising or lowering the pen.

After thoroughly testing the discharges, water was run into the receiver for some hours, and the action of the float and discharger was found to be quite satisfactory, and I left the instrument in good order and acting very well. The trial curve thus obtained is appended to this report.

I left a supply of bands for binding sheets on the cylinder to check expansion in the very wet weather, and a supply of fresh ink, and the gauge should now give good results.

A new measure is required here for the Beckley gauge, and it would be more convenient in use and much less liable to get broken if it could be about half the length, and holding 0.25 inch instead of 0.50 inch, as heretofore, especially as there cannot be more than 0.20 inch to measure at any time.

The thermometers were compared with K.S. No. 720, at 55°, and require the following corrections:—

					0
Dry bulb, No.	671	...	...	...	0.0
Wet „ „	672	...	...	...	−0.2
Maximum „	1092	...	...	...	+0.1
Minimum „	1322	...	...	...	+0.6
Thermometer attached to standard barometer...					−0.3

Glasgow, August 20th-23rd.—Since my last visit here (1895), Dr. Becker has had a platform and guard rails erected on top of the iron lattice column on which the anemometer stands, and this renders inspection, &c. more convenient and less risky.

I entirely dismantled the exterior portion of the Robinson anemometer, and was agreeably surprised to find that the old asbestos lubricant in which the direction rollers had been working for the past two years was still clean and fluid. The only place where it had thickened and discoloured was in the cup containing the step-bearing, on which the lower end of the velocity shaft works.

All parts were cleaned and freshly lubricated with the sperm oil recently supplied by the Office.

The stays to the cup-arms are beginning to show signs of age, and the worm on the direction fan-spindle is wearing away rather rapidly.

The clock was oiled, and the orientation was examined and found good, and the sheet showing same is sent herewith.

There was nothing in the condition either of the barograph or thermograph calling for special remark.

The clock escapements, lenses, and mirrors received the customary attention.

A new water-tank has been recently fitted up in the thermograph screen, for the wet bulb thermometers.

The rain-gauge appeared to be working properly, but I examined it and cleaned the clock, &c. The action of float and discharger was tested by artificial fillings, and was found good.

The thermometers in use were compared at 60°, with K.S. 720, and found to require the following corrections:—

					°
Dry bulb, No. 708	...	...	...	...	−0.1
Wet „ „ 711	...	...	...	...	0.0
Maximum „ 58,846	...	...	...	...	+0.1
Minimum „ 63,942	...	...	...	...	+0.1
Grass minimum, No. 59,003	...	...	...	...	0.0
Thermometer attached to standard barometer...	...	...	...	...	−0.6

Alnwick Castle, August 25th-26th.—I had proposed this year, with the approval of Mr. Willyams to endeavour to dismount if possible all the exterior portion of the Robinson anemometer here, but the weather unfortunately turned out too wet and unsettled to carry out the proposal entirely, but I did all that was possible in the way of examination, &c., and satisfied myself, before leaving, that the instrument was working properly.

The anemometer is regularly attended to and oiled. I used asbestos lubricant for the present oiling, and it was agreed that this should be used in future, and a supply has been sent to Mr. Willyams.

The orientation was tested, and—considering the large amount of “back-leash” in this particular instrument—was satisfactory, and the sheet for same is appended to this report.

North Shields, August 27th-28th.—The anemometer at this station was in good condition and well lubricated.

The new fans and fan-spindle were fitted in July, but the vane seemed then to work rather stiffly, so Captain Harrison had the *lignum vitæ* bearings slightly reduced, which improved it. I dismounted the instrument and had all the parts overhauled.

The base of the cup-spindle showed signs of burring at the edge; this was ground down and surface smoothed, but I could not see any indication of “wearing” on the step-bearing for spindle. The oil in the cup for the direction rollers was only put in when the new fans were fitted, but the smith who does this work for Captain Harrison, stated that the oil (asbestos lubricant) he took out at the time was in good condition.

For the present lubrication I used the sperm oil supplied by the Office, and the opinion here is decidedly in favour of sperm oil.

The clock, and fittings of the pencils, required cleaning, which was done, and the instrument now is in good working order.

The orientation was checked as usual, and was good, and the sheet is sent herewith.

Yarmouth, August 31st-September 1st.—During the preliminary examination of the Robinson anemometer here, I found that several of the small cheese-head screws holding the cover round direction platform were missing, and the others plugged, the threads being worn. These screws have been faulty for some time, so I thought it advisable to have a new set tapped and drilled and fitted with washers, so that now the new screw-heads project well beyond the cover and are not sunk flush as were the old ones, rendering them liable to be painted over and difficult to find.

The instrument was taken to pieces and all parts seemed in good order and properly oiled, excepting that the cup at top of velocity

spindle was practically dry, the oiling hole having been accidentally painted over. I had the hole cleaned out, and instructed observer to use it frequently.

The asbestos lubricant was in very good condition; it was removed and sperm oil supplied by the Office used. All parts, both interior and exterior, were cleaned, &c. Just before restarting instrument it was noticed that the coupling rod of the velocity pencil was loose. The dislocation was found to be just under the principals of the roof, which made it awkward to attend to.

The upper part of coupling rod is screwed, but not pinned, and it is probable that the lower part had been depending for some time on the last turn or so of the thread. To prevent the danger of this occurring again I screwed rods hard home, and had holes drilled above and below the joint, and bound it round with copper wire.

The orientation was examined before and after dismounting instrument, and was good in each case. Sheet showing the first test is sent herewith, and the others will be found on the anemograph curve for August 31st-September 1st.

TELEGRAPHIC REPORTING AND CLIMATOLOGICAL STATIONS.

Alnwick, August 24th.—The thermometers here were in good order and appear to be properly looked after. They were compared at 60° with Kew Standard No. 720, and found to require the following corrections:—

					°
Dry, 54,385	...	...	...	...	-0.1
Wet, 54,381	...	...	...	...	-0.3
Maximum, 83,756	...	...	...	...	-0.1
Minimum, 55,769	...	...	...	...	+0.4

The 5-inch bottle rain-gauge is very old, and has been frequently repaired. I noticed a hole at side just below the rim; it was promised that this should be soldered up at once.

I took a "squeeze" of the rim, which is sent with this report.

North Shields, August 26th.—I found the thermometer at this station in good order and the muslin of the wet bulb was clean and well moistened. The screen has been strengthened by additional footings.

Comparisons of the thermometer with Kew Standard No. 720 at 60°, showed that they required corrections as below:—

					°
Dry bulb, B.T. 4187	...	...	...	...	-0.1
Wet „ „ 3344	...	...	...	...	-0.2
Maximum, M.O. 55	...	...	...	...	-0.3
Minimum, M.O. 2474	...	...	...	...	+0.6
Spare tube, B.T. 4384	...	...	...	...	0.0

I got Mr. Clarke, who acts for Mr. Irvine, to read the thermometers and barometers with me, and his observations were satisfactory and dependable, and he appears to be much interested in the instruments.

The rain-gauge has been badly treated. The rim was deeply indented, apparently by heavy stones. I had the edge hammered out and the rim "trued" as much as possible, and it is now fairly good, as will be seen by the "squeeze" sent herewith.

Yarmouth, August 30th.—The thermometers, screen, and rain-gauge at this station were in good order, with the exception that the minimum was reading 1° too low, but by heating up the chamber this was reduced to the normal error.

The thermometers, compared at 62° with Kew Standard 720, require the following corrections:—

Dry bulb, B.T. 1542	...	...	...	...	0.6
Wet " " 1665	...	...	...	...	—0.1
Maximum (no number)	...	...	...	...	—0.4
Minimum, No. 2480	...	...	...	...	+0.5
Spare tube, B.T. 515	...	...	...	...	—0.6

(The maximum is not divided on the stem.)

Radcliffe Observatory, Oxford, November 4th-5th.—The exterior part of the Robinson anemometer here has not been taken down for several years, as it is risky owing to the unprotected position of the instrument, but on examination I found that the remaining old oil in the bottom of the trough in which the direction rollers work had become so very thick and dirty that it was really necessary that the instrument should be dismantled.

The weather on the morning of November 4th, luckily, was calm, and with the aid of the observatory staff, I was able to take down the cups, velocity shafts, &c., and every part was overhauled.

The oil on direction rollers had thickened, and they would only move with considerable pressure—they were soaked in paraffin and well cleaned.

The old oil was all removed and new asbestos lubricant used, and the anemometer is now again in very good order.

The orientation was tested and found good, and the check sheet is sent herewith.

The barograph and thermograph were found to be in their usual first-class condition, and the photographic curves are very good.

The rain-gauge is working properly and the pen supplied last year has given satisfaction, but there is occasional trouble owing to the swelling of the Willesden sheets in very wet weather.

The thermometers in use were compared with K.S. No. 720. at 50° , and found to require the following corrections:—

Dry bulb, No. 576 in thermograph screen	...	...	...	...	—0.1
Wet " " 575	...	...	...	...	—0.2
Dry " " 1710 in Stevenson	...	...	...	...	—0.3
Wet " " 1709	...	...	...	...	—0.2
Maximum, No. 356	...	...	...	...	—0.4
Minimum, " 363	...	...	...	...	—0.0
Grass minimum, No. 70,852	...	...	...	...	+0.4
Thermometer 17,249, attached to Newman barometer	...	...	...	...	—0.6
[for readings above 32°]	
Thermometer 1708, attached to Newman barometer	...	...	...	...	—0.3
[for readings below 32°]	

(Signed) E. G. CONSTABLE.

INSPECTION OF ANEMOMETERS AT HOLYHEAD, 1897.

BRIDLED ANEMOMETER.

I dismantled this instrument and carefully examined it in every part.

The cups were in better order than when I last saw them, and were very little dented, if at all, by stones having been thrown at them.

The various bearings were free and clean, and the sperm oil had worked very well indeed; the whole was thoroughly cleaned and re-erected, and left in good order.

I again tested the zero point of the instrument, and after looking very carefully into the position of the arm carrying the pen, I satisfied myself that it could not be in its proper place, although Davis assured me that when he first took charge of the instrument several years ago, it was fixed as I then saw it. After shifting it I at last got it into the position it was evidently intended to be in, as the screws for securing it fitted the holes in the spindle much better than in the other position. It seems clear that from the first the arm has been improperly fixed. I made a series of trials and placed a new zero mark upon the cylinder for the purpose of setting the sheets, and for the future this mark will be used; the change will not affect the accuracy of the previous records, but it will give the pen a much longer range, and reduce the chance of its getting beyond the top limit of the paper in very heavy gales.

The pen fitted in 1895 is working very satisfactorily, and appears to meet the requirements of the instrument in every respect.

PRESSURE-TUBE ANEMOMETER.

This instrument was also dismantled and carefully examined.

Its adjustment was found to be correct, and, except that the observer appears to have some difficulty at times with his pen, the traces obtained were satisfactory.

When opened I found the water fairly clean, but considerable electrolytic action had been going on in the container, with the result that the solder had become partially decomposed, and a thick deposit of lime had been thrown down along all the joints in the vessel, and upon the mass of metal at the foot of the float, placed there for the purpose of adjusting its weight and balance.

The water used was from the ordinary town supply, and as no such action has occurred elsewhere, so far as my experience goes, I concluded that the result must have been due to some constituent peculiar to the water of the district; the water is certainly very "hard," and contains a good deal of lime.

To guard against a continuance of the action I used rain water to refill the container; and I also asked the observer to again open it and examine the inside in three months' time, and then to take the further precaution to refill with rain water which has first been well boiled.

The glass shade I found broken, and a new one is required at once; and also a fresh supply of ink for both this and the bridled anemometer.

I fitted a reservoir pen, of a new kind, which I asked the observer to try, and which I think may be an improvement upon the pen he has hitherto used.

NEW PRESSURE PLATE ANEMOMETER.

For the erection of this instrument Mr. Cotton kindly gave me a square block of dressed stone which was sunk in the ground, levelled, and bedded in concrete, and formed an excellent base upon which the foot of the pillar could be bolted.

In addition to the bolts the pillar was further secured by three wire stays, which were attached at their lower ends to iron eyes fixed in large pieces of stone sunk in the ground. When properly stayed I found the mast to be quite firm, and it stood very well indeed the strain of a strong wind (force 8) which commenced to blow immediately afterwards.

The height of the plate above ground is 26 feet, and the mast is placed 6 feet away from the south-west angle of the hut which carries the bridled anemometer.

After trial I discarded the stiff brass wire cord supplied with the instrument, and used instead some of the flexible copper cord which answers so well with the bridled anemometer.

I explained to both Mr. Cotton and his assistant, Mr. Davis, the construction of the instrument, and the method of setting and reading it; and I also settled the form in which the observations should be recorded and sent to the Meteorological Office.

ROBINSON CUP ANEMOMETER.

The velocity trace of this instrument was not quite satisfactory, as a considerable shake was shown in the lines whenever the wind was strong. I found that this was due to two causes, the bevelled wheel which turns the velocity pencil was not "sitting" properly upon its bearing; and the clock was a little out of place, and did not gear properly to the cylinder. The latter was due to the fact that the clock was not originally made for the stand on which it is placed, and a little readjustment was required to make it fit; this is now done, and the clock cannot again shift.

The instrument generally was in good order and has evidently been attended to carefully. It was entirely dismounted and examined, cleaned in every part, and re-erected and oriented satisfactorily.

The sperm oil used last year was found to be perfectly limpid and good; in no part was there any tendency shown for it to become sticky or thick; and it was only discoloured by the wearing of parts in contact with it.

One of the stay-rods of the direction fan was found to be broken, and it required to be soldered.

GENERAL NOTE.

Salt Island Instruments.—Upon the whole the instruments on Salt Island appear to have been less tampered with during the past year than has been the case during some preceding years.

The principal harm seems to have come from loafers, who idle about at the end of the island with nothing to do, and cut the wood-work of the hut, or do other mischief thoughtlessly and because it happens to be at their hands to do. Mr. Cotton advocated the erection of a dwarf wall of dry stone, which would keep them away from the hut and the pillars of the pressure-tube and pressure-plate

instruments, and thus lessen the temptation to do mischief. He told me that if the Office would pay for the erection of such a wall the cost would be only that of labour (3s. 6d. per lineal yard), as there was plenty of stone on the spot the free use of which could be had.

As authorised, I ordered a notice board to be painted and affixed to the hut.

Robinson Anemometer. — Whilst at Holyhead an opportunity presented itself for testing experimentally the theory I had previously put forward to account for the smaller record yielded, with certain winds, by the Robinson cup anemometer, as compared with that yielded by the anemometers on Salt Island (Report for 1895-6).

The periodical fire-drill took place on the pier, during a strong wind from west, and the water from the hose being thrown up upon the roof, over the open end of the sheds, into which the wind was blowing, I noticed that the water was distinctly drawn *backwards* and *downwards* into the opening, instead of going freely over the roof as it would otherwise have done.

(Signed) R. H. CURTIS.

September, 1897.

APPENDIX VI.

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 X. to the Report for 1891

DAILY WEATHER REPORT.

The Office receives, when the telegraphic communications are perfect, sixty reports each morning, eighteen each afternoon (except on Sundays), and twenty-nine each evening, the arrangement of which is explained in the Annual Reports for recent years.

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 regularly 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 78 stations, the individual values for which are given on the second page of the Report. Sunshine records taken at 60 stations are given on the second and sixth pages of each Report. The Reports from Harrogate have ceased. A new station (Cranley) has commenced reporting, and the observations will be found in District 5.

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° Fahr.

Accumulated Temperature is expressed in *Day degrees*; a Day-degree signifying 1° F. of excess or defect of temperature above or below the base (42° 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° 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° F.	Below 42° F.
If the minimum is <i>above</i> 42° F., or <i>equal</i> to 42° F.	Subtract 42° F. from the mean.	There is none.
If the minimum is <i>below</i> 42° F., but the mean for the day is <i>above</i> 42° F.	From the difference between the mean for the day and the minimum deduct the accumulated temperature below 42° F., calculated as stated in the next column.	The required quantity is the excess of 42° F. over the minimum, multiplied by the coefficient 0.4.
If the mean for the day is <i>below</i> 42° F., but the maximum is <i>above</i> 42° F.	The required quantity is the excess of the maximum over 42° 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° F., calculated as stated in the preceding column.
If the maximum is <i>below</i> 42° F., or <i>equal</i> to 42° F.	There is none.	Subtract the mean from 42° 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 co-efficient given above, in Rules 2 and 3, is for a weekly period, and for the base temperature 42° F. The following are its values for other base temperatures,—for 32° F., 0.4; for 52° F., 0.33; for 62° F., 0.25.*

* 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.

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 XI., p. 88.

An early copy of the MS. of the Report is prepared on Tuesday in every 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.

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., &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. In the course of this year the number of Stations reporting Sunshine has increased largely, so that the arrangement of the Tables on pp. 2, 3 and 4 of each Summary has been modified somewhat.

Two Appendices, I. and II., have appeared, similar to those for several recent years.

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 10).
- (2.) At 3.30 p.m. (from the morning and afternoon reports), for the day following that of issue. This set of forecasts is supplied to a few newspapers and a copy is exhibited regularly at the door of the Meteorological Office. During the Hay Harvest they are telegraphed to about 28 well-known agriculturists, to be made known in their neighbourhood (see p. 11).
- (3.) At 8.30 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 for them, and send for them regularly. A very large number of the more important papers and news agencies avail themselves of this advantage.

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

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, The Needles, Scilly, Holyhead, and Valencia (Ireland), and the observations posted up are those for 8 a.m. and 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 any 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, a nominal fee of 2s. 6d. being charged for an official quarter or any part thereof, in addition to 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 should 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 1897 will be found on pp. 11-15.

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 Light-house 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.

APPENDIX VII.

REPORT ON THE COMPARISON OF THE FORECASTS ISSUED AT 8h. 30m. p.m. WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 Months, April 1897 to March 1898. 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 per-centage of success in "Wind," the second in "Weather," and the third the average of the other two.

The Summary for the various districts is given at page 11.

Months.		Per-centages.				Months.		Per-centages.			
		Wind.	Weather.	Average.	a + b.			Wind.	Weather.	Average.	a + b.
April	a	48	58	53	77	November	a	46	55	51	75
	b	21	23	24			b	23	26	24	
	c	21	13	17			c	24	10	17	
	d	7	6	6			d	7	9	8	
May	a	53	66	60	85	December	a	49	60	55	82
	b	29	21	25			b	26	28	27	
	c	13	7	10			c	20	6	13	
	d	5	6	5			d	5	6	5	
June	a	57	59	58	81	January	a	54	60	57	84
	b	22	23	23			b	29	25	27	
	c	14	12	13			c	14	8	11	
	d	7	6	6			d	3	7	5	
July	a	66	71	69	88	February	a	41	63	52	83
	b	21	17	19			b	37	25	31	
	c	11	7	9			c	18	8	13	
	d	2	5	3			d	4	4	4	
August	a	46	55	51	78	March	a	49	64	57	82
	b	28	27	27			b	29	21	25	
	c	23	12	18			c	16	9	12	
	d	3	6	4			d	6	6	6	
September	a	46	57	52	83	The entire year	a	50	60	55	81
	b	32	30	31			b	24	24	26	
	c	12	8	10			c	17	10	14	
	d	10	5	7			d	5	6	5	
October	a	48	52	50	79						
	b	34	24	29		b					
	c	14	15	15		c					
	d	4	9	6		d					

APPENDIX VIII.

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-Tweed.
Dunrossness.	New Ross.	Falmouth.	Cullercoats.
Sumburgh Hd. L.H.	Dunmore East.	Pendennis.	Tynemouth.
Scalloway.	Dungarvan.	Mevagissey.	South Shields.
Stromness.	Minehead L.H.	Mount Batten.	Souter Point L.H.
Kirkwall.	Youghal.	Plymouth.	Sunderland.
Cantick Head L.H.	Queenstown.	Devonport.	Hartlepool.
Holborn Head.	Cork.	Prawle Point.	Middlesborough.
Dunnet Head.	Passage.	Teignmouth.	Redcar.
Wick.	Kinsale.	Exmouth.	Flamborough Hd.
Tarbet Ness L.H.	Do. (Old Head).		Whitby.
Avoch.	Galley Head L.H.		Filey.
Inverness.	Castletownshend.		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.	Tory Island L.H.		
Fraserburgh.	Rathmullan.		
Peterhead.	Malin Head.		
Aberdeen.	Portrush.		
Girdleness L.H.	Port Ballintrae.		
	IRISH SEA.		
	Belfast.		
	Donaghadee.		
	Burr Point.		
	Howth.		
	Kingstown.		

[Continued.]

NORTHERN.	WESTERN.	SOUTHERN.	EASTERN.
SCOTLAND, E.	IRISH SEA— <i>cont.</i>	ENGLAND, S.	ENGLAND, E.
Stonehaven.	Pt. of Ayre (I. of M.)	Guernsey.	Sutton Bridge.
Montrose.	Ramsey "	St. Helier's	Lynn.
Scurdy Ness L.H.	Douglas "	(Jersey).	Sheringham.
Broughty Ferry.	Castletown "	Gorey "	Cromer.
Dundee.	Silloth.	Weymouth.	Great Yarmouth.
St. Andrews.	Maryport.	Anvil Point L.H.	Southwold.
Anstruther.	Workington.	Poole.	Orford Ness L.H.
Pittenweem.	Whitehaven.	Southampton.	Ipswich.
Buckhaven.	Barrow.	Hamble.	Harwich.
Wemyss, West.	Morecambe.	Yarmouth.	Gunfleet L.H.
Burntisland.	Fleetwood.	Cowes.	
Grangemouth.	Blackpool.	Ryde.	
Bo'ness.	Lytham.	St. Catherine's Pt.	
Granton.	Southport.	Portsmouth.	
Newhaven.	Formby.	Littlehampton.	
Leith.	Liverpool.	Brighton.	
Fisherrow.	Runcorn.	Newhaven.	
Dunbar.	Hoyle.		
Cockburnspath.	New Brighton.		
St. Abb's Head.	Connah's Quay.		
Eyemouth.	Penmaenmawr.		
	Port Penrhyn.		
	Point Lynas L.H.		
	Holyhead.	ENGLAND, S.E.	
	South Stack L.H.	Eastbourne.	
	Caernarvon.	Hastings.	
	Port Dinorwic.	Rye.	
SCOTLAND, N.W.	ST. GEORGE'S	Sandgate.	
Fair Isle L.H.	CHANNEL.	Folkestone.	
C. Wrath L.H.	Aberystwyth.	Dover.	
Stourhead L.H.		Deal.	
Port of Ness.	BRISTOL CHANNEL.	Ramsgate.	
Stornoway.	Milford.	North Foreland.	
Portnaguiran.	Pembrey.	Margate.	
	Llanelli.	Faversham.	
	Swansea.	Sheerness.	
	Briton Ferry.	Chatham.	
	Porthcawl.		
	Nash L.H.		
	Penarth.		
SCOTLAND, W.	Cardiff.		
Glasgow.	Do. (Bute Dock).		
Greenock.	Do. (Barry Dock).		
Rothesay.	Newport.		
Lamlash.	Weston-super-Mare.		
Carradale.	Burnham.		
Campbelton.	Bridgewater.		
Mull of Cantire L.H.	Lundy Island.		
Rhinns of Islay L.H.	Ilfracombe.		
Ardrossan.	Bull Point L.H.		
Girvan.	Barnstaple.		
Ballantrae.	Appledore.		
Cairn Ryan.	Hartland Pt. L.H.		
Corsewall Point	Roscastle.		
L.H.	Port Isaac.		
Mull of Galloway	Newquay.		
L.H.	Hayle.		
	St. Ives.		
	St. Sennen.		
	Newlyn, West.		
	Penzance.		
	Scilly.		

APPENDIX IX.

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, 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, Burham, Highbridge, Weston-super-Mare.

Wales.—Briton Ferry, Swansea, Angle, Milford, Aberystwyth, Nevin, 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, 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, Portree, Armadale (Isle of Skye), Isle of Soay, Plockton, Shieldaig, Gruinard, Badachro, Ullapool, East Mey, Gills, Stroma (2).

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

APPENDIX X.

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

These stations are of seven classes, as stated on page 16.

I.—*Observatories continuously observing 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 curve made by the assistants at the Meteorological Office, and which always amount to 40, and in doubtful cases to many more, per month, for each element. 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.

Results of
examination
and report to
Council.

General
supervision
of observa-
tory work.

In connection 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 1895 is in the press. See p. 18.

It will be noticed that this publication includes results from only five observatories, while on page 17 seven observatories are mentioned. This is owing to the fact that 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 those of the Royal Cornwall Polytechnic Society.

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 orders. 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 57 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 after their receipt has been acknowledged, they are duly stamped, dated and then stored in the Office.

Sunshine records.

Weekly
totals.

A tabulation of most of the curves is published in the Weekly Weather Report, mentioned in Appendix VI., and for those stations, which are also Stations of the Second Order, the monthly totals of bright sunshine in hours, together with the per-centages 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.*

These are 30 in number in these islands, and the particulars as to the observations taken at them, and the methods adopting in dealing with them, will be found fully detailed in Appendix VII. to the Report for 1888-89, and in Appendix VI. 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 1898 the total number was 149, including 16 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 both Societies.

The Stations of the Second Order are distributed as follows: 45 in England, 3 in Wales, 25 in Scotland, and 10 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 1894 contained returns from 72 stations and that for 1895, now in the Press, also contains returns from 72 stations.

Arrangements have been made under which it is hoped that the arrears of this publication will be rapidly reduced.

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, where 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 66 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, 36 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 to Mr. Symons, F.R.S., for publication in "British Rainfall."

INSPECTION.

The Stations of the Second Order are regularly inspected, the attention of the inspector being directed by the Office to any special point which may require investigation.

LIST OF STATIONS.

In Appendix XI., page 88, is given a complete list of the stations supplying information to the Office.

APPENDIX XI.

LIST of STATIONS in the BRITISH ISLANDS from which INFORMATION has been received at the METEOROLOGICAL OFFICE during the year ending March 31st, 1898.

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. *Observatories*.—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.

B. *Anemographic Stations*.—Continuous record of the direction and velocity (or force) of the wind.

C. *Barographic Stations*.—Continuous record of pressure.

D. *Second Order Stations*.—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 maxima and minima of temperature, the daily rainfall, and general remarks on the weather.

E. *Second Order Stations*.—Monthly means and summaries on Form B. of observations taken at 9 a.m. and 9 p.m., each day as above.

F. *Climatological Stations*.—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."

G. *Third Order Stations*.—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.

R. *Rainfall Stations*.—Monthly sheets containing the daily observations of the amount of rainfall, with remarks on the weather.

S. *Sunshine Stations*.—Continuous record of bright sunshine.

T. *Telegraphic Stations*.—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 maxima and minima 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, as required, for use in the "Weekly Weather Report."

W. *Sea-temperature*.—Daily observations of the temperature of the sea water.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Page where Inspector's Report for 1897 will be found.
Aberdeen Observatory ..	57 10	2 6 W.	40	Prof. C. Niven ..	A. T. C.	49, 65
" Cove Bay ..	57 9	2 5 "	—	Coastguard ..	W.	—
Adare, Limerick ..	52 33	8 46 "	—	The Earl of Dun- raven.	R.	—
Alnwick Castle ..	55 25	1 43 "	210	Humphry Wiliams, for the Duke of Northumberland.	B. F.	69, 70
Ardrossan, Ayrshire ..	55 38	4 50 "	15	J. W. Mayes ..	T.	50
Arlington Court, Barnstable ..	51 8	3 58 "	613	Lady Chichester ..	F.	—
Armagh Observatory ..	54 21	6 39 "	196	J. L. E. Dreyer ..	B. D. F. S.	63, 65
Arran, North, Galway ..	53 6	9 40 "	—	Coastguard ..	G. W.	—
Aspley Guise ..	52 1	0 38 "	410	E. E. Dymond ..	S.	—
Aysgarth Vicarage, Yorks.	54 18	1 58 "	646	Rev. F. W. Stow ..	D.	—
Bahama Bank Lightship ..	51 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.	—
Bantry ..	51 41	9 27 "	—	R. Brennan ..	R.	—
Belmullet, Co. Mayo ..	54 13	9 59 "	40	Miss E. Tolan ..	T.	45
Belvoir Castle, Grantham ..	52 54	0 47 "	259	W. H. Divers, for the Duke of Rutland.	D.	60
§ Ben Nevis ..	56 48	5 0 "	4,406	A. Rankin, for Di- rectors Ben Nevis Observatory.	S. E.	—
§ Bennington, Herts. ..	51 54	0 5 "	407	Rev. J. D. Parker ..	E.	—
§ Berkhamsted ..	51 46	0 34 "	400	E. Mawley ..	E.	—
Bidston Observatory, Liver- pool.	53 24	3 4 "	188	W. E. Plummer ..	D. T.	53
Birr Castle, Parsonstown ..	53 6	7 55 "	175	R. Jacob and T. Haines, for the Earl of Rosse.	D. S. T.	45
§ Blackpool ..	53 48	3 3 "	31	A. J. Anderson ..	F. S.	52
Blacksod Point, Co. Mayo ..	54 6	10 4 "	—	Coastguard ..	W.	—
Bolton, Chadwick Museum ..	53 35	2 27 "	389	W. W. Midgley ..	G.	—
Bournemouth ..	50 43	1 53 "	—	Messrs. Primaveri, for Town Council.	S.	—
§ Braemar ..	57 0	3 24 "	1,111	J. Aitken ..	D. F. S.	49
Bramley, Surrey ..	51 11	0 33 "	148	J. Bartlett ..	D.	52
Bray, Co. Wicklow ..	53 12	6 6 "	—	Coastguard ..	G.	—
Brighton ..	50 49	0 8 "	—	A. Newsholme ..	S.	—
Burnmouth, Ayton, Berwick ..	55 51	2 4 "	—	Coastguard ..	W.	—
Burntisland ..	56 4	3 14 "	—	" ..	W.	—
§ Buxton ..	53 14	1 54 "	987	E. A. Dent ..	E.	—
Caernarvon Bay Lightship ..	53 6	4 45 "	—	Light-keepers ..	W.	—
Cambridge ..	52 13	0 6 E.	88	Miss A. Walker ..	T. S.	—
Campden, Glos. ..	52 5	1 46 W.	524	Capt. W. Wright, R.A.	R.	57
Cardigan Bay Lightship ..	52 25	5 1 "	—	Light-keepers ..	W.	—
§ Cargen ..	55 2	3 37 "	72	A. Peacock ..	E.	—
Carrigallen, Co. Leitrim ..	53 58	7 38 "	2350	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 Surveying.	G.	51
§ Cheadle ..	52 58	1 57 W.	646	J. C. Philips ..	E. F.	—
§ Cheltenham ..	51 54	2 3 "	184	R. Tyrer ..	E.	—
Chester ..	53 12	2 54 "	59	Rev. J. Cairns Mit- chell.	D.	53
Churchill, Oxon ..	51 56	1 34 "	509	Giles Edmonds ..	R.	—
§ Churchstoke ..	52 31	3 5 "	538	P. Wright ..	D. F. S.	—
Cirencester ..	51 43	1 57 "	446	Prof. Ohm ..	F. S.	56, 57
Cleggan, Co. Galway ..	53 33	10 8 "	—	Coastguard ..	W.	—
Clifton ..	51 27	2 37 "	230	D. Rintoul ..	F.	56
Colly Weston ..	52 37	0 31 "	280	Miss A. Tasker ..	R.	—
Colwyn Bay ..	53 17	3 43 "	—	R. E. Lord ..	S.	52
Coningbeg Lightship ..	52 2	6 40 "	—	Light-keepers ..	W.	—
Cooper's Hill, Egham ..	51 26	0 34 "	279	Prof. H. McLeod ..	G.	—
Cromarty ..	57 41	4 0 "	—	Coastguard ..	W.	—
Cronkbourne (Douglas) ..	54 10	4 29 "	137	A. W. Moore ..	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.	51
Cullen ..	57 41	2 49 "	18	R. A. J. Glover ..	D.	—
§ Cullompton ..	50 51	3 23 "	202	T. Turner ..	F. S.	—
Currygrane (Edgeworths- town), Co. Longford.	53 45	7 39 "	267	J. M. Wilson ..	D. F.	—

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Page where Inspector's Report for 1887 will be found.
Deerness, Orkney Islands..	58 56	2 45 W.	169	M. Spence ..	B. D. S.	66
Disserth (Llandrindod) ..	52 13	3 24 "	711	Rev. J. Le Herbert..	R.	—
Dolmelynlyn (Dolgelly) ..	52 47	3 53 "	—	W. Simmonds, for C. R. Williams.	R.	—
Donaghadee	54 38	5 32 "	26	T. MacGowan ..	T.	44
Doneraile, Co. Cork..	52 13	8 34 "	266	Captain Evans ..	R.	—
Dover, Waterworks..	51 7	1 18 E.	198	H. E. Stilgoe ..	R.	—
Dublin, Botanic Gardens ..	53 23	6 16 W.	67	F. W. Moore..	D.	45
" City	53 20	6 15 "	47	J. W. Moore..	D. F.	—
" Mountjoy Obs., Phoenix Park.	53 22	6 21 "	155	Maj. R. C. Hellard, R.E.	B. D. S.	62, 65
Duddington	52 36	0 32 "	152	Fred Coventry ..	F.	—
S Dundee	56 28	2 56 "	160	J. Carnochan ..	D. S.	49
Dungeness	50 55	0 59 E.	26	W. Batten ..	T.	51
S Dunrobin Castle	57 59	3 56 W.	12	D. Melville, for the Duke of Sutherland.	D.	49
Durham	54 46	1 35 "	336	H. J. Carpenter ..	D. F. S.	—
Dursley (Farnley), Glos. ..	51 41	2 21 "	250	R. W. Pinney ..	R.	—
Eastbourne	50 46	0 17 E.	33	R. Sheward ..	D. S.	51
East Goodwin Lightship ..	51 13	1 36 "	—	Light-keepers ..	W.	—
East Dereham	52 41	0 57 "	158	G. H. Cooper ..	R.	—
Edgbaston (Birmingham)..	52 28	1 56 W.	534	Alf. Cresswell ..	D.	55
Edinburgh	55 57	3 12 "	253	R. C. Mossman ..	D. S.	48
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.	—
Epsom, R. Med. College ..	51 20	0 14 "	271	H. E. Gardner ..	D.	51
Falmouth	50 9	5 4 "	187	E. Kitto ..	A. F.	62, 65
Fleetwood	53 56	3 1 "	—	M. S. Gaultier ..	B.	63
Forquahenny, Perth	56 21	3 20 "	175	C. L. Wood ..	C.	—
S Fort Augustus.. .. .	57 8	4 40 "	68	Rev. M. Wall ..	E. F. S.	—
Fort William	56 48	5 6 "	31	A. Rankin, for Direc- tors, Ben Nevis Observatory.	A. F.	67
Foynes, Co. Limerick	52 37	9 7 "	108	Lord Montague ..	F.	—
Fredville (Dover)	51 7	1 18 E.	173	H. W. Plumptre ..	R.	—
Fulbeck, Lincolnshire ..	53 3	0 37 W.	185	Rev. Vere F. Willson	C. D.	60
Geldeston (Beccles).. ..	52 28	1 31 E.	37	E. T. Dowson ..	D. F. S.	—
Gilcrux (Maryport).. ..	54 44	3 23 W.	261	J. Monkhouse ..	D. F. S.	53
Glasgow	55 53	4 18 "	180	Prof. L. Becker ..	A. D. F.	50, 68
Glencarron	57 30	5 14 "	489	D. D. Munro ..	E. F.	48
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.	49
Gorleston (Suffolk)	52 35	1 43 E.	—	R. J. C. Day ..	G.	—
Guernsey (St. Peter's) ..	49 32	2 32 W.	—	F. E. Carey ..	S.	56
Harpenden, Herts.	51 49	0 20 "	419	T. Wilson ..	G.	—
Haslar Hospital, Hants. ..	50 47	1 7 "	—	R. Harring ..	G.	—
Hawes Junction	54 19	2 18 "	1135	W. H. Bunce..	G.	53
Hesley Hall (Bawtry)	53 26	1 2 "	65	B. I. Whitaker ..	F.	60
H Hereford	52 5	2 45 "	274	T. A. Chapman ..	F.	—
Heysham Hall, Lancashire	54 3	2 54 "	95	S. Lomas, for Miss L. Gralton.	D.	53
Hillington	52 48	0 33 E.	88	Rev. H. E. B. Folkes	D. F. S.	—
Hollesley Bay	52 3	1 27 "	38	Prof. C. G. F. Thon- ger.	D. S.	50
Holyhead, Harbour Office..	53 18	4 39 W.	57	F. M. Cotton ..	B. W.	72
" Sailors' Home	53 18	4 39 "	48	T. Chope ..	T.	53
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.	55
Kearsney Abbey, Dover ..	51 8	1 17 E.	? 100	C. W. Curtis ..	R.	—
Ketton, Stamford	52 38	0 32 W.	—	G. Drabble ..	R.	—
Kew Observatory	51 28	0 19 "	18	C. Chree ..	A.	—
Kilredano, Co. Clare	52 35	9 47 "	—	Coastguard ..	W.	—
Kilkenny	52 39	7 14 "	212	H. Carlton, for the Marquis of Or- monde.	C. F.	45

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Page where Inspector's Report for 1897 will be found.
At Killarney	52 4	9 30 W.	86	Ven. Archdeacon Wynne.	G. F.	—
Killiney (Cloneevin), Co. Dublin.	53 18	6 7 "	249	R. O'Brien Farlong	R.	—
Kirkwall	58 59	2 57 "	—	Coastguard	W.	—
Kish Bank Lightship ..	53 19	5 55 "	—	Light-keepers ..	W.	—
Ladylaw (Hawick)	55 28	2 47 "	447	T. Wilson	D.	—
Lahinch	52 55	9 21 "	52	Miss J. Bowes ..	R.	—
§ Lairg	58 1	4 22 "	335	Rev. D. Macrae ..	E. F.	49
Lamlash, Isle of Arran, Scotland.	55 32	5 8 "	—	Coastguard	W.	—
Laudale, Argyleshire ..	56 41	5 41 "	14	A. Fletcher, for T. H. G. Newton.	D. F.	—
§ Lednathie	56 45	3 7 "	719	W. Morrison, for J. Stormonth Dar- ling.	E.	49
Leith	55 58	3 10 "	20	T. Richardson ..	T.	49
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.	—
Liscannor, Co. Clare ..	52 56	9 23 "	—	Coastguard	W.	—
§ Lissan, Co. Tyrone	54 41	6 45 "	300	Sir N. Staples, Bt. ..	E.	44
Llandinam, Montgomery ..	52 29	3 26 "	500	John Owens	R.	—
Llandovery	51 59	3 48 "	217	J. Watkins	F.	45
At Llandudno	53 21	3 50 "	88	J. Nicol	E. F.	52
London, Brixton	51 29	0 7 "	77	Wm. Little	S.	—
" City	51 32	0 5 "	80	F. Gaster	T.	—
" Pall Mall	51 32	0 8 "	—	Messrs. de la Rue ..	S.	—
" Westminster	51 31	0 8 "	76	Athenæum Club ..	C.	—
" Westminster Training College.	51 31	0 8 "	—	The Staff of the Met. Office.	C. G.	—
" Westminster	51 31	0 8 "	—	H. A. Reateblous ..	S.	—
Londonderry	55 0	7 19 "	67	J. Conroy	D. F.	44
Loughborough	52 47	1 12 "	169	W. Berridge	T.	—
Lowestoft	52 29	1 44 E.	—	J. Moore	G.	—
At Lowestoft	52 29	1 44 "	85	S. H. Miller	E.	—
Malin Head, Co. Donegal ..	55 23	7 24 W.	230	J. Williams	T. C.	44
Manchester	53 29	2 13 "	190	J. Niven	D.	53
§ Marchmont	55 44	2 25 "	428	J. A. Wood	E. F. S.	—
At Margate	51 24	1 24 E.	83	J. Stokes	S.	—
Market Rasen	53 23	0 20 W.	83	W. B. Jevons	R.	61
Markree Castle, Co. Sligo ..	54 11	8 27 "	122	Miss E. Reynolds, for Col. Cooper.	D. F. S.	41
Minard, Co. Kerry	52 7	10 8 "	—	Coastguard	W.	—
Morpeth	55 13	1 41 "	324	G. P. Berry	D. S.	59
Mount Callan (Inagh), Co. Clare.	52 53	9 16 "	479	Lt.-Col. Tottenham	R.	—
Nairn	57 36	3 52 "	84	Miss Penny	T.	49
Newcastle, Co. Wicklow ..	53 5	6 6 "	256	B. H. Steede	D.	45
Newcastle-on-Tyne	54 59	1 36 "	152	N. H. Martin	G. S.	59
Newarp Lightship	52 45	1 53 E.	—	Light-keepers ..	W.	—
Newport, Monmouth	51 35	3 0 W.	—	C. Cullum	R.	—
Newquay, Cornwall	50 25	5 4 "	7250	J. Pearce	S.	—
"	50 25	5 5 "	—	Coastguard	W.	—
Northallerton	54 20	1 26 "	129	W. Stead	R.	—
North Foreland	51 23	1 27 E.	115	S. Jenkins	T.	50
North-West Lightship, Liverpool.	53 31	3 31 W.	—	Light-keepers ..	W.	—
At Norwood	51 26	0 6 "	220	W. Marriott	E.	—
§ Ochtertyre	56 23	3 53 "	329	G. Croucher, for Sir P. K. Murray, Bt.	E. F.	48
Omagh (Edenfel)	54 36	7 19 "	300	Col. Buchanan	F.	—
Oswaldkirk, Yorkshire ..	54 12	1 3 "	—	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	W. Wickham	T. S.	71
Parkstone, Dorset	50 43	1 56 "	197	B. H. Barnes	D.	—
Penbedw. Mold	53 12	3 11 "	650	H. W. Buddicom ..	C.	—
Pennant Bay, Aberdour ..	57 40	2 16 "	—	Coastguard	W.	—

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Page where Inspector's Report for 1897 will be found.
S Pinmore, Girvan	55 12	4 49 W.	187	P. Donald, for Capt. Hamilton.	E.	50
Plumstead	51 29	0 6 E.	—	J. G. Waller	S.	—
Plymouth, The Hoe	50 22	4 8 W.	116	H. Victor Prigg	D. F. S.	55, 56, 57
Freedom Fields	50 24	4 8 "	207	"	R.	57
S Poltalloch	56 8	5 30 "	132	J. Russell, for Lord Malcolm.	E.	—
Portrush	55 13	6 40 "	—	Coastguard	W.	—
Port Talbot	51 34	3 45 "	—	J. Hollingworth, for Miss Talbot.	S.	—
Prawle Point	50 12	3 43 "	332	M. Howe	T.	55
Prestwich (Manchester) ..	53 32	2 17 "	320	T. R. H. Clunn	D. F. S.	53
Rede Court (Rochester) ..	51 24	0 29 E.	224	W. H. Tingey	D.	51
Roche's Point, Co. Cork ..	51 47	8 19 W.	42	W. Kennedy	T.	45
Rochford, Tenbury	52 18	2 36 "	316	Rev. John Tomson ..	C. R.	—
S Rosewell	55 51	3 7 "	690	R. W. D. Cameron ..	E.	—
Rothamsted	51 48	0 22 "	368	Sir J. B. Lawes and Sir J. H. Gilbert.	F. S.	—
S Rothesay	55 50	5 4 "	115	J. Kay	E.	—
R Rounton, Yorkshire	54 24	1 18 "	249	Sir I. L. Bell, Bart. ..	E.	—
R Rousdon, Devon	50 43	3 0 "	515	C. E. Peek	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 23	1 15 W.	379	E. Kitchener	G.	55
St. Ann's Head, Pembroke ..	51 41	5 11 "	150	H. T. Knott	T. S. W.	45
St. Aubin's, Jersey	49 12	2 11 "	25	J. Fisher	T.	55
St. David's, Pembrokeshire ..	51 53	5 16 "	215	W. P. Probert	D.	—
St. Helen's, Lancashire	53 28	2 45 "	151	F. Drew Harris	G.	53
St. Helier's, Jersey	49 11	2 6 "	—	Signal Officer, Fort Regent.	S.	56
St. Leonard's	50 51	0 33 E.	171	H. Colborne	D. F. S.	51
(West Marina)	50 51	0 32 "	—	T. Eldridge	G.	—
Salcombe, Devon	50 14	3 46 W.	—	Coastguard	W.	—
Sandgate, Kent	51 4	1 9 E.	56	A. Robert Bowles ..	R.	—
R Scarborough	54 17	0 23 W.	159	E. W. Ellerbeck	D. F. S.	—
"	54 17	0 23 "	—	Coastguard	W.	—
Schull	51 32	9 32 "	—	"	G.	—
Scilly Islands, St. Mary's ..	49 56	6 18 "	80	A. Hicks	B. S. T. W.	61, 64
Seafeld, Miltown Malbay, Co. Clare.	52 48	9 30 "	—	Coastguard	W.	—
Seaham Harbour	54 50	1 19 "	148	G. H. Aird	D.	—
Sedburgh	54 19	2 32 "	400	Miss Burra	R.	—
Seven Stones Lightship	50 4	6 5 "	—	Light-keepers	W.	—
R Shaftesbury	51 1	2 12 "	—	Miss L. Waud	F.	—
Shambles Lightship	50 31	2 20 "	—	Light-keepers	W.	—
Sheffield	53 23	1 29 "	429	E. Howarth	D. S.	—
Sheephaven (Dunfanaghy) ..	55 11	7 58 "	—	Coastguard	W.	—
Shields, North	55 0	1 27 "	97	W. B. Clark	T.	70
Shields, North, High Light- house.	55 0	1 27 "	—	Captain Harrison ..	B.	60
Shipwash Lightship	52 2	1 38 E.	—	Light-keepers	W.	—
Shirley, near Birmingham ..	52 25	1 49 W.	460	B. Boothroyd	F.	57
Skipton	53 58	2 9 "	567	W. Eeroyd	G.	53
Solway Lightship	54 48	3 32 "	—	Light-keepers	W.	—
Southampton	50 55	1 24 "	78	J. T. Cook, for Dir. Gen. of Ordnance Survey.	D. F. S.	56
Southport	53 39	2 59 "	—	J. Baxendell	S.	52
South Rock Lightship	54 25	5 23 "	—	Light-keepers	W.	—
Spidall, Co. Galway	53 15	9 17 "	—	Coastguard	G.	—
Spurn Head	53 34	0 7 E.	19	G. Freeman	T.	59
Spurn Lightship	53 34	0 13 "	—	Light-keepers	W.	—
Stokesay, Craven Arms	52 26	2 52 W.	370	Miss M. A. Digges La Touche.	D.	—
Stonyhurst College	53 51	2 28 "	375	Rev. W. Sidgreaves ..	A. D. F.	64, 65
Stornoway	58 11	6 22 "	28	J. Mackenzie	T. S. C.	48
"	58 11	6 22 "	—	Coastguard	W.	—
Stranraer	54 54	5 2 "	—	"	G.	—
Strathpeffer-Spa, N.B.	57 37	4 28 "	253	J. Tregelles Fox	D. S.	—
Sumburgh Head (Shet- lands).	59 51	1 17 "	136	Rev. W. Brand	T. C.	—
Sunderland	54 54	1 23 "	—	Coastguard	W.	—
Symbister, Shetlands	60 14	1 25 "	—	J. S. Nicolson	G.	—
Syston, Leicester	52 43	1 5 "	178	S. K. Daniels	R.	—

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Page where Inspector's Report for 1897 will be found.
†† Tavistock	50 33	4 8 W.	391	E. E. Glyde	D.	—
Tealby, Lincolnshire ..	53 24	0 16 "	251	Rev. S. Lewin	D.	60
Teelin, Co. Donegal ..	54 38	8 39 "	—	Coastguard	W.	—
Tenby	51 41	4 42 "	79	W. T. Balmer	D. S.	46
Thurcaston, Leicester ..	52 42	1 10 "	253	Rev. T. A. Preston..	S.	—
Torquay	50 28	3 31 "	—	A. Chandler	S.	—
Totland Bay, Isle of Wight	50 41	1 33 "	84	J. Dover	G.	57
Union Hall, Co. Cork ..	51 33	9 8 "	—	Coastguard	G.	—
Uppingham	52 35	0 44 "	484	Rev. G. H. Mullins..	D.	—
Uzon (Montrose)	56 40	2 28 "	—	Coastguard	W.	—
Valencia Observatory, Ca- hireiveen.	51 56	10 15 "	30	J. E. Cullum.. ..	A. T. C.	45, 63
" 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.	56
†† Wakefield	53 41	1 30 "	96	H. Clarke	E.	—
Waterford	52 16	7 7 "	—	Harbour Authorities	C.	—
Watergate (Emsworth) ..	50 56	0 55 "	—	R. Christy	S.	—
Wealdstone	51 37	0 20 "	179	G. E. Eland	R.	—
Westbourne, Sussex ..	50 52	0 55 "	—	Rev. L. B. Birkett ..	S.	—
Westray, Orkney	59 17	3 0 "	—	J. Hewison	G.	—
Wick	58 27	3 0 "	80	J. Sinclair	T.	49
"	58 27	3 6 "	—	Coastguard	W.	—
† Wolflee	55 23	2 39 "	587	W. Cockburn	D.	—
†† Woolacombe	51 10	4 12 "	59	E. Henshall	D.	—
Worksop	53 18	1 8 "	—	H. Mellish	S.	—
Yarmouth	52 37	1 43 E.	10	G. T. Watson	B. T. C.	69, 71
" 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 "	—	E. B. Collimon	S.	—
" The Museum	53 57	1 5 "	56	H. M. Platnauer ..	D. T.	59, 60

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 Centra Météorologique Paris.
Hernösand		Brussels	
†Stockholm		Cape Gris Nez	
Wisby		†Brest (St. Mathieu) ..	
Karlstad	} Meteorological Institute, Christiania.	Lorient (Ile de Groix)..	
Bodö		*†Rocheport (Ile d'Aix)..	
†Christiansund		†Biarritz	} Cent. Met. Inst. of Germany.
*†Skudesnaes		†Paris	
Færder	} Meteorological Institute, Copenhagen.	Belfort	
†The Scaw		Lyons	
Fahö		Nice	
Cuxhaven.. ..		Perpignan	
	} Deutsche See- warte, Ham- burg.	Berlin	} Observatory, Lisbon.
		Wiesbaden	
		Munich	
		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.

APPENDIX XII.

LIST OF DOCUMENTS received from FOREIGN LAND STATIONS during the year ending March 31st, 1898.

Place.	Observer.	Nature of Observations.
Antigua	Francis Watts	Observations twice daily, 1897, March to December; 1898, January, February.
Bahamas (Abaco)	Lightkeepers...	Lighthouse Register, 1897, January to December.
" (Cat Cay)	A. S. Haigh	Barometer diagrams, 1897, March to May, November, December; 1898, January, February.
" (Cay Lobos)	Lightkeeper	Lighthouse Register, 1897, January to December.
" (Cay Sal)	"	" " " " " "
" (Inagua)	"	" " " " " "
" (Nassau)	J. A. Kerr	Observations once daily, 1897, March to December; 1898, January.
" (Watling Island)	Lightkeeper	Lighthouse Register, 1897, January to December.
Barbados	J. R. Bovell	Monthly summary of observations twice daily, 1897, March to December; 1898, January.
Beyrout (Lee Observatory)	R. H. West, M.A.	Observations twice daily, 1897, March to December; 1898, January, February.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper	Lighthouse Register, 1897, January to December.
Cape Spartel (Tangier) ...	E. C. Hathaway and J. J. Emmott, Lloyd's Signalmen.	Observations twice daily, 1897, March to December; 1898, January, February.
Colon, Isthmus of Panama	Rev. S. P. Hendrick	Observations twice daily, 1897, October to December; 1898 January, February.
Cyprus (Famagusta)	G. Eliades	Observations twice daily, 1897, January to December.
" (Kyrenia)	P. Michaelides	" " " " " "
" (Larnaca)	C. Perini	" " " " " "
" (Limassol)	Luigi Béraud	" " " " " "
" (Nicosia)	E. Ioannides	" " " " " "
" (Papho)	E. A. Malliotis and M. Theodorides	" " " " " "
Ebolowode, West Africa ...	A. L. Bennett, M.D....	Daily observations of maximum and minimum temperature, 1897, October, November.

George Town (British Guiana)...	Robert Ward...	...	...	Observations twice daily, 1897, March to December.
" " " " " "	" " " " " "	...	...	Daily record of sunshine, 1897, March to December.
Gibraltar	Sergeant A. W. Harwood, Med. Staff Corps.	...	...	Observations twice daily, 1897, March to December; 1898, January, February.
Gold Coast (Aburi) ...	Assistant Colonial Surgeons	...	...	Observations twice daily, 1897, March to December.
" " (Accra) ... ..	" " " " " "	...	...	" " " " " " February to December.
" " (Adda) ... ..	" " " " " "	...	...	" " " " " " November.
" " (Axim) ... ..	" " " " " "	...	...	" " " " " " March to December.
" " (Cape Coast Castle)	" " " " " "	...	...	" " " " " " "
" " (Kwitta) ... ..	" " " " " "	...	...	" " " " " " "
Lagos	T. B. Wright and J. T. C. Robbin	...	...	" " " " " " ; 1898, January.
Mojanga (Madagascar) ...	S. C. Knott	...	...	" " " " February to December.
Namirembe, Mengo, Uganda ...	Rev. A. J. Pike	...	...	" once daily; 1897, January to December (except October).
St. Helena	H. S. Hands	...	...	Observations once daily, 1897, March to December.
" " " " " "	" " " " " "	...	...	Continuous record of wind (direction and velocity), 1897, March to December.
" (James Town)	P. Clifford and A. E. Broadway	...	...	Daily rainfall, 1897, March to December.
" (Mount Pleasant) ...	T. C. Barker	...	...	" " " " " " 1885-1887; 1890-1895.
St. Lucia (Morne Fortuné) ...	Unknown	...	...	Monthly results of observations, 1885-1887; 1890-1895.
Sierra Leone	Z. Grant	...	...	Observations twice daily, 1897, March to December; 1898, January, February.
Sombrero	J. A. Richardson and A. L. Richardson, son.	...	...	Lighthouse Register, 1896, October to December; 1897, January to March.
Soulina	Unknown	...	...	Monthly means of observations for 1896.
Tenerife (Sitio de Cullen) ...	A. F. Perry	...	...	Observations twice daily, 1897, March to December; 1898, January, February.
" " " " " "	" " " " " "	...	...	Continuous record of pressure, 1897-1898.
" " " " " "	" " " " " "	...	...	" " " " " " temperature, 1897-1898.
Trinidad	J. H. Hart, Supt. Botanic Gardens	...	...	Observations twice daily, 1897, January to December.
" " " " " "	" " " " " "	...	...	Daily record of sunshine, 1897, January to December.

APPENDIX XIII.

ADDITIONS TO THE LIBRARY DURING THE YEAR ENDING
31ST MARCH, 1898.

Aachen, Meteorologische Station.—Deutsches meteorologisches Jahrbuch für 1896. Meteorologische Station I. Ordnung in Aachen. Ergebnisse der meteorologischen Beobachtungen. Herausgegeben . . . von P. Polis. Jahrg. 2. 1a. 4°. Karlsruhe, 1897.

——— Ergebnisse der 1897 in Aachen von der meteorologischen Station Aachen des Königl. Preuss. Meteorologischen Instituts angestellten Beobachtungen. sm. f°. Sheet.

Abbadie, Antoine d'.—Observations relatives à la physique du Globe faites au Brésil et en Ethiopie par Antoine d'Abbadie. Rédigées par R. Radau. 1a. 4°. Paris, 1883.

Abercromby, Hon. R.—Instructions for observing clouds on land and sea, with photographs and engravings. 8°. London, 1888.

|| ——— The peculiar sunrise-shadows of Adam's Peak in Ceylon. Read before the Physical Soc. on Nov. 13, 1886. 8°. (*Phil. Mag.*, 1887, *Jan.*, p. 29.)

|| ——— Observations on the height, length, and velocity of ocean waves. Read before the Physical Soc. on Feb. 25, 1888. 8°. (*Phil. Mag.*, 1888, *Apr.*, p. 263.)

|| ——— On the heat and damp which accompany cyclones. 1a. 8°. (*Quart. Journ. Meteor. Soc.*, 1875, *Jan.*, p. 274.)

|| ——— On certain small oscillations of the barometer. 1a. 8°. (*Quart. Journ. Meteor. Soc.*, 1875, *Oct.*, p. 435.)

|| ——— On the barometric fluctuations in squalls and thunderstorms. 1a. 8°. (*Quart. Journ. Meteor. Soc.*, 1875, p. 450.)

|| ——— On an improvement in aneroid barometers. 1a. 8°. (*Quart. Journ. Meteor. Soc.*, 1876, *Apr.*, p. 87.)

|| ——— On certain types of British weather. Read Nov. 15, 1882. 1a. 8°. (*Quart. Journ. Meteor. Soc.*, 9, p. 1.)

|| ——— On the diurnal variation of wind and weather in their relation to isobaric lines. 1a. 8°. (*Quart. Journ. Meteor. Soc.*, 1882, *Oct.*, p. 213.)

|| ——— On the reduction of wind records. Read June 20, 1883. 1a. 8°. (*Quart. Journ. Meteor. Soc.*, 9, p. 226.)

|| ——— On the explanation of certain weather prognostics. 1a. 8°. (*Quart. Journ. R. Meteor. Soc.*, 10, 1884, p. 26.)

|| ——— On the origin and course of the squall which capsized H.M.S. "Eurydice," March 24th, 1878. 1a. 8°. (*Quart. Journ. R. Meteor. Soc.*, 10, 1884, p. 172.)

|| ——— On the physical significance of concave and convex barographic or thermographic traces. 1a. 8°. (*Quart. Journ. R. Meteor. Soc.*, 10, 1884, p. 241.)

|| ——— On the cloud to which the name of "Roll Cumulus" has been applied. 1a. 8°. (*Quart. Journ. R. Meteor. Soc.*, 13, 1887, *Apr.*)

|| ——— On the identity of cloud forms all over the world; and on the general principles by which their indications must be read. 1a. 8°. (*Quart. Journ. R. Meteor. Soc.*, 13, 1887, p. 140.)

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.

|| **Abercromby, Hon. R.**—Electrical and meteorological observations on the Peak of Teneriffe. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, 14, 1888, p. 101.)

|| ——— Observations on cloud movements near the Equator; and on the general character of the weather in the "Doldrums." la. 8°. (*Quart. Journ. R. Meteor. Soc.*, 14, 1888, p. 281.)

|| ——— Observations on the motion of dust, as illustrative of the circulation of the atmosphere, and of the development of certain cloud forms. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, 16, 1890, p. 119.)

Adelaide Observatory.—Meteorological observations made at the Adelaide Observatory, and other places in South Australia and the Northern Territory, during the year 1894, under the direction of C. Todd. sm. f°. Adelaide, 1897.

[———] Rainfall in South Australia and the Northern Territory during 1894–1895; with weather characteristics of each month. By Sir C. Todd. 2 vols. f°. Adelaide, 1896–97.

Aitken, James.—Meteorological tables for the years 1895–1896. Compiled from observations taken at Braemar, Aberdeenshire. oblong sm. f°. Sheets.

Aitken, John.—Observations of atmospheric dust. la. 8°. (*Rep. Internat. Meteor. Congr. Chicago*, 1893, Part 3, p. 734.)

|| ——— On some nuclei of cloudy condensation. la. 4°. Edinburgh, 1897 (*Trans. R. Soc. Edinb.*, 39, Part 1, p. 15.)

|| **Albert Ier, Prince de Monaco.**—Sur les observatoires météorologiques de l'océan Atlantique. 4°. (*Compt. rend. Acad. Sc.*, 126, 1898.)

|| ——— Sur la quatrième campagne scientifique de la "Princesse-Alice." 4°. (*Compt. rend. Acad. Sc., Paris*, 126, 1898.)

[**Algiers, Service Météorologique du Gouvernement Général de l'Algérie.**]—Bulletin météorologique de l'Algérie. 1897, Jan. 1—Dec. 31. sm. f°. Sheets.

[**Allahabad, Meteorological Office.**]—Administration report of the Meteorological Reporter to Government, North-West Provinces and Oudh. 1889–90—1896–97. 8 parts. sm. f°. s.l.e.a.

[———] Brief sketch of the meteorology of the North-West Provinces and Oudh and adjacent parts of Rajputana and the Punjab. 1896. sm. f°. s.l.e.a.

Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap. Tijdschrift. Tweede serie. Deel 14. 8°. Leiden, 1897.

|| **Andrée, S. A.**—Iakttagelser under en ballongfärd den 4 Augusti. 1894. 8°. Stockholm, 1895. (*K. Svenska Vet.-Akad. Handl.*, 21, Afb. 2, No. 3.)

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|| ——— W.B. No. 149. A winter barograph curve from the South Pacific Ocean. By R. De C. Ward. 1a. 8°. Washington, 1898. (*Monthly Weather Rev.*, 1897, *Nov.*)

——— Weather map. 1897. Jan. 1.-Dec. 31. 1a. f°. Sheets.

——— **Hydrographic Office.**—Pilot charts of the North Atlantic Ocean. 1897. Jan.-Dec. Charts. 1a. f°.

——— Pilot charts of the North Pacific. 1897. Jan.-Dec. Charts 1a. f°.

——— **Smithsonian Institution.**—Annual report. 1895. 1a. 8°. Washington, 1896.

——— Smithsonian miscellaneous collections. Vol. 35. 1a. 8°. Washington, 1897.

——— The Smithsonian Institution, 1846-1896. The history of its first half century. Edited by G. B. Goode. 1a. 8°. Washington, 1897.

Wellington, Meteorological Department.—[Meteorological observations in New Zealand.] 1896. sm. f°. (*Statist. New Zealand*, 1896.)

|| ——— **Meteorological Office.**—Rainfall. 1897, Jan.-Dec. sm. f°. Sheets. (*New Zealand Gazette*.)

|| ——— Return of rainfall (in inches) for each year from 1864 to 1896 inclusive. 2 sheets, sm. f°. (*New Zealand Gazette*, Feb. 10, 1898.)

* **Wenley, W. G.**—Proposed revolution in the science of meteorology. sm. 8°. Chelmsford, [1898].

* **Wetter, Das.**—Meteorologische Monatsschrift für Gebildete aller Stände. Herausgegeben von R. Assmann. 14 Jahrg., 1897. 1a. 8°. Berlin, 1897.

* (**Whitmore, C. A.**)—English weather. 1a. 8°. (*Nat. Rev.*, xxix., 1897, *May*, p. 421.)

|| **Wild, H.**—Über die Differenzen der Bodentemperaturen mit und ohne Vegetations- resp. Schneedecke nach den Beobachtungen im Konstantinowschen Observatorium zu Pawlowsk. 1a. 4°. St. Pétersbourg, 1897. (*Mém. Acad. Imp. Sc. St. Pétersb.*, 8^e sér., *Cl. phys. math.*, v., No. 8.)

|| ——— Verbesselter Ombrograph und Atmograph. sm. f°. (*Bull. Acad. Imp. Sc. St. Pétersb.*, v., 1896, p. 357.)

* **Wilson, E. M.**—Notes on malaria in connection with meteorological conditions at Sierra Leone. 8°. London, 1897.

Wise, A. T.—Meteorological observations taken in the Maloja during the winter of 1883-84. 8°. s.l.e.a.

|| **Wollny, E.**—Untersuchungen über die Temperaturverhältnisse der Bodenarten. (Erste Mittheilung.) 8°. (*Forschungen auf dem Geb. Agrik.-phys.*, Heidelberg, 19, Heft 4-5.)

——— Untersuchungen über das Verhalten der atmosphärischen Niederschläge zur Pflanze und zum Boden. 9. Der direkte Einfluss der atmosphärischen Niederschläge auf die Pflanze. 8°. (*Forschungen auf dem Geb. Agrik.-phys.*, Heidelberg, 20, Heft 1.)

|| ——— Untersuchungen über die Temperaturverhältnisse der Bodenarten (Zweite Mittheilung). 8°. (*Forschungen auf dem Geb. Agrik.-phys.*, Heidelberg, 20, Heft 2.)

|| **Wollny, E.**—Untersuchungen über das Verhalten der atmosphärischen Niederschläge zur Pflanze und zum Boden. 10. Die künstliche Beeinflussung der Wirkungen der atmosphärischen Niederschläge. 8°. (*Forschungen auf dem Geb. Agrik.-phys.*, Heidelberg, 20, Heft 3.)

Wragge, C. L.—An observatory on Mount Wellington. f°. (*Tasmanian Mail*, 1895, May 25.)

York, Yorkshire Philosophical Society.—Annual report . . . for 1896. 1a. 8°. York, 1897.

Zi-ka-wei, Observatoire Magnétique et Météorologique.—Bulletin mensuel. Tome 21. Année 1895. sm. f°. Chang-hai, 1897.

——— **Observatory.**—The "Iltis" typhoon, July 22-25, 1896. By the Rev. L. Froc. sm. f°. Zi-ka-wei, 1896.

Zürich, Schweizerische Meteorologische Central-Anstalt.—Annalen. 1895. "Der Schweiz. meteor. Beob." 32. Jahrg. 4°. Zürich, s.a.

——— **Wetterbericht.** 1897, Jan. 1-Dec. 31. sm. f°. Sheets.

APPENDIX XIV.

ACCOUNT of RECEIPTS and PAYMENTS for the year ending 31st March, 1898:—

RECEIPTS.			PAYMENTS.		
	£	s. d.		£	s. d.
Balance from year 1896-97	1,429	5 3	ADMINISTRATION :	£	s. d.
Parliamentary Vote ...	15,300	0 0	Council... ..	968	9 5
Repayment of expenses charged under—			Secretary	800	0 0
(1.) Incidental expenses ...	12	8 4	Salaries and wages ...	990	1 3
(2.) Observatories ...	37	5 11	Rent, fuel, and lighting	712	9 4
(3.) Inspections ...	0	19 0	Incidental and contingent expenses ...	239	17 10
	50	13 3	Furniture and fittings	96	18 1
			Pensions	144	0 0
SUPPLY OF INFORMATION :					3,951 15 11
Daily Weather Charts and Forecasts ...	263	16 11	SPECIAL RESEARCHES :		
6 p.m. Charts ...	25	0 0	Salaries and other charges		782 12 9
Reports for Press Agencies, &c. ...	103	0 5	LAND METEOROLOGY :		
Telegrams sent abroad... ..	143	3 11	Observatories and stations, including remuneration of observers	2,273	12 2
	535	1 3	Salaries :—Discussion and reduction of observations, &c. ...	1,344	14 10
SALE OF INSTRUMENTS, &c. :					3,618 7 0
Royal Navy account ...	29	18 3	WEATHER INFORMATION AND FORECASTS :		
Mercantile Marine account ...	120	17 6	Telegraphic reports and storm warnings, remuneration of observers, &c. ...	2,634	18 5
"M.O." (Stations) account	42	6 9	Salaries :—Preparation and issue of reports and forecasts ...	1,886	3 1
	193	2 6			4,521 1 6
Repayment of miscellaneous Commissions executed for Colonial and Foreign institutions, &c. ...	149	0 8	INSPECTIONS :		
Commission charged on work done for Colonies, &c. ...	10	16 0	Salaries and travelling expenses		404 4 11
			OCEAN METEOROLOGY :		
			Salaries :—Discussion and reduction of observations ...	1,408	10 1
			Expenses incidental to the supply of instruments :—		
			Proportion for care and issue of instruments ...	398	6 8
			Royal Navy	249	18 1
			Mercantile Marine	368	8 3
			Distant island and coast stations ...	10	0 0
					2,435 3 1
			Miscellaneous commissions executed for Colonial and Foreign institutions, &c. ...		199 4 7
			BALANCE :		
			Cash at Bank	1,686	17 9
			" at Office	53	11 5
			Advance for travelling expenses	15	0 0
					1,755 9 2
£	17,667	18 11		£	17,667 18 11

In the year 1897-98 the sum of 1,613*l.* 10*s.* 6*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires, &c.

APPENDIX XV.

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.
1889	[1-9]	Summaries of Rainfall and Mean Temperature, for the First, Second, Third, and Fourth Quarters, and for the Whole Year, during the 24 Years 1866 to 1889. [Contains Separate Yearly Values from the year 1866.]
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. [For separate Yearly Values for 1866-89, <i>see</i> 1889 [1-9].]
"	[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 the whole Period comprehended in the 15 Years 1881-95, the Mean Temperature of the Air, for each week in the Year.
1897	[1-9]	Summaries of Rainfall and Mean Temperature for the First, Second, Third, and Fourth Quarters, and for the Whole Year, during the 32 Years 1866-97. [For the separate Yearly Values for 1866-89, <i>see</i> 1889 [1-9].] (p. 123.)

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	[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.

Year.	Page.	—
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 Mr. 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.
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 Mr. W. H. Dines.
"	46	Experiments with Violle's Actinometer Apparatus.
"	47	On the Work done with the Harmonic Analyser at the Meteorological Office.

Year.	Page.	
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	27	Report on the Comparisons made between two Pressure Tube Anemometers on the roof of the Meteorological Office, by Mr. R. H. Curtis.
1895-96	24	Note on Anemometer Experiments, by Mr. 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.

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 XVI.

LIST OF PUBLICATIONS issued under the Authority
of the Meteorological Council.

OFFICIAL.

- No. 1. Report of the Meteorological Committee for 1867. 1*s*.
2. Instructions for Meteorological Telegraphy. New Edition, 1891. Prepared for the use of observers exclusively.
3. Fishery Barometer Manual. (New edition, 1887.) 6*d*.
4. Charts showing the Surface Temperature of the South Atlantic Ocean in each Month of the Year. 2*s*. 6*d*.
5. Report of the Meteorological Committee for 1868. 5*d*.
6. Report of the Meteorological Committee for 1869. 10*d*.
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5*s*. each.
8. Barometer Manual. (Out of print. See Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5*s*. each.
10. Report of the Meteorological Committee for 1870. 10*d*.
11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2*s*. 6*d*.
12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2*s*. 6*d*.
13. A Discussion of the Meteorology of that Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February, 1870. With Book of Charts, 5*s*.
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5*s*. each.
15. Report of the Meteorological Committee for 1871. 10*d*.
16. Quarterly Weather Report for 1871.—Parts I. to IV. 5*s*. each.
17. Report of the Meteorological Committee for 1872. 1*s*.
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2*s*.
19. Quarterly Weather Report for 1873.—Parts I. to IV. 5*s*. each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20°—30° W., and remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20*s*.
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1873. 1*s*.
22. Report of the Meteorological Committee for 1873. 4*d*.
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2*s*.

24. Instructions in the Use of Meteorological Instruments. [Reprinted 1892.] (New edition in course of preparation.) 2s. 6d.
25. Quarterly Weather Report for 1874.—Parts I., II., and IV., 5s. each. Part III., 5s. 9d.
26. Report of the Meteorological Committee for 1874. 6d.
27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. 24s.
28. Contribution to the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger*. 1s.
29. Report of the Meteorological Committee for 1875. 4d.
30. Quarterly Weather Report for 1875.—Parts I.—IV. 5s. each.
31. Report of the Meteorological Committee for 1876-7. 3s. 5d.
32. The Meteorology of the North Atlantic during August, 1873, with 31 Synoptic Charts. With Book of Charts. 15s.
33. Quarterly Weather Report for 1876 (New Series).—Part I., 6s.; Parts II., III., and IV., 5s. each.
- *33A. Meteorological Observations at Stations of the Second Order for the year 1876.
- 33B. Meteorological Observations at Stations of the Second Order for the year 1877.
34. Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Vol. I.: Part I., 2s.; Part II., 10s.; Part III., 6s.; Part IV., 5s.; Part V., 6s.
35. Report of the Meteorological Council for 1877-8. 1s.
36. Report of the Proceedings of the Second International Meteorological Congress at Rome, 1879. 1s. 6d.
37. Report on the Meteorology of Kerguelen Island. By Rev. S. J. Perry, S.J., F.R.S. 3s.
38. Report of the Meteorological Council for 1878-9. 5d.
39. Meteorological Observations at Stations of the Second Order for the year 1878. 20s.
40. Aids to the Study and Forecast of Weather, by W. Clement Ley, M.A. 1s.
41. Report of the Meteorological Council for 1879-80. 1s.
42. Report of the Meteorological Council for 1880-81. 1s. 2d.
43. Meteorological Charts for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Charts, 25s.; Remarks, 7s.
44. 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. 7s. 6d.
45. Meteorological Observations at Stations of the Second Order for the year 1879. 20s.
46. Report on the Storm of October 13-14, 1881. By Robert H. Scott, F.R.S. 1s. 6d.

* The Observations at Stations of the Second Order for the years 1873-1875 will be found in the Quarterly Weather Reports for the respective years.

LIST OF PUBLICATIONS—*continued.*

47. Rainfall Tables of the British Isles for 1866-80. Compiled by G. J. Symons, F.R.S. 7s. 6d.
48. Report of the Meteorological Council for 1881-2. 1s.
49. Quarterly Weather Report for 1879. (New Series.) Parts I., II., and III., 6s. each; Part IV., 5s. 6d. Appendices and Plates. 27s.
50. Quarterly Weather Report for 1880. (New Series.) Parts I. and II., 6s. each; Part III., 4s.; Part IV., 6s. Appendices and Plates. 28s.
- 51.* Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1881. (New Series.) Part I., 10s. 6d. Parts II., III., and IV., 21s. each.
52. Quarterly Weather Report for 1877. (New Series.) Part I., 10s.; Part II., 5s.; Part III., 4s. 6d.; Part IV., 6s. Appendices and Plates. 27s.
53. Meteorological Atlas of the British Isles. 5s. 6d.
54. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1882. Parts I. and II., 20s. each; Part III., 22s. 6d.; Part IV., 26s.
55. Quarterly Weather Report for 1878. (New Series.) Parts I., II., III., and IV., 6s. each. Appendices and Plates. 28s.
56. Sunshine Records of the United Kingdom for 1881. 4s.
57. Meteorological Observations at Stations of the Second Order for the year 1880. 34s. 6d.
58. Report of the Meteorological Council for 1882-3. 10½d.
59. Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. 21s.
60. Principles of Forecasting by means of Weather Charts. By the Hon. Ralph Abercromby, F.R.Met.Soc. (Second edition.) Revised. 2s.
61. A Barometer Manual for the Use of Seamen. With an Appendix on the Thermometer, Hygrometer, and Hydrometer. (Third Edition.) 6d.
62. Monthly Weather Reports for 1884. Jan., Feb., March, May—Nov., 1s. 6d. each. April (with 2 Appendices), 2s. 6d. Dec., 1s. 9d.
63. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1883. Parts I., II., and III., 21s. each; Part IV., 30s.
64. Report of the Meteorological Council for 1883-4. 1s. 2d.
65. Monthly Weather Reports for 1885. Jan. to Dec., 1s. 6d. each.
66. Meteorological Observations at Stations of the Second Order for the year 1881. 35s.
67. Report of the Meteorological Council for 1884-5. 4s. 4d.
68. Monthly Weather Reports for 1886. Jan. to Dec., 1s. 6d. each.

* For the years 1874-1880 the Hourly Readings were issued in lithographed form. Price 20s. per annum.

69. Meteorological Observations at Stations of the Second Order for the year 1882. 35s.
70. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1884. Part I., 12s.; Part II., 10s.; Part III., 10s. 6d.; Part IV., 15s.
71. Synchronous Weather Charts of the North Atlantic and the adjacent Continents. Aug. 1, 1882, to Sept. 3, 1883. Parts I. to IV. (33 sheets each.) 17s. each.
72. Report of the Meteorological Council for 1885-86. 8d.
73. Meteorological Observations at Stations of the Second Order for the year 1883. 30s.
74. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1885. Parts I. and II., 11s. each; Part III., 10s. 6d. Part IV., 12s.
75. Report of the Meteorological Council for 1886-87. 8d.
76. Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. 10s. 6d. Supplementary Chart, 6d.
- *77. Monthly Weather Reports for 1887. January to April, 1s. 6d. each. May to December, in wrapper, 12s.
78. Meteorological Observations at Stations of the Second Order for the year 1884. 32s.
79. Report of the Meteorological Council for 1887-88. 1s.
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