

R E P O R T
OF THE
METEOROLOGICAL COUNCIL

TO THE
ROYAL SOCIETY,

For the Year ending 31st of March 1891.

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



L O N D O N :
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1892.

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THE METEOROLOGICAL COUNCIL,

1890-91.

Lieutenant-General RICHARD STRACHEY, R.E., C.S.I., F.R.S.,
Chairman.

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

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MR. EDWARD J. STONE, M.A., F.R.S.

Captain WILLIAM J. L. WHARTON, R.N., F.R.S., Hydrographer of
the Admiralty.

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

For the Year ending March 31, 1891.

THERE has been no change in the Council during the year. Introductory.
The executive officers are as in the last Report :—

Mr. R. H. Scott, M.A., F.R.S., Secretary.

Nav.-Lieut. C. W. Baillie, R.N., F.R.A.S., Marine Superintendent.

Purchase of new House for Valencia Observatory.—The Council, Transfer of
Valencia
Observatory. having come to the conclusion that it was desirable to transfer their observatory on Valencia Island to a house in the immediate neighbourhood in a more favourable situation, arranged, with the sanction of the Treasury and the assent of the Royal Society, to supply the necessary funds for the purchase of Westwood House, Cahirciveen, in the name of the President and Council of the Royal Society, the legal status of the Meteorological Council not admitting of their entering into a contract of this description. The particulars will be found in Appendix I., p. 23.

Registration under Companies Act.—In view of the difficulty that arose in the foregoing matter the Council further resolved to apply to the Board of Trade for registration under section 23 of the Companies Act, 1867, having first obtained the consent of the President and Council of the Royal Society to their action. The matter is now under the consideration of the Board of Trade. Registration of
Council as a
corporate
body.

Admission of Boy Clerks.—To regulate in a more satisfactory manner the admission of boy clerks to the Office, rules were framed on the subject during the past year, following as far as practicable the system followed in the Public Service. The rules will be found at Appendix II., p. 25.

The present Report is arranged under three headings :—

- I. Ocean Meteorology.
- II. Weather Telegraphy.
- III. Land Meteorology of the British Isles.

PART I.

OCEAN METEOROLOGY.

Collection of
information.

Collection of Information—The practice followed by the Office with reference to observers at sea, as described in former Reports, remains unchanged.

Recognition of
"excellent"
observers.

Appendix III. (p. 26) contains a list of all the observers who during the past year have contributed logs classed as "excellent." Several of these observers have regularly co-operated with the Office for many years. The names which appear in the list for the first time are as follow:—

Captain's Name.	Ship.
George of Wales, H.R.H. Prince (Lieut. and Commr., K.G.).	H.M.S. "Thrush."
Andersen, O. E. - - -	S.S. "Longhirst."
Buckler, J. H. - - -	S.S. "Essequibo."
Day, Lieut. E. A., R.N. - - -	H.M.S. "Dart."
Elliott, W., R.N.R. - - -	S.S. "Clan Murray."
Gilpin-Brown, Lieut. F. D., R.N. - - -	H.M.S. "Egeria."
Gould, H. W. - - -	S.S. "Norse King."
Home, W. E., R.N., M.B., B. Sc. - - -	H.M.S. "Thrush."
Nicholson, J. I. - - -	"Majestic."
Somerville, Lieut. Boyle, T. R.N. - - -	H.M.S. "Dart."
Squares, W. G., Chief Officer - - -	S.S. "Minia."
Speck, F. - - -	S.S. "Rohilla."
Streater, R. - - -	"Lutterworth."
Trenaman, R. W. - - -	S.S. "Pascal."
Young, W. H., Chief Officer - - -	S.S. "Clan Murray."

Proportion of
"excellent" to
total number of
logs received.

The total number of logs received in the year ending March 31, 1891, is 156, of which 115, or 74 per cent., have been classed as "excellent."

The average number of logs received annually during the five years, 1885-89, was 183, of which the per-centage of "excellent" logs was 75.

The Council take this opportunity of expressing their best thanks to the observers who have assisted them during the past year.

They regret to have to announce the deaths of two of their observers; Capt. W. Hird, ship "Marlborough," who had kept 6 "excellent" logs; and Capt. T. Mesnard, ship "Sierra Miranda," who had kept 9.

Appendix IV. (p. 28) gives a list of meteorological logs and of meteorological reports from stations abroad, received at the Office during the year.

The following summary of the voyages of the ships observing for the Office shows the districts from which observations were received during the year:—

Districts from which observations are obtained.

To Baffin's Bay or Greenland	-	-	-	-	4
„ North America, East Coast	-	-	-	-	17
„ „ „ West „	-	-	-	-	3
Off East Coast of North America	-	-	-	-	3
To West Indies	-	-	-	-	16
„ South America, East Coast	-	-	-	-	19
„ „ „ West „	-	-	-	-	3
„ Australia and New Zealand, viâ Cape of Good Hope	-	-	-	-	23
At Australian stations	-	-	-	-	7
To India, viâ Suez	-	-	-	-	5
„ India, viâ Cape of Good Hope	-	-	-	-	22
„ China, viâ Suez	-	-	-	-	8
„ Cape of Good Hope	-	-	-	-	12
„ East Coast of Africa	-	-	-	-	1
Between British Ports	-	-	-	-	4
To Continental Ports	-	-	-	-	9

Red Sea Charts.—The printing of these charts has been delayed by the introduction of new matter relating to the distribution of gales. The charts are now almost completed. Red Sea.

Cape Guardafui Charts.—These charts have been engraved and published. Cape Guardafui.

The Aden Cyclone of June 1885.—These charts have been engraved and published. The Aden Cyclone.

Cyclone Tracks in the Southern Indian Ocean.—These have been engraved and published. Indian Ocean Cyclones.

Current Charts for the Atlantic, Pacific, and Indian Oceans.—The extraction of data from the Remark Books of the Royal Navy has been completed, and the Royal Navy log books are now being examined for the period prior to the introduction of the uniform system of Remark Books. Current Charts

Southern Ocean.—The extraction of data from the Office logs for this district has been completed, and the log books of H. M. ships are now being dealt with. Southern Ocean.

Supply of Instruments to Stations in the Pacific, &c.—In further continuance of the endeavour to obtain information from the Pacific Islands and other rarely visited parts of the ocean, instruments have been supplied during the year to three stations in British New Guinea, to Fotuna Island, New Hebrides, and to Valua Island in the Banks Group, lying to the north of the last-named group. The Council also intend in the coming summer to supply a meteorological outfit, with a self-recording anemometer, to St. Helena. Pacific Ocean.

Heligoland.—The instruments belonging to the Office at Heligoland have been withdrawn, on the transfer of that island to Germany.

Stock of
Instruments
belonging to
the Office.

Supply and Stock of Instruments.—In Appendix V. (p. 34) is given a list of the meteorological instruments supplied by the Office to ships in the Royal Navy during the year, with a statement for the 31st March 1891 of the stock and distribution of the instruments standing on the books to the account of the Admiralty.

Appendix VI. (p. 35) gives similar information with regard to the disposal of the other instruments belonging to the Office, remaining in store, or which have been supplied to the Mercantile Marine, observatories, telegraph offices, &c.

PART II.

WEATHER TELEGRAPHY AND FORECASTS.

Administra-
tive.

There have been no serious interruptions of telegraphic communication, and no changes in the reporting staff, during the year.

A list of the telegraphic reporting stations, British and Foreign, is given in Appendix VII. (p. 36).

The work in this branch of the Office continues to increase. The Daily and Weekly Weather Reports, in particular, have been extended and improved.

Inspection of
the Stations.

Inspection of the Telegraphic Reporting Stations.—The telegraphic reporting stations have been inspected during the year, in England by Mr. Ley, in Scotland by Mr. Buchan, and in Ireland and Wales by Mr. Scott. The reports submitted by the Inspectors to the Council, which are printed in Appendix VIII. (p. 37), show that the efficiency of the service continues to be satisfactorily maintained.

Discussion of
the reports.

Discussion and Publication of the Information received.—The practice of the Office in collecting, discussing, and disseminating the meteorological information received by telegraph is described in Appendix IX. (p. 55). The Daily Weather Report has appeared regularly during the year; for details see that Appendix. It is distributed free of cost as follows:—To newspapers, seven copies; to seaports, for public exhibition, 71 copies; to Government offices and public institutions, 66 copies; to correspondents of the Office, 73 copies; and to foreign meteorological establishments, 46 copies. Nearly 200 copies are issued regularly to subscribers.

The Weekly Weather Report, with its Monthly Appendices, has also appeared regularly; for particulars of this publication see Appendix IX., p. 56.

Display of
information in
front of the
Office.

Public display at the Office of the State of the Weather on British Coasts.—With a view to the earliest possible supply to the public of the latest information as to the weather received from the principal points on the southern coasts, the substance of the reports received by telegraph at 9.30 a.m. and 3 p.m. every week day, of the state of the weather and sea at the following stations: Yarmouth, Dungeness, the Needles (Hurst Castle), Scilly, Holyhead, and Valencia, is displayed in a conspicuous manner on the front of the Office, 63, Victoria Street.

Weather Forecasts.—Forecasts are prepared three times a day, namely, at 11 a.m., at 3.30 p.m., and 8.30 p.m. The Forecasts prepared at 11 a.m., on the information derived from the 8 a.m. reports, refer to the probable weather between noon on the day of issue and noon on the following day. They are publicly exhibited in several places in London,* and are supplied to the afternoon editions of the newspapers. The 3.30 p.m. Forecasts are employed for storm warnings only, excepting in the hay harvest season, when they are issued, as subsequently explained. The forecasts at 8.30 p.m. are specially prepared for publication in the morning newspapers, but all the forecasts are available for the information of anyone who applies for them at the Office.

The inquiries received through the Post Office for special forecasts during the year amounted to 58, and the personal applications to 45. The rules of the Office relating to such inquiries are stated in Appendix IX. (p. 60).

The results of a comparison of the Forecasts issued at 8.30 p.m. during the year, with the weather actually experienced are given in Appendix X. (p. 62). The following summary shows the successes and failures over the whole United Kingdom, estimated as explained in that Appendix. The results were best, 88 per cent., for England South, and worst, 77 per cent., for Ireland South.

SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1890-91.

Districts.	Per-centages.				Total per-centage of Success.
	Complete Success.	Partial* Success.	Partial* Failure.	Total Failure.	
SCOTLAND, N. - -	48	35	11	6	83
" E. - -	53	27	13	7	80
ENGLAND, N.E. - -	54	29	12	6	83
" E. - -	53	30	13	5	83
MIDLAND COUNTIES -	53	30	13	4	83
ENGLAND, S. - -	58	30	10	3	88
SCOTLAND, W. - -	46	33	14	8	79
ENGLAND, N.W. - -	49	34	11	6	83
" S.W. - -	52	31	11	7	83
IRELAND, N. - -	45	34	12	9	79
" S. - -	42	35	14	10	77
Summary - -	50	32	12	6	82

* Note "partial" implies "more than half."

* Viz., 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 House of Commons, at Messrs. Elliot'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.

Testing of the
Forecasts.

The following table shows for each year from 1882 to 1890, inclusive, the per-centages of complete and partial success of the Forecasts issued at 8.30 p.m. for the whole year.

PER-CENTAGES OF RESULTS OF FORECASTS for the whole of the
BRITISH ISLES.

	Year.	Complete Success.	Partial, <i>i.e.</i> , more than Half Success.	Total Success.
	1882 - -	43	37	80
	1883 - -	48	33	81
	1884 - -	50	31	81
	1885 - -	50	34	84
	1886 - -	49	31	80
	1887 - -	52	32	84
	1888 - -	51	31	82
	1889 - -	49	32	81
	1890 - -	50	32	82
	Average - -	49	32	81

Hay Harvest
Forecasts.

Hay Harvest Forecasts.—The Council renewed in 1890 the offer made in previous years to the Royal Agricultural Society, the Royal Dublin Society, and the Highland and Agricultural Society to send Daily Forecasts *gratis* during the haymaking season to a number of observers selected by those Societies, on two conditions, viz., that the information should be made known as widely as possible, and a record of the weather actually experienced sent weekly to the Office. The Societies accepted the proposal, and the Forecasts were issued as shown in the following table:—

LIST of those who received HAY HARVEST FORECASTS
in 1890.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass - Major Smith -	Golspie. Munlochy, Inverness.
1. SCOTLAND, E.	J. Whitton - G. Murdoch - C. L. W. Forbes -	Glamis Castle, by Forfar. Rothiemay, Huntly. Aberfeldy.
2. ENGLAND, N.E.	Sir J. Wilson - J. Turner -	Chillingham Barns, Chatton, Northumberland. The Grange, Ulceby.
3. ENGLAND, E.	W. Birkbeck - Sir J. B. Lawes, Bt., and J. H. Gilbert, Ph.D.	High House, Thorpe, Norwich. Rothamsted, Harpenden.
4. MIDLAND COUNTIES	Royal Agricultural College. E. E. Harcourt-Vernon	Cirencester. Grove Hall, East Retford.
5. ENGLAND, S.	C. Whitehead - E. P. Squarey - G. M. Allender - M. J. Sutton -	Barming House, Maidstone. The Moot, Downton, Wilts. Stammerham, Horsham. Reading.

Districts.	To whom sent.	Address.	Hay Harvest Forecasts.
6. SCOTLAND, W.	W. Calder - -	Castle Hill, Dalreoch, Dum-barton.	
	M. J. Stewart, M.P. -	Ardwell, Stranraer.	
	J. S. R. Ballingal -	Eallabus House, Islay.	
7. ENGLAND, N.W.	G. W. Wray - -	Leyburn, Yorkshire.	
	The Earl of Derby, K.G.	Knowsley Hall, Prescott.	
8. ENGLAND, S.W.	Colonel T. Picton Turbervill.	Ewenney Priory, Bridgend, Glamorganshire.	
	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, J.P. -	Currygrane, Edgeworthstown.	
10. IRELAND, S.	D. A. Milward -	Lavistown, Kilkenny.	
	W. Talbot Crosbie, D.L.	Ardfert Abbey, Tralee, Co. Kerry.	
	The Earl of Rosse, K.P.	Birr Castle, Parsonstown.	

The issue of the forecasts commenced on June 11th with those for the South and East of England, and were continued for about five weeks, ending on the 3rd of August over the greater part of Scotland, and a week later in Ireland.

The general result of the issue of these forecasts, shown by the subjoined table, has been prepared solely from the reports of the above-mentioned gentlemen, and is entirely independent of any estimate formed within the Office itself:—

SUMMARY OF RESULTS.—HAY HARVEST FORECASTS, 1890.

Districts.	Names of Stations.	Percentages.				Total percentage of Success.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
SCOTLAND, N.	Munlochy and Golspie - -	52	35	8	5	87
" E.	Aberfeldy, Glamis, and Rothiemay -	53	42	5	—	95
ENGLAND, N.E.	Chatton and Ulceby - -	57	31	10	2	88
" E.	Rothamsted, and Thorpe - -	54	32	13	1	86
MIDLAND COUNTIES	Cirencester and East Retford -	50	42	6	2	92
ENGLAND, S.	Reading, Maidstone, Downton, and Horsham.	52	42	6	—	94
SCOTLAND, W.	Stranraer, Islay, and Dumbarton -	60	28	12	—	88
ENGLAND, N.W.	Leyburn and Prescott - -	47	38	12	3	85
" S.W.	Tortworth, Clifton, Bridgend, and Glastonbury.	52	36	11	1	88
IRELAND, N.	Moynalty and Edgeworthstown -	55	37	5	3	92
" S.	Tralee, Kilkenny, and Parsonstown -	50	37	9	4	87
	Mean for all districts - -	53	36	9	2	89

These figures show that the results for the forecasts for 1890 were about the same as those for 1889, and indicate the highest proportion of success that has ever been reached.

Hay Harvest
Forecasts.

The largest general per-centage (95) was attained in the east of Scotland, and the lowest (85) was in England North-west.

A further reference was made to the Board of Agriculture on the subject of the possible extended utilization of these forecasts in agricultural districts, in pursuance of the intention noted in last year's Report.

Supply of Forecasts to the Fleet during the Manœuvres.—At the request of the Admiralty daily forecasts were supplied to the Commander-in-Chief of the "A" Fleet during the continuance of the Manœuvres as in the two preceding years.

Storm
warnings.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix XI. (p. 63) are given the names of the stations furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade issued in February 1874.

These stations were, at the end of March 1891, 153 in number, situated:—

72 in England, 16 in Wales, 44 in Scotland, 15 in Ireland, 3 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 weather experienced on our coasts, the warnings being tested by the method explained in Appendix IX. (p. 60). The results of this comparison are shown in the following tables:—

RETURN of the RESULT of the COMPARISON between the
WARNINGS ISSUED and the WEATHER EXPERIENCED in 1890.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent gales, Force 8 and upwards.	Warnings justified by subsequent strong Winds, Forces 6 and 7.	Warnings not justified by subsequent Weather.	Warnings late, Force 9 reached at two Stations before issue.	Warnings partially late, Force 9 reached at one Station before issue.	Storms for which no Warning was issued.
Scotland, N.E.	40	32	6	2	—	—	Mar. 12,* Ap. 8, June 25.
„ E.	32	17	11	3	—	1	—
„ N.W.	44	26	13	2	1	2	June 25.
„ W.	45	24	13	7	—	1	—
Ireland, S.W.	53	34	8	8	1	2	Nov. 14.
„ N.W.	49	32	10	2	3	2	Jan. 14, Mar. 12, Mar. 24, Ap. 9, Nov. 4, Dec. 31.
Irish Sea	46	34	4	4	—	4	Jan. 7, Ap. 8, Nov. 14, Dec. 30.
St. George's Channel	40	21	13	6	—	—	—
Bristol Channel	39	23	14	1	—	1	Dec. 30.
England, S.W.	35	21	12	1	—	1	Jan. 17.
„ S.	26	15	9	2	—	—	—
„ S.E.	23	12	9	2	—	—	—
„ E.	24	11	9	3	1	—	—
„ N.E.	29	18	3	6	1	1	Jan. 9, Mar. 12, Ap. 8.
Totals -	525	320	134	49	7	15	
Per-centages -	—	61.0	25.5	9.3	1.3	2.9	

* This gale was confined to the extreme northern part of the district.

With a view of adding to the efficiency of these warnings a revision of the districts in which the stations are arranged has been made during the year, and further measures taken to improve the record of storms on the coasts by means of which the utility of the warnings are better checked than was formerly the case. Storm warnings.

NOTES as to GALES in 1890 for which WARNINGS were not issued.

Gales, for which no warning was issued, were experienced on 11 occasions. They were in almost all instances confined to very limited portions of the coast, and may be grouped as follows:—

Three (on January 14th, March 24th, and November 4th) were felt in "Ireland, N.W." only. This is the first year in which any attempt has been made to warn this coast at all, as its very exposed position makes it liable to be affected by gales which arise from causes too far distant to be detected by the instruments in our islands in time for warnings to be issued.

One (January 7th) was of a sporadic character—only a few of the stations in the district (the Irish Sea) feeling any gale at all.

Three (January 9th, 17th, and December 30th–31st) resulted from the unexpected extension to an unwarned portion of the coast of gales which had been duly warned for in the other districts where they were felt.

Two (April 8th–9th and November 4th) were caused by a very sudden increase of pressure in the rear of disturbances which appeared to be passing away as unimportant systems.

Those needing special remark were the gales of—

March 12.—A fresh to strong gale from south-west and west felt over the northern parts of the kingdom. Its approach was not indicated by the Reports of March 11th.

June 25th.—Severe south-westerly to westerly gale in Scotland—caused by a depression which was either (1) much deeper on evening of 24th than appeared from the telegraphic reports, or (2) increased greatly in intensity as its centre advanced towards Scotland.

November 14.—Fresh to strong southerly to south-easterly gale felt over "Ireland, S.W." and the Irish Sea. No indication of its approach was given by the reports of the 13th.

December 30th–31st.—An easterly gale felt in the Bristol Channel and Irish Sea. Caused by the advance of a depression to Spain while an anticyclone of great intensity lay over the North Sea and south of Scandinavia. Our southern, eastern, and north-eastern coasts were warned, but the Bristol Channel and Irish Sea did not seem to be threatened.

Comparison of
results for
1889 with
previous years.

The following table contains a comparative statement of the storm warnings and their results in 1890, and in the ten preceding years. It will be seen that the total per-centage of warnings justified is 86·5, being 5·3 per cent. more than that for the preceding year:—

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.
1880	390	58·2	24·6	82·8	13·3
1881	454	58·6	23·3	81·9	14·8
1882	503	61·4	21·1	82·5	14·9
1883	610	56·2	21·6	77·8	20·8
1884	461	66·4	20·0	86·4	12·1
1885	591	55·3	24·0	79·3	19·5
1886	542	55·3	26·9	82·2	15·9
1887	472	55·5	26·1	81·6	16·4
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

Fishery
barometers.

Fishery Barometers.—To add to the means of obtaining warnings of stormy weather by the sea-going population, barometers were many years ago supplied by the Board of Trade on loan to fishing villages and other places on the coast, to be set up for public information. The whole number of stations supplied by the Office with these instruments is 180. Of these 58 are in England, 6 in Wales, 51 in Ireland, 60 in Scotland, 4 in the Isle of Man, and 1 in Jersey. The list is given in Appendix XII., p. 65.

The inspection of the Fishery Barometers in England and Ireland, which was commenced two years ago, has been completed by Captain Toynbee during the past summer.

In almost all cases the instruments were found to be in good order, and they seemed to be valued by the fishermen. Whenever possible, the opportunity of the inspection was taken to impart instruction in the use of instruments in connexion with weather observations.

Simultaneous
observations.

Simultaneous Observations.—The Office has continued its co-operation in the system of International simultaneous observations, taken at Greenwich mean noon, as explained in former Reports, which was organised in 1874, at the request of the Chief Signal Officer of the United States.

The number of these observations which have been received during the year from the Royal Navy has been 4,000, and from the Mercantile Marine, 3,820.

PART III.

LAND METEOROLOGY OF THE BRITISH ISLES.

Observatories and Stations.—The observations of the climate of the British Isles, which are received by the Office from certain

stations, may be arranged in five classes, according to the degree of completeness with which they are made.

1. The Observatories furnished with self-registering instruments by which all the principal meteorological phenomena are recorded continuously. These alone afford the materials necessary for the study of the periodic variations of the meteorological elements. Self-recording observatories.

2. Anemographic stations furnished with instruments registering the wind only. The records from these stations relate rather to weather as distinguished from climate, and are especially important in connexion with storms. They are often useful in affording evidence available in courts of law with respect to collisions at sea, and damage done by wind. Anemographic stations.

3. Stations of the Second Order furnishing climatological information from eye observations taken twice a day. The observers at these stations are all volunteers. Stations of Second Order.

4. The Telegraphic Reporting Stations, at which the observations are taken by eye, but supplemented in some cases by self-recording aneroids, &c., supply the material upon which the daily weather reports and forecasts are based. The hours of observation at these stations are determined by the requirements of the telegraphic system, as explained in Part II., but the data which they furnish are also utilized to afford climatological information for parts of the country where Stations of the Second Order do not exist. Telegraphic Reporting Stations.

5. Extra stations furnishing returns with less completeness and detail than those of Class 3. Extra stations.

A continuous record of the amount of bright sunshine is received from 42 stations in the British Isles, of which some are first or second order stations, whilst from others the sunshine record is alone received. See Appendix XIII., p. 66. Sunshine stations.

A fuller account of these several stations and of the methods employed by the Office in dealing with their records will be found in Appendix XIV., p. 67.

Appendix XV., p. 70, contains a list of all documents relating to the land meteorology of the British Isles received at the Office during the year. Documents received.

Inspection of the Stations.—The self-recording observatories and the anemographic stations (Classes 1 and 2), as well as the Telegraphic Reporting Stations (Class 4), are regularly visited each year by the Inspectors of the Office. The extra stations (Class 5) are inspected as opportunity offers. Of the Stations of the Second Order (Class 3), some belong to the Royal Meteorological Society, and these are visited by an Inspector appointed by that Society, an allowance being made by the Office toward the cost of the inspection, in accordance with the recommendation of the Treasury Committee (1877). The remaining Stations of the Second Order, including those belonging to the Scottish Meteorological Society, are visited most of them annually by the Inspectors of the Office. The Superintendent of the Kew Observatory, Mr. G. M. Whipple, and his chief assistant, Mr. T. W. Baker, are specially employed to inspect and report on the self-registering apparatus, and on the Inspection of stations.

Inspection of stations. photographic processes at the observatories. Extracts from the Reports of the Inspectors are given in Appendix VIII., p. 37.

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

Publications. *The Quarterly Weather Report.*—The volume for 1880 has been completed, and with it the issue of these Reports, with the reproduction of the continuous records from the seven observatories, comes to an end. A list of the volumes of this publication, with the dates of their several appearances, was given in the last Report. In its place there have been successively issued, first, the Monthly Weather Report for the years 1884 to 1887, and subsequently the Monthly Summary of the Weekly Weather Report. It is intended to publish a quarterly summary of the principal weather changes for the years 1881 to 1883, so as to connect the Quarterly Weather Reports with the Monthly Weather Report series.

The Weekly Weather Report, which is prepared in the Telegraphic Branch of the Office (see Appendix IX., p. 56), supplies, by its synchronous charts and Monthly Summaries, a very complete and instructive view of the chief meteorological changes, day by day, over the greater part of Europe, such as is not to be found in any of the similar publications issued by any other office.

Appendix I. to the Weekly Weather Report for 1890 gives a summary for each quarter, and for the whole year, of the Rainfall and Temperature for each district, for the 25 years 1866–1890, and also the Monthly and Progressive values of Accumulated Heat, Rainfall, and Bright Sunshine for all the districts in each month of 1890. Appendix II. to the same Report gives the Weekly and Progressive values for the same elements during the year 1890 (in continuation of Appendix II. for the year 1889), and Appendix III. gives the Mean Weekly values for the following number of years:—

Accumulated Heat and Rainfall, 13 years, 1878 to 1890.

Bright Sunshine - - - 10 „ 1881 „ 1890.

Appendix IV. gives for each district, for the 13 years 1878 to 1890, the mean temperature for each week in the year.

Hourly Readings of Meteorological Instruments.—The Volume of Hourly Means for 1887, which, as was announced in the last Annual Report, the Council have determined to substitute for the Hourly Readings hitherto published, has been issued. It comprises:—

- (1.) *Hourly* means of pressure, temperature, the difference between the dry and wet bulbs, and of wind components, together with the amount and frequency of rain; these hourly means will be for periods of (a) five days, (b) calendar months, and (c) the year.

- (2) The daily, five-daily, monthly, and yearly means of pressure and temperature, and amounts of rainfall. Publications.
- (3.) The daily extremes of pressure and temperature, and the maximum hourly fall of rain in each month.
- (4.) The number of observations of wind and the mean velocity, referred to eight points, for each hour of the day and for the day, for each month; and also the mean velocity of the wind, irrespective of direction, at each hour of the day for each month.

The computation of mean hourly values of the temperature of the air and of barometrical pressure for the seven observatories and for each month has been completed for several years, and is still being carried on. The work is somewhat lengthy, but considerable progress has already been made with it.

Observations at Stations of the Second Order.—The volumes for 1886 and 1887 have appeared.

As mentioned in the last Report, the number of stations returns from which are published *in extenso* has been reduced to 21, while at the same time the number of those from which monthly means and summaries are published has been largely increased.

The following is the list of stations for which returns have been published for 1887:—

STATIONS for PUBLICATION in DETAIL on Form A.,
21 in Number.

Stations.	In connexion with	Years already published in detail.	Remarks.
Glasgow -	M. O.	11	Formerly observatories. 10 years hourly readings already published. Continuous records of pressure, temperature, wind, and rainfall still available, except for Armagh, which furnishes wind and rain only. For Stonyhurst and Armagh the records for 1884 and 1885 have been published among the stations on Form A.
Stonyhurst -	M. O.	13	
Armagh -	M. O.	13	
Dunrobin Castle -	S. Met. Soc.	7	High-level station (1,113 feet).
Braemar -	S. Met. Soc.	7	
Dundee -	S. Met. Soc.	7	
Wolfelee -	S. Met. Soc.	1	
Scarborough -	R. Met. Soc.	6	Sutton Coldfield to be substituted for Churchstoke for 1889.
Hillington -	R. Met. Soc.	10	
Churchstoke -	R. Met. Soc.	11	
Carmarthen -	R. Met. Soc.	12	Dartmoor (1,395 feet) to be substituted for Babbacombe in 1890.
Margate -	R. Met. Soc.	5	
Babbacombe -	R. Met. Soc.	10	
Swanbister (Orkneys).	M. O.	1	This is the most northern station available, and there is a continuous record of wind.

Publications.

Stations.	In connexion with	Years already published in detail.	Remarks.
Laudale -	M. O.	8	At both of these stations there are long series of observations available taken by the officers of the Ordnance Survey.
Douglas (Isle of Man).	M. O.	9	
Southampton -	M. O.	9	
Dublin (Mountjoy Observatory).	M. O.	1	
Markree Castle -	M. O.	12	
Parsonstown -	M. O.	14	
Londonderry -	M. O.	8	

LIST for PUBLICATION on Form B. (Monthly Means and Summaries).

Swanbister.	£ Hillingdon (Norfolk).
£ Lairg.	£ Leicester.
£ Dunrobin Castle.	£ Uppingham.
£ Gordon Castle.	£ Churchstoke (Montgomeryshire).
£ Glencarron.	£ Geldeston (Beccles).
£ Aberdeen.	£ Bennington.
£ Fort Augustus.	£ Cheltenham.
£ Braemar.	£ St. David's.
£ Fort William.	£ Carmarthen.
£ Lednathie.	£ Berkhamsted.
£ Laudale (Argyleshire).	£ Kew.
£ Dundee.	£ Margate.
£ Ochtertyre.	£ Southampton (Ord. Survey Office).
£ Callton Mor.	£ St. Leonard's.
£ Glasgow.	£ Eastbourne.
£ Rosewell.	£ Southbourne.
£ Rothesay (Isle of Bute).	£ Rousdon.
£ Marchmont.	£ Dartmoor.
£ Wolfelee.	£ Babbacombe (Torquay).
£ Pinmore (Ayrshire).	£ Falmouth.
£ Glenlee.	£ Londonderry.
£ Cramlington.	£ Lissan (Co. Tyrone).
£ Cargen.	£ Armagh.
£ Durham.	£ Brookeborough (Colebrooke Park).
£ Newton Reigny.	£ Markree Castle (Co. Sligo).
£ Aysgarth (Yorkshire).	£ Dublin (Glasnevin).
£ Scarborough.	£ Dublin (Mountjoy Observatory,
£ Cronkbourne (Douglas), Isle of Man.	£ Phoenix Park).
£ York.	£ Dublin (City).
£ Stonylhurst.	£ Parsonstown (Birr Castle).
£ Wakefield.	£ Killarney.
£ Prestwich.	£ Valencia.
£ Llandudno.	
£ Buxton.	

The Stations marked £ belong to the Scottish, and those marked £ to the Royal Meteorological Society.

Observations on Ben Nevis.

Observations on Ben Nevis.—The arrangements made with the Directors of the Observatory on the summit of Ben Nevis, at a height of 4,406 feet above the sea, and explained in the Report for 1885, remain in force, and the Council have continued the annual grant of 100*l.* towards the expenses of the Observatory,

and have received MS. copies of all the meteorological observations taken. Observations on Ben Nevis.

The building of the new observatory at Fort William, which has been constructed in connexion with that on Ben Nevis, is now completed. It has previously been explained that the Council had agreed to subsidize this observatory to the extent of 250*l.* a year, and supply it with the necessary outfit of instruments. These were sent down and erected in July 1890, and the observations began on July 14. Observatory at Fort William.

Removal of the Anemometer from Swanbister, Orkney.—In the month of August the anemometer which had been situated at Swanbister, in the parish of Orphir, Orkney, since the death of Dr. Clouston, of Sandwick, was removed to Stenness schoolhouse. The change was rendered necessary by the removal of Mr. Fortescue from Swanbister. Mr. Whipple superintended the operations. Change of position of station in the Orkney Islands.

Sea Surface Temperature on the Coasts of the British Isles.—These observations, which are obtained through the courteous assistance of the Admiral Superintendent of Naval Reserves, the Trinity House, and the Commissioners of Irish Lights, are still continued, and a large amount of valuable information is thereby collected. Sea Surface Temperature.

Cloud Photography and Measurement.—This subject has continued to receive attention, but as yet thoroughly satisfactory results have not been obtained. Cloud Photography.

The methods formerly adopted for this work have been considerably modified, and the present arrangements are still of a somewhat tentative character; but it is hoped that results will eventually be obtained under the improved system, by means of which the difficulties of observation and computation hitherto met with will be overcome, and a practical method arrived at which will enable the height and velocity of clouds to be readily ascertained by the comparison of photographs made simultaneously at the extremities of a base of known length.

The Bridled Anemometer.—This instrument, devised by Professor Stokes for recording the force of strong gusts of wind, has been altered in accordance with the conclusions arrived at from the experiments carried out by Mr. W. H. Dines mentioned in the last Report, and further experiments have since been made by him in order to determine the scale of the instrument. Further experiments have also been carried on by Mr. Dines at Hersham with respect to other questions relating to wind from which many very interesting results are anticipated. An account of these will be found at Note A., p. 22. The Bridled Anemometer.

Electrical Anemometer.—The electrical recording anemometer, that had been removed from Valencia on account of the continued irregularities in its action, which it had not been found possible to Electrical Anemometer.

remedy, was erected at Kew for a fresh trial, after careful cleaning and the adoption of further modifications of parts of the mechanism in the hope of removing the defects in the operation of the apparatus. A prolonged trial and comparison of the records with the self-recording anemometer of the usual construction having conclusively shown that the electrical arrangement could not be relied on, the instrument was dismantled in July last, and it is not intended to persevere further with the experiment.

Violle's
Actinometer.

Violle's Actinometers.—At the request of the Solar Physics Committee the Council have undertaken to institute some experiments at Kew Observatory on Violle's apparatus for measuring solar radiation. A series of observations have been made with two Violle's actinometers (*boules conjuguées*) in order to ascertain whether these instruments can be relied on to afford trustworthy and comparable measures of isolation, and also whether they are suited for the use of observers who have had no special training in the use of physical apparatus. After the thermometers had been verified, and the constants of the instruments, viz., their masses, dimensions, and respective rates of cooling, had been determined, they were subjected to a prolonged comparison, exposed to the sun under constant conditions. Subsequently several special series of observations were made with variations of the blackened surface, and with changes in the position of the instruments, in order to ascertain in what degree their indications are affected by such changes. The results have been communicated to the Committee on Solar Physics, and are now under discussion.

Trevandrum
observations.

The negotiations mentioned in the last Report with regard to the discussion and publication of the meteorological and magnetic observations made by the late J. Allan Broun, F.R.S., in the years 1853 to 1865, at Trevandrum and Agastia in Southern India have been continued, with the result that the Indian Meteorological Department has agreed to undertake the work as far as regards the meteorological data. The whole of the records have accordingly been despatched to India, except those relating exclusively to magnetical work.

LIBRARY.

Library.

The library contains standard works on Meteorology and the allied Sciences, and is, besides, particularly rich in Transactions, Proceedings, Reports, and other Publications which give a large mass of Meteorological observational data from all parts of the world, extending over many years. It consists at present of over 11,000 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men for reference at the Office.

Appendix XVI., p. 75, contains a list of the additions to the library during the year, which have been catalogued upon cards, and are entered in the reference catalogues under (1) Authors, and (2) Subjects.

EXPENDITURE.

Appendix XVII., p. 96, shows the receipts and payments during the year ending 31st March 1890. The amount voted by Parliament was 15,300*l.*, as in the previous year. Financial

The following abstract of expenditure shows the amount properly chargeable to the year in question, and its distribution under the various heads, together with the increase or decrease in 1890-91 as compared with the previous year :

NET EXPENDITURE.	1889-90.	1890-91.	Increase.	Decrease.
GENERAL ADMINISTRATION:	£ s. d.	£ s. d.	£ s. d.	£ s. d.
<i>Payment of Council</i> -	955 18 4	988 15 0	32 16 8	—
<i>Secretary</i> -	800 0 0	800 0 0	—	—
<i>Office</i> -	801 4 2	789 14 0	—	11 10 2
<i>Rent, fuel, and lighting</i> -	701 14 3	726 10 3	24 16 0	—
<i>Alterations to premises, attendance, and contingencies</i> -	474 7 6	736 16 2	263 8 8	—
<i>Expenses incidental to International Meteorological Congress</i> -	5 2 0	37 9 8	32 7 8	—
<i>Pensions</i> -	186 16 4	186 16 4	—	—
SPECIAL RESEARCHES -	710 10 6	950 13 3	240 2 9	—
LAND METEOROLOGY -	3,544 9 11	3,412 10 0	—	131 19 11
WEATHER INFORMATION -	3,777 19 5	3,759 17 11	—	18 1 6
INSPECTIONS -	664 2 5	706 8 9	42 6 4	—
OCEAN METEOROLOGY -	2,736 9 4	2,294 5 2	—	442 4 2
Total -	£ 15,358 14 2	15,390 16 6	635 18 1	603 15 9

In the year 1890-91 the sum of 1,515*l.* 10*s.* 8*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to clerks, and rental of private wires.

(Signed) R. STRACHEY,
Chairman.

NOTE A.

In the Report of 1890 it was stated that Mr. Dines was carrying out a series of experiments on the resistance of plates of various forms at oblique incidences to the wind. These experiments were carried out with skill and care, and the results have been communicated to the Royal Society in a valuable paper.* It is unnecessary to give an account here of the experiments, and it will suffice to say that the conclusions arrived at are interesting and novel, so that the Council feel that their support of the investigation has been fully justified.

On the suggestion of the Royal Meteorological Society, the Council requested Mr. Dines to carry out on their behalf a series of experiments for the purpose of comparing various forms of anemometer under the action of the natural wind. He hopes ultimately to make comparisons between—

1. A medium-sized Robinson anemometer.
2. A small Robinson anemometer.
3. Richard Frères anemometer.
4. Dines's self-adjusting helicoidal instrument.
5. A circular-pressure plate.
7. Sir G. Stokes's bridled anemometer.
8. An air-meter.

When the experiments are completed, a final report on all these instruments will be submitted to the Council.

For the present it will suffice to say that experiments were made on December 30th, 1890, for comparing the Kew pattern Robinson anemometer (with factor 2·00), an air-meter, and a tube anemometer. The constants of the air meter had been carefully determined by means of a series of experiments with the whirling machine. The tube anemometer was a combination of Lind's and Hagemann's instruments. The instruments were kept in action during about 25 minutes, with the result that the mean velocity of wind deduced from—

1. The Kew instrument, was 14·50 miles an hour.
2. The air-meter, was 15·62 miles an hour.
3. The tube anemometer, was 16·5 miles an hour.

Mr. Dines has also been making some supplementary experiments with his whirling machine on the resistances of curved plates and vanes. The work is nearly finished, and his report will be communicated to the Royal Society.

* "On Wind Pressure on an inclined Surface," by W. H. Dines, *Proc. Roy. Soc.*, vol. xlviii., pp. 233-257.

APPENDIX.

APPENDIX I.

CORRESPONDENCE with the ROYAL SOCIETY as to PURCHASE of the
LEASE of a HOUSE for the VALENCIA OBSERVATORY.

Meteorological Office,

SIR,

January 12, 1891.

I AM directed by the Meteorological Council to forward, for the consideration of the President and Council of the Royal Society, copies of letters* that have passed between the Meteorological Office and the Treasury relative to the proposed purchase of the lease of a house at Valencia, in Ireland, for an observatory in place of the present building now so used.

The Meteorological Council being satisfied that, so long as the meteorological services at present conducted under their supervision are maintained, an observatory at Valencia will be necessary, have been led to the conclusion that it is very desirable to take advantage of an opportunity that has now presented itself of securing, for what may be practically regarded as a permanency, a building much more conveniently situated and otherwise more suitable than the house now occupied for this purpose.

The constitution of the Meteorological Council and their dependence on the annual Parliamentary grant would make it impossible for them to enter into an agreement such as is involved in the purchase of a lease for a long term of years; and it has occurred to them that the object they have in view might be easily attained if the Royal Society would agree to become the purchasers of the lease, the purchase money and ground rent, together with all other liabilities, being at the entire charge of the Meteorological Office.

The Meteorological Council have at their command a sufficient sum to purchase the lease, viz., 1,400*l.*, and they can without any difficulty meet all other charges that may arise in connexion with the transaction.

They considered it to be essential to solicit the approval of the Treasury to the arrangement before addressing the Royal Society, and they have now obtained this necessary authority, and have also been informed that the representatives of the present leaseholders are prepared to sell for the sum already named.

Together with the letters before referred to, I also have the honour of forwarding, for the information of the President and Council of the Royal Society, a copy of the lease, which, it will be seen, is held from Trinity College, Dublin, for the residue of a term of 99 years, of which about 25 years have expired. The obligations under the lease are not in any way onerous or likely to give trouble in the future.

Should the President and Council of the Royal Society assent to this proposal, as it is hoped they may do, there would seem to be no necessity for entering into any formal agreement between the Society and the Meteorological Council, which is in fact a Committee of the Royal Society, recognised by the Treasury for the discharge of certain duties.

* Not printed here.

The contemplated arrangement would constitute the Royal Society the absolute owners of the lease, on the understanding, first, that all pecuniary liabilities would be discharged by the Meteorological Council from the funds at its disposal; second, that in the event of circumstances arising of whatever nature, to lead the Royal Society to desire to sell the lease or otherwise dispose of it, they should have full power to do so at their discretion; and third, that in the event of the lease being sold, the net proceeds should be held at the disposal of the Treasury as required by their letter.

At the same time, I am to add that should the President and Council of the Royal Society be of opinion that any special precautions are required to protect their interests, the Meteorological Council will endeavour to meet their wishes so far as is practicable.

I am, &c.

(Signed) ROBERT H. SCOTT,
Secretary.

To the Secretary
of the Royal Society.

Royal Society, Burlington House,
January 17, 1891.

SIR,

Your letter dated January 12, 1891, has been laid before the President and Council of the Royal Society, and I am directed to reply as follows:—

The President and Council are willing to become the purchasers of the lease of the house at Valencia in Ireland, on the conditions named in your letter, viz.:

1. That the Meteorological Council should pay the sum demanded for the lease, viz., 1,400*l.* (fourteen hundred pounds), and all the costs of the purchase, and defray all other pecuniary liabilities connected with it, such as ground rent, rent and taxes, costs and repairs, including those rendered necessary by fire, storm, or tempest, insurance, &c., as stated in the lease.

2. That the Royal Society should have the power to sell the lease or otherwise dispose of it should such a course seem to them at any time desirable.

The President and Council on their part undertake, in the event of the lease being sold, to place the net results of such sale at the disposal of my Lords of the Treasury, as required by their letter of January 9, 1891.

I am, &c.

(Signed) M. FOSTER,
Secretary, Royal Society.

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

APPENDIX II.

REGULATIONS for the ENGAGEMENT and EXAMINATION of BOY CLERKS
at the METEOROLOGICAL OFFICE.

1. The salaries of boy clerks will begin at from 12*s.* 6*d.* to 15*s.* 6*d.* per week, according to the age of the lads, and will rise annually by 1*s.* 6*d.* per week up to a maximum of 20*s.* per week.

2. Candidates must not be less than 15 and not more than 17 years of age on the first day of the examination referred to in the next paragraph.

3. No boy shall be eligible to serve as a boy clerk in the Meteorological Office who has not passed an examination recognised by the Council as equivalent to that of the Civil Service Commission in the following subjects, viz. :—

Handwriting,
Orthography, and
Arithmetic, including vulgar and decimal fractions.

4. Boy clerks will not be retained as such after completing their 20th year, but will be eligible, subject to Rule 5, for appointment to the regular staff, when suitable vacancies occur, after two years (or if admitted after 17 years of age, one year) of good service, to the satisfaction of the Secretary.

They will also be considered eligible, subject to Rule 5, to fill suitable vacancies occurring within two years of their leaving the Office, provided they have served in it not less than two years.

5. No boy shall be eligible for appointment to the regular staff unless he has passed two of the examinations in the advanced stage of the Science and Art Department in the following subjects :—

- a.* Subject 5. Mathematics (II. Stage),
- b.* „ 6. Theoretical Mechanics,
- c.* „ 8. Sound, Light, and Heat,
- d.* „ 9. Magnetism and Electricity,
- e.* „ 10. Inorganic Chemistry,
- f.* „ 23. Physiography,

or the same subjects at any other examination recognised by the Council as equivalent.

6. It is to be clearly understood that boy clerks are liable to be discharged at the discretion of the Council on receiving one week's notice.

APPENDIX III.

LIST of CAPTAINS and OFFICERS who have sent in Logs classed as "Excellent" during the year ending March 31, 1891. The figures opposite to each show the total number of such Logs which they have returned to the Office during the period that they have been observing.

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Andersen, O. E. - -	3	S.S. "Longhirst."
Angus, T. S. - -	3	S.S. "Canton."
Atkinson, S. P. H. - -	4	"Hollinwood."
Balfour, Lieut. and Comr. A. F., R.N.	24	H.M.S. "Stork."
Baxter, A. S. - -	5	"City of York."
Belding, R. - -	3	"Atlantic."
Blackburne, Mr. H. S. - -	9	S.S. "Rohilla."
Bolton, S. H. - -	11	S.S. "Baidar."
Bright, H. - -	4	"Beltana."
Buchan, J. - -	21	"Elise."
Buckler, J. H. - -	1	S.S. "Essequibo."
Cameron, J. G., R.N.R.	6	S.S. "Germanic."
Campbell, J. - -	8	"Glengarry."
Campbell, R. - -	5	S.S. "Elton."
Clapp, Comr. E. S., R.N.	12	L.H. Tender "Richmond."
Clarke, Comr. A. C., R.N.	3	H.M.S. "Espègle."
Couper, W. - -	3	"Clackmannanshire."
Crichton, A. T. - -	6	SS. "Circe" and S.S. "Amarynthia."
Cromarty, D. S. - -	4	"Cassandra."
Crowley, C. - -	5	"Alexander Lawrence."
Crutchley, W. C., R.N.R.	22	S.S. "Kaikoura."
Dart, L. C. - -	11	"Semantha."
Dawson, Comr. L. S., R.N.	10	H.M.S. "Rambler."
Day, Lieut. E. A., R.N.	2	H.M.S. "Dart."
De Horne, M. - -	2	S.S. "Rohilla."
Docherty, H. - -	3	"Baron Colonsay."
Dunbar, J. I. - -	20	S.S. "Arracan."
Elliott, W., R.N.R.	1	S.S. "Clan Murray."
England, T. - -	10	"Jane."
Exham, T. K., F.R.A.S.	9	S.S. "Esk" and S.S. "Tamar."
Field, Comr. A. M., R.N.	5	H.M.S. "Egeria."
Frederick, Lieut. and Comr. G. C., R.N.	10	H.M.S. "Dart."
Garnsworthy, T. - -	2	S.S. "Ardancorrach."
George of Wales, H.R.H. Prince, Lieut. and Comr., K.G.	1	H.M.S. "Thrush."
Gilpin-Browne, Lieut. F. D., R.N.	1	H.M.S. "Egeria."
Gould, H. W. - -	1	S.S. "Norse King."
Gray, J. - -	14	S.S. "Hope."
Hepworth, C. M. W. - -	8	S.S. "Port Adelaide."
Home, Dr. W. E., R.N., B.Sc.	1	H.M.S. "Thrush."
Irving, P. J., R.N.R.	9	S.S. "Teutonic."

Name of Captain or Officer.	Number of "Ex- cellent" Logs.	Ship.
Janes, G. - - -	4	"Middlesex."
Jennings, R. C. - - -	5	S.S. "Colina" and S.S. "Circe."
Kemp, A. H. - - -	4	"Hudson."
<i>Mesnard, T.</i> - - -	9	"Sierra Miranda."
Milne, W. F. - - -	8	S.S. "Esquimaux" and S.S. "Polynia."
Milner, W. H. - - -	10	S.S. "La Plata."
Mitchell, G. - - -	3	S.S. "Trinacria."
Moignard, P. - - -	5	"Fort James."
Molony, E. J. - - -	9	"British Merchant."
Munn, L. A. - - -	4	S.S. "Durban" and S.S. "Spartan."
Murdoch, P. - - -	11	"Sierra Lucena."
Nicholson, J. I. - - -	1	"Majestic."
North, W. G. - - -	15	S.S. "Flato."
Oldham, Comr. C. F., R.N. -	11	H.M.S. "Egeria."
Parry, M., F.R.Met.Soc. -	16	S.S. "Prydain."
Parson, G. F. - - -	10	"Earnock."
Peebles, R. - - -	14	"Bracadale."
Pope, J. - - -	4	S.S. "Dee."
Powles, F. W. - - -	8	S.S. "Essequibo."
Price, J. H. - - -	5	"Viola."
Pritchard, Lieut. C. E., R.N. -	4	H.M.S. "Espiegle."
Quaile, D. W. A. - - -	4	"Craigerne."
Randall, W. - - -	12	"Laomene."
Ritchie, A. - - -	3	"Four Winds."
Rosseter, W. L. - - -	12	"Columba" and "Brenda."
Sargent, A. H. - - -	5	"Pleione."
Scott, G. - - -	5	"Holcrood."
Scott, W. - - -	21	"Winifred."
Simpson, A. - - -	13	S.S. "Australasian."
Simpson, A. - - -	20	S.S. "Traveller."
Somerville, Lieut. Boyle T., R.N. - - -	2	H.M.S. "Dart."
Speck, F. - - -	2	S.S. "Rohilla."
Squares, Mr. W. G. - - -	1	S.S. "Minia."
Streater, R. - - -	1	"Lutterworth."
Thompson, Lieut. H., R.N. -	4	H.M.S. "Rambler."
Tizard, Staff-Capt. T. H., R.N. -	11	H.M.S. "Triton."
Travers, H. D. - - -	9	S.S. "Tartar."
Trenaman, R. W. - - -	2	S.S. "Pascal."
Trevor-Roper, Dr. G. D., R.N. -	2	H.M.S. "Stork."
Trott, S., F.R.Met.Soc. -	18	S.S. "Minia."
Wait, A. M. - - -	5	S.S. "Spartan."
Walker, H., R.N.R. - - -	13	S.S. "Servia."
Wheaton, N. J. - - -	12	"Eliza."
Wilson, J., R.N.R. - - -	6	S.S. "Ethiopia."
Woolward, R. - - -	7	S.S. "Nile" and S.S. "Don."
Young, Mr. W. H. - - -	1	S.S. "Clan Murray."

Names of deceased observers printed in italics.

APPENDIX IV.—SHIPS supplied and DOCUMENTS returned during the year ending 31st March 1891.

The number of merchant ships supplied with standard instruments and meteorological logs during the above period was 86.

The number of meteorological logs, and documents from Foreign Stations, received during the same period, and registered in the Office, amounted altogether to 321, of which 184 were returned from ships, and the remainder from land stations, outside the British Isles.

List of DOCUMENTS received from FOREIGN LAND STATIONS.

Place.	Observer.	No. of Documents.	Nature of Observations.
Abaco (Bahamas)	T. R. Thompson, sen., and C. A. Strachan, Lightkeepers.	3	" Lighthouse " Register, 1889, July to December; 1890, January to December.
Akassa, Nun River, Niger Delta	Frank Russell, F.R.G.S.	2	Two observations daily, 1889, December; 1890 January to March.
Reyrou (Lee Observatory)	R. H. West, M.A.	11	" " " 1890, March to December; 1891, January.
Brumana (Mt. Lebanon)	Thomas Little	1	" " " 1891, February.
Cape Juby (N.W. Africa)	Hubert Bray, M.R.C.S., L.R.C.P.	9	" " " 1890, February to November.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper	2	" Lighthouse " Register 1890, January to December.
Cay Lobos (Bahamas)	Lightkeepers	2	" " " 1890, January to December.
Cay Sal (Bahamas)	T. R. Thompson, Sen., Light- keeper.	2	" " " 1890, January to December.
Famagusta (Cyprus)	G. Elades	3	Two observations daily, 1889, January to December.
George Town (British Guiana)	Robert Ward	9	" " " 1890, February to December; 1891, January.
Gibraltar	Staff-Sergeant H. Spackman, and Sergeant R. Scott, Med. Staff Corps.	12	" " " 1890, February to December; 1891, January.

LIST of DOCUMENTS—continued.

Place.	Observer.	No. of Documents.	Nature of Observations.
Grand Bassam -	G. Baillan, West African Tel. Co.	2	Two observations daily, 1890, March, April.
Heligoland -	J. J. Friederichs, Lightkeeper	10	" " 1890, March to December.
Inagua (Bahamas) -	Lightkeepers -	1	" " " Register, 1890, February to August.
Kyrenia (Cyprus) -	M. Fuletham and C. Natais -	3	Two observations daily, 1889, January to December.
Larnaca (Cyprus) -	G. P. Voudiziano -	3	" " " " "
Limassol (Cyprus) -	Luigi Béraud -	3	" " " " "
Nicosia (Cyprus) -	G. Stephen -	3	" " " " "
Papho (Cyprus) -	E. A. Malliotis -	3	" " " " " 1890, February to October; 1891, January.
Principe Island (West Africa) -	G. R. Scovell -	9	" " " " " 1890, February to October; 1891, January.
Suva (Fiji) -	J. D. W. Vaughan, F.R.Met. Soc.	7	One observation daily, 1890, January to April, July to November.
Teneriffe (San Antonio) -	Mrs. W. L. Boreham -	4	Two observations daily, 1890, February, November, December; 1891, January.
Teneriffe (Sitio de Cullen) -	A. F. Perry -	7	" " " 1890, March to December; 1891, January.
Tobago -	J. P. Tulloch, M.A., M.D. -	12	" " " 1890, January to December; 1891, January, February.
Trinidad -	J. H. Hart, Supt. Botanic Gardens. -	11	" " " 1890, February to December; 1891, January.
Valua Island (Banks Archipelago) -	W. Ford -	1	One observation daily, January 1887 to September 1890.
Watling Island (Bahamas) -	T. R. Thompson, jun., Light-keeper. -	1	" " " Register, 1890, January to December.

LIST of DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Voyage.	Year.
Andersen, O. E.	S.S. Longhirst	Algoa Bay, Akyab	1889-90
" "	"	Genoa, Philadelphia, Bremerhaven	1890
" "	"	Genoa, Philadelphia	1890
Anderson, Charles	S.S. Achilles	China, via Suez	1888-89
Angus, T. S.	S.S. Canton	" "	1890
¹ " "	"	" "	1890
Armstrong, B. G.	R.M.S. Elbe	Brazil	1889-90
² " "	"	East coast of South America, Barbadoes	1890-91
Asquith, W.	S.S. Deucalion	China, via Suez	1888
Atkinson, S. P. H.	Hollinwood	Melbourne, San Francisco	1889-90
³ Balfour, Lient. and Comr. A. F., R.N.	H.M.S. Stork	Simon's Bay, East coast of Africa	1889-90
Barker, R. J. M.	Barque Earl of Aberdeen	Calcutta	1889-90
Bartlett, T.	S.S. Diomed	China, via Suez	1889
Baxter, A. S.	City of York	Rio Janeiro, Rangoon	1889-90
Behenna, Richard	Loch Katrine	Melbourne	1890
Belding, Rawstin	Barque Atlantic	River Plate	1890
Bennett, J. T.	Alcester	Batavia	1889-90
⁴ Berwick, G. R.	S.S. Strathleven	Chinese Ports, New York, via Suez	1890
Bigley, W. B.	S.S. Diomed	China, via Suez	1888
Bolton, S. H.	S.S. Baidar	Continental Ports	1890
" "	"	"	1890
Bright, Henry	Barque Beltana	Adelaide	1889-90
Brown, R. J.	S.S. Titan	China, via Suez	1888
Buchan, James	Barquentine Elise	Demerara, Philadelphia	1890
⁵ Buckler, J. H.	S.S. Essequibo	West Indies	1890
Bulkeley, T. D.	S.S. Derwent	" "	1889-90
⁶ Cameron, J. G., R.N.R.	S.S. Germanic	New York	1890
Campbell, James	Glengarry	Rangoon	1890-91
⁷ Campbell, Robert	S.S. Elton	Bombay, via Suez, Alexandria, Sulina	1890
⁷ " "	"	Ports in the Black Sea and Mediterranean	1890
⁸ Clapp, E. S., R.N.	Schooner Richmond	Bahamas	1890
⁸ " "	"	"	1890
⁹ Clarke, Comr. A. C., R.N.	H.M.S. "Espiegle"	Esquimalt, Honolulu, Malden Island, Acapulco	1889-90
Cook, T. H.	S.S. Gulf of St. Vincent	Valparaiso	1890
Couper, William	Clackmannanshire	Sydney	1889-90
Crichton, A. T.	S.S. Amarynthia	Montreal	1890
" "	S.S. Circe	Baltimore	1890
Cromarty, D. S.	Barque Cassandra	New York, Adelaide	1889-90
Crowley, C.	Barque Alexander Lawrence.	New York, Madras, Mauritius	1889-90
Crozier, F. R. M.	H.M.S. Terror	"	1839-42
" "	"	"	1839-42
¹⁰ Crutchley, "W. C., R.N.R.	R.M.S. Kaikoura	Cape Town, Hobart, Rio Janeiro	1890
¹⁰ " "	"	"	1890
¹¹ " "	"	Cape Town, Wellington, Rio Janeiro	1890-91
Dart, L. C.	Semantha	Calcutta	1889-90
¹² Davies, David	Andora	San Francisco, Sydney	1889-90
¹³ Dawson, Comr. L. S., R.N.	H.M.S. Rambler	Sydney, Hong-Kong	1890
¹³ " "	"	China Sea	1890
¹⁴ De Horne, M.	S.S. Rohilla	China, via Suez	1890
Dickinson, L. R.	S.S. Atrato	Brazil	1890
Docherty, Hugh	Baron Colonsay	Singapore	1889-90

Captain's Name.	Ship.	Voyage.	Year.
Docherty, Hugh	Baron Colonsay	Port Pirie - - -	1890-91
Dunbar, J. I.	S.S. Arracan	Rangoon, via Suez - - -	1890
" "	"	" " - - -	1890
" "	"	" " - - -	1890-91
Elliott, Wm., R.N.R.	S.S. Clan Alpine	Cape Town, Colombo - - -	1890
⁵ " "	S.S. Clan Murray	Cape Town, Ceylon, home via Suez - - -	1890
" "	" "	Ceylon, via Cape Town, home via Suez - - -	1890
England, Thomas	Barque Jane	Demerara - - -	1889-90
" "	"	Quebec - - -	1890
⁵ Exham, T. K.	R.M.S. Esk	West Indies - - -	1889-90
⁵ " "	"	" - - -	1890
" "	S.S. Tamar	Brazil - - -	1890
¹⁶ Field, Comr. A. M., R.N.	H.M.S. Egeria	Thursday Island, Singapore, Hong-Kong - - -	1890
Fordyce, William	County of Edinburgh	Calcutta - - -	1888-89
Foster, Henry	H.M.S. Chanticleer	Madeira, Fernando de Noronha, Cape of Good Hope, Staten Island, Deception Island - - -	1828-29
" "	"	Staten Island, Deception Island, St. Martin's Cove - - -	1828-29
¹⁷ Frederick, Lieut. and Comr. G. C., R.N.	H.M.S. Dart	Surveying off Queensland - - -	1889
¹⁷ " "	"	At Australian station - - -	1889-90
¹⁸ " "	"	" " - - -	1890
¹⁸ " "	"	Australian station, Sandwich Island, New Hebrides - - -	1890
Garnsworthy, Thomas	S.S. Ardancorack	Havanna, New York, Norfolk (Va.) - - -	1890
¹⁹ George of Wales, Lieut. and Comr. H.R.H. Prince, K.G.	H.M.S. Thrush	Gibraltar, Las Palmas, Bermuda, Halifax - - -	1890
¹⁹ " "	"	Halifax, Bermuda, Jamaica - - -	1890-91
²⁰ Gillies, W. - "	S.S. Medway	West Indies - - -	1889-90
" "	"	Jamaica, Barbadoes - - -	1890
Gordon, G. G.	Falkland Hill	Cape Town, Lyttleton - - -	1889-90
²¹ Gould, H. W.	S.S. Norse King	Montreal - - -	1890
²² Gray, John	S.S. Hope	Greenland - - -	1890
²³ Griffin, E. J., R.N.R.	R.M.S. Moor	Cape Town - - -	1889-90
²⁴ " "	"	" - - -	1890
²⁴ " "	"	" - - -	1890-91
Guthrie, W. E.	S.S. Bellerophon	China, via Suez - - -	1888
Hannah, W. T.	S.S. Glaucus	" - - -	1888-89
⁵ Hepworth, C. M. W.	S.S. Port Adelaide	Adelaide, via Cape of Good Hope, home, via Suez - - -	1890
²⁵ Hicks, G. M.	S.S. Thames	Lisbon, Brazil - - -	1890
Hutchinson, I.	S.S. Orestes	China, via Suez - - -	1888-89
²⁶ Huxtable, R. G.	Barque Lanarkshire	Brisbane, New Caledonia - - -	1890
²⁷ Irving, P. J.	S.S. Teutonic	New York - - -	1890
Jackson, Charles	S.S. Palamed	China, via Suez - - -	1888-89
" M. H. F.	S.S. Telamon	" - - -	1889
" T. S.	S.S. Palinurus	" - - -	1888
Janes, George	Middlesex	Singapore - - -	1889-90
Jennings, R. C.	S.S. Colina	Halifax - - -	1889-90
²⁸ " "	S.S. Circe	Montreal - - -	1890
" "	"	" - - -	1890
Jones, Henry	S.S. Telemachus	China, via Suez - - -	1888-89
Kemp, A. H.	Barque Hudson	New Zealand - - -	1890
⁵ King, James	City of Hankow	Monte Video, Philadelphia, Hiogo, San Francisco - - -	1889-91
Lapage, W. P.	S.S. Anchises	China, via Suez - - -	1888-89
Martin, T. C.	Loch Tay	Melbourne - - -	1890-91

Captain's Name.	Ship.	Voyage.	Year.
²⁹ Martin, W. -	S.S. German -	Cape Town -	1890
³⁰ " -	" -	" -	1890-91
Mesnard, Thomas -	Sierra Miranda -	" Chittagong -	1889-90
³¹ Miller, A. T., R.N. -	H.M.S. Conway -	Off Birkenhead -	1890
Milligan, John -	S.S. Jason -	China, via Suez -	1888-89
" S. -	S.S. Stentor -	" -	1888-89
Milne, W. F. -	S.S. Esquimaux -	St. John's, Newfoundland -	1890
" " -	S.S. Polynia -	Baffin's Bay -	1890
³² Milner, W. H. -	R.M.S. La Plata -	Brazil -	1890
" " -	" -	W. coast of South America -	1890
Mitchell, George -	S.S. Trinacria -	Genoa, Philadelphia -	1889-90
" " -	" -	Gibraltar, New York, Mediter- ranean Ports -	1890-91
Moignard, Philip -	Fort James -	San Francisco -	1890-91
Molony, E. J. -	British Merchant -	Melbourne, San Francisco -	1890-91
³³ Munn, L. A. -	S.S. Durban -	Cape Town -	1889-90
⁵³ " " -	" -	" -	1890
³⁴ " " -	S.S. Spartan -	" -	1890
Murdoch, Peter -	Sierra Lucena -	Melbourne, Rangoon -	1889-90
Murray, Alexander -	S.S. Perseverance -	Cumberland Straits -	1889
Nicholson, J. I. -	Majestic -	Calcutta -	1890-91
Nish, H. -	S.S. Cyclops -	China, via Suez -	1888-89
North, W. G. -	S.S. Plato -	Hamburg -	1889-90
" " -	" -	" -	1890
" " -	" -	" -	1890
Oldham, Comr. C. F., R.N. -	H.M.S. Egeria -	Sydney, Tongatabu -	1890
¹⁶ " " -	" -	Thursday Island, Singapore, Hong- Kong -	1890
Parry, Moses -	S.S. Prydain -	New Orleans, Norfolk (Va.) -	1890
Parson, G. F. -	Earnock -	Port Pirie -	1889-90
Pattman, R. -	Barque Loch Torridon -	Calcutta -	1889-90
Pearson, C. W. -	S.S. Strathleven -	Japan, via Suez -	1889-90
Peebles, R. -	Bracadale -	New York, Calcutta -	1889-90
Pike, Thomas -	Ben Voirlich -	Guayaquil -	1889-90
³⁵ Pope, James -	R.M.S. Dee -	West Indies -	1889-90
³⁵ " " -	" -	" -	1890
³ Powles, F. W. -	R.M.S. Essequibo -	" -	1890
" " -	" -	" -	1890
Price, J. H. -	Barque Viola -	Buenos Ayres, Calcutta, Pisagua -	1889-91
Pulford, J. -	S.S. Patroclus -	China, via Suez -	1889
Pardy, Thomas -	S.S. Dardanus -	" -	1888-89
³⁶ Puttkamer, A. von -	Barque Elvira -	Paysandu, Calcutta, Buenos Ayres -	1889-90
Quaile, D. W. A. -	Barque Craigerne -	Sydney, San Francisco -	1889-90
Randall, W. -	Laomene -	Melbourne, Pisagua -	1889-90
²⁹ Reynolds, — -	S.S. German -	Cape Town -	1889-90
³⁷ Rigaud, H. C. -	R.M.S. Tamar -	River Plate -	1889-90
" " -	" -	" -	1890
Riley, James -	S.S. Ajax -	China, via Suez -	1888-89
Ritchie, Alexander -	Four Winds -	Calcutta -	1889-90
Ross, J. C. -	H.M.S. Erebus -	" -	1839-42
" " -	" -	" -	1839-42
" " -	" -	" -	1840
³⁸ Rosseter, W. L. -	Brenda -	Calcutta, Demerara, New York -	1890-91
" " -	Columba -	Calcutta, Mauritius, New York -	1889-90
⁵ Sargent, A. H. -	Pleione -	Wellington -	1890-91
Scale, R. F. -	S.S. Laertes -	China, via Suez -	1888-89
Scott, George -	Holyrood -	New York, Calcutta -	1889-90
" William -	Barquentine Winifred -	Rio Grand de Sul -	1889-90
Simpson, Alexander (No. 90,667). -	S.S. Australasian -	Melbourne, via Cape Town -	1889-90
" " -	" -	Australia, via Cape of Good Hope, Batavia, and home via Suez -	1890-91

Captain's Name.	Ship.	Voyage.	Year.
Simpson, Alexander (No. 19,365).	Barquentine Traveller	Greenland - - -	1889-90
Smith, E. J. -	S.S. Adriatic - -	New York - - -	1890
³¹ Smith, J. H., R.N.R.	H.M.S. Worcester -	Off Greenhithe - -	1890
³⁰ Speck, F. -	S.S. Rohilla - -	Bombay, Shanghai -	1890
⁴⁰ " -	" - -	Calcutta, via Suez -	1890-91
Stewart, Alexander -	County of Selkirk -	Calcutta - - -	1890-91
Streater, R. -	Barque Lutterworth -	Wellington - - -	1889-90
Stroak, J. D. -	County of Roxburgh -	Calcutta - - -	1890-91
Swynnerton, Godfrey	S.S. Lennox - -	China, via Suez - -	1889-90
" "	" - -	Hong-Kong, Yokohama, Singa- pore to New York, via Suez -	1890
⁴¹ Symmers, John -	Barque Inverurie -	Rangoon, Rio Janeiro -	1889-90
⁴² Symons, F. J., R.N.R.	S.S. Daue - -	Cape Town - - -	1889-90
Thompson, J. S. -	S.S. Nestor - -	China, via Suez - -	1888
Tizard, Staff Capt. T. H., R.N.	H.M.S. Triton - -	Off British Isles - -	1884-5
" "	" - -	" - - -	1890
⁴³ Travers, H. D. -	R.M.S. Tartar - -	Cape Town - - -	1889-90
⁴⁴ " -	" - -	" - - -	1890
⁴⁵ Treneman, R.W. -	S.S. Pascal - -	River Plate - - -	1889-90
⁴⁵ " -	" - -	Lisbon, Rio Janeiro, New Orleans	1890
Trott, Samuel -	S.S. Minia - -	Halifax - - -	1890
⁴⁶ " -	" - -	Nova Scotia - - -	1890-91
⁴⁷ Wait, A. McLean -	R.M.S. Spartan -	Cape Town - - -	1889-90
" "	" - -	" - - -	1890
⁴⁸ " "	S.S. Tartar - -	" - - -	1890
Walker, Henry, R.N.R.	S.S. Servia - -	New York - - -	1889-90
" "	" - -	" - - -	1890-91
Wheaton, N. J. -	Barque Eliza - -	Rio Janeiro, Barbadoes -	1890
" "	" - -	Ceara (Brazil) - -	1890-91
Wilding, J. -	S.S. Agamemnon -	China, via Suez - -	1888
⁴⁹ Williams, John -	Barque Elissa - -	Monte Video, Barbadoes, Georgia	1889-90
Wilson, John, R.N.R.	S.S. Ethiopia - -	New York - - -	1889-90
" "	" - -	" - - -	1890
⁵⁰ Woolward, R. -	R.M.S. Don - -	West Indies - - -	1890
⁵⁰ " "	" - -	" - - -	1890
⁵⁰ " "	R.M.S. Nile - -	" - - -	1890

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

- ¹ Assisted by W. B. Palmer, 2nd Officer, C. A. Williams, 3rd Officer, and H. W. Potter, 4th Officer.
- ² Kept by C. Cottinan.
- ³ Kept by G. D. Trevor-Roper, Surgeon, R.N.
- ⁴ Kept by John Kynoch, 2nd Mate.
- ⁵ Assisted by Officers.
- ⁶ Kept by J. T. Sheuton.
- ⁷ Assisted by C. Matthews and R. Knill.
- ⁸ Kept by Fred. W. Holden.
- ⁹ Kept by Lieut. C. E. Pritchard, R.N.
- ¹⁰ Kept by H. C. Kiddle.
- ¹¹ Kept by W. L. Paske, 4th Officer.
- ¹² Assisted by 1st Officer.
- ¹³ Kept by Lieut. Henry Thompson, R.N.
- ¹⁴ Kept by E. C. Carter, 4th Officer, D. Asbury, 5th Officer, and N. K. Cornish, 4th Officer.
- ¹⁵ Kept by W. H. Young, 2nd Officer.
- ¹⁶ Kept by F. D. Gilpin-Brown, R.N.
- ¹⁷ Kept by Lieut. Boyle T. Somerville, R.N.
- ¹⁸ Kept by Lieut. E. A. Day, R.N.
- ¹⁹ Kept by William E. Home, B.Sc., M.B., Surgeon, R.N.
- ²⁰ Kept by William Anderson, 2nd Officer.
- ²¹ Assisted by John Beavan and E. C. Crosby, 1st and 2nd Mates.
- ²² Kept by Oscar Lundus, Mate.
- ²³ Kept by J. V. Williams, 4th Officer.
- ²⁴ Kept by H. E. Butler, 4th Officer.
- ²⁵ Kept by W. H. Fooks.

- ²⁶ Kept by Lockhart W. McLaren.
- ²⁷ Kept by Walter L. D. Chapman, 2nd Officer.
- ²⁸ Kept by John Dickie, 2nd Officer.
- ²⁹ Kept by A. H. Rhodes, 3rd Officer.
- ³⁰ Kept by J. George, 3rd Officer.
- ³¹ Kept by the Cadets.
- ³² Kept by Mr. Moses, 3rd Officer.
- ³³ Kept by R. H. Sach, 3rd Officer.
- ³⁴ Kept by J. J. Brickhill, F.R.G.S.
- ³⁵ Kept by A. Jolliffe, 2nd Officer.
- ³⁶ Kept by Cecil R. A. Newby and Charles M. Redhead, R.N.R.
- ³⁷ Kept by A. Hackland, 2nd Officer, C. Langmaid, 3rd Officer, and J. Mien, 4th Officer.
- ³⁸ Assisted by Mr. Rosewarne, 1st Officer.
- ³⁹ Kept by H. S. Blackburn, Chief Officer, F. Hay's, 4th Officer, and D. Asbury, 5th Officer.
- ⁴⁰ Kept by the Officers.
- ⁴¹ Kept by George Dawson, Chief Officer.
- ⁴² Kept by G. H. Watkins, 2nd Officer.
- ⁴³ Kept by James Bowyer, 2nd Officer.
- ⁴⁴ Kept by C. R. Taylor, 3rd Officer.
- ⁴⁵ Assisted by 2nd Officer.
- ⁴⁶ Kept by W. G. Squares, Chief Officer.
- ⁴⁷ Kept by H. P. Adams, 4th Officer.
- ⁴⁸ Kept by John Bernard, 4th Officer.
- ⁴⁹ Kept by William Tait and H. Woodcock.
- ⁵⁰ Kept by F. S. Newton, 2nd Officer.

APPENDIX V.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Baro- meters.	Ane- roids.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1890, afloat -	211	480	1,328	289	258	167	53
Issued since -	75	126	365	66	60	30	53
	286	606	1,693	355	318	197	106
Returned since -	77	108	325	51	41	29	24
April 1st, 1891, afloat -	209	498	1,368	304	277	168	82

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

April 1st, 1890, in use -	61	63	208	21	21	3	11
Issued since -	11	4	98	9	8	2	1
	72	67	306	30	29	5	12
Returned since -	4	2	28	2	2	—	—
April 1st, 1891, in use -	68	65	278	28	27	5	12

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1891.

Afloat in Royal Navy -	209	498	1,368	304	277	168	82
In use at stations -	68	65	278	28	27	5	12
In store at M.O. -	46	49	224	92	110	24	38
" Chatham -	7	10	6	6	7	—	13
" Sheerness -	5	3	32	8	8	5	9
" Portsmouth -	19	50	28	7	11	5	5
" Devonport -	16	34	46	12	13	5	16
" Queenstown -	2	4	21	1	1	—	4
" Gibraltar -	1	1	8	—	—	—	4
" Malta -	11	16	56	8	12	2	17
" Bombay -	4	3	12	4	4	1	4
" Halifax -	4	10	24	3	5	—	14
" Bermuda -	4	12	25	3	5	2	15
" Jamaica -	4	3	31	2	2	—	—
" Cape of Good Hope -	4	7	30	5	6	3	4
" Trincomalee -	4	3	21	4	4	—	—
" Hong Kong -	6	20	12	7	5	—	17
" Coquimbo -	5	4	20	1	1	—	19
" Sydney -	3	5	23	5	3	—	8
" Esquimalt -	9	8	24	3	3	—	—
Total, April 1st, 1891 -	431	805	2,289	503	504	220	281
Lost, &c. since April 1st, 1890 -	2	11	294	30	10	15	18
Under repair -	8	12	—	—	—	—	—

APPENDIX VI.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1890, afloat -	107	—	636	—	—	106	342
Issued since -	41	—	284	—	—	40	131
	148	—	920	—	—	146	473
Returned since -	53	—	365	—	—	58	192
April 1st, 1891, afloat -	95	—	555	—	—	88	281

INSTRUMENTS at Stations, viz., Telegraph Offices, Observatories,
Fishing Villages, &c.

April 1st, 1890, in use -	256	4	247	55	57	54	11
Issued since -	13	—	12	6	7	3	2
	269	4	259	61	64	57	13
Returned since -	13	1	17	8	6	4	2
April 1st, 1891, in use -	256	3	242	53	58	53	11

DISPOSITION of Board of Trade Instruments on April 1st, 1891.

In merchant ships -	95	—	555	—	—	88	281
In use at stations -	256	3	242	53	58	53	11
In store at M.O. -	64	3	299	21	33	60	137
At Liverpool Agency -	7	7	33	—	—	4	34
„ Aberdeen „ -	3	—	22	—	3	4	12
„ Glasgow „ -	8	—	53	—	—	8	32
„ Dundee „ -	17	—	37	—	—	13	38
„ Hull „ -	8	—	30	—	—	6	26
„ Southampton „ -	7	—	24	—	—	11	34
Total, April 1st, 1891 -	465	13	1,295	74	94	247	605
Lost, &c. since April 1st, 1890 -	1	—	84	2	1	14	18
Under repair -	1	—	—	—	—	—	—

APPENDIX VII.

LIST of STATIONS reporting Meteorological Observations to the Office by Telegraph on 31st March 1891, with the Names of Observers.

*†Sumburgh Head -	Rev. W. Brand - - -	Minister of Dunrossness.
*†Stornoway - - -	J. Forbes - - -	Nicolson Institution.
Wick - - -	J. Sinclair - - -	Watchmaker.
Nairn - - -	Miss Penny - - -	Schoolmistress.
*†Aberdeen - - -	W. Boswell - - -	Assistant at the Observatory.
Leith - - -	W. Hay - - -	Telegraph Clerk.
*†Shields - - -	J. W. Irvine - - -	Do.
Spurn Head - - -	J. H. Watson - - -	Lightkeeper.
†York - - -	H. M. Platnauer, F.G.S. - - -	Curator of Museum.
Loughboro' - - -	W. Berridge - - -	—
†Ardrossan - - -	J. W. Mayes - - -	Telegraph Clerk.
Malin Head - - -	O. O'Doherty - - -	Signalman, Lloyd's.
*†Mullaghmore - - -	K. Kerr - - -	Retired Coastguard Officer.
*†Belmullet - - -	Miss M. J. Tolan - - -	Telegraphist.
†Donaghadee - - -	T. MacGowan - - -	Postmaster.
Parsonstown - - -	E. Haines - - -	Assistant Observer at Lord Rosse's Observatory.
*†Holyhead - - -	Capt. Richards - - -	Keeper of Sailors' Home.
Liverpool - - -	J. Hartnup, F.R.Met.Soc. - - -	Bidston Observatory.
*†Valencia - - -	J. E. Cullum, F.R.Met.Soc. - - -	Superintendent of the Observatory.
†Roche's Point - - -	W. Kennedy - - -	Telegraph Clerk.
Pembroke - - -	S. Blake - - -	Lightkeeper.
*†Scilly - - -	A. Hicks - - -	Signalman.
Prawle Point - - -	W. Hewitt - - -	Coastguard Officer.
†Hurst Castle - - -	G. G. Appleton - - -	Lightkeeper.
†Jersey - - -	J. Fisher - - -	Station Master.
*†Dungeness - - -	W. Batton - - -	Assistant Lightkeeper.
*†London - - -	F. Gaster, F.R.Met.Soc. - - -	Clerk, Meteorological Office.
Oxford - - -	W. Wickham - - -	Radcliffe Observatory.
Cambridge - - -	H. Todd - - -	Observatory.
*†Yarmouth - - -	G. T. Watson - - -	Secretary, Sailors' Home.
†Hawes Junction - - -	W. H. Bunce - - -	Station Master.

In addition to the above, reports are received daily from the following Continental Stations.

Station.	Authority.	Station.	Authority.
Haparanda - - -	} Meteorological Office, Sweden.	†The Helder - - -	} Bureau Central Météorologique, Paris.
Hernösand - - -		Cape Gris Nez - - -	
†Stockholm - - -		†Brest (St. Mathieu) - - -	
Wisby - - -		Lorient (Île de Groix) - - -	
Bodö - - -	} Meteorological Institute, Norway.	*†Rochefort (Île d'Aix) - - -	
†Christiansund - - -		†Biarritz - - -	} Cent. Met. Inst. of Germany.
*†Skudesnaes - - -		†Paris - - -	
Færder - - -		Belfort - - -	
†The Scaw - - -	} Meteorological Institute, Denmark.	Lyons - - -	} Observatory, Lisbon.
Fanö - - -		Nice - - -	
Cuxhaven - - -		Perpignan - - -	
		Berlin - - -	
	} Deutsche Seewarte, Hamburg.	Wiesbaden - - -	} Observatory, Lisbon.
		Munich - - -	
		Corunna - - -	
		†Lisbon - - -	

Note.—The stations marked with an asterisk (*) report also at 2h. p.m.; and those with a dagger (†) at 6h. p.m.; Lisbon reports at 8h. a.m. and 4h. p.m.

† This station now reports by post only.

Paris has ceased reporting at 6 p.m. on Sundays.

APPENDIX VIII.

REPORT OF INSPECTIONS, IRELAND AND WALES.

GENTLEMEN,

I HAVE to report that I have completed my usual inspections. The only stations unvisited on this occasion have been Malin Head (telegraphic), Londonderry (Second Order), and two Weekly Weather Report stations, Llandoverly and Kilkenny.

TELEGRAPHIC STATIONS.

St. Ann's Head, visited September 25.—This station calls for no remark.

Roche's Point, visited September 27.—I found that a new rain-gauge was required, and it has been supplied.

Valencia, visited October 1.—The only matter calling for notice is that there are frequent complaints of delay in the telegrams, owing to lateness of attendance at the local post office. I have further remarks on this station, which will be found in the next section of the Report.

Donaghadee, visited October 6.—This station is good, but the observer's health is not satisfactory, and in damp weather the observations are taken by substitutes, who are fairly competent.

Mullaghmore, visited October 9.—The station is in good order. An endeavour is being made to have the wire carried to the post office here. If this is done it would release the Office from its engagements as to the private wire.

Belmullet, visited October 11.—The station is in good order, but, as is usual at other stations, the space available for rain-gauge and thermometer screen is not adequate.

Parsonstown, visited October 16.—The station is in good order. The wind observations are not satisfactory, as the demesne is thickly wooded. The Council can gather the effect of this from a remark of Dr. Bæddicker's to me, to the effect that, he was often able to photograph with the 3-foot reflector when there was a breeze outside in the open country.

Holyhead, visited October 21.—This station is also in good order. I saw the bridled anemometer. The new arrangement of cups, as ordered by Sir G. Stokes, has been carried out. The instrument has occasionally been worked with quick motion, so as to expand the time scale.

On the whole, I can say that I found all the telegraphic reporters attentive and efficient, and the instruments clean and in reasonably good order.

Tory Island.—As regards the proposed change of the Lloyd's signal station from Malin Head to Tory Island, I learnt, when I was on the coast, on the authority of a lightkeeper now stationed at Tory, that Lloyd's have been unable to get the materials for the proposed signalman's residence landed before the winter, so that this station cannot be ready before Easter.

The regular communication with the island is by post boat (sailing), from Gort-a-hork coastguard station, near the Bloody Foreland, distant about 10 miles from the island. There is no sleeping accommodation near Gort-a-hork, and the post boat only sails once a week. I hear the

the hire of a special boat is 35s. at least. Passengers can reach Tory by the steamer from Sligo to Glasgow, landing in a boat. This route probably involves a stay of about four days on the island.

SECOND ORDER STATIONS AND OBSERVATORIES.

St. David's, visited September 24.—The station was, as usual, in excellent order.

Valencia Observatory, visited October 1.—I did not examine the S.R. apparatus, as Mr. Baker was expected in a week from my visit.

I found that the Post Office authorities had not yet removed the posts and wire from Kilbeg Hill. There is a certain quantity of apparatus, cells, &c. at the observatory, the property of the Council. I have instructed Mr. Cullum to prepare a list of this, and send it up for your instructions as to its disposal.

I visited Westwood House, 1 mile from Cahirciveen. This is now vacant. It is an ordinary dwelling-house standing in 20 acres of land, with frontage to road and sea, held under a direct lease from Trinity College, with 60 years to run.

Its situation is much more open than the present locality of the observatory, and the fact of its being within a mile of the town, without the intervention of a ferry, would render communication much easier and cheaper.

Dublin, Mountjoy Observatory, visited October 4.—The observer at this station has been changed, Sergeant Lipscombe having retired; Corporal Stone now takes the observations. He is careful and efficient.

Dublin, Glasnevin Gardens, visited October 4.—This station goes on satisfactorily. We have not had of late as much interference with the instruments by children visiting the gardens as in former years.

Dublin (Fitzwilliam Square), visited October 4.—The station calls for no remark; it is always in excellent order.

Lissan, visited October 7.—This is a new station, the records from which are supplied by the Scottish Meteorological Society. It is the property of Sir N. Staples, Bart., who, when at home, is the observer. His substitute, J. Donaldson, the gardener, is very efficient.

The instruments are not of the quality usual at Second Order Stations, as only one of the thermometers is graduated on the stem. The barometer is of the Kew pattern, by Adie of Edinburgh, but bears no distinguishing number that I could discover. The rain-gauge is worn out.

The observer, Donaldson, had received no printed instructions at any time.

The situation of this station is good; the country about is undulating, but less so than at Armagh.

Slieve Gallion, height 1,500 feet, is distant about 4 miles on the North and N.N.W.

Armagh, visited October 8.—The instruments are all in good order. At this station there is an old standard barometer by Newman, which seems to be a very good instrument. I propose that the Council should have this cleaned; and then their own standard, supplied in 1868, might be recalled, and be available for use elsewhere.

Colebrooke, Brookeborough, visited October 8.—This station calls for no special remark.

Markree, visited October 10.—This station is in very good order, Mr. Marth having trained his servant to take the readings accurately.

Currygrane, visited October 15.—This station is satisfactory, the new observer being now quite efficient.

Parsonstown, visited October 16.—At this station a new observer takes the 9 p.m. readings. His name is White, and he has had previous training, so that the work is well done.

I also visited a few fishery barometers and a sunshine record station.

Ballycastle, co. Antrim, visited October 18.—A barometer supplied to this station last summer was reported to be useless. I went down specially and found air in the tube, which I removed.

Carnarvon, visited October 22.—The barometer is suspended just inside the entrance door of the Custom House, and is probably attended to, the diagram being kept correctly. Mr. Holmes, the collector, is a very old correspondent of the Office.

Nevin or Morfa Nevin.—A barometer was supplied at Mr. Holmes's suggestion last spring. On inquiry, I found that it had been erected in a private house. I wrote (P.C. 1782) to the effect that it must be erected in some situation accessible to the public, and Mr. Holmes has promised to see that this is done, as the place is within his district. He had never been informed that the barometer had been received. He told me that the same thing had occurred at Carnarvon before his arrival, a barometer supplied for Abersoch, had been intercepted in transit at Carnarvon and suspended in a private house. This is the barometer above referred to as at the Custom House.

Llandudno, visited October 22.—I went to this station to see the sunshine recorder which had been transferred from the Great Orme's Head to the end of the pier by Mr. Whipple in the summer. I found it still somewhat out in level and in azimuth, but set it right. The man in charge of it, John Roberts, the piermaster, seems very intelligent and careful.

WEEKLY WEATHER REPORT STATIONS.

Waterford, visited September 26.—The observations are carefully taken.

Foynes, visited October 2.—This station is in good order, but the observations are only kept up when Lord Montecagle is at home.

Corrections to be applied to readings of—

STATIONS.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare Therm.	Remarks.
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STATIONS OF THE SECOND ORDER.

Armagh	-0.2	-0.3	-1.0	—	—	Grass min. +0.7. Kew standard -1.2. Observer reads high.
Brookeborough	-0.5	-1.0	-0.1	+1.0	—	—
Dublin (City)	-0.3	-0.3	-0.8	0.0	—	—
Dublin (Phoenix Park)	-0.4	-0.6	-0.2	0.0	-1.0	Grass min. -0.5. Do. +0.4.
Edgeworthstown	-0.6	-0.6	-0.6	+0.2	—	Do. -0.2.
Glasnevin	-0.2	-0.4	-1.0	+0.4	—	—
Lissan	-0.8	-0.9	0.0	+0.5	—	—
Markree Castle	-0.1	-0.2	0.0	+0.1	-0.2	Kew standard -0.1
Parsonstown	-0.5	0.0	-0.4	0.0	—	—
St. David's	-0.2	-0.3	0.0	-0.1	—	Grass min. -0.2.

STATIONS.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare Therm.	Remarks.
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TELEGRAPHIC REPORTING STATIONS.

Holyhead	-	-0.1	-0.2	-0.2	+0.4	-0.2	
Mullaghmore	-	-0.1	-0.1	+0.1	+0.5	-0.2	
Belmullet	-	-0.2	-0.1	-0.1	-0.2	-	No spare ther.
Donaghadee	-	-0.5	-0.6	-0.1	-0.2	-0.5	
Parsonstown	-	-0.8	-0.1	-0.8	-0.3	-	No spare ther.
Valencia	-	-1.1	-0.7	-0.3	+0.2	-0.2	
Roche's Point	-	-0.7	-0.7	-0.4	+0.2	-	No spare ther.
St. Ann's Head	-	-0.2	-0.5	+0.2	-0.5	-0.3	

Malin Head not inspected this year.

WEEKLY WEATHER REPORT STATIONS.

Killarney	-	-0.2	-0.2	0.0	0.0	-	
Waterford	-	-0.7	-0.8	-0.2	0.0	-	
Foynes	-	-	-	-0.2	+0.2	-	

Londonderry, Kilkenny, and Llandoverly not inspected this year.

(Signed) ROBERT H. SCOTT.

REPORT OF INSPECTION—SCOTLAND.

Barometers.—During August the inspection of the barometers did not include a comparison with the standard mercurial barometer. This comparison was made as regards the last 12 stations inspected, which is inclusive of six barometers not previously reported on to the Council. From the direct and indirect comparisons made, I am able to report that the whole of the barometers specified in the annexed table are correct, allowance for instrumental errors being made, are in good order, and the observations accurately made.

TABLE I.

Stations.	Inspector's Standard, No. corrected.	Rep. Baro. uncorrected.	Check Baro. uncorrected.	Remarks.
	ins.	ins.	ins.	
Laudale	-	30.248	30.242	Check barometer is 8 feet higher.
Fort William	-	30.208	-	
Fort Augustus	-	29.774	-	
Glencarron	-	29.130	-	Standard mercurial barometer not taken this year to these stations.
Lairg	-	28.835	-	
Dunrobin	-	29.120	-	
Wick	-	29.114	-	
Swanbister	-	29.770	-	
Stornoway	-	29.800	29.800	
Nairn	-	29.648	29.648	
Gordon Castle	-	29.486	-	Check is standard of observatory.
Aberdeen	-	29.173	29.170	
Braemar	-	28.200	28.180	
Lednathie	-	29.189	-	Do. old bar. now out of order.
Dundee	-	29.985	-	
Callton Mor	-	29.985	-	
Rothsary	-	29.958	-	Check barometer in Mr. M.'s house.
Ardrossan	-	29.888	29.854	
Glasgow	-	30.030	-	
Clober (Milngavie)	-	29.694	-	
Ochertyre	-	29.680	-	Check is a Redier's barometer.
Hawick	-	29.462	-	
Wolfelee	-	28.800	-	
Marchmont	-	29.676	-	
Edinburgh	-	30.030	30.082	
Leith	-	30.480	30.486	
Rosewell	-	29.643	29.632	

Thermometers.—The minimum thermometers were this year again very specially examined, but with a result scarcely so satisfactory as last year. The following were out of order: At Wick about $4^{\circ}\cdot 0$ were lodged near the top of the tube. A comparison of the past readings will show how long this thermometer had been out of order. At Rothesay a minute portion of spirit, about $0^{\circ}\cdot 3$, was lodged at the very top of the tube. At Leith $1^{\circ}\cdot 8$ of the spirit was lodged at the top of the tube. This was discovered by the observer about five months ago, who since then has regularly added fully a degree and a half to each reading. All these thermometers were rectified.

New minimum thermometers have been supplied to Dunrossness and Nairn.

TABLE II.

Stations.	Standard No. 4433, corrected.	Dry Bulb.	Wet Bulb.	Spare Thermometer.	Max. Thermometer.	Min. Thermometer.	Time in Water in Minutes.	Change of Temperature.	Remarks.
Laudale -	60.4	+0.2	+0.2	—	+0.2	+0.3	150	+0.4	C. Livingston observer
Fort William.	63.1	-0.1	+0.1	—	+0.1	-0.3	60	+0.4	
The Observatory, F.W.	63.9	+0.1	+0.1	—	0.0	-0.1	90	+0.5	
Fort Augustus	58.8	+0.1	+0.1	—	+0.1	-0.4	80	Uniform	Index of Max. T. lost. Min. T. was 4° out of order.
Glencarron-	55.7	0.0	-0.2	—	0.0	-0.2	100	+0.3	
Lairg -	57.8	+0.2	+0.1	—	-0.3	0.0	70	+0.2	
Dunrobin -	60.0	-0.5	-0.4	—	—	-0.6	75	Uniform	
Wick -	58.7	+0.5	+0.4	—	-0.3	—	60	Do.	
Stornoway -	55.9	+0.5	+0.5	—	+0.7	-0.4	90	Do.	
Nairn -	54.5	+0.7	+0.6	+0.1	0.0	-0.1	90	Do.	
Gordon Cas	57.0	+0.1	+0.2	—	+0.5	+0.1	120	+0.7	
Aberdeen -	57.2	+0.2	+0.2	—	+0.1	+0.1	75	-0.2	
Braemar -	54.7	+0.4	+0.5	—	+0.2	0.0	90	+0.3	
Lednathie -	51.9	+0.2	0.0	—	+0.2	-0.1	100	Uniform	
Dundee -	52.6	+0.5	+0.4	—	+1.4	-0.3	60	Do.	
Callton Mor	59.6	+0.1	0.0	—	+0.8	-0.5	60	-0.3	
Rothesay -	56.6	0.0	0.0	—	+0.2	-0.4	65	Uniform	
Ardrossan -	54.7	+0.2	+0.3	—	-0.2	-0.2	80	-0.2	
Glasgow -	55.8	—	—	—	-0.2	-0.1	50	+0.2	
Clober -	55.7	-0.1	+0.1	—	+0.5	+0.1	75	Uniform	Temp. practically uniform.
Ochertyre-	53.8	0.0	0.0	—	+0.1	0.0	70	Do.	
Hawick -	59.2	0.0	-0.1	—	-0.1	+1.0	80	+0.3	
Wolfelee -	53.0	-0.2	-0.2	—	+0.2	-0.5	120	-0.3	
Marchmont	53.4	-0.1	-0.1	—	0.0	-0.1	300	Uniform	
Edinburgh-	52.7	-0.1	0.0	—	0.0	0.0	85	Do.	
Leith -	52.5	+0.2	+0.4	—	+0.2	-0.4	50	Do.	

HYGROMETERS.

I have to report very favourably regarding the care with which the wet-bulb thermometer is attended to at all the stations without exception. While inspecting the station at Rothesay the weather was dull and drizzling, the air being apparently filled with the fine drizzle, the dry and wet bulbs in the screen read exactly the same. This is the first occasion I have seen this correspondence to occur since it was begun, some years ago, to give special attention to the working of the hygrometer in the thermometer screen.

Laudale, August 7, 1890.—There has been some trouble at this station from the index portion of the column of the maximum thermometer being shaken from its position during high winds. Accordingly, since last inspection, four new wooden supports and four new wire stays have been added to the Stevenson screen, which is now very firmly fixed, and it is believed the index now retains its place in high winds.

The instruments were all in very good order, and the observations are carefully made.

Fort William, August 9th.—The instruments were in good order, and the observations are correctly made. It has been resolved that the observations at this station, inclusive of those recorded by barograph and thermograph, be continued for some time till a satisfactory comparison be made between them and the observations made at the new observatory.

The Observatory, Fort William, August 8-9.—This observatory has been equipped as a station of the First Order by the Meteorological Council, and as a station of the Second Order by the Scottish Meteorological Society. Both sets of observations are forwarded to the Meteorological Office.

The Stevenson screen, rain-gauge, and sunshine recorder are placed in an open situation over grass, on which the sun shines all day from one hour after sunrise to sunset in summer, and the whole day in winter. There are three rain-gauges, Beckley's, with its accompanying check gauge, and one of the type in use at the Ben Nevis Observatory.

The self-recording instruments furnished by the Council have been recently fitted up by Mr. Baker, of the Kew Observatory, and the regular observations commenced on July 14th.

Everything at the observatory was in excellent order, and the observations were made with the greatest care and punctuality.

The Abbey, Fort Augustus, August 11.—The instruments were all in excellent order and are particularly well attended to and observed by Father Cody, the new observer. The sun reaches the sunshine recorder all day, except when it is behind the mountains, which here form a very irregularly outlined horizon.

Glencarron, August 14.—All the instruments were in very good order, and are observed with scrupulous accuracy. A Richard's hygograph has just been added to this station and is placed in the same Stevenson screen with the thermograph.

Lairg, August 14-15.—The thermometer screen has been furnished with a new stand, been repainted, and thoroughly repaired. A new rain-gauge has been sent since the date of inspection, viz., on October 8th. The instruments were otherwise in good order and are well observed.

Dunrobin, August 15.—The index of the maximum thermometer (Phillips') was inadvertently lost at the time of the inspection. A new thermometer was sometime after sent from Edinburgh. All the other instruments were in good order, and are carefully observed.

Wick, August 15.—The minimum thermometer was seriously out of order, a part of the spirit, about $4^{\circ}\cdot 0$, being lodged near the top of the tube. This was shaken down. On comparison with the standard, as it still read $0^{\circ}\cdot 7$ too low, it was ordered to be placed in a highly inclined position for some hours before being replaced in the screen, to allow time for the whole of the spirit to drain down. Subsequent readings show that it is now correct. The other instruments were in good order, and are very well observed.

Swanbister and Stenness, August 18.—At the time of Mr. Fortescue's removal from Swanbister, the instruments were handed over to Mr. W. Halero, joiner, who had been one of the assistant observers. He made the observations regularly and forwarded them to Mr. Fortescue for entry on the monthly schedules. Here the temporary positions of the instruments were good, but the maximum thermometer had been

accidentally broken in the end of last year, of which no intimation was given. (A new one was forwarded on my return to Edinburgh in October.) Thereafter I drove to the station at Stenness, taking the barometer with me, and placing it in its new position, and arranged with Mr. Fortescue, who kindly accompanied me, and with Mr. Spence, the new observer, for the immediate removal of the rest of the instruments to Stenness, and the positions in which they were to be placed. The situation of Stenness is a very open one, and Mr. Spence is likely to prove a good intelligent observer.

Stornoway, August 20.—Particular attention was given to the omission from the daily telegram of July 25th of any notice of the rapid fall of the barometer and storm during the previous night, for which Mr. Forbes expressed great regret. He made no attempt to account for the neglect, but he is unable to understand how it did occur. I believe the effect will be to make him thoroughly alert in future against the recurrence of so serious an omission. The rain-gauge was slightly deformed, but it was made right. The glass measure was broken accidentally on the Saturday. What remains still measures 0·3 inch, and will be used till a new measure arrives. All the other instruments were in excellent order and are well observed.

Nairn, August 22.—The instruments were all in good order and intelligently observed, and the telegrams made up with care and expertness. The new minimum thermometer was hung up and the old one packed in the box and ordered to be despatched to the Office.

Gordon Castle, August 23.—Mr. John Webster, who had observed nearly 40 years, died last Christmas, and has been succeeded by his son Charles as head gardener and observer. The instruments are well exposed and placed in the kitchen garden, and were all in excellent order, and observed with great care and accuracy.

Aberdeen, August 26.—Everything at this station is well attended to, and the observations are made with remarkable care and intelligence.

The same remark applies to the self-recording instruments of the observatory. At the time of the inspection the "drop" from the wet-bulb fell at the rate of one in a minute and a half. As at the Fort William Observatory, the rain-gauge, after being emptied, does not begin to register till 0·005 inch of rain has fallen. It was satisfactory to observe from an examination of the curves, as showing the state of efficiency of the anemometer, that changes of wind were quickly shown with such small velocities as a rate of from 2 to 3 miles an hour.

Braemar, August 27.—As indicated in last Report, a new set of instruments has been supplied by Her Majesty to this station to replace those in use since 1855, and the screen in which they are kept has been thoroughly repaired and painted. They are superior instruments, kept in excellent order, and are well observed by Mr. Aitken and his niece.

Lednathie, August 29.—Everything at this station was in very good order, and the observations are made with remarkable intelligence. The vane works well except during frost, but in all cases its indications are checked by observations of smoke, trees, &c. The station is well up the slope of the Lednathie Burn, a tributary of the Prosen. The situation in the valley gives necessarily an undue proportion of N.W. and S.E. winds.

Dundee, August 30.—The instruments here continue to be thoroughly well kept, and the observations accurately made.

Callton Mor, September 1.—The instruments were in very good order, and are observed with much care and intelligence by Mr. Russell and assistant. As the index of the maximum thermometer (Phillips') was too long, it has since the time of inspection been sent to Edinburgh for rectification. This station was established in 1855, with the same observer, and with substantially the same instruments throughout. The instruments are placed in a very open situation in the garden.

Rothsay, September 2.—A comparison of the minimum thermometer with the standard suggested an examination, when a minute portion of spirit (about $0^{\circ}\cdot3$) was seen lodged at the top of the tube. This was rectified. With this exception, the instruments were all in thoroughly good order, and observed with great intelligence.

Ardrossan, October 1.—The rain-gauge and thermometer screen are repaired and repainted, both jobs being well and strongly done. All the instruments now are in good order, and the observations are made with considerable intelligence.

Glasgow Observatory, October 2.—Except the 5 inches rain-gauge which has been raised to 16 inches above the ground, all the instruments remained as they were at the time of last inspection; they were all in very good order.

Milngavie, October 3.—The instruments at this station were in good order, and are intelligently observed and attended to. The anemometer is in a good position on a knoll in a field about a quarter mile from the other instruments.

For the sake of securing uniformity with the other stations of the Office, a Stevenson's thermometer screen was recommended, and it was also recommended that the barometer be removed from the large thermometer screen to the office adjoining. These suggestions have since been carried out. Mr. Bertram is very desirous in establishing this station that everything be in accordance with the requirements of the Office; and doubtless in his hands the station will become a valuable addition to the system.

Ochertyre, October 4.—Everything at this station was in excellent order, and the observations are made most intelligently.

Ladylaw, Hawick, October 14.—The instruments are very good, and the observations, which began at the New Year, are intelligently and accurately made.

Wolfelee, October 15.—Instructions were given to paint the Stevenson screen and the rain-gauge. As regards the other instruments, they are good, were in good order, and the observations made with great care. The observer showed a good deal of interest in the observations, and a strong desire to do all in his power to make them correctly.

Marchmont, October 18.—The instruments are all in excellent order, and the observations made with marked intelligence. Mr. Loney has a good assortment of additional instruments at this station.

Edinburgh, October 21.—In addition to the usual instruments, which are nearly all in duplicate, Mr. Moss has a Redier's barograph, a Richard's thermograph, a Robinson's anemometer, and a sunshine recorder. The whole of the instruments are in remarkably good order, well placed, and are observed with much intelligence and enthusiasm.

Leith, October 22.—The minimum thermometer was found with $1^{\circ}\cdot8$ of the spirit lodged near the top of the tube, which the observer, under my direction, set right. This was discovered by the observer five

months ago, and since then the readings have been regularly increased by adding 1.5 degree. Otherwise the instruments were in very good order, and the observations very intelligently made. Since last inspection the thermometer screen and enclosure has been repaired in a very satisfactory manner.

Rosewell, October 23.—The instruments are all good, and are well protected in a railed-off grass plot. They are in good order, and are attended to and observed with great care and intelligence.

(Signed) ALEXANDER BUCHAN.

REPORT OF INSPECTION—ENGLAND.

TELEGRAPHIC REPORTING STATIONS.

Scilly (St. Mary's), June 26 and 27.—Since the death of Mr. Thomas, which occurred in the early part of the year, and by which the Council have been deprived of an observer of long experience, Mr. A. Hicks has undertaken the charge of the instruments at this station. I have in previous years given him some instruction, and have recommended him as being probably the only man in the island at present capable of undertaking the work of observation. I found him to require further teaching as regards the reporting of important changes indicated by the self-registering aneroid, and also as to the setting of the verniers of the barometers, which he had lowered too much (the error thus caused having been about -0.026 in.). He has also a slight personal error in reading both barometers and thermometers, which appeared to me to be constant and unimportant.

All the instruments at Scilly are in their old positions, and in good order, except that a part of the anemometer again required cleaning, and that the maximum thermometer is very difficult to set, and should therefore be exchanged for another. I think that the present observer's estimates of wind forces of "5" and upwards, will be found to be slightly lower, in the mean, than were the estimates made by Mr. Thomas.

Prawle Point, June 29.—I found the observer at this station, Mr. Hewitt, to read the instruments, as before, with accuracy; but some loss has been sustained by the departure of Mr. Mehegan. Mr. Hewitt will probably be himself removed from Prawle in a short time. Another of the men at this station, Mr. Macarthy, appeared to me to be an intelligent and careful observer. The station is an excellent one, but the frequent changes of *personnel*, common to all coastguard stations, naturally form an obstacle to perfection in the observations. The observers at the time of my visit showed some aptitude for cirrus observations; they had, however, failed to report important changes of weather occurring between the fixed hours of observation. The instruments were in good order, but the maximum reads somewhat low.

Hurst Castle, July 2.—The instruments at this station were found to be in a satisfactory condition. The reports of the barometer and of the highest temperature show, as in former years, occasional errors. These are certainly not due to any inability to read the instruments correctly on the part of Mr. Appleton, but he has a somewhat hasty and casual way both of handling the instruments and taking the readings, and this appears to be ineradicable. Both the winds and the state of the sea are, as I have previously remarked, affected by local causes at this station.

Dungeness, July 31.—Mr. Curnow has left this station, and the observations are chiefly conducted by Mr. Batten. Inaccuracies still appear to occur from time to time in the barometric reports; but in my presence the light-keepers, who, as formerly mentioned, take the readings in rotation, as they are on duty, certainly read the instruments well, and all those now at the lighthouse give me the impression of being sober and reliable men. The muslin of the wet-bulb had not been changed with sufficient frequency.

Yarmouth, August 2-3.—The instruments at this station are in good order; but the wet-bulb is not kept sufficiently clean. The tracings of the self-registering aneroid have for a long time been too thick, in consequence of Mr. Watson's having attempted to alter the working of the pen, in order, as he told me, to "prevent the jumpings" produced in its trace. I accidentally broke off the ink-holder altogether in opening the case, which has no hinge, and was unclamped on the right-hand side. The pen has since been repaired, and the aneroid tracings are now good.

Cambridge, August 4.—Mr. Todd was again absent from Cambridge on the day of my visit. The reports have occasionally arrived late from this station. In reply to a letter on this subject, I was informed by Mr. Todd that they were in each case handed in punctually at the telegraph office. The fault lay with the latter, and the reports now arrive punctually. The alterations made in the height of the anemometer appear to me to be very advantageous. The dome of the observatory used formerly to obstruct Southerly, and to a less extent Northerly winds, in a very appreciable degree, and the obstruction is now less serious.

The observatory is, however, considerably sheltered by trees, and, as will be noticed from the horizon-breaks in the altazimuth sketch, these trees cut off the sun's rays from the sunshine recorder in the mornings of the late autumn and the beginning of the year. The observer states that he considers that, upon the average, not more than 30 minutes are lost by reason of the trees.

I found the instruments to be all in good condition, except that there was some deposit on the wet bulb.

Loughborough, October 9.—The observer was absent until very shortly before I left the station. Both the barometer and all the thermometers were found to be perfectly correct, and all the instruments to be attended to, as usual, with the very greatest care.

York, October 12.—The barometric reports from this station have not appeared to be quite satisfactory, the errors being usually positive. Some of the mistakes may be due to the want of punctuality on the part of the observer, of which I have formerly complained. On the occasion of this visit, however, the observer, to my surprise, set the vernier as much as '018 too high. On my calling his attention to the mistake, he immediately set the vernier correctly. The thermometers are very accurate, but the muslin of the wet-bulb is not changed as frequently as the atmosphere of York requires.

Shields.—I visited North Shields on October 13. The barometers were removed from the old post office buildings to the telephone room of the new buildings on February 21st, 1890. Here their position is excellent, possessing several advantages which were wanting in their former site. The height of the cisterns, obtained from the builder's plan, is 117 feet above mean sea level. The muslin of the hygrometer had not been changed on the Saturday before my Monday's visit, the day of

the week on which it is said to be usually changed. It was more foul than usual, and in the extremely smoky air of Shields a daily change would be requisite to ensure anything like freedom from dirt. The rain-gauge as previously reported, receives occasional injuries, the inhabitants of the houses round Dockwray Square, with a considerable number of children, having access to it. The instruments are otherwise in good order.

STATIONS SUPPLYING MONTHLY OR WEEKLY RETURNS.

Cirencester, July 3.—Professor Ohm was engaged during almost the whole of my visit, and I only obtained one or two minutes conversation with him between his lectures. The instruments are in good order. The thermometers are well mounted in an enclosure made for that purpose in the large vegetable garden on the north-west side of the College; their readings are very correct. The sunshine recorder is well mounted on the top of a large and firm stand, reached by a ladder, and its adjustments are correct. It will be seen by the altazimuth sketch, which I have sent to the Office, that sunshine is cut off during the summer solstice between 7.25 and 7.32 p.m., or thereabouts, by a dense and growing clump of trees. Trees must also slightly interfere with the sunshine in winter, both in the morning and afternoon. The instrument was shifted to its present position in the autumn of 1888. It previously occupied an excellent vantage ground at the summit of the College tower, which had to be relinquished at the orders of the Principal on account of mischief done by some of the students, who seem to have gained access to the tower.

Epsom, July 30.—The observer was absent throughout the afternoon. The assistant was unfamiliar with the proper mode of treating the wet-bulb during frost, and I gave instructions on this subject. He read the instruments correctly. The muslin round the wet-bulb was somewhat stiff with lime and copper salts. The max. read $0^{\circ} \cdot 6$, or with its usual correction $0^{\circ} \cdot 4$, too low. The observations show decided improvement at this useful station.

St. Leonards, August 1.—I regret to say that I have not changed my opinion that Mr. Colborne is not a painstaking observer. He was absent from home on the day of my visit. The thermometer screen in the Gensing gardens required repairs, and it is rather surprising that the instruments remain unbroken, considering that they are accessible to the public. As it is, the minimum had disappeared, and had been replaced by the grass thermometer, which was simply laid on the bottom of the screen. I could not obtain the corrections for the thermometers; as compared with my standards the wet-bulb required a correction of $-0^{\circ} \cdot 5$.

The sunshine recorder, which has a good exposure at the Hastings reservoir, is attended to by the keeper of the reservoir. I could not obtain access to the instrument on the day of my visit this year.

Eastbourne, August 1.—The returns from this station continue to be satisfactory. The instruments are in excellent order. The observer attaches no muslin to the wet-bulb, but winds the wet thread of wick round the bulb. I think that it may be best to permit him to adhere to this custom.

From the altazimuth sketch which I took at the sunshine recorder it is evident that the evening sun is cut off, principally in winter, by the range of high land, the southern extremity of which forms Beachy Head. The instrument has in other respects a perfect exposure, and the cards are carefully attended to.

A new copper rain-gauge is greatly needed at this station, the old instrument being almost entirely worn out.

Market Rasen, Tealby Vicarage, October 10.—Since Mr. Jevons relinquished the observations at Market Rasen the instruments, with the exception of the rain-gauge, were removed by the Reverend S. Lewin to his house at Tealby, about four miles north-east of their former position. Mr. Lewin, who required some instruction in the work of observation, was necessarily absent during a considerable portion of my visit. Levelling from an O. S. mark, I found the barometer cistern to be 260·1 foot above M. S. L. The instrument, which is fastened into its wooden box, was not suspended in a satisfactory way. The thermometer screen requires some repair and repainting. I could find no convenient site for a rain-gauge.

That the observer will fill in the returns conscientiously and punctually to the best of his ability I have no doubt. Unfortunately not only are the instruments rather inconveniently placed (and there seems to be no chance of improving their position here), but the whole locality is so much obstructed by trees and buildings and characterised by such hilly and broken ground, that I hesitate to give an opinion as to its suitability, desirable as it is that some station should be found in this neighbourhood. I should recommend that a few months' trial of the station be made, rainfall reports being had if possible from Mr. Jevons.

I have sent a rough ground plan of the position of the instruments.

Fork, October 12th.—The instruments at the Museum Gardens are in good order, and the observer reads the thermometers with accuracy, though he appears to be careless with his barometer. The screen is too crowded with instruments, the difference between the readings of which, when the door is closed, well exemplifies the effect of raising or lowering a thermometer-bulb in a Stevenson's screen.

The sunshine recorder was well adjusted at the date of my visit. The question whether it should be removed from the Friends School at Bootham should, in my opinion, be definitely decided in the negative. Mr. Clarke is a most able scientific teacher. The exposure at Mr. Thompson's house would not, I think, be so good, although that at Bootham is rendered imperfect by the Minster tower, an immovable obstacle, and by chimneys. Further, although the wooden pedestal on which the instrument is erected is unsteady, the school authorities are not disposed to go to the expense of erecting anything more substantial, and although it is difficult to get the instrument thoroughly well attended to in the vacations, and in term time some carelessness may be expected in the boys who occasionally have the charge of it, it is to be remembered that much is to be gained by the keeping of scientific instruments at educational establishments.

While it is easy to estimate a small present loss due to occasional clumsy manipulation, it is difficult to set too high a value on the possible acquisition of a taste for meteorological observation at our schools, and at such institutions as Epsom College, Cirencester, Cooper's Hill, &c. And if I may here be permitted such a digression, I think that the downward percolation of science is so great, that one lecture at a public school is worth very many at a fishery station.

Seaham, October 13.—The barometer was moved October 11, 1889 (since last year's inspection), from its rather inconvenient position in Mr. Aird's house to a good site in the residence of Mr. Leith at the cemetery grounds. The observations are all taken by Mr. Leith, who seemed inclined to set the vernier of the barometer somewhat low, but is accurate and careful in his readings of the thermometers. All corrections and reductions are still made by Mr. Aird, with whom I had no

interview on the day of my visit, as he was absent at his new residence, about six miles from the station. As might perhaps be expected, some inaccuracies have been noticeable in the returns. The max. read 1° too low. The screen has been repaired and repainted. All the instruments were found to be in good order. The present level of the barometer cistern is given as 150 feet. I question whether this is not 1 or 2 feet too high.

Stokesay, October 17.—The barometric returns from this station have for a long period been questionable. All the instruments are usually read carefully, as I think, by Miss La Touche, but at times the readings are taken by some of Mr. La Touche's young pupils, and I think that the barometer may occasionally be handled with insufficient care. I dislodged a small bubble of air from the tube, but after this had been done the mercury appeared to stand $\cdot 027$ too low. The thermometer screen is home-made and of peculiar but not unsatisfactory type. I requested that it should be repainted and have some slight necessary repairs. I also advised that the grass minimum, which is new, but out of order, should be exchanged for another instrument. A good solar radiation thermometer is in use here now. As I have formerly observed, the wind at this station is very greatly affected by the hills.

Sutton Coldfield, October 18.—Since my last inspection the thermometer screen and rain-gauge have been removed to the observer's garden, where they have a satisfactory position. The barometer, an instrument on the Fortin principle, is by Bailey, of Birmingham, and has no error throughout the scale. It has not been removed from its former position on the ground floor of the borough offices. All the instruments are in good order, and appear to be well attended to, but some inaccuracies and omissions have been observed in the returns. I think improvement may be expected.

I inspected the following FISHERY BAROMETER STATIONS, with rather disappointing results:—

Hull.—I examined the fishery barometer at noon of October 11th. The number of this instrument, which was supplied in 1853, is B.T. 17. The level of the cistern is 7 feet above M.S.L. I found the instrument (at $30\cdot 270$) to have a somewhat large error, requiring the correction of $+ \cdot 074$, but the tube to contain no air. The foreman at the Humber Dock is in charge of the instrument, which he reads fairly correctly, but does not understand. The readings are sent in daily to the principal dockmaster's office, but are, as I was told, made no further use of. I think that the instrument attracts but little attention, except from a stray loiterer at the docks.

Withernsea.—I had selected Saturday as the most convenient day for lecturing to the fishermen at this station, and had written to Mr. John Ward, who is in charge of the instrument, on the subject. On my arrival, however, I found that there are only ten fishermen here, all of whom had gone to a fair at Hull. The barometer, B.T. 76, which was supplied in 1863, is affixed to the outside wall of what was formerly Mr. Ward's shop. I examined the instrument at 3 p.m. of the 11th, and found it, with a reading of $30\cdot 179$, to require a correction of $+ \cdot 017$. The instrument, however, appeared to be free from air. The altitude of the cistern was given to me by Mr. Ward as 20 feet above M.S.L., but, having plenty of time, I levelled and found it to be $22\cdot 3$ feet. I could not elicit from Mr. Ward any tokens of intelligence as to the use of the instrument, neither do I think that the fishermen at this desolate spot employ it much.

(Signed) W. CLEMENT LEE.

October 21, 1890.

STATION.	NAME OF STATION.	BARO- METER.	THERMOMETERS.												General State of Station.	STATION.	NAME OF STATION.		
			Temperature of Water.	DRY BULB.		WET BULB.		MAXIMUM.		MINIMUM.		SPARE.		GRASS.					
				Correction to re- duce to Inspec- tor's Standard.	Correction hitherto applied.	Correction to re- duce to Inspec- tor's Standard.	Correction hitherto applied.	Correction to re- duce to Inspec- tor's Standard.	Correction hitherto applied.	Correction to re- duce to Inspec- tor's Standard.	Correction hitherto applied.	Correction to re- duce to Inspec- tor's Standard.	Correction hitherto applied.	Condition of Hygro- meter.					
Cambridge		-.003	-.01	0	0.0	0	-.04	0	+.05	0	0	0	0	0	B	A	Cambridge.		
Cirencester		-	+.01	0	0.0	0	-.01	0	-.01	0	0	0	0	0	B	A	Cirencester.		
Dungeness		+.001	0.0	0	+.01	0	0.0	0	0.0	0	0	0	0	0	B	A	Dungeness.		
Eastbourne		-	0.0	0	+.01	0	+.01	0	+.04	0	0	0	0	0	A	A	Eastbourne.		
Epsom		-.002	-.025	-.01	-.01	0	+.06	+.02	-.03	0	0	0	0	0	A	A	Epsom.		
Hurst Castle		.000	-.015	0	0.0	0	-.015	0	+.05	0	0	0	0	0	A	A	Hurst Castle.		
Loughborough		-	+.005	0	0.0	0	0.0	0	+.07	0	0	0	0	0	A	A	Loughborough.		
Market Rasen		-.002	+.01	0	-.01	0	-.04	0	+.04	0	0	0	0	0	B	C	Market Rasen.		
Prae Point		-.002	-.01	0	0.0	0	+.02	0	+.04	0	0	0	0	0	A	A	Prae Point.		
St. Leonards		-	-.02	0	-.05	0	0.0	0	0	0	0	0	0	0	B	C	St. Leonards.		
Seilly		-.020	0.0	0	0.0	0	-.07	0	+.02	0	0	0	0	0	A	A	Seilly.		
Seaham		-.002	0.0	0	0.0	0	+.00	+.05	0.0	0	0	0	0	0	A	A	Seaham.		
Shields		+.002	0.0	0	0.0	0	-.02	0	+.01	0	0	0	0	0	B	A	Shields.		
Stokesay		+.001	+.01	-.01	-.02	-.04	-.01	-.03	+.03	0	0	0	0	0	A	B	Stokesay.		
Sutton Coldfield		+.004	-	0	-.005	0	0	0	0	0	0	0	0	0	B	B	Sutton Coldfield.		
Yarmouth		-.001	-.035	0	0.0	0	+.015	0	+.035	0	0	0	0	0	B	A	Yarmouth.		
York		+.018	0.0	0	0.0	0	-.02	0	+.02	0	0	0	0	0	B	B	York.		
York		+.018	0.0	0	0.0	0	+.01	0	+.04	0	0	0	0	0	B	B	York.		

REPORT ON INSPECTIONS OF THE SELF-RECORDING OBSERVATORIES and ANEMOGRAPH STATIONS.

(M.O. 2119.)

Stonyhurst Observatory was inspected on August 14, 1890.

The instruments were found in good order, the barograph lenses were cleaned, although found to be much discoloured with fungoid growth between them, and the clocks were oiled. The thermograph calls for no note, beyond the fact that the wet-bulb threads required to be replaced by new ones, which was done.

The anemograph was in want of cleaning and oiling; it was accordingly wiped and oil applied. The joints in the long shafts have very considerable play, but that could not be rectified without fitting new screws. The rain-gauge was in very good order, but the pencil in use seemed to be coarser than is usually employed.

The sunshine recorder was in good order.

At the time of the inspection the two senior assistants were absent on account of illness, and the routine work was being carried on by a lad under the superintendence of the Rev. W. Sidgreaves.

Comparisons of thermometers were made as follows, Kew Standard of reference, K.S. No. 682 being used:—

Corrections to Dry, K.S. 619 -	-	-	-	-	-	0.2
„ Wet, K.S. 382 -	-	-	-	-	-	0.5
„ Bar. Ther., K.S. 339 -	-	-	-	-	-	0.5
„ Max., M.O. 439	-	-	-	-	-	0.3
„ Min., B.T. 501	-	-	-	-	-	+0.3

Aberdeen Observatory, visited August 2, 1890.—All the instruments were found duly working in good order. Lenses, &c. were cleaned and clocks oiled. No repairs were required. Owing to inclement weather the anemograph could not be entirely dismantled, but the bearings were all examined, and being found in good order were freshly oiled throughout. The sunshine recorder examination is registered on the printed form. The comparison of the thermometers was made in pounded ice, the results being entered in appended table:—

Dry, K.S. 397	-	-	-	-	-	0.05
Wet, K.S. 395	-	-	-	-	-	0.6
Max., M.O. 1,002	-	-	-	-	-	0.0
Min., 5,056	-	-	-	-	-	0.1
Bar. Std., K.O. 71,061	-	-	-	-	-	0.4

Glasgow Observatory, visited August 18, 1890.—The barograph, thermograph, and rain-gauge were all found to be working in good order. The lenses were cleaned and clocks oiled. The thermometers were compared with the inspector's standard, with the result given in the appended table. The anemograph was cleaned and examined, all the bearings being found in good order and the shafts sound. A blade of one direction fan being loose, it was carefully soldered up and set right. The sunshine recorder was also examined. The corrections to the thermometers were found to be as follows:—

Dry Std., K.S. 550	-	-	-	-	-	0.1
Wet Std., K.S. 472	-	-	-	-	-	0.3
Max., 58,846	-	-	-	-	-	+0.1
Min., 63,942	-	-	-	-	-	0.1
Bar. Ther.	-	-	-	-	-	0.7

Swanbister, Orkney, visited August 25, 1890.—Mr. Fortescue having removed from this station to a house in Kirkwall, the care of the anemograph, together with the sunshine recorder, had been delegated to a young woman residing about a mile distant, and both instruments were found to have been maintained in thorough order. A new site for the instruments having been selected by Mr. Fortescue and approved by Mr. Buchan, on the hill above Stenness schools, where Mr. Spence, the schoolmaster, had undertaken the duties of observer, the anemograph, its hut and the sunshine recorder with its support, were dismantled and packed upon carts for removal. The next morning these were driven over the hills to the new site, where they were met by the inspector on arrival, with Mr. Fortescue, who kindly gave his assistance in the operation of re-erection. Mr. Spence was on the spot with the necessary workmen, and after marking the ground out with due regard to the proper orientation, foundations were dug and the necessary masonry built up to support the hut. This being done and the external parts of the anemograph being thoroughly cleaned, it was set up, approximately adjusted, and the instrument started by nightfall. The inspector and mechanic drove back to Kirkwall and returned next day, when the recording apparatus was taken to pieces and all, including the clock, thoroughly overhauled, cleaned, and oiled. Compass bearings were then taken of distant objects and the instrument properly adjusted, the observer instructed as to the working and care of it, and the anemograph fairly started in action.

The weather was very inclement and stormy, with heavy rain showers both days, with cloud, so rendering it impossible to adjust the sunshine recorder properly. This operation had therefore to be left in the hands of Mr. Spence, who was instructed how to perform it as soon as opportunity served. The exposure of the site is perfectly free and open on all sides, with the exception of slightly rising ground to the south, which, however, is insufficient to obstruct the solar rays at any time, or materially to influence the wind's force when blowing from that quarter.

The following are the bearings of landmarks from Stenness anemometer :—

N. corrected.—Western extremity of the headland of Ness and Harry and near farm of Brodgar.

E. and S.—Nil.

W. point.—Garden on farm of Marcequoi cairsto.

Fleetwood.—The anemograph at this station was inspected on August 11th–13th. The instrument was found working properly and well kept. Both shafts were taken out, and when cleaned of corrosion, small cracks were found in both shafts, which I had soldered up by a smith before replacing them. The direction fans were found free in their action, but their pitch is apparently coarser than in the case of other instruments, hence the diminished oscillation usually recorded. The loose blades on the fans were soldered up, and the nut on the clamping screw of the clock, which was found loose, was made tight. The orientation was examined and re-adjusted by a compass. At the request of Mr. Gaultier, I looked out a suitable spot for placing the sunshine recorder, should the town commissioners decide upon purchasing such an instrument. From the south side of the pavilion a perfectly clear horizon could be obtained for about 300° from NNE. to NNW.

North Shields.—Visited the high lighthouse to inspect the anemograph September 5th–6th. Found it working in good order; cleaned the whole thoroughly, and examined the shafts. These were not split,

but the Hook's joints appear somewhat slack. Oriented vane anew from sun's observation.

Yarmouth, September 11-12.—The anemograph at the Sailor's Home was thoroughly examined and cleaned, the shafts being also tested and found sound. A joint in the velocity shaft had worked loose and was screwed up tight. The clock was taken down, cleaned, and freshly oiled. The Hook's joints are all loose from wear. The orientation was tested by sun, and instructions given to Mr. Watson to set for N. about half a compass point further to the east than he had been in the habit of doing when checking the direction in future.

(Signed) G. M. WHIPPLE.

(M.O. 2120.)

Radcliffe Observatory, Oxford, October 1.—The whole of the instruments here were in a satisfactory condition and call for no special remark. The sunshine recorder is very well placed on the tower of the observatory about 100 feet above the ground, and has an uninterrupted exposure all the year through. Further details are given on the special form which accompanies this report.

A comparison of the various thermometers in use with the Kew standard thermometer No. 682 was made by me with the following results at 62°:—

Correction to standard dry bulb, No. 576	-	-	-0.1
" " " wet " No. 575	-	-	-0.2
" " maximum, M.O. 356	-	-	-0.5
" " minimum, M.O. 363	-	-	-0.1
" " barograph thermometer	-	-	-0.2

The instruments placed in the Stevenson's screen were also examined as follows at 62°:—

Correction to dry bulb, B.T. 1,710	-	-	-0.3
" " wet " " 1,709	-	-	-0.3

Holyhead, visited October 2-3.—At this station the anemograph was found in excellent working order, and as usual is well attended to. Unfortunately at the time of my visit the wind was blowing hard so that it was impracticable to dismount the exterior portions of the instrument.

The bearings, however, were examined and the orientation duly tested.

My attention was called to the unsatisfactory state of the clips which fasten the paper to the cylinder; these were put right before leaving.

Mountjoy Barracks, October 4.—Here the anemograph was in want of cleaning, the oil in the direction bearing having become thick and hard. The instrument was accordingly dismounted, the external parts cleaned and fresh oil added. After re-mounting, the orientation was examined.

The clock was taken to pieces and cleaned.

Armagh, visited October 7-8.—On dismounting the anemometer at this observatory it was found that the oil in the direction bearing had become dry and hard. After cleaning all parts of the instrument the bearings were lubricated with mineral oil.

Dr. Dreyer called my attention to the pricker, which worked very stiffly; this was cleaned and set right.

The orientation was examined and found satisfactory.

As regards the rain-gauge the clock was taken to pieces, cleaned, and a new line attached to the weight.

Valencia Observatory, visited October 11-15.—The instruments here were all found to be in excellent order, and the anemometer well oiled and cared for.

The barograph and thermograph clocks were duly cleaned, and the lenses, condensers, and mirrors carefully wiped.

The various thermometers were compared with Kew standard thermometer No. 682, and found to require the following corrections, namely :—

Standard, dry bulb, No. 399	-	-	-	-	-0°7
" wet " " 398	-	-	-	-	-0·5
Maximum, M.O. 1,003	-	-	-	-	-0·1
Minimum, M.O. 2,497	-	-	-	-	-0·1
Barograph thermometer	-	-	-	-	-2·0
Standard barometer, attached thermometer No. K.O.					
71,062	-	-	-	-	-0·1

The external parts of the anemometer were taken down and cleaned, after which all the bearings were lubricated by means of mineral oil. After cleaning the clock the orientation was tested as usual.

The rain-gauge clock was cleaned and the Stonyhurst discharger, which had been removed by Mr. Cullum (previous to my visit), was examined and re-adjusted, and after repeated trials was again fitted to the gauge.

Falmouth Observatory, visited October 20-24.—Everything was found to be working satisfactorily.

The usual cleaning of the barograph and thermograph clocks was duly performed, and the lenses and other parts attended to. A new line was attached to the barograph clock. On looking over the photographic traces, I noticed in the case of the thermograph sheet that it was slightly discoloured by stray light; this was rectified before leaving, and the zero lines shifted from the summer to the winter position.

The thermometers were compared with Kew standard 682, and found to have the following corrections at 62°, namely :—

Dry, Standard 383	-	-	-	-	-0°6
Wet, " 388	-	-	-	-	-0·3
Maximum, M.O. 104	-	-	-	-	-0·5
Minimum, M.O. 308	-	-	-	-	0·0
Barograph thermometer (no number)	-	-	-	-	-0·8
Standard barometer attached thermometer (no number)					-0·8

As regards the sunshine recorder, this instrument is placed on an iron support, which is fixed to the south railing on the roof of the observatory, the exposure being good all the year round. The adjustment for latitude was not quite right, the trace being a little too low on the card, but this was corrected by means of a wooden wedge.

The anemometer was completely dismantled and all parts cleaned, the bearings afterwards being lubricated with mineral oil.

Two blades of one of the direction vanes were found loose, but these I caused to be soldered tight before again erecting the instrument.

The clock was cleaned and the orientation tested.

The rain-gauge was examined and the clock cleaned.

(Signed) T. W. BAKER.

APPENDIX IX.

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. The Daily Weather Report also has not been altered in form during the year, but the average monthly values printed therein have been improved by the incorporation in them of the results for the five years 1886-90.

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

At the British and Irish stations the morning observations are taken at 8 a.m. Greenwich time, and most of the telegrams arrive in London at about 9 o'clock, when the Intelligence Department of the Post Office extracts from them the portions required for its wind and weather reports. They are then transmitted to the Meteorological Office by its private wire.

DAILY WEATHER REPORT.

No important change has been made during the past year in the *form* of the Daily Weather Report, a detailed description of which is given in the Annual Report for 1887. The Report still fills four large quarto pages, and contains on page 1 the whole of the 58 reports from which the maps for the day (given on page 2) are prepared, and the 6 p.m. reports of the previous day, together with the maximum and minimum temperatures of the air, and the rainfall for the previous 24 hours.

On page 2 are two maps, showing (1) for 8 a.m. the distribution of pressure, the prevalent winds, and the sea disturbance, with necessary explanations: (2) the distribution of temperature at 8 a.m., the weather at each station, and the distribution of rainfall during the past 24 hours. Tables are added, giving the means of pressure, temperature, and rainfall as heretofore, but since January 1st the mean values employed have been improved, and are now—

For Pressure, those for the 20 years 1871-90			
„	Temperature	„	20 1871-90
„	Rainfall	„	25 1866-90

Page 3 contains (1) notes on the “General situation at 8 a.m.,” and the “Probable changes in system now prevalent;” and (2) the forecasts drawn up at 11 a.m. for each district, relating to the weather likely to be experienced during the 24 hours ending at noon on the day succeeding that of publication; also an explanation of the meaning of the storm signals exhibited on our coasts.

Page 4 contains the observations made at 2 p.m. on the previous day, and “General Remarks on the Weather over Europe during the past 24 hours.”

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

The subscription for the Report is —

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

MS. copies of the observations and remarks can be supplied at the rate of 2*l.* 10*s.* per annum. Arrangements can also be made for the supply of charts drawn from the 8h. a.m. or 6h. p.m. observations, such as appear in the “Times.”

Correction and Addition List.

The following additional steps are taken to insure accuracy in the Daily Weather Report. Monthly returns are received, from nearly all of the telegraphic reporting stations, of all the observations which have been transmitted to London by wire. These are used for checking the daily telegrams, for the preparation of the average and other values of the different elements, and also as evidence in the case of legal proceedings. A lithographed sheet is issued each month with the Daily Weather Report, containing corrections for all discrepancies which have been discovered, and supplying any observations which have been omitted in the daily reports.

WEEKLY WEATHER REPORT.

The Weekly Weather Report, which has appeared since February 1878, was rearranged at the commencement of 1890, and is now prepared for the calendar week, Sunday to Saturday, in order to bring it into agreement with other weekly publications. This enables it to be published on Thursdays instead of Saturdays. The three daily synchronous maps which it contains (showing the outline of the land and sea) are printed in blue, while the information on them is in black. These maps show (1) for 8 a.m., the temperature, weather, and sea disturbance; and (2) for 8 a.m. and 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 has been added to, as stated below.

The Summary on the first page contains the average and extreme temperatures, the rainfall values, and the total amount of bright sunshine in each week for twelve districts in Great Britain and Ireland, together with the difference between them and the respective mean values for the corresponding week in previous years. The district values for Accumulated Temperature, Rainfall, and Bright Sunshine are also given, both for the week and for the whole period since the beginning of the year. Two new columns have been added to this Summary, giving the differences between the amounts of sunshine recorded in the week, and corresponding averages in former years in addition to those previously published. The information is derived from observations made at 76 stations, the individual values for which are now given on the second page of the Report.

The tables of Accumulated Temperature are designed to give persons engaged in agriculture better means of 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. They 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 adopted is 42° F., as being nearly equivalent to 6° Cent. which has been considered by continental writers on these subjects to be the critical value, the temperature above which is mainly effectual in starting and maintaining the growth, and in completing the ripening of agricultural crops in a European climate. This base is also convenient as being 10° F. above the freezing point.

Accumulated Temperature is expressed in Day-degrees; a Day-degree signifying 1° F. of excess or defect of temperature above or below 42° F. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours.

An explanation of these rules will be found in the last Annual Report, and full details as to the facts on which the rules are founded are published in Appendix II. to the Quarterly Weather Report for 1878.

The temperature means, derived from the daily maxima and minima, are corrected so as to agree as closely as possible with the true mean daily value, and the average values for the corresponding period in former years have been improved and added to, and are :—

For Temperature	-	-	20 years 1871-90
„ Accumulated Heat	-	10	„ 1881-90
„ Rainfall	-	20	„ 1866-85
„ Bright Sunshine	-	10	„ 1881-90

The values for temperature, accumulated heat, rainfall, and sunshine for *each station** are given on the second page of each Report, and to this table also two columns have been added giving the difference between the current and average values for bright sunshine.

The Synchronous Charts referred to on page 16, with the daily Remarks thereon, occupy the third to sixth pages.

In addition to the reports from the Telegraphic Reporting Stations, and the returns from the self-recording Observatories, weekly schedules from 43 volunteer observers are used, the names of the stations and observers being as under :—

Names of Stations.				Names of Authorities.
Alnwick Castle	-	-	-	Lieut.-Col. F. Holland, for the Duke of Northumberland, K.G.
Arlington (N. Devon)	-	-	-	J. Carter, for Lady Chichester.
Bawtry (Hesley Hall)	-	-	-	B. I. Whitaker, J.P., F.R. Met. Soc.
Blackpool	-	-	℥	J. Wolstenholme.
Braemar	-	-	℥	J. A. Aitken, J.P.
Brookeborough	-	-	-	Mr. Fergusson, for Sir Victor Brooke, Bt., F.L.S.
Cheadle	-	-	℥	J. C. Philips.
Churchstoke	-	-	℥	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester	-	-	-	The Royal Agricultural College.
Cullompton	-	-	℥	T. Turner, J.P., F.R. Met. Soc.
Douglas (Isle of Man)	-	-	-	A. W. Moore, M.A., J.P.
Dublin	-	-	-	J. W. Moore, M.D., F.R. Met. Soc.
Durham Observatory	-	-	-	H. J. Carpenter.
Edgeworthstown (Currygrane)	-	-	-	J. M. Wilson, J.P.
Fort Augustus	-	-	℥	The late Rev. E. G. Cody and Rev. A. Weld-Blundell, O.S.B.
Foynes	-	-	-	W. Ward, for Lord Monteagle, K.P.
Geldeston	-	-	-	E. T. Dowson, F.R. Met. Soc.
Glencarron	-	-	℥	D. D. Munro for Lord McLaren.
Glenlee	-	-	℥	W. Melville for C. Maxwell.
Hastings (St. Leonard's)	-	-	-	H. Colborne, M.R.C.S.
Hereford	-	-	℥	T. A. Chapman, M.D.
Hillington	-	-	℥	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Kilkenny	-	-	-	H. Carlton, for the Marquis of Ormonde, K.P.
Killarney	-	-	-	The Ven. Archdeacon Wynne, F.R. Met. Soc.
Lairg	-	-	℥	J. Young, Schoolmaster.
Laudale (Loch Sunart)	-	-	-	A. Fletcher, for T. H. G. Newton, M.A., F.R. Met. Soc.
Llandovery	-	-	-	J. Watkins, F.R. Met. Soc.
Llandudno	-	-	℥	J. Nicol, M.D., F.R. Met. Soc.
Londonderry	-	-	-	J. Conroy, F.R. Met. Soc.
Marchmont	-	-	℥	P. Loney for Sir Hugh P. Campbell, Bart.

* The sunshine values are furnished for only a limited number of carefully selected stations. See p. 66.

Names of Stations.		Names of Authorities.
Markree Castle (Co. Sligo) -	-	A. Marth, F.R.A.S., for Colonel Cooper, F.R.A.S.
Newton Reigny (Penrith) -	-	T. G. Benn, F.R. Met. Soc.
Ochertyre -	£	G. Croucher for Sir P. Keith Murray, Bart.
Oswaldkirk (sunshine only) -	-	R. Thompson.
Plymouth -	-	J. Merrifield, LL.D., F.R.A.S.
Prestwich (Manchester) -	-	T. R. H. Clunn, M.D., F.R. Met. Soc.
Rothamsted -	-	Rainfall by Sir J. B. Lawes, Bart., LL.D., F.R.S., and J. H. Gilbert, Ph.D., F.R.S.; temperature by T. Wilson, F.R. Met. Soc.
Scarborough -	£	W. Robinson.
Southampton -	-	J. T. Cook, R.E., Ordnance Survey Office.
Stamford (Ketton Hall)* -	-	Fred. Coventry.
Stowell -	£	Rev. H. J. Poole, F.R. Met. Soc.
Strathfield Turgiss -	£	Rev. C. H. Griffith.
Thurcaston (sunshine only) -	-	Rev. T. A. Preston, M.A., F.R. Met. Soc.
Waterford (Brook Lodge) -	-	C. Percival Bolton, J.P.
Worksop (sunshine only) -	-	H. Mellish, J.P., F.R. Met. Soc.

The returns marked "£" are supplied through the Royal Meteorological Society, those marked "£" are through the Scottish Meteorological Society.

* Added at beginning of 1891.

The MS. of the report is now prepared on Tuesday in every week, and the printed copies are ready for sale on Thursday afternoon, but the summary on its first page is sent to the "Times," "Daily News," and several other papers on Tuesday evening.

Appendices.

Appendices, four in number, have appeared, similar to those for recent years, and a supplement in the form of a Monthly Summary.

Monthly Summary.

This Supplement to the Weekly Report gives for each calendar month the mean and principal values for the different elements, Pressure, Temperature, Rainfall, and Sunshine, and the differences between these and the averages for the corresponding months in former years. The periods covered by the averages are the same as those used in preparing the Weekly Weather Report. See page .

There are also four maps, showing the distribution of Pressure, Wind, Temperature, and Rainfall, and the movements of the principal depressions observed during the month, and some brief notes as to the chief features exhibited. These have all been issued to the end of 1890.

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.

- (I.) 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 stations. See page

- (2.) At 3.30 p.m. (from the morning and afternoon reports), for the day following that of issue. This set of forecasts is not intended for publication in newspapers, but a copy is exhibited regularly at the door of the Meteorological Office.
- (3.) At 8.30 p.m. (from the 8 a.m., 2 p.m., and 6 p.m. reports), for the 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 most important papers and news agencies avail themselves of this advantage.

The forecasts are made for the following districts :—



0. SCOTLAND, NORTH.
1. SCOTLAND, EAST.
2. ENGLAND, N.E.
3. ENGLAND, EAST.
4. MIDLAND COUNTIES.
5. ENGLAND, SOUTH.
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 can be supplied.

A series of boards are 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 S.W. coasts. The stations selected are Yarmouth, Dungeness, The Needles, Scilly, Holyhead, and Valencia Island, 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 9.45h. 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 11 a.m. Forecasts, 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 of the districts and for any of the hours mentioned on p. 9 can be forwarded by telegraph daily, on payment of 3d. per day for any definite period, in addition to the cost of telegraphy.

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 free, 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.

* Good Friday and Christmas Day are reckoned as Sundays.

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 a quarter or any part thereof, in addition to the cost of the telegrams.

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.

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 and with 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 any district of the United Kingdom by payment of a fee of 1s. 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 some future specified day.

CHECKING OF FORECASTS.

In order to test the accuracy of the forecasts they are compared carefully with the weather reported in the various districts on the days to which they referred, and the results of the checking for 8.30 p.m. are given in this Report (page 9).

In carrying out this comparison the portions of the forecasts which referred to wind have been carefully separated from those relating to weather. The detailed results of the comparison will be found in Appendix X., page 62.

CHECKING OF STORM WARNINGS.

The testing of the warnings is still conducted in the manner indicated in earlier reports.

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, made application to the various Lighthouse Boards, and have obtained from them the original log-books from some of the most exposed lightships and lighthouses. They would here express their cordial thanks for the co-operation so readily granted to them by these Boards.

The result of the checking for 1890 will be found on page 12.

In the course of the year improvements have been made both in the issue and checking of these storm warnings.

APPENDIX XI.

TELEGRAPHIC WEATHER INTELLIGENCE.

THE following stations are supplied with telegraphic information of storms, free of expense, and signal "cones" have been furnished to most of them, all further expenses attendant on the maintenance and repair of the apparatus being borne locally. The stations are situated, 94 in England and Wales, 46 in Scotland, 20 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.E.	IRELAND, S.W.	ENGLAND, S.W.	ENGLAND, E.
Lerwick.	New Ross.	St. Just.	Harwich.
Scalloway.	Dunmore East.	St. Sennen.	Ipswich.
Dunrossness.	Dungarvan.	Penzance.	Southwold.
Stromness.	Youghal.	Scilly.	Yarmouth.
Kirkwall.	Queenstown.	The Lizard.	Cromer.
Holborn Head.	Passage.	Falmouth.	Sheringham.
Dunnet Head.	Cork.	Pendennis.	Lynn.
Wick.	Kinsale.	Mevagissey.	Sutton Bridge.
Avoch.	Do. (Old Head)	Plymouth.	
Inverness.	Brow Head.	Devonport.	
Nairn.	Tralee.	Prawle Point.	
Burghhead.	Limerick.	Teignmouth.	
Lossiemouth.	Galway.	Exmouth.	
Buckie.			
Port Knockie.	IRELAND, N.W.		
Cullen.	Malin Head.		
Portsoy.	Portrush.		
Banff.	Port Ballintrae.	ENGLAND, S.	
Fraserburgh.		Guernsey.	ENGLAND, N.E.
Peterhead.	IRISH SEA.	St. Helier's	Boston.
Aberdeen.	Belfast.	(Jersey).	Cleethorpes.
	Donaghadee.	Gorey (Jersey).	Grimsby.
	Howth.	Weymouth.	Goole.
	Kingstown.	Poole.	Hull.
	Ramsey (I. of M.).	Cowes.	Bridlington Quay.
SCOTLAND, E.	Douglas "	Ryde.	Filey.
Stonehaven.	Castletown "	St. Catherine's	Whitby.
Montrose.	Silloth.	Point.	Redcar.
Broughty Ferry.	Maryport.	Portsmouth.	Middlesborough.
Dundee.	Workington.	Littlehampton.	West Hartlepool.
St. Andrews.	Whitehaven.	Brighton.	Sunderland.
Anstruther.	Barrow.	Newhaven.	South Shields.
Pittenweem.	Morecambe.		Tynemouth.
Burntisland.	Fleetwood.		Berwick - on -
Grangemouth.	Blackpool.		Tweed.
Bo'ness.	Lytham.		
Granton.	Southport.	ENGLAND, S.E.	
Newhaven.	Liverpool.	Hastings.	
Leith.	Runcorn.	Rye.	
Fisherrow.	Connah's Quay.	Sandgate.	
Dunbar.	Penmaenmawr.	Folkestone.	
Cockburnspath.	Port Penrhyn.	Dover.	
St. Abb's Head.	Port Dinorwic.	Margate.	
Eyemouth.	Carnarvon.	Faversham.	
	Holyhead.	Sheerness.	
		Chatham.	
	ST. GEORGE'S		
	CHANNEL.		
	Aberystwith.		
	Milford.		

[continued.]

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.W. Port of Ness (Island of Lewis). SCOTLAND, W. Glasgow. Greenock. Rothesay. Campbelton. Girvan. Ballantrae.	BRISTOL CHANNEL. Pembrey. Llanelly. Swansea. Briton Ferry. Porthcawl. Penarth. Cardiff. Do. Barry Dock. Newport. Weston-super- Mare. Burnham. Bridgewater. Ilfracombe. Barnstaple. Appledore. Boscastle. Port Isaac. Newquay. Hayle. St. Ives.		

APPENDIX XII.

FISHERY BAROMETERS.

LIST of PLACES supplied with FISHERY BAROMETERS.

Shetland Isles.—Balta Sound, Uya Sound, Nesting, Lerwick, Sandsair, Scalloway, Symbister.

Orkney Isles.—Westray, Burra, Kirkwall.

Scotland, east coast.—Freswick, Auchengill, Keiss, Staxigoe, Wick, Sarclet, Lybster, Dunbeath, Portmahomack, 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, Harwich, Brightlingsea, West Mersea, Margate, Deal, Kingsdown, Dover.

England, south coast.—Bognor, Ryde, Bembridge, Brixton, Atherfield, Ventnor (2), Gorey (Jersey), Haslar Hospital, Poole, Weymouth, Portland, Budleigh Salterton, Exmouth, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscath, Penryn, Durgan, Porthallow, Falmouth, Coverack, Newlyn, Mousehole.

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

Wales.—Briton Ferry, Swansea, Angle, Milford, 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, Crookhaven.

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

Ireland, north coast.—Dunfanaghy, Rathmullen, Buncrana, Merville, Greencastle, Portstewart, Portrush, Ballycastle (Co. Antrim).

Scotland, west coast.—Tarbert (Loch Fyne), Campbeltown, Carradale, Portree (Isle of Skye), Plockton, East Mey, Stroma.

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

SUMMARY of STATIONS supplied with INSTRUMENTS.

England and Wales -	-	-	-	-	65
Scotland and Isle of Man	-	-	-	-	6½
Ireland	-	-	-	-	51
					<hr/>
					180
					<hr/>

APPENDIX XIII.

LIST of STATIONS from which CONTINUOUS RECORDS of BRIGHT
SUNSHINE have been received.

Station.	Observer.
Aberdeen Observatory - - -	Prof. C. Niven, M.A., F.R.S.
Armagh - - -	J. L. E. Dreyer, Ph.D., F.R.A.S.
Blackpool - - -	J. Wolstenholme.
Cambridge - - -	H. Todd.
Churchstoke - - -	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester - - -	Prof. Ohm, B.A., F.R. Met. Soc.
Cronkbourne, Isle of Man - -	A. W. Moore, M.A., J.P.
Cullompton - - -	Thos. Turner, J.P., F.R. Met. Soc.
Dublin, Mountjoy Observatory -	Major Kirkwood, R.E.
Durham - - -	H. J. Carpenter.
Eastbourne - - -	R. Sheward, F.R. Met. Soc.
Falmouth Observatory - - -	E. Kitto, F.R. Met. Soc.; for the R. Cornwall Polytechnic Soc.
Fort Augustus - - -	(The late) Rev. E. G. Cody, O.S.B., and Rev. A. Weld-Blundell, O.S.B.
Fort William - - -	R. T. Omond, F.R.S.E.; for the Scottish Meteorological Society.
Geldeston, Beccles - - -	E. T. Dowson, F.R. Met. Soc.
Glasgow - - -	Prof. R. Grant, M.A., LL.D., F.R.S.
Harpenden - - -	T. Wilson, F.R. Met. Soc.
Hastings - - -	H. Colborne, M.R.C.S.
Hillington - - -	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Jersey (St. Helier's) - - -	Capt. Richard, Harbour Master.
Kew Observatory - - -	G. M. Whipple, B.Sc., F.R.A.S.; for the Kew Committee.
Leicester (Thurcaston) - - -	Rev. T. A. Preston, M.A., F.R. Met. Soc.
Llandudno - - -	J. Nicol, M.D., J.P., F.R. Met. Soc.
London, Bunhill Row - - -	Messrs. de la Rue.
" Westminster - - -	The Staff, Meteorological Office.
Marchmont - - -	P. Loney; for Sir Hugh P. Campbell, Bt.
Markree Castle - - -	A. Marth, F.R.A.S.; for Col. E. H. Cooper, F.R.A.S.
Newton Reigny (Penrith) - - -	T. G. Benn, F.R. Met. Soc.
Oswaldkirk, Yorkshire - - -	R. Thompson.
Oxford - - -	E. J. Stone, F.R.S.
Parsonstown - - -	O. Boeddicker, Ph.D.; for the Earl of Rosse, K.P., F.R.S.
Plymouth - - -	J. Merrifield, LL.D., F.R.A.S.
St. Ann's Head - - -	S. Blake, Principal Lightkeeper.
Southampton - - -	Sir C. Wilson, Col. R.E., K.C.B., F.R.S.
Stenness (Orkney) - - -	M. Spence.
Stonyhurst - - -	Rev. W. Sidgreaves, S.J.
Stornoway - - -	John Forbes.
Sutton Coldfield - - -	C. F. Marston, C.E.
Valencia - - -	J. E. Callum, F.R. Met. Soc.
Westgate-on-Sea - - -	J. Norman Lockyer, F.R.S.
Workshop - - -	H. Mellish, F.R. Met. Soc.
York - - -	J. E. Clarke, B.A., B.Sc.
Georgetown, British Guiana - -	G. S. Jenman.

In addition, the number of hours sunshine recorded each day is reported from the following Stations:—

Arley Cottage (Co. Cavan) - -	Major Somerset H. Maxwell.
Edinburgh - - -	R. C. Mossman, F.R. Met. Soc.
Braemar - - -	James Aitken, J.P.
Stowell - - -	Rev. H. J. Poole, F.R. Met. Soc.
Torquay - - -	Alfred Chandler.

APPENDIX XIV.

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

These stations are of five classes, as stated on page 15.

I.—*Observatories continuously observing all the Meteorological Elements.*

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. Returns from observatories.

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 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 curves and tabulations are eventually bound and stored in the Office. Examination of returns.

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

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

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. General supervision of observatory work.

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 Four Observatories under the Meteorological

" Council." The volume for 1887 has been issued during the year, and considerable progress has been made with the calculations for the year 1888.

Tables for the
Quarterly
Weather Reports.
Gale tables.

The gale tables printed in the text of the Quarterly Weather Report, which show the extent, duration, and degree of severity of all the stronger gales, are prepared from the tabulations of the anemograms received from the self-recording observatories, together with those received from the extra anemographic stations.

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

The anemograms received from the stations enumerated on page 70 are regularly examined and tabulated in the Office, and the sheets bound up in volumes. Besides special inquiries on legal and other points that from time to time arise, and in which these documents are of high importance, the tabulations are always employed in the preparation of the summary of weather and gale tables for the Quarterly Weather Report. They are also regularly used in the checking of the Storm Warnings issued by the Office.

III.—*Land Stations of the Second Order.*

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. In that year there was only one station, but by 1871 the number had increased to 15, and five years later to 49, including 14 stations belonging to the Royal Meteorological Society, copies of the returns from which were sent to the Office under a special arrangement with the Society.

At the end of the present year the total number of stations was 103, including 17 belonging to the Royal Meteorological Society and 19 belonging to the Scottish Meteorological Society. This is an increase of 6 stations as compared with the previous year.

It must, however, be observed that while this number is exclusive of the self-recording observatories and of the anemographic stations, it includes several others from which only very scanty information is received.

The stations are distributed as follows: 45 in England, 5 in Wales, 28 in Scotland, and 25 in Ireland.

The methods followed with regard to the examination and publishing 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 that for 1887. 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 for 1887 contains returns from 66 stations.

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

Reports from 11 of 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, and any information for these districts would be valuable.

The daily records of sunshine which are now received from 42 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 and dated and then stored in the Office. Sunshine records.

A tabulation of these curves is published as part of the Weekly Weather Report, mentioned in Appendix VIII., and for those stations which are also Stations of the Second Order the monthly totals of bright sunshine in hours, together with the per-centages of its possible duration, published as Part IV. of "Returns from Stations of the Second Order." 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. Weekly totals

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.

IV.—*Telegraphic Reporting Stations.*

Full particulars relating to these stations, the information received from them, and the method of dealing with that information, will be found in Appendix VII. to the Report for the year 1888-9. A paragraph in that Appendix (p. 60) explains the use that is made of the monthly schedules sent in by the observers.

V.—*Extra Stations.*

No returns from Stations of the Fifth Class are published by the Office, but some of them are regularly used in the checking of the Storm Warnings, and all are available for any special investigation that may be taken up.

The rainfall values at these stations are, however, copied and supplied to Mr. Symons, F.R.S., for publication in "British Rainfall."

APPENDIX XV.

LIST OF DOCUMENTS RELATING TO THE LAND METEOROLOGY OF THE BRITISH ISLANDS, RECEIVED DURING THE YEAR ENDING MARCH 31ST, 1891.

Stations.	Observers.	Nature of Information received.	Notes.
CLASS I. †Valencia	J. E. Callum, F.R. Met. Soc.	Continuous records of pressure, temperature, wind, sunshine, and rain, with eye observations of the clouds and notes on the weather.	Till August 25th. From August 27th.
†Aberdeen	Prof. C. Niven, M.A., F.R.S.		
†Falmouth	E. Kitto, F.R. Met. Soc.		
†Kew	G. M. Whipple, B.Sc., F.R.A.S., F.R. Met. Soc.		
†Glasgow	Prof. R. Grant, M.A., LL.D., F.R.S.		
†Stonyhurst	Rev. W. Sidgreaves, S.J.	Continuous records of pressure, temperature, wind, sunshine, and rain.	Till August 25th. From August 27th.
CLASS II. †Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S.	Continuous record of wind, rainfall, and sunshine.	
Alawick Castle	Lt.-Col. F. Holland, for the Duke of Northumberland, K.G.	Continuous record of wind (direction and velocity).	
†Dublin (Phoenix Park)	Major Kirkwood, R.E.	"	
†Fleetwood	M. S. Gaultier, C.E.	"	
†Holyhead	Hugh Williams, C.E.	"	
†North Shields	Capt. W. Harrison	"	
†Scilly	A. Hicks	"	
†Swanbister (Orkney)	W. Irvine Fortescue	"	
Stenness (Orkney)	M. Spence	"	
†Yarmouth	G. T. Watson	"	
†Kilkenny Castle	The Marquis of Ormonde, K.P.	Continuous record of pressure.	
London	The Athenæum Club	"	
†Waterford	The Harbour Authorities	"	
CLASS III. †Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S.	Regular observations at 9 a.m. and 9 p.m. 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.	From August 1890.
Aysgarth	Rev. Fenwick W. Stow, M.A., F.R. Met. Soc.		
†Braemar	James Aitken, J.P.		
†Brookeborough	W. Ferguson, for Sir Victor Brooke, Bt., F.L.S.		
†Carmarthen	G. J. Hearder, M.D.		
†Clober (Mingavie)	A. M. Bertram	-	

LIST OF DOCUMENTS—continued.

Stations.	Observers.	Nature of Information received.	Notes.
†Cronkbourne, L. of Man	A. W. Moore, M.A., J.P.	-	-
†Dartmoor	F. W. S. Stone, M.B.	-	-
†Douglas, Isle of Man	Thos. Keig	-	-
†Dublin (City)	J. W. Moore, M.D., F.R. Met. Soc.	-	-
†Dublin (Phoenix Park)	Corporal Stone for Major Kirkwood, R.F.	-	-
†Dublin (Glasnevin)	F. W. Moore, M.R.I.A.	-	-
†Dundee	W. Ross McKelvie	-	-
†Dunrobin Castle	D. Melville, for the Duke of Sutherland, K.G.	-	-
†Durham	H. J. Carpenter	-	-
†Eastbourne	R. Sheward, F.R. Met. Soc.	-	-
†Edgeworthstown	J. M. Wilson, M.A., J.P.	-	-
†Edinburgh	R. C. Mossman, F.R. Met. Soc.	-	-
†Epsom (Royal Med. College).	J. S. Jackson and E. C. Montgomery	-	-
Geldeston (Beccles)	E. T. Dowson, F.R. Met. Soc.	-	-
†Glasgow	Prof. R. Grant, M.A., LL.D., F.R.S.	-	-
†Hillington, Norfolk	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.	-	-
†Ladylaw, Hawick	W. R. Wilson	-	-
†Langton (Dorset)	H. Stilwell	-	-
†Laudale (Argyleshire)	A. Fletcher, for T. H. G. Newton, M.A., J.P.	-	-
†Liverpool	J. Hartnup, F.R.A.S., F.R. Met. Soc.	-	-
†Londonderry	J. Courroy, F.R. Met. Soc.	-	-
†Margate	J. Stokes, F.R. Met. Soc.	-	-
†Markree Castle, Sligo	A. Marth, F.R.A.S., for Col. Cooper, F.R.A.S.	-	-
†Mount Nugent (Arley Cottage).	Major Somerset H. Maxwell, F.R.A.S.	-	-
†Newton Reigny (Penrith).	T. G. Benn, F.R. Met. Soc.	-	-
†Parkstone	R. H. Barnes, B.A., F.L.S., F.R. Met. Soc.	-	-
†Parsonstown	O. Boeddicker, Ph.D., for the Earl of Rosse, K.P., F.R.S.	-	-
†Prestwich (Manchester)	T. R. H. Clunn, M.D., F.R. Met. Soc.	-	-
†St. David's, Pembroke	W. P. Probert, LL.D., F.G.S., F.R. Met. Soc.	-	-
		Regular observations at 9 a.m. and 9 p.m. 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.	From June 1890.
			From January 1891.
			From January 1891.
			From May 1891.

LIST OF DOCUMENTS—continued.

Stations.	Observers.	Nature of Information received.	Notes.
† Scarborough -	W. Robinson -	Regular observations at 9 a.m. and 9 p.m. 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.	Now Stenness. From February 1891.
† Seaham -	G. H. Aird -		
Southampton	J. T. Cook, for Dir. Gen. of Ordnance Survey.		
† Stokesay -	Miss M. A. Digges La Touche		
† Stonyhurst -	Rev. W. Sidgreaves, S.J. -		
† Sutton Coldfield	C. F. Marston, C.E. -		
† Swanbister -	W. Irvine Fortescue -		
Tenby -	J. E. Gower -		
Uppingham -	Rev. G. H. Mullins, M.A., F.R. Met. Soc.		
† Wolfelee (Roxburghshire).	M. W. Cockburn, for Lady Elliott -		
† York -	J. Wright, for Yorkshire Phil. Soc. -		
CLASS IIIA. †† Babbacombe, Devon.	E. E. Glyde, F.R. Met. Soc. -	Monthly means and summaries on Form B. of observations taken at 9 a.m. and 9 p.m. each day as above.	
† Bennington, Herts	Rev. J. Dunne Parker, LL.D., F.R. Met. Soc. -		
† Berthamsted	E. Mawley, F.R.H.S., F.R. Met. Soc. -		
† Buxton	E. J. Sykes, M.B., F.R.A.S., F.R. Met. Soc. -		
†† Callton Mor -	J. Russell, for J. Malcolm of Pottaloch, M.P.		
† Cargen (Dumfries)	P. Dudgeon, F.R.S.E., and Alex. Peacock -		
† Cheddle	J. C. Philips -		
† Cheltenham	R. Tyrer, B.A., F.R. Met. Soc. -		
† Churchstoke -	P. Wright, F.C.S., F.R. Met. Soc. -		
† Crumlington -	W. Bonallo, F.R. Met. Soc. -		
†† Fort Augustus	The late Rev. E. G. Cody and Rev. A. Weld Blundell, O.S.B. -		
†† Fort William -	C. Livingston, for Directors of Ben Nevis Observatory.		
†† Glencarron -	D. D. Munro, for Lord McLaren -		
†† Glenlee (Kirkcudbrightshire).	W. Melville, for George Maxwell -		
†† Gordon Castle	J. Webster, for the Duke of Richmond, K.G. -		

LIST OF DOCUMENTS—continued.

Stations.	Observers.	Nature of Information received.	Notes.
† Killarney -	The Ven. Archdeacon G. R. Wynne, M.A., F.R. Met. Soc.		
† Laing -	J. Young, for The Duke of Sutherland, K.G. -		
† Ledaithie (Forfar-shire).	W. Morrison, for Stormonth Darling, Q.C. -		
† Lissau (Co. Tyrone) -	Sir Nathaniel Staples, Bart. -		
† Llandudno -	J. Nicol, M.D., F.R. Met. Soc. -		
† Marchmont -	Peter Loney, for Sir Hugh P. Campbell, Bt. -		
† Ochertyre -	G. Croucher, for Sir Patrick Keith Murray, Bt. -		
† Pinmore -	Peter Donald, for Capt. Hamilton -		
† Rosewell -	R. W. D. Cameron, M.D. -		
† Rothesay (Isle of Bute) -	James Kay -		
† Rousdon -	C. E. Peek, M.A., F.R.A.S., F.R. Met. Soc. -		
† Wakefield -	H. Clarke, L.R.C.P., F.S.S., F.R. Met. Soc. -		
CLASS IV. The Telegraphic Stations, see List on page 36.			
CLASS V. Baltimore -	J. Halsey -	Pressure, temperature, wind, and weather, once daily.	
Bolton -	W. W. Midgley, F.R. Met. Soc. -	Full monthly summary.	
Bray (Co. Wicklow) -	Coast Guard -	Pressure and temperature four times daily, with wind and weather twice daily.	
Castletownsend -	Coast Guard -	Pressure and temperature four times daily, and wind twice daily.	
Chatham (School of Military Engineering).	L. M. S. Hall, for Instructor in Surveying -	Full return for 9 a.m.	
Cooper's Hill (Egham) -	Prof. H. McLeod, F.R.S. -	Full return for 9 a.m. and 3 p.m.	
Crookhaven -	Coast Guard -	Pressure and temperature four times daily, and wind twice daily.	
Crosshaven -	J. W. Bridle -	Pressure, temperature, and wind, twice daily.	

List of Documents—continued,

Stations.	Observers.	Nature of Information received.	Notes.
Cuckfield -	John Howe -	Daily rainfall.	July to December 1889.
Ennis -	J. Hill, M.I.C.E., F.R. Met. Soc. -	Daily rainfall.	
Galway -	Coast Guard -	Pressure and temperature four times daily, with wind.	
Gorleston -	R. J. C. Day -	Pressure and wind twice daily.	
Hartenden -	T. Wilson, F.R. Met. Soc. -	Pressure, temperature, and wind, twice daily, with rainfall.	
Haslar Hospital -	G. Coppen -	Pressure and temperature four times daily.	
Knightstown (Valencia).	Coast Guard -	Pressure, wind, and weather once daily.	
North Arran -	Coast Guard -	Pressure, temperature of air and sea four times daily, with wind and weather at noon.	
Rosebearty -	Coast Guard -	Pressure once daily.	
†Rugby -	W. N. Wilson, M.A., and H. P. Highton, B.A. -	Full set of 9 a.m. observations with 9 p.m. temperatures.	
†St. Leonards -	H. Colborne, M.R.C.S. -	Full set of 9 a.m. observations.	
Schull -	Coast Guard -	Pressure, temperature, and wind twice daily.	
Sheffield (Weston Park) -	Elijah Howarth, F.R.A.S. -	Full return for 9 a.m. and 6 p.m.	
Stamford (Ketton Hall) -	Fred. Coventry -	Pressure, temperature (max., min., min. on grass), rainfall, and wind once daily.	
Stranraer -	P. Doran -	Pressure, wind, and weather once daily.	
Sudbury -	W. Bayley Ransom -	Pressure, temperature (dry-bulb, max., min.), wind, cloud, and rainfall, once daily, with general remarks.	
Symbister, Shetland -	J. S. Nicolson -	Pressure and temperature twice daily.	
Tarbert, Harris -	Donald Bethune -	Pressure and wind twice daily.	
Totland Bay -	John Dover, B.A., F.R. Met. Soc. -	Full return for 9 a.m.	
Union Hall (Glandore) -	Coast Guard -	Pressure, temperature, and wind, twice daily.	

NOTE.—The Stations marked "†" belong to the Royal Meteorological Society; those marked "‡" belong to the Scottish Meteorological Society; those marked thus † have been inspected during the year.

APPENDIX XVI.

ACCESSIONS TO THE LIBRARY DURING THE YEAR ENDING
31ST MARCH 1891.

* **Abich, [W. H.]**—Meteorologische Beobachtungen in Transkaukasien. Lu le 12 avril 1850. la. 4°. (*Bull. Cl. Phys. Math. Acad. Imp. Sc. St. Petersb.*, ix.)

Adelaide Observatory.—Meteorological observations made at the Adelaide Observatory, and other places in South Australia and the Northern Territory, under the direction of **C. Todd**. 1883, 1888. 2 vols. sm. f°. Adelaide, 1889-90. [1887, 1890.]

|| **Agamennone, G.**—Il terremoto a Roma del 23 Febbraio, 1890 ed il sismometrografo Brassart. sm. f°. Roma, 1890. (*Ann. Uff. Centr. Meteor. e Geodinam.*, x., 1888, Parte iv.)

|| ——— Sopra la correlazione dei terremoti con le perturbazioni magnetiche. la. 8°. Roma, 1890. (*Rend. R. Accad. Lincei*, vi., 1890, p. 21.)

|| **Aguilar Santillán, R.**—Apuntes relativos á algunos observatorios é institutos meteorológicos de Europa. la. 8°. Mexico, 1889. (*Mem. Soc. Cient. Antonio Alzate*, iii., 1889, No. 1.)

——— Bibliografía meteorológica mexicana que comprende las publicaciones de meteorología, física del globo y climatología hechas hasta fines de 1889. la. 8°. México, 1890.

[**Algiers, Service Météorologique du Gouvernement Général de l'Algérie.**]—Bulletin météorologique de l'Algérie. 1890, Jan. 1—Dec. 31. oblong sm. f°. Sheets.

[**Allahabad, Meteorological Office.**]—Brief sketch of the meteorology of the North-Western Provinces and Oudh, and adjacent parts of Rájputana and the Panjáb. 1889. sm. f°. s.l.e.a.

* || **Allen, W., and Woods, S.**—Barometrical measurements. 4°. London, 1817. (*Trans. Geol. Soc.*, iv.)

American Meteorological Journal.—A monthly review of meteorology, medical climatology, and geography. Edited by **M. W. Harrington, A. L. Rotch**, and **W. J. Herdman**. Vol. VI., 1889-1890. la. 8°. Ann Arbor, s.a.

Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap.—Tijdschrift . . . onder redactie van **C. M. Kan** en **J. Æ. C. A. Timmerman**. Tweede serie. Deel vii. 2 vols. 8°. Leiden, 1890.

* **Andrews, W.**—Famous frosts and frost fairs in Great Britain. Chronicled from the earliest to the present time. sm. 4°. London, 1887.

* **Arago, F.**—Œuvres de François Arago, publiées d'après son ordre sous la direction de **J.-A. Barral**. Mémoires scientifiques, Tomes, i.-ii. 2 vols. 8°. Paris and Leipzig, 1858-59.

|| **Augustin, F.**—Über die Schwankungen des Wasserstandes in Moldau. la. 8°. (*Sitzungsber. k. böhm. Gesellsch. Wissensch.*, 1891, p. 50.)

Avignon, Commission Météorologique du Département de Vaucluse.—Compte-rendu pour l'année 1889. sm. f°. s.l.e.a.

Azambuja, G. A. de.—Anuario da Provincia do Rio Grande do Sul para o anno de 1891. sm. 8°. Porto Alegre, 1890.

Baltá R. de Cela, J.—Observaciones efectuadas en la Estación Meteorológica de Vilafranca del Panadés durante el año 1890. 8°. Vilafranca, 1891.

Batavia, Magnetical and Meteorological Observatory.—Observations . . . Published . . . under the direction of **J. P. Van Der Stok**. Vol. xii., 1889. f°. Batavia, 1890.

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.

Batavia, Observatorium.—Regenwaarnemingen in Nederlandsch-Indië. Elfde Jaarg. 1889. Door J. P. Van der Stok. 8°. Batavia, 1890.

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|| ——— Abstract of meteorological results for the Borough of Southport. Averages for the 18 years, 1872–89 inclusive. oblong 18°. Sheet. (*Southport Corporation Year Book for 1890–91.*)

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* **Bebber, W. J. van.**—Die Wettervorhersage. Eine praktische Anleitung zur Wettervorhersage auf Grundlage der Zeitungswetterkarten und Zeitungswetterberichte für alle Berufsarten. la. 8°. Stuttgart, 1891.

Belize.—Summary of meteorological observations at St. Joseph's Observatory during the months of Jan.—Dec. 1890. 4°. Sheets. (*The Angelus, Belize, 1890–91.*)

|| **Berg, E.**—Über die Beobachtungen der Schneedecke im Europäischen Russland in der ersten Hälfte von 1890. Der Akademie vorgelegt am 20 Nov. 1890. sm. f°. St. Petersburg, 1891. (*Repert. Meteor., xiv., No. 5.*)

|| **Bergmann, R.**—Über die Abweichungen der Temperaturen und Niederschlagsmengen im Europäischen Russland von ihren Normalwerthen während des Frühlings und Sommers 1890. Der Akad. vorgelegt am 20 Nov. 1890. la. 4°. St. Petersburg, 1891. (*Repert. Meteor., xiv., No. 6.*)

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——— **Hydrographisches Amt des Reichs-Marine-Amts.**—Annalen der Hydrographie und maritimen Meteorologie. xviii., Jahrg. 1890. la. 8°. Berlin, s.a.

|| ——— **Königlich Preussisches meteorologisches Institut.**—Witterung nach den Beobachtungen des königlichen meteorologischen Instituts. 1890, Jan.—Dec. la. 4°. (*Statist. Korresp.*)

Bezold, W. v.—Das königlich Preussische meteorologische Institut in Berlin und dessen Observatorium bei Potsdam. la. 8°. Berlin, 1890.

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* **Blyth, A. W.**—A manual of public health. 8°. London, 1890.

Bombay, Government Observatory.—Magnetical and meteorological observations made at the Government Observatory, Bombay, in the years 1888 and 1889, under the direction of C. Chambers and F. Chambers, together with appendices containing accounts of magnetic researches. f°. Bombay, 1890.

(——— ———) Report on the condition and proceedings of the Government Observatory, Colába, for the year which ended with the 30th June, 1890. f°. s.l.e.a.

[——— **Meteorological Office.**]—Brief sketch of the meteorology of the Bombay Presidency in 1888–90. 2 parts. f°. (Bombay, s.a.)

* **Bompas, Right Rev. W. C.**—Diocese of Mackenzie River. sm. 8°. London, 1888.

|| **Brezina, A.**—Die Meteoritensammlung des k.k. mineralogischen Hofkabinetes in Wien am 1. Mai 1885. la. 8°. Wien, 1885. (*Jahrb. k.k. geol. Reichsanstalt, 1885, Bd. 35, Heft 1, p. 151.*)

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— Summaries of meteorological observations taken at Sweer's Island, Gulf of Carpentaria. Jan. 1870—Dec. 1871. oblong 8°. Sheets.

— Summaries of meteorological observations taken at Toowoomba. Apl. 1871—Mch. 1872, Jan.—June 1875. oblong 8°. Sheets.

— Summaries of meteorological observations at Toowoomba and Warwick during the month of July 1869. oblong 8°. Sheet.

— Summaries of meteorological observations at Toowoomba, Warwick, and Cape Moreton. Aug. 1869—Mch. 1871. oblong 8°. Sheets.

— Summaries of meteorological observations taken at Warwick. April 1871—Mch. 1872. oblong 8°. Sheets.

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(Calcutta, Meteorological Office, Bengal.)—Administration report of the Meteorological Reporter to the Government of Bengal for the years 1887–90. With summary of the meteorology of the year 1889. f°. s.l.e.a.

(—) Meteorological and rainfall table of the Province of Bengal for the weeks ending January 4, 1890, to January 3, 1891. f°.

— Meteorological and rainfall table of the Province of Bengal for the months of January to December 1890, with annual tables. sm. f°.

[—] Bay of Bengal weather chart. 1890, Jan. 1—Dec. 31. sm. f°. Sheets.

— Bengal daily weather report. 1890. sm. f°. Sheets.

These reports are only published during the rainy season.

[—] Summary of the meteorology of the year 1889. sm. f°. s.l.e.a.

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— Abstract of the results of the barometric and thermometric observations taken at the Meteorological Office, Chowringhee. 1890, Jan.—Dec. sm. f°. Sheets.

— Cyclone memoirs. Part ii. Bay of Bengal cyclone of August 21st–28th, 1888. Published . . . under the direction of J. Eliot. la. 8°. Calcutta, 1890.

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|| — — — **New England Meteorological Society.**—Bulletin of the New England Meteorological Society, in co-operation with the Astronomical Observatory of Harvard College and the United States Signal Service. Appendix for the year 1889. 1a. 4°. Cambridge, Mass., 1890. (*Ann. Astr. Obs. Harvard Coll.*, xxi., Part ii., p. 107.)

— — — Bulletin, 1890. Jan.—Dec. 4°. s.l.e.a.

|| — — — Investigations of the New England Meteorological Society for the year 1889. An investigation of the sea-breeze by **W. M. Davis**, **L. G. Schultz**, and **R. De C. Ward**. 1a. 4°. Cambridge, 1890. (*Ann. Astr. Obs. Harvard Coll.*, xxi., Part ii., p. 215.)

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Carlsruhe, Centralbureau für Meteorologie und Hydrographie.—Deutsches meteorologisches Jahrbuch für 1889. Grossherzogthum Baden. Die Ergebnisse der meteorologischen Beobachtungen im Jahre 1889. Bearbeitet von . . . **Ch. Schultheiss**. 1a. 4°. Karlsruhe, 1890.

— — — **Centralbureau für Meteorologie und Hydrographie im Grossherzogthum Baden.**—Uebersicht der Ergebnisse der an den badischen meteorologischen Stationen angestellten Beobachtungen, nebst Wasserstandsaufzeichnungen an den wichtigsten Hauptpegeln des Rheins. 1890, Jan.—Dec. f°. Sheets.

* || **Carpenter, W. B.**—Summary of recent observations on ocean temperature, made in H.M.S. "Challenger" and U.S.S. "Tuscarora"; with their bearing on the doctrine of a general oceanic circulation sustained by difference of temperature. 8°. London, 1875. (*Proc. R. Geogr. Soc.*, xix., 1875.)

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* || **Celsius, A.**—Observationes quædam astronomicæ et meteorologicæ habitæ Upsaliæ anno 1739. sm. 4°. (*Mém. acad. sc., Sav. étrang.*, iv., p. 129.)

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|| **Clark, J. E.**—The wind-rush at York, March 8th, 1890, with maps and aneroidograms. 8°. (*Nat. Hist. Journ.*, xiv., p. 137.)

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Contains rainfall observations only.

* **Cullimore, D. H.**—The book of climates. Acclimatization; climatic diseases; health resorts and mineral springs; sea sickness; sea voyages; and sea bathing. By D. H. Cullimore. Second edition, with a chapter on the climate of Africa as it affects Europeans, by Surgeon [T. H.] Parke. sm. 8°. London, 1891.

* **Davy, J.**—Observations sur les températures de l'océan et de l'atmosphère, et sur la densité de l'eau de mer, faites durant un voyage à Ceylan. Translated from Phil. Trans., 1817, Part 2. 8°. (*Annal. de Chimie*, vii., 1817, p. 49.)

|| **Decamps, L.**—La neige et les cartes du temps. 8°. (*Ciel et Terre*, 1891, Janv., p. 521.)

|| **Denza, F.**—L'anticiclone del Novembre 1889. 4°. Roma, 1890. (*Atti Accad. Pont. Nuovi Lincei*, xliii., 1890.)

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* ——— Recherches sur la diffusion entre l'air sec et l'air humide à travers une cloison de terre poreuse. 8°. (*Bull. Soc. Vaud. Sc. Nat.*, xiii., p. 165.)

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* **Finley, J. P.**—Storm track, fog and ice charts of the North Atlantic Ocean, and hurricane track charts of the Gulf of Mexico. 1a. 4°. Boston, Mass., 1889.

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|| **Wollny, E.**—Forstlich-meteorologische Beobachtungen. Zweite Mittheil. 8°. (*Forschungen auf dem Geb. Agrik.-phys.*, Heidelberg, xiii., Heft 1 u. 2, p. 134.)

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APPENDIX XVII.

METEOROLOGICAL OFFICE : ACCOUNT OF RECEIPTS AND PAYMENTS for the year ending 31st March 1891.

RECEIPTS.			PAYMENTS.		
£ s. d.	£ s. d.		£ s. d.	£ s. d.	
Balance from year 1889-90 -	3,416 6 8		ADMINISTRATION:		
Parliamentary Vote -	15,300 0 0		Payment of Council -	988 15 0	
Repayment of expenses charged under—			Secretary -	800 0 0	
(1.) Incidental expenses -	15 2 7		Salaries and wages -	729 14 0	
(2.) Expenses incidental to International Meteorological Congress -	12 12 0		Rent, fuel, and lighting	713 6 10	
(3.) Special researches -	2 3 11		Incidental and contingent expenses:—		
(4.) Observatories -	3 10 6		Attendance, cleaning, &c. -	372 15 2	
	33 9 0		Furniture and fittings	438 0 10	
SUPPLY OF INFORMATION:			Expenses incidental to International Meteorological Congress -	69 13 8	
D.W. Charts and Forecasts -	258 14 1		Pensions -	186 16 4	4,359 1 10
6 p.m. Charts -	25 0 0		SPECIAL RESEARCHES	- - -	997 7 2
Information for Press Agencies, &c. -	130 11 2		LAND METEOROLOGY:		
Telegrams -	288 6 2		Observatories and stations -	2,308 18 0	
	702 11 5		Salaries:—Discussion and reduction of observations -	1,246 18 0	3,555 16 0
SALE OF INSTRUMENTS, &c.:			WEATHER INFORMATION AND FORECASTS:		
Royal Navy (A) -	31 12 0		Telegraphic reports and storm warnings	2,565 2 8	
Mercantile Marine account (B) -	58 0 7		Salaries:—Preparation and issue of reports and forecasts -	1,810 10 8	4,375 13 4
	89 12 7		INSPECTIONS:		
Commissions executed for Colonial and Foreign Institutions, &c. (C) -	672 17 10		Salaries and travelling expenses -	- - -	706 8 9
Commission charged on work done for Colonies, &c. -	37 8 5		OCEAN METEOROLOGY:		
			Salaries:—Discussion and reduction of observations -	1,608 0 0	
			Expenses incidental to the supply of instruments:—		
			Proportion for care and issue of instruments -	200 0 0	
			Royal Navy -	566 7 6	
			Mercantile Marine -	190 6 8	
			Distant island and coast stations -	4 16 8	2,569 10 10
			Commissions executed for Colonial and Foreign Institutions, &c. -	- - -	587 6 10
			BALANCE:		
			Cash at Bank -	3,024 12 4	
			„ at Office -	76 8 10	3,101 1 2
	£ 20,252 5 11			£ 20,252 5 11	

In the year 1890-91 the sum of 1,515*l.* 10*s.* 8*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to clerks, and rental of private wires.

APPENDIX XVIII.

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

OFFICIAL.

- No. 1. Report for 1867. Presented to Parliament. 1s.
2. Instructions for Meteorological Telegraphy. New Edition 1891, prepared for the use of observers exclusively.
3. Fishery Barometer Manual. (New edition, 1887.) 6d.
4. Charts of Surface Temperature, South Atlantic Ocean. 2s. 6d.
5. Report for 1868. Presented to Parliament. 5d.
6. Report for 1869. Presented to Parliament. 10d.
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5s. each.
8. Barometer Manual. (Out of print, see Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5s. each.
10. Report for 1870. Presented to Parliament. 10d.
- *11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2s. 6d.
- *12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2s. 6d.
13. A Discussion of the Meteorology of the Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February 1870. Price, with Book of Charts, 5s.
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5s. each.
15. Report for 1871. Presented to Parliament. 10d.
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5s. each.
17. Report for 1872. Presented to Parliament. 1s.
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2s.
19. Quarterly Weather Report, 1873.—Parts I. to IV. 5s. each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20°—30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20s.
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1873. 1s.
22. Report for 1873. Presented to Parliament. 4d.
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2s.
24. Instructions in the Use of Meteorological Instruments. [Reprinted 1888.] 2s. 6d.
25. Quarterly Weather Report for 1874.—Parts I., II., and IV., 5s. each. Part III., 5s. 9d.
26. Report for 1874. Presented to Parliament. 6d.

* The Meteorological Council have given away the copies which were placed at their disposal, but the work can be purchased from the Publishers.

LIST OF PUBLICATIONS, &c.—continued.

- No. 27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. 24s.
28. Contributions to our Knowledge of the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger*. 1s.
29. Report for 1875. Presented to Parliament. 4d.
30. Quarterly Weather Report for 1875.—Parts I.—IV. 5s. each.
31. Report for 1876–7. Presented to Parliament. 3s. 5d.
- *32. A Discussion of the Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. 15s.
33. Quarterly Weather Report for 1876 (New Series).—Part I., 6s.; Parts II., III., and IV., 5s. each.
- *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 for 1877–8. Presented to Parliament. 1s.
36. Report of the Proceedings of the Meteorological Congress at Rome, 1879. 1s. 6d.
37. Report on the Meteorology of Kerguelen Island. By the Rev. S. J. Perry, S.J., F.R.S. 3s.
38. Report for 1878–9. Presented to Parliament. 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 the Rev. W. Clement Ley, M.A. 1s.
41. Report for 1879–80. Presented to Parliament. 1s.
42. Report for 1880–81. Presented to Parliament. 1s. 2d.
43. Charts of Meteorological Data for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Price of the Charts, 25s.; of the 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. 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.
47. Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. 7s. 6d.
48. Report for 1881–2. Presented to Parliament. 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, 1881. (New Series.) Part I., 10s. 6d.; Parts II., III., and IV., 21s. each.

* The Meteorological Council have given away the copies which were placed at their disposal, but the work can be purchased from the Publishers.

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

- No. 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, 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 for 1882-3. Presented to Parliament. 10½d.
59. Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. 21s.
60. Principles of Weather Forecasting. By the Hon. Ralph Abercromby, F.R.Met.Soc. (Second edition), 2s.
61. A Barometer Manual for the Use of Seamen. 1s. 3d.
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, 1883. Parts I., II., and III., 21s. each; Part IV., 30s.
64. Report for 1883-4. Presented to Parliament. 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 for 1884-5. Presented to Parliament. 4s. 4d.
68. Monthly Weather Reports for 1886. Jan. to Dec., 1s. 6d. each.
69. Meteorological Observations at Stations of the Second Order for the year 1882. 35s.
70. Hourly Readings, 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 for 1885-86. Presented to Parliament. 8d.
73. Meteorological Observations at Stations of the Second Order for the year 1883. 30s.
74. Hourly Readings, 1885. Parts I. and II., 11s. each; Part III., 10s. 6d.; Part IV., 12s.
75. Report for 1886-87. Presented to Parliament. 8d.
76. Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. 10s. 6d. Supplemental Chart, 6d.
77. Monthly Weather Reports for 1887. January to April, 1s. 6d. each. May to December, in wrapper, price 12s.
78. Meteorological Observations at Stations of the Second Order for the year 1884. 32s.
79. Report for 1887-88. Presented to Parliament. 1s.
80. Daily Weather Charts for the period of six weeks ending June 25, 1885, to illustrate the tracks of two cyclones in the Arabian Sea. 10s.

LIST OF PUBLICATIONS, &c.—continued.

- No. 81. Hourly Readings. 1886. Parts I., II., and III., 10s. 6d. each. Part IV., 12s. 6d.
82. Meteorological Observations at Stations of the Second Order for the year 1885. 31s.
83. Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers and Army Medical Department, 1852–1886. 23s.
84. Report for 1888–89. Presented to Parliament. 5½d.
- *85. Weekly Weather Report for the year 1888. Vol. V. Second Series. 4d. per week. With Appendices and Monthly Supplements, priced separately.
86. Weekly Weather Report for the year 1889. Vol. VI. Second Series. 6d. per week. With Appendices and Monthly Supplements, priced separately.
87. Weekly Weather Report for the year 1890. Vol. VII. Third Series. 6d. per week. With Appendices and Monthly Supplements, priced separately.
88. Meteorological Observations at Stations of the Second Order for 1886. 25s.
89. Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo. 1886–88. By the late W. Reid, M.D. 8s. 6d.
90. Cyclone Tracks in the South Indian Ocean. From information compiled by Dr. Meldrum, C.M.G., F.R.S. Price 7s.
91. Report for 1889–90. Presented to Parliament. 7½d.
92. Meteorological Charts of the portion of the Indian Ocean adjacent to Cape Guardafui and Ras Hafún. 6s.
93. Harmonic Analysis of Hourly Observations of Air Temperature and Pressure at British Observatories. (In the Press.)
94. Hourly Means of the Readings obtained from the Self-recording Instruments at the Four Observatories under the Meteorological Council, 1887. 16s.
95. Meteorological Observations at Stations of the Second Order. 1887. 24s.
96. Weekly Weather Report for the year 1891. Vol. VIII., Third Series. 6d. per week. With Appendices and Monthly Supplements, priced separately. Annual subscription, including Supplements and Appendices, post paid, 30s.
97. Hourly Means of the Readings obtained from the Self-recording Instruments at the Four Observatories under the Meteorological Council, 1888. (In the Press.)
98. Ten Years Sunshine in the British Isles (1881–90). (In the Press.)
99. Report for 1890–91. Presented to Parliament.

* The publication of the Weekly Weather Report began in February 1878.

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- *85. Weekly Weather Report for the year 1888. Vol. V. Second Series. 4d. per week. With Appendices and Monthly Supplements, priced separately.
86. Weekly Weather Report for the year 1889. Vol. VI. Second Series. 6d. per week. With Appendices and Monthly Supplements, priced separately.
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97. Hourly Means of the Readings obtained from the Self-recording Instruments at the Four Observatories under the Meteorological Council, 1888. (In the Press.)
98. Ten Years Sunshine in the British Isles (1881–90). (In the Press.)
99. Report for 1890–91. Presented to Parliament.

* The publication of the Weekly Weather Report began in February 1878.

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

NON-OFFICIAL.

- No. 1. Report to the Committee on the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6*d*.
- *2. Report to the Committee on the Meteorology of the North Atlantic.—By Captain H. Toynbee, Marine Superintendent. 1*s*.
- *3. Report to the Committee on the Use of Isobaric Curves.—By Captain H. Toynbee, Marine Superintendent. 1*s*.
4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. 6*d*.
5. On the Winds, &c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6*d*.
6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1872. 1*s*.
7. Notes on the Form of Cyclones in the Southern Indian Ocean.—By C. Meldrum, M.A., F.R.S. [Out of Print.]
8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 1873. 6*d*.
9. Report of the Permanent Committee of the Vienna Congress for 1874. 1*s*. 6*d*.
10. On the Physical Geography of that part of the Atlantic which lies between 20° N. and 10° S. and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875.—By Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1*s*. 6*d*.
11. Report of the Permanent Committee of the Vienna Congress for 1876. With Supplement. 2*s*.
12. Reports to the Permanent Committee of the Vienna Congress on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2*s*.
13. Report of the Permanent Committee of the Vienna Congress for 1878. 6*d*.
14. Report of the International Meteorological Committee Meeting at Berne, 1880. 1*s*.

* The Meteorological Council have given away the copies which were placed at their disposal, but the work can be purchased from the Publishers.

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

- No. 15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen, August 1882. 2s. 6d.
16. Report of the Third Meeting of the International Meteorological Committee, held at Paris, September 1885. 1s.
17. Report of the Fourth Meeting of the International Meteorological Committee held at Zürich, September 1888. 4d.
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