

R E P O R T
OF THE
METEOROLOGICAL COUNCIL

For the Year ending 31st of March 1895;

SUBMITTED TO THE
PRESIDENT AND COUNCIL
OF THE
ROYAL SOCIETY.

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



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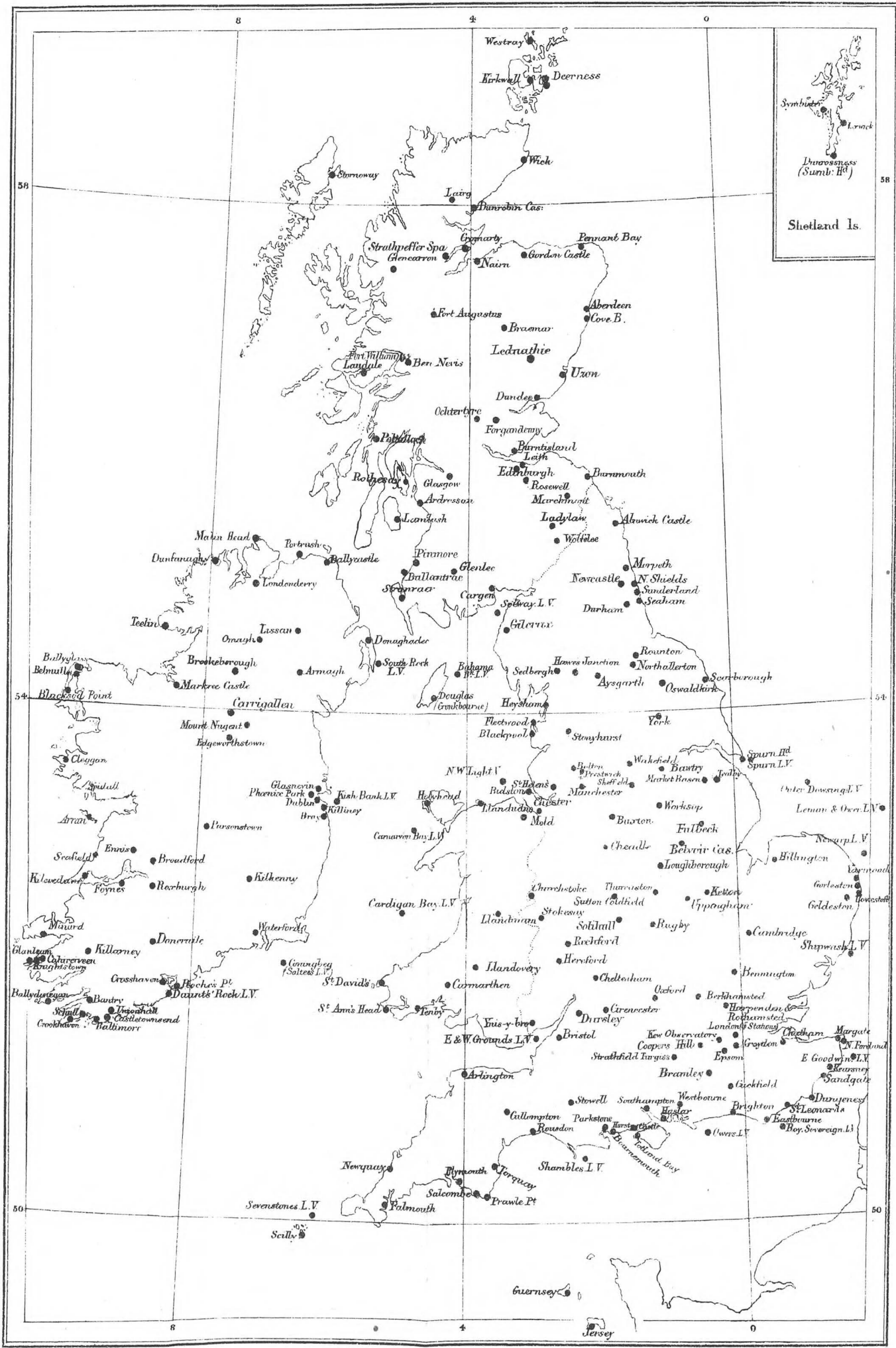
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MAP SHOWING THE APPROXIMATE POSITIONS OF THE STATIONS FROM WHICH OBSERVATIONS ARE RECEIVED.



For details of Information Received. See Appendix XI.



THE METEOROLOGICAL COUNCIL,

1894-95.

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F.R.S., Chairman.

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

MR. ROBERT H. SCOTT, M.A., F.R.S. (Secretary).

REPORT

OF THE

METEOROLOGICAL COUNCIL

TO THE

ROYAL SOCIETY,

For the Year ending March 31, 1895.

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

Mr. Scott, Secretary.

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

The Report is, as usual, divided into four sections or parts :

- I. OCEAN METEOROLOGY.
- II. WEATHER TELEGRAPHY.
- III. CLIMATOLOGY.
- IV. MISCELLANEOUS.

PART I.

OCEAN METEOROLOGY.

Collection of Information.—The practice followed by the Office in the collection of information has been to supply observers with a complete outfit of verified instruments, on the condition of their returning the instruments, and the log of observations made with them, to the Office at the completion of the voyage. *Collection of information.*

The instruments supplied are :—

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

The first record of observations is made in a rough book supplied for the purpose, which is retained by the Captain, who copies the observations into a regular form of log kept for the Office. As regards the Royal Navy, Her Majesty's ships are supplied by the Office with the meteorological instruments used in the Service, and the Council are glad to say that they receive meteorological logs of high value from this source.

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

Collection of
information.

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

Aberdeen, J. R. Jones, Navigation School.
 Cardiff, T. L. Ainsley, Bute Docks.
 Dundee, Capt. A. Wood, Navigation School.
 Glasgow, Messrs. D. McGregor and Co., Clyde Place.
 Greenock, Messrs. D. McGregor and Co., Brymner Street.
 Hull, Z. Scaping, Trinity House.
 Liverpool, J. Gill, Nautical College.
 Southampton, Capt. D. Forbes, High Street.

Occasionally captains are supplied at ports where there are no agencies, and in these cases the instruments are sent direct from the Office in London. The number of merchant ships supplied with standard instruments and logs during the year was 90.

A set of instruments is kept in working order at the Office in London, and at each agency, for the purpose of instructing observers in the handling and reading of all the instruments. A notice to captains is frequently distributed to vessels lying in the various London docks, and copies of it are also supplied to each agent for circulation.

Various publications (see App. XVI., p. 122) are presented by the Council to observers who supply the Meteorological Office with thoroughly well kept logs, in recognition of their co-operation in a work which is calculated to be of very great advantage to navigators and to science generally.

Recognition of
"excellent"
observers.

Appendix I. (p. 36) 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 :—

Observer's Name.	Ship.
Darby, H. G.	S.S. "Ormuz."
Dulling, G.	S.S. "Strathclyde."
Free, T., R.N.R.	S.S. "Port Chalmers."
Gibson, J. H.	S.S. "Wydale."
Gubbins, Lieut. G. W., R.N.	H.M.S. "Penguin."
McGregor, J.	S.S. "Glenartney."
Seaton, W. A., R.N.R.	S.S. "Thames."
Thomas, H. G.	S.S. "Yarrawonga."
Thorpe, V. G., (Surgeon)	H.M.S. "Penguin."
Walton, R.	S.S. "Port Victor."

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 death of two of their observers, Capt. H. G. Darby, S.S. "Ormuz," and Capt. J. C. Long, S.S. "Japan," the latter of whom had been observing for the Office for seven years.

The total number of Meteorological logs received in the year ending March 31, 1895, was 127, of which 121, or 95 per cent., have been classed as either "excellent" or "very good."

The Council continue to receive, through the Ocean Steamship Company of Liverpool, a considerable number of ships logs, mostly from voyages to and from the China Seas, viâ Suez.

Appendix II. (p. 38) gives a list of the meteorological logs from ships, received at the Office during the year.

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

North Atlantic	-	388	Pacific Ocean, South	-	56
South	„	124	Mediterranean	-	160
Indian Ocean	-	211	Red Sea	-	141
Pacific Ocean, North	-	80	Arctic Ocean	-	10

Districts from which observations are obtained.

The following is an account of the works either published or in course of preparation in this branch of the Office during the year :—

Red Sea Charts.—These charts are in the hands of the binders and will be issued immediately.

Current Charts for all Oceans.—Having collected all the information available from English and foreign sources, the work of obtaining generalised results is in progress, and the charts of the Indian Ocean are already well advanced.

The Meteorology of the South Sea.—The charts for this region, embracing the area from the Cape of Good Hope to New Zealand, and south of the latitude 30° S., are now almost completed, and will shortly be sent to the engraver.

The South Atlantic and West Coast of South America.—The preparation of logs and extraction of the data for this district is steadily advancing.

Supply of Instruments to Distant Stations.—In the course of the year the outfit of a complete meteorological station has been supplied to the Church Missionary Society for one of their settlements in Uganda. The Jackson-Harmsworth Arctic Expedition was also supplied with meteorological instruments suitable for use in the polar regions.

Supply and Stock of Instruments.—In Appendix III. (p. 42) 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 1895 of the stock and distribution of the instruments standing on the books to the account of the Admiralty. The recent augmentation of the number of ships in commission and in reserve has led to the necessity of providing a considerably larger stock of instruments than had been required in former years.

Appendix IV. (p. 43) 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, and to observatories, telegraph stations, &c.

PART II.

WEATHER TELEGRAPHY AND FORECASTS.

Administra-
tive.

There have been no long continued interruptions of telegraphic communication during the year. At Christmas our reports from the northern and north-western districts were entirely stopped for three days, owing to the wholesale destruction of telegraph wires caused by the gale of December 22nd. Communication with Norway and Denmark was interrupted November 14th, 1894 and January 14th, 1895.

Among the observers there have been three changes. At Cambridge Miss A. Walker has replaced Mr. P. Morris, at Prawle Point Mr. T. Howse has replaced Mr. M. Holmes in command of the coastguard station and as reporter, and at Stornoway Mr. J. Mackenzie has been appointed in place of Mr. J. Forbes.

A list of the telegraphic reporting stations in the United Kingdom is given in Appendix XI. (p. 84), and of the Foreign stations in Appendix XI. (p. 89).

The work in this branch of the Office has gone on as usual. The only addition to the list of reporting stations has been Karlstad on Lake Wener in the interior of Sweden.

Inspection of
the Stations.

Inspection of the Telegraphic Reporting Stations.—The telegraphic reporting stations have been inspected during the year, in England by Messrs. F. Gaster and R. and J. Curtis, in Scotland by Mr. Buchan, and in Ireland and Wales by Mr. Scott. The reports submitted to the Council by the Inspectors, which are printed in Appendix V. (p. 44), show that the efficiency of the service has not been impaired. The stations in Foreign countries are controlled by the Meteorological authorities of the respective countries.

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 X. of the Report for 1891. 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, 79 copies; to correspondents of the Office, 61 copies; and to foreign meteorological establishments, 35 copies. Nearly 200 copies are issued regularly to paying subscribers.

Distribution
of reports.

The Weekly Weather Report, with its Monthly Appendices, has also appeared regularly; for particulars of this publication see Appendix VI. (p. 72). Weekly Weather Report.

Public display at the Meteorological Office in London of the State of the Weather on British Coasts.—This arrangement, which was made 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 eastern, southern, and western coasts, has been regularly carried out, and it is believed with general public approval, to judge from the number of persons constantly found examining the maps and frames. It supplies at 9.30 a.m. and 3 p.m. every week day the substance of the reports received by telegraph, of the state of the weather and sea at the following stations: Yarmouth, Dungeness, the Needles (Hurst Castle), Scilly, Holyhead, and Valencia, and this is displayed in a conspicuous manner on the front of the Office, 63, Victoria Street, S.W. Display of information in front of the Office.

Supply of Forecasts to the Admiralty.—At the request of the Admiralty daily forecasts were supplied to the Commander-in-Chief, Devonport, as in previous years. Forecasts for the Admiralty.

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. Forecasts.

The inquiries received through the Post Office for special forecasts during the year amounted to 95, and the personal applications to 72. The rules of the Office relating to such inquiries are stated in Appendix VI., p. 75. Inquiries at the Office.

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 VII. (p. 76). The following summary shows the successes and failures over the whole United Kingdom, estimated as explained in that Appendix. Results of Forecasts.

* 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 the 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.

SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1894-95.

Districts.	Per-centages.				Total per-centage of Success.
	Complete Success.	Partial* Success.	Partial* Failure.	Total Failure.	
SCOTLAND, N. - -	55	28	11	6	83
„ E. - -	56	25	14	5	81
ENGLAND, N.E. - -	59	25	12	4	84
„ E. - -	58	29	9	4	87
MIDLAND COUNTIES -	56	28	12	4	84
ENGLAND, S. - -	61	27	8	4	88
SCOTLAND, W. - -	49	29	14	8	78
ENGLAND, N.W. - -	56	27	12	5	83
„ S.W. - -	59	25	10	6	84
IRELAND, N. - -	55	24	12	9	79
„ S. - -	52	29	13	6	81
Summary - -	56	27	12	6	83

* Note, “partial” implies “more than half.”

Testing of
Forecasts.

The following table shows for each year from 1885 to 1894 inclusive, the per-centages of complete and partial success of the Forecasts issued at 8.30 p.m. for the whole year. It will be seen that the total for “complete success” was highest in 1893, and that 1894 did not fall far short of its predecessor.

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.
1885 - -	50	34	84
1886 - -	49	31	80
1887 - -	52	32	84
1888 - -	51	31	82
1889 - -	49	32	81
1890 - -	50	32	82
1891 - -	50	30	80
1892 - -	46	33	79
1893 - -	59	25	84
1894 - -	56	27	83
Average - -	51·2	30·7	81·9

Hay Harvest
Forecasts.

Hay Harvest Forecasts.—The Council renewed in 1894 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 1894.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass -	Golspie.
	Major Smith -	Munlochy, Inverness.
	T. Wilson -	Glamis Castle, by Forfar.
1. SCOTLAND, E.	C. Pirrie -	Rothiemay, Huntly.
	T. Bett -	Dalnaine, Aberfeldy.
2. ENGLAND, N.E.	Sir J. Wilson -	Chillingham Barns, Chatton, Northumberland.
3. ENGLAND, E.	W. Birkbeck -	High House, Thorpe, Norwich.
	Sir J. B. Lawes, Bt., and Sir J. H. Gilbert, Ph.D.	Rothamsted, Harpenden.
	Royal Agricultural College.	Cirencester.
4. MIDLAND COUNTIES	Major Fosbery -	Warwick.
	T. H. Thursfield -	Barrow, Broseley, Salop.
	E. E. Harcourt-Vernon -	Grove Hall, East Retford.
	*J. Watson -	Shirburn, Tetsworth, Watling- ton.
5. ENGLAND, S.	*Rev. S. H. Williams -	Newport Pagnell, Bucks.
	C. Whitehead -	Barming House, Maidstone.
	E. P. Squarey -	The Moot, Downton, Wilts.
	M. J. Sutton -	Kidmore Grange, Caversham.
	*T. Stirton -	Stratton, Micheldever, Hants.
	*R. Webb -	Beenham, Berks.
	W. Calder -	Castle Hill, Dalreoch, Dum- barton.
6. SCOTLAND, W.	Sir M. J. Stewart, Bt., M.P.	Ardwell, Stranraer.
	J. S. R. Ballingal (the late).	Eallabus House, Islay.
7. ENGLAND, N.W.	G. W. Wray (the late)	Leyburn, Yorkshire.
	The Earl of Ducie -	Tortworth, Gloucestershire.
8. ENGLAND, S.W.	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.
	D. A. Milward -	Lavistown, Kilkenny.
10. IRELAND, S.	W. Talbot Crosbie, D.L.	Ardfert Abbey, Tralee, Co. Kerry.

* An asterisk is inserted against the names of those recipients who subscribed for the forecasts.

The telegrams were sent daily for the period of about five weeks commencing June 11th. In some cases, by special request, they were continued for the period of the corn harvest.

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:—

Hay Harvest
Forecasts.

SUMMARY OF RESULTS.—HAY HARVEST FORECASTS, 1894.

Districts.	Names of Stations.	Per-centages.				Total per-centage of Success.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
SCOTLAND, N.	Munlochy and Golspie - - -	60	33	7	—	93
" E.	Aberfeldy, Glamis, and Rothiemay -	56	34	10	—	90
ENGLAND, N.E.	Chatton - - - - -	67	24	9	—	91
" E.	Rothamsted and Thorpe - - -	64	30	6	—	94
MIDLAND COUNTIES	Cirencester, East Retford, Warwick, Broseley, Watlington, and Newport Pagnell.	67	25	8	—	92
ENGLAND, S.	Maidstone, Downton, Reading, Beenhams, and Micheldever.	58	35	7	—	93
SCOTLAND, W.	Stranraer, Islay, and Dumbarton -	56	32	12	—	88
ENGLAND, N.W.	Leyburn - - - - -	53	37	10	—	90
" S.W.	Tortworth, Clifton, and Glastonbury -	65	23	11	1	88
IRELAND, N.	Moynalty and Edgeworthstown -	68	15	11	6	83
" S.	Tralee and Kilkenny - - -	62	20	15	3	82
Mean for all districts - - -		61	28	10	1	89

These figures show that the forecasts for 1894 gave a total percentage of 89, which may be considered very satisfactory as the weather was very unsettled at the season.

Forecasts
to the Board
of Agriculture.

Forecasts to Her Majesty's Board of Agriculture.—The Board of Agriculture extended their system of issuing these forecasts considerably as compared with the previous year. The Council are indebted to them for a Report on the service, from which the subjoined extracts have been made:—

"In the spring of 1894 the Board of Agriculture made arrangements, with the sanction of the Lords Commissioners of Her Majesty's Treasury, to repeat on a larger scale the experiments initiated in the previous year of exhibiting at telegraphic stations in rural districts every afternoon the daily weather forecasts issued by the Meteorological Council. The counties of Somerset, Carnarvon, Ayr, Cambridge, York (East Riding), and Haddington were selected for this experiment and arrangements were made that the forecasts should be despatched to the telegraph offices at such varying periods as would suit the agricultural conditions of the hay and corn harvest in the several counties. The period of exhibition was (in the case of each county) of eight weeks' duration. The forecasts were issued in the first instance to the county of Somerset on June 11th; a fortnight later (June 25th) forecasts were issued to Ayr and Carnarvon. Cambridge followed a week later, namely, July 2nd, while to York (East Riding) and Haddington the first forecast was despatched on July 23rd and August 16th respectively.

“ The number of stations at which the forecasts were exhibited in Somerset was 106, in Ayr 54, in Carnarvon 32, in Cambridge 50, in York (East Riding) 47, and in Haddington 16. Forecasts to the Board of Agriculture.

“ A form of ‘ Record of Weather,’ similar to the form used by the Meteorological Office in connexion with the issue of the hay harvest forecasts, but having room for only one observation a day, was issued to observers, who were requested to record daily the hour at which the forecast was exhibited, the direction and force of the wind, and the general conditions of the weather, including ‘ temperature,’ ‘ sky,’ ‘ rainfall,’ and ‘ storms.’ A column was also reserved for recording the number of hours daily that work was suspended owing to rain.”

The observations recorded in these forms were analysed and compared with the forecasts by the Board of Agriculture. There appears to have been some uncertainty in the minds of several of the reporters as regards the interval covered by the forecasts, and the results of the checking are not quite conclusive. An interesting report on the forecasts for the neighbourhood of Reading by Mr. H. N. Dickson to the Council of the University Extension College at Reading has been communicated to the Board of Agriculture, by whose permission the paper has been reprinted in this Report as Note A, p. 22.

The Council regret that the experiment thus made in 1894 is not to be repeated in the present year. It is apparent that the proper appreciation of the value of information, such as is given in the forecasts, can only be arrived at after somewhat continued experience, and that the best mode of framing and distributing the forecasts can only be satisfactorily determined by actual trial. In such a matter the fact that many persons after such experience attest the value of the information supplied, cannot be reasonably held to be controverted by the opinions of those who after a short trial have failed to recognise its utility. In this, as in many other directions, the public has to be educated, before knowledge presented in a form that is not familiar is appreciated at its true worth. The Council, therefore, trust that the subject may continue to receive the attention of the Board of Agriculture, which they are satisfied it deserves, in connexion with what is one of the most important industries of our country.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix VIII., p. 77, 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. Storm Warnings.

These stations were, at the end of March 1895, 180 in number, situated :—

103 in England and Wales, 48 in Scotland, 23 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 VI., p. 75. 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 1894.**

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. -	42	28	9	2	—	3	Feb. 3, May 4, Dec. 26-27.
" E. -	34	20	8	6	—	—	—
" N.W. -	45	35	7	3	—	—	—
" W. -	42	20	19	3	—	—	Dec. 18-19.
Ireland, S.W. -	39	30	7	—	2	—	April 24, Dec. 14- 15, Dec. 18-19.
" N.W. -	48	38	7	3	—	—	Dec. 18-19.
Irish Sea -	41	35	5	—	—	1	Dec. 14-15, Dec. 18-19.
St. George's Channel -	39	20	19	—	—	—	Dec. 18-19.
Bristol Channel -	36	27	7	1	1	—	Jan. 31, Dec. 18-19.
England, S.W. -	35	28	6	1	—	—	Jan. 31, Dec. 14-15, Dec. 18-19.
" S. -	27	16	10	1	—	—	—
" S.E. -	27	17	6	4	—	—	—
" E. -	22	14	5	3	—	—	—
" N.E. -	25	16	3	3	1	2	—
Totals -	502	344	118	30	4	6	
Per-centages -	—	68·5	23·5	6·0	0·8	1·2	

**NOTES as to GALES EXPERIENCED in 1894 but for which no
WARNING was issued.**

1. *January 31st. A North-Westerly Gale, in the Bristol Channel and on the Coasts of England S.W.*—The coasts of Ireland and the N.W. coasts of Great Britain were all duly warned; but the unexpected development of a secondary disturbance near Holyhead caused the gale to spread southwards down our south-western coasts.

2. *February 3rd. A Westerly Gale, in Scotland N.E.*—This gale had been duly warned for on our W. and N.W. coasts. but it extended further in a North-Easterly direction than was expected.

3. *April 24th. A Southerly Gale in Ireland S.W.*—At 6 p.m. on 23rd there was nothing in the chart to show that anything of the character of a deep depression was advancing from the Atlantic; next morning the disturbance had advanced too far for this district to be warned.

4. *May 4th. A North-Westerly Gale, in Scotland N.E.*—A small depression, lying between the Shetland Islands and Norway on the 3rd appeared to be moving away to the eastward, but at night it suddenly grew deeper and moved southwards. There was no indication of this change at 6 p.m. on the 3rd.

5. *December 14th and 15th. A Westerly Gale over the South-Western parts of our Islands and the Irish Sea.*—At 6 p.m., 14th, a depression lay off our north-western coasts, but was not of threatening intensity. In the night, however, a sudden increase of pressure on its Western side (*i.e.* over the Atlantic) increased the gradient over the districts named, and as a result the gales here mentioned were experienced. There was nothing in the observations to show that such a change was probable. Storm warnings.

6. *December 18th and 19th. A Westerly Gale on all our W. and N.W. coasts.*—At 6 p.m. on the 17th it was evident that a depression was coming on from the Atlantic, and strong winds were forecasted. The system, however, proved to be more serious than was anticipated and at 8 a.m., 19th it was too late for warnings to be issued.

7. *December 26th–27th. North-Westerly Gales in Scotland N.E.*—A large deep depression was advancing over Northern Europe from the north-westward, causing gales in Norway. Our coasts did not appear to be threatened, all the northern reports were coming in late, and those from Sumburgh Head had not arrived for some time, owing to telegraphic interruption caused by the heavy gale of December 22nd. A secondary disturbance came rapidly towards the Shetlands without warning, and caused the gale referred to.

Had the Sumburgh Head reports been in promptly this gale would probably have been warned for, but it is one of a type which have defeated our efforts several times, and which will probably do so again unless we can obtain good information regularly from the Farø Islands.

The following table contains a comparative statement of the storm warnings and their results in 1894, and in the nine preceding years. It will be seen that the total per-centage of warnings justified was nearly the same as in 1892, and the total justified by subsequent gales was the highest on record. Comparison of results for 1894 with previous years.

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
		p.c.	p.c.	p.c.	p.c.
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
1891	522	62·3	24·5	86·8	7·5
1892	483	59·4	31·2	90·6	6·8
1893	480	60·8	28·6	89·4	7·1
1894	502	68·5	23·5	92·0	6·0

Storm
warnings.

The following diagrams Figs. 1 and 2, show the figures of the last two columns of the table in a graphical form :—

DIAGRAM showing the INCREASE in PER-CENTAGE of SUCCESSFUL WARNINGS issued in each Year from 1885-94.

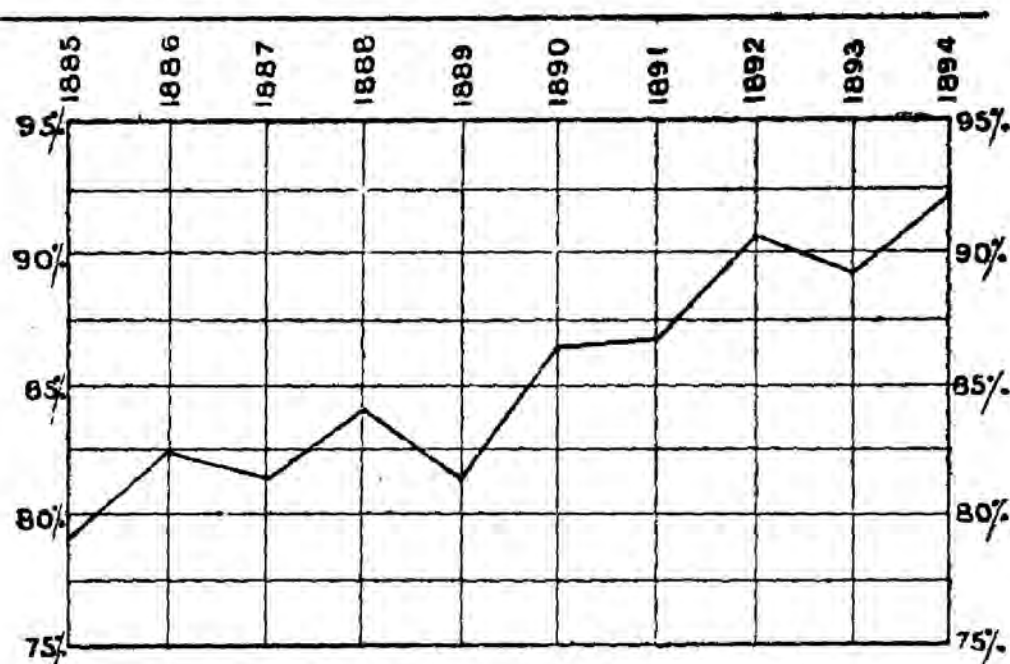


FIG. 1.

DIAGRAM showing the DECREASE in the PER-CENTAGE of UNNECESSARY WARNINGS issued in each of the Years 1885-94.

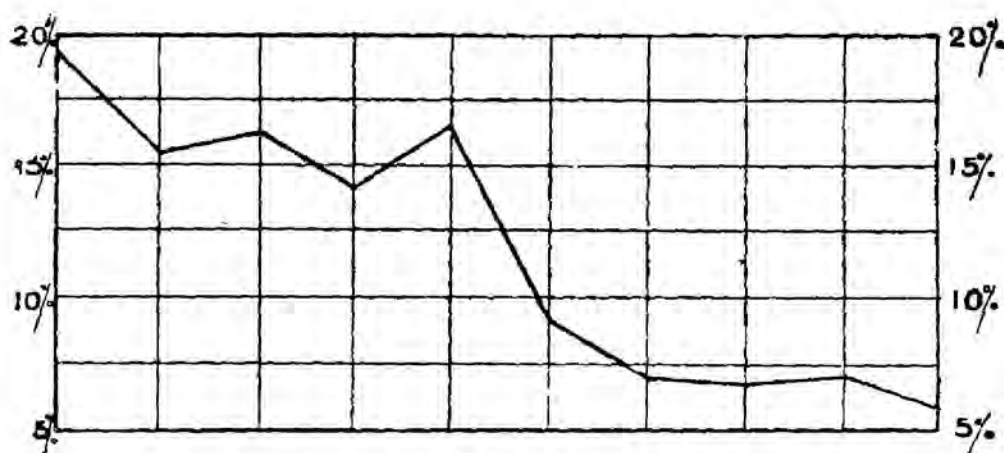


FIG. 2.

Fishery
Barometers.

Fishery Barometers.—To add to the means available to the sea-going population for obtaining warnings of stormy weather barometers have for many years been supplied by the Office on loan to fishing villages and other places on the coast, to be set up for public information. The whole number of stations provided by the Office with these instruments is 203. Of these 64 are in England, 7 in Wales, 60 in Ireland, 67 in Scotland, 4 in the Isle of Man, and 1 in Jersey. The list is given in Appendix IX., p. 80.

PART III.

CLIMATOLOGY.

A.—BRITISH ISLES.

Observations relating to the climate of the British Isles are received by the Office from 245 stations in all. These stations may be divided into seven classes, according to the kind and completeness of the observations supplied to the Office from them, as follows:—

1. *Observatories.*—Seven Observatories, furnishing a continuous record of pressure, temperature, wind, sunshine, and rainfall, with frequent eye observations of cloud and weather. At Fort William there is no anemometer, as the country is very hilly. These alone afford the materials necessary for the study of the periodic variations of the meteorological elements. Self-recording observatories.

2. *Anemographic Stations.*—Nine Anemographic stations furnishing a continuous record of the wind. 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. *Barograph Stations.*—Stations furnishing a continuous record of pressure obtained from some form of self-recording aneroid. These are valuable as giving the exact time of the occurrence of pressure maxima and minima at certain stations, and thus helping to determine the rate of movement of the various depressions that cross these islands. Barograph Stations.

4. *Sunshine Stations.*—Forty-eight stations furnishing a continuous record of bright sunshine. At 47 of these stations, the instrument in use is the Campbell-Stokes recorder (*see* Report for 1879, p. 32); at the other station the Jordan photographic recorder is employed. A return of the daily duration of sunshine is also received from eight other stations. Sunshine Stations.

5. *Telegraphic Stations.*—Thirty Telegraphic Reporting Stations, at which the observations are taken by eye, but supplemented in some cases by self-recording aneroids, &c. These supply the material upon which the daily weather reports and forecasts are based. Telegraphic Reporting Stations.

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.

6. *Second Order Stations.*—Seventy-four Stations of the Second Order, furnishing complete climatological information from eye observations taken twice a day. The observers at these stations are all volunteers. Stations of Second Order.

Stations of the
Third Order.

7. *Third Order Stations*.—Stations of the Third Order furnishing returns similar in kind to those in Class 6, but with less completeness and detail.

It must be explained that some of the stations are really of a higher class than would appear from the list in App. XI., p. 84, which is compiled solely with reference to the amount of the data supplied to this Office.

For instance at Liverpool (Bidston) and Oxford, there are regularly equipped meteorological observatories, though the stations appear only as telegraphic or Second Order stations in the list; and the same remark applies to other cases.

A fuller account of the methods employed by the Office in dealing with these records will be found in Appendix X. (p. 81).

List of
Stations.

Appendix XI. (p. 84) contains a list of the stations furnishing information relating to the land meteorology of the British Isles during the year.

Inspection of
stations.

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 6), 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 inspection of the self-recording observatories was carried on by Mr. Charles Chree, D.Sc., Superintendent of the Kew Observatory, and Messrs. T. W. Baker and E. G. Constable, his assistants.

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

Reports sup-
plied to
Registrar
General for
Ireland.

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

Publications.

The Weekly Weather Report, which is prepared in the Telegraphic Branch of the Office (see Appendix VI., p. 72), 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 believed not to be found in the similar publications issued by any other office.

Appendix I. to the Weekly Weather Report for 1894 gives a summary for each quarter, and for the whole year, of the Rainfall and Temperature for each district, for the 29 years 1866–1894, and also the Monthly and Progressive values of Accumulated Heat, Rainfall, and Bright Sunshine for all the districts in each month of 1894. Appendix II. to the same Report gives the Weekly and Progressive values for the same elements during the year 1894 (in continuation of Appendix II. for the year 1893).

Hourly Means of Meteorological Observations.—The Volumes of Hourly Means for 1891 and 1892 are now in the press. Hourly Means of Meteorological Observations.

The volume for 1891 contains, in addition to what has appeared in previous volumes, results for Fort William Observatory, and also hourly records of sunshine for all the observatories.

There is further a special appendix giving the results of the hourly tabulation of the sunshine recorded in the ten years 1881–90, at the seven observatories, as announced in last Report.

Observations at Stations of the Second Order.—The volume for 1890 is now issued, and that for 1891 is far advanced. Stations for publication.

As regards the detailed publication on Form A., the list of stations for 1891 is the same as that for 1890. With regard to the B. Stations (monthly means and summaries) the list has been increased by two, viz.,

St. Leonards—re-inserted—the evening observations having been resumed.

Arley Cottage, Mount Nugent, Co. Cavan.

B.—FOREIGN and COLONIAL STATIONS.

For a long time returns from various Foreign and Colonial stations have been received at the Meteorological Office, and in previous Reports a list of such documents has been given in the Appendix which contains the list of Logs received. Foreign and Colonial Stations.

During the year ending March 31st 1895, returns were received from 35 of these stations, as shown in Appendix XII, p. 90.

Most of these stations furnish observations taken twice daily, and the results are dealt with in the same way as those from Stations of the Second Order, as in Class 6 above. Continuous records of bright sunshine are received from Georgetown, British Guiana, and from Trinidad.

The results thus obtained are published from time to time when deemed of sufficient value. A paper has been prepared in the Office on the climate of Mojanga on the N.W. coast of Madagascar and published in the Quarterly Journal of the Royal Meteorological Society.

Besides this the meteorological tables published in the official Blue Book for the island of Cyprus have been prepared in this Office.

At the present time the observations from Cape Juby on the N.W. coast of Africa, and Georgetown, Demerara, are being discussed.

PART IV.

MISCELLANEOUS.

Anemometer Experiments.—Experiments have been continued during the year with the Dines' pressure-tube anemometer, erected on the roof of the Office in Victoria Street, to test its indications. The Council erected a second instrument by the side of the first in order to make some comparative experiments as to the effect of varying the length of the tube, and contracting its bore, which Anemometer Experiments.

Anemometer Experiments. it was considered desirable to test before arriving at a definite opinion concerning the merits of this instrument and the best form to give to it. The result of these experiments are given in Note B., p. 27.

Influence of Situation on Anemometrical Results.—During the very severe gale of December 22nd the indications of the two anemometers at Holyhead exhibited remarkable discrepancies, which were found to vary with the direction of the wind. These could only be due to differences in the exposures of the two instruments. A report on this subject by Mr. R. H. Curtis is given as Note C., p. 29.

Hourly Mean Values. *Hourly Mean Values of Pressure and Temperature.*—The mean hourly values of these elements for the seven observatories for the 15 years 1869–1883, and for four of the observatories for the further period of seven years 1884–1890, are being grouped and combined ready for discussion preparatory to publication.

Rain Tables for the British Isles. *Rainfall Means for the British Islands.*—This work is now in a very advanced stage, and it is hoped that it may appear before Christmas. The number of stations for which the monthly and annual values for the decade 1881–90 will be published in Part I. is as follows:—

England and Wales	-	-	-	287
Scotland	-	-	-	152
Ireland	-	-	-	52

Part II., giving the values for the years prior to 1881, wherever obtainable, is almost ready, and Part III. giving the names of the authorities for the information and various other particulars, is being prepared.

LIBRARY, &c.

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 about 13,000 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 XIII., p. 92, 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.

List of Papers issued by the Office. Appendix XV., p. 116, gives a list of all the papers, &c. on scientific subjects which have appeared in the various Reports issued by the Office since 1866.

Appendix XVI., p. 122, gives the usual catalogue of Office publications.

EXPENDITURE.

Appendix XIV., p. 115, shows the total receipts and payments Financial of the Council during the year ending 31st March 1895. The amount voted by Parliament was 15,300*l.*, as in the previous year, in addition to which extra receipts from various sources amounting to 721*l.* 19*s.* 9*d.* also became available.

The following abstract of expenditure shows the amount properly chargeable against the Parliamentary grant of the year in question, and its distribution under the various heads, together with the increase or decrease in 1894-95 as compared with the previous year :—

NET EXPENDITURE.	1893-94.	1894-95.	Increase.	Decrease.
GENERAL ADMINISTRATION:	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Payment of Council -	991 5 0	987 10 0	—	3 15 0
Secretary -	800 0 0	800 0 0	—	—
Office -	903 18 8	891 6 9	—	12 11 11
Rent, fuel, and lighting -	703 7 1	717 2 2	13 15 1	—
Alterations to premises and contingencies -	387 13 1	291 8 10	—	96 4 3.
Expenses incidental to International Meteorological Congress -	—	30 13 2	30 13 2	—
Pensions -	186 16 4	159 3 3	—	27 13 1
SPECIAL RESEARCHES -	1,052 9 5	792 9 11	—	259 19 6
LAND METEOROLOGY -	3,657 2 3	3,594 16 4	—	62 5 11
WEATHER INFORMATION -	3,804 6 4	3,705 11 10	—	98 14 6
INSPECTIONS -	589 6 7	436 16 5	—	152 10 2
OCEAN METEOROLOGY -	2,893 2 9	2,805 2 3	—	88 0 6
Total -	£ 15,969 7 6	15,212 0 11	44 8 3	801 14 10

In the year 1894-95 the sum of 1,528*l.* 0*s.* 10*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires &c.

(Signed) R. STRACHEY,
Chairman.

NOTE A.

REPORT to the COUNCIL of the UNIVERSITY EXTENSION COLLEGE at READING on WEATHER FORECASTS during the HAY HARVEST of 1894, by H. N. DICKSON.

In connexion with the work of the Meteorological Department it was decided to distribute the special weather forecasts, issued by the Meteorological Office during the hay harvest, to four centres in different parts of the districts worked by the College. At each of the under-mentioned stations observers were found willing to undertake the keeping of a record by which to check the forecasts, and the public exhibition of the telegrams received:—

- | | | |
|-----------------------------|-----------|----------------------|
| 1. Newport Pagnell (Bucks), | observer, | Rev. S. H. Williams. |
| 2. Shirburn (Oxon) | „ | John Watson, Esq. |
| 3. Beenham (Berk.) | „ | R. Webb, Esq. |
| 4. Stratton (Hants) | „ | T. Stirton, Esq. |

The forms sent out by the Meteorological Office have in each case been filled up and forwarded from week to week with the greatest care and promptitude, and the best thanks of the Department are due to the gentlemen who have carried out a somewhat irksome task so fully.

The four stations selected lie approximately on a straight line running S.S.W. and N.N.E. Stratton is situated on the north-western slope of the South Downs; Beenham, 20 miles to the N.N.E., in the Kennet Valley; Shirburn, 16 miles N.N.E. from Beenham, on the south-western slope of the Chilterns; and Newport Pagnell, 32 miles N.N.E. from Shirburn, on the River Ouse, north and west from the Chilterns. The first three stations are within the district called, by the Meteorological Office for forecasting purposes, “England, South,” while Newport Pagnell is included in the “Midland Counties.” The reports from the first-named district have been compared with the telegrams sent to Mr. Sutton at Reading, Mr. Sutton having kindly supplied the College with copies, while the Newport Pagnell reports have been compared with the forecasts received at that station.

The just estimation of the success or failure, in any given locality, of a forecast issued for a large district, is by no means the easy problem it is usually considered. It is obviously necessary to adopt a method capable of being reduced to figures, and any such method must be to a certain extent arbitrary, especially where both forecast and report must be couched in general terms. The method I have adopted is that of allotting to each forecast a certain number of marks, regarding it as a kind of examination paper. Dividing into the three headings of wind, weather, and rain, four marks are allowed under each for “complete success,” three for “partial success,” two or one for different degrees of

"partial failure," and none for "total failure." Thus for wind:—

Direction and force both right	-	-	=4
Direction right, force partly wrong	-	-	=3
Direction right, force wholly wrong	-	-	=2
Direction partly right (within eight points)			
force wholly wrong	-	-	=1
Direction and force both wholly wrong	-	-	=0

and similarly for the others. The following table shows the per-centage of available marks gained:—

—	Stratton.	Beenham.	Shirburn.	Newport Pagnell.
Wind - - -	64	68	70	70
Weather - - -	67	71	74	73
Rain - - -	65	56	76	88
Means - - -	65	65	73	77
Total 70 per cent.				

To obtain an idea of the success or non-success of the work it is necessary to classify the forecasts according to the numbers obtaining a certain proportion of marks. The following table gives the number of forecasts which were awarded each number of the marks from 0 to 12; and as the question of rainfall is the most important for haymaking purposes, a special table is appended of the cases of marks (0 to 4) allotted to that element. The forecasts number 36 for each station, dating from 26th June to 5th August, exclusive of Mondays, no forecast being issued on Sunday.

WHOLE FORECAST.

Marks-	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	—
Beenham -	—	—	—	2	1	5	3	7	5	3	4	5	1	36
Stratton -	—	—	—	1	4	3	5	4	3	4	7	2	3	36
Shirburn -	—	—	—	1	2	2	1	4	4	6	5	7	4	36
Newport Pagnell -	—	—	—	—	—	2	1	5	3	7	7	6	5	36
	—	—	—	4	7	12	10	20	15	20	23	20	13	144

RAIN.

—	0.	1.	2.	3.	4.	—
Beenham - - -	10	5	3	3	15	36
Stratton - - -	6	1	10	3	16	36
Shirburn - - -	4	2	4	4	22	36
Newport Pagnell -	0	2	3	6	25	36
	20	10	20	16	78	144

For the whole forecast, we may group the 12 marks available as follows:—

0-3 Complete failure,
3-6 Partial failure,
7-9 Partial success,
10-12 Complete success,

and we get the following per-centages:—

—		Stratton.	Beenham.	Shirburn.	Newport Pagnell.
Complete failure	0-3	3	6	3	0
Partial failure	3-6	34	25	14	9
Partial success	7-9	29	41	39	42
Complete success	10-12	34	28	44	49
Total failures	0-6	37	31	17	9
Total successes	7-12	63	69	83	91

Similarly for rain:—

—		Stratton.	Beenham.	Shirburn.	Newport Pagnell.
Complete failure	0	17	28	11	0
Partial failure	1 and 2	30	22	17	13
Partial success	3	8	8	11	17
Complete success	4	45	42	61	70
Total failures	0-2	47	50	28	13
Total successes	3-4	53	50	72	87

The difficulties of weather forecasting, especially during summer, become at once abundantly evident. Newport Pagnell and Shirburn show excellent results, both for the forecasts as a whole and for rain, while the other two stations, especially in the matter of rain, are not encouraging. We may conclude that in the former case local influences did not produce so great modifications in the weather they seem to have done in the latter, and it is easy to bring this out by dividing up the period over which the forecasts extend. The following table gives the per-centage of possible marks obtained during each week of six days:—

WHOLE FORECAST.

—		Stratton.	Beenham.	Shirburn.	Newport Pagnell.
June 26—July 1	-	88	85	95	92
July 3— " 8	-	59	54	72	70
" 10— " 15	-	63	74	68	71
" 17— " 22	-	56	54	77	84
" 24— " 29	-	61	61	50	67
" 31—Aug. 5	-	63	56	78	82

RAIN.

—		Stratton.	Beenham.	Shirburn.	Newport Pagnell.
June 26—July 1	-	100	100	100	100
July 3— „ 8	-	42	46	63	63
„ 10— „ 15	-	71	84	79	96
„ 17— „ 22	-	55	21	84	88
„ 24— „ 29	-	67	55	46	88
„ 31—Aug. 5	-	59	29	88	92

During the six days June 26th to July 1, anticyclonic conditions prevailed over the whole area, and forecasting was comparatively easy: the marks obtained for the whole forecast ranged from 88 to 95 per cent., a few being lost, not from any fault in the telegrams, but from local influences affecting the light winds. In the matter of rain 100 per. cent. was scored in every case. From July 3 to July 8 conditions were much more complicated, an area of high pressure to the south changing its form and position in a manner which gave rise to great irregularities in the motions of low pressure systems to the north and west. This type of weather, with its local showers and thunderstorms, is notoriously the most difficult to forecast, and the per-centage of success at Shirburn and Newport Pagnell cannot be regarded as unsatisfactory in the present state of knowledge. The smaller per-centages at Beenham and Stratton are due to the fact that these stations from their situation frequently escape showers even when the weather favours their occurrence. The period July 10 to 15 was chiefly occupied by the slow passage of a depression up the English Channel, northwards into the North Sea, and finally north-westwards. The results are again very good, the loss of marks being chiefly due to unimportant discrepancies in the direction and force of the wind.

From 17th to 22nd July there was a recurrence of the complex distribution of pressure favouring the formation of secondary cyclones. Winds were in general west and south-west, but the rain area varied most irregularly. Shirburn and Newport Pagnell show remarkable success in the matter of rain (84 and 88 per cent.), while Stratton and especially Beenham break down hopelessly, the weather remaining fair when showers might reasonably have been expected. Easterly winds prevailed from July 21st to 29th, pressure being low in the south. It is remarkable that with the change of wind we find the per-centage of success at Stratton and Beenham higher, while at Shirburn and Newport Pagnell it is lower. The most marked failure of the whole period occurred on July 29th, when a heavy thunderstorm passed over the three southern stations.

From 31st July to 5th August winds were again westerly, depressions moving eastwards over the northern part of the British Isles. The greater part of the forecasting area was accordingly in the showery region to the right of the low pressure;

and we find as before that with westerly winds Shirburn and Newport Pagnell show a high per-centage, while Beenham, and to a certain extent Stratton, break down, simply through the fact that when showers might have been expected, none fell.

It is, of course, impossible to discuss the local meteorology of the four stations from the slender data afforded by six weeks' forecast reports. The results hinted at are sufficiently interesting. Stratton and Beenham are on the lee side of elevated ground when the winds are Westerly, and Shirburn and Newport Pagnell when they are Easterly. In these two cases the air passing over the stations is therefore no longer rising, and the probability of certain types of rain falling is accordingly reduced ; and the chance is less, the less the intensity of the meteorological conditions favouring the fall of rain, for the local effects play a larger proportional part.

The following results are sufficiently clear from the foregoing :—

1. Detailed forecasting from a central office is impossible ; and it is impossible to form a fair estimate of a general forecast from its success at a few isolated stations.

2. By establishing a net work of observing stations, even if the observations are of the simple nature required by the appended form, much important information might be obtained as to local peculiarities, and the results would greatly help in the interpretation of the forecast telegrams. The discussion of such observations seems a legitimate undertaking for the Department of the College.

3. The value of the forecasts would be greatly increased if the farmers received sufficient elementary instruction in meteorology to enable them to understand the general nature of the changes predicted.

At the close of their work the four observers were kind enough to furnish reports on the interest taken in the forecasts in their respective districts, and the general impression produced by them.

NOTE B.

REPORT on the COMPARISONS made between two PRESSURE-TUBE ANEMOMETERS on the Roof of the METEOROLOGICAL OFFICE, by Mr. R. H. CURTIS.

In the Report for last year it was intimated that the Council intended to erect a second pressure-tube anemometer by the side of the one already set up on the roof of the Meteorological Office, in order to make a series of comparisons between them. This was done in May 1894, the second instrument being placed at a distance of 6 feet to the south of the first, and having its vane at a height of 25 ft. 3 ins. above the roof, instead of 24 ft., which was the height of the vane of the other instrument.

Since its erection several series of experiments have been made, which have been chiefly directed to the elucidation of the two following points :—

1. What amount of agreement might be looked for in the indications of two instruments erected under similar conditions as to exposure, and length of tube connecting the “head” with the recording apparatus, but otherwise quite independent of each other.
2. To what extent would the indications of two instruments be affected by—
 - (a.) Variations in the length of the tube connecting the head with the recording apparatus.
 - (b.) Contraction of the bore of the connecting tube.

As regards the first point, the results of the comparisons were wholly satisfactory. It was found that two instruments similarly exposed, but in all respects independent of each other, gave practically identical results, the traces yielded by the two instruments being almost perfect fac-similes of each other under every variety of wind-force. This was satisfactory, inasmuch as it showed that the method of manufacture allowed of the float, which is the essential part of the instrument, being made with great accuracy; and that therefore the indications of different instruments might be confidently compared with each other.

As to the second point, the effect of altering the length of tube connecting the vane or “head,” with the float was first tested by inserting an extra length of 25 feet in both the pressure and the exhaust tubes of the second instrument, making in each a total length of 95 feet, instead of 70 feet as in the original instrument. The effect was quite inappreciable, and the traces yielded by the two instruments continued to resemble each other as closely as before, not only in their general appearance but also as regards their record of isolated and transient gusts.

The length of the tubes was therefore further increased by inserting an additional 100 feet, making in all 195 feet as against 70 feet. The damping effect of this increase at once became apparent in the trace in the elimination of the smaller and very

transient oscillations of the float, which are constantly taking place when the wind is blowing with at least moderate strength, but which do not last sufficiently long to make themselves felt through so great a length of tube. The main features of the trace were, however, still retained, and all the important variations in the wind-force, including all gusts and lulls which lasted for two or three seconds, and which almost invariably included the maximum and minimum, were similarly registered by both instruments. The damping thus effected had indeed this advantage, that it brought into even greater prominence the larger variations of wind-force, some of which cover a period of twenty minutes or half an hour, through the elimination of the very small oscillations by which to some extent they are oftentimes masked, especially in very gusty winds.

The practical deduction from these experiments appears to be that a very considerable variation is allowable in the length of tube which may be employed, without detriment to the record, in the erection of an instrument. It is no doubt advisable to keep the length as nearly as possible the same in all instruments, and from 50 feet to 100 feet is suggested as the limits which may most usefully be adopted, but if the exigencies of the case require that a greater length should be employed, it would appear that no material "damping" need be feared by the use of another 50 feet. If more than 150 feet of tube is necessary it would probably be advisable to use tubes of slightly larger diameter, say five-eighths of an inch, instead of half an inch.

The effect of contracting the bore of the tube was tested by means of a series of metal discs, one of which could be fixed in the pressure tube at its junction with the recording cylinder. Each disc was a tenth of an inch thick, and had a hole bored through its centre, the holes varying from 0.30 in. to 0.02 in. in diameter.

It was found that so long as the diameter of the hole in the disc was not less than 0.06 in. the effect upon the trace was insignificant. When, however, it was reduced to 0.04 in. the motion of the float became greatly retarded. The smaller alternations in the wind-force became entirely eliminated, and many of the larger gusts and lulls were cut off also, whilst the maximum and minimum were never registered. The trace obtained was merely a generalised record of the wind-force, in which only those variations exhibiting considerable persistence were recorded. By still further reducing the aperture in the disc to 0.02 in. this sluggishness became much greater, and the trace was reduced to little more than a record of the mean force, from which very little information as to the character of the wind could be obtained. By increasing the length of the contracted passage, which was done by substituting a piece of glass tube for the metal disc, the "damping" effect for a given diameter was greatly increased.

This is, of course, what might have been anticipated, remembering that every movement of the float necessitates the passage into or out of it, according as it rises or falls, of a volume of air proportional to the extent of the movement.

NOTE C.

NOTE ON THE EXPOSURE OF THE ROBINSON ANEMOMETER AT HOLYHEAD, by Mr. R. H. CURTIS.

The question of the effect of the exposure of anemometers on their indications has, in various forms, been long under consideration, but as regards the anemometer at Holyhead it was brought prominently forward by the violent gale of December 22nd, 1894.

This gale was one of unusual severity, and the wind velocities recorded at some of the anemometer stations in various parts of the kingdom were higher than had ever been recorded before; yet at Holyhead, where, from the damage done to shipping and from other evidence, the full force of the gale appears to have been felt, the velocity recorded by the Robinson anemometer only reached the comparatively moderate maximum of 71 miles in 60 consecutive minutes.

The anemometer is erected on the top of the lighthouse which stands at the entrance to the Old Harbour, and the fact that this building, which is a stone tower, 48 feet high, rising from the pier, is surrounded at its base by some large railway sheds, suggested the probability of local obstruction of the wind currents having been the cause of the low anemometer record; fortunately data were available for testing, at least to some extent, the truth of this supposition.

As will be seen from the plan and section accompanying, (Figs., pp. 30, 31) the lighthouse stands at the eastern end of the old pier, which runs from W. to E. for about 360 yards, whilst a wooden jetty extends beyond the lighthouse, but in a direction slightly to the north of east, for a further distance of 170 yards. The cups of the anemometer are 53 feet above the level of the pier, and 30 feet above the roofs of the sheds. The pier itself is 6 feet above the level of high water, and 23 feet above that of low water, at spring tides; and whilst its southern face is vertical the northern slopes upwards from the sea, and rises to a height of 10 feet above the general level of the pier.

It is therefore evident that the pier must, under ordinary conditions, form a very considerable obstacle to the wind, especially when it blows from any southerly and westerly point, in addition to which there is the further obstruction caused by the range of sheds, and by the tower itself.

At a distance of rather less than a third of a mile, in a straight line, from the lighthouse is the bridled anemometer designed by Sir G. G. Stokes, F.R.S., a description of which will be found in the Report for 1889. It is erected above the roof of a hut which stands on the western side of Salt Island, where it has a perfectly free exposure to the New Harbour and the sea from west through

north to east ; to the south-east and south the exposure, though not quite so good, is still fair ; whilst to the south-west lies the town of Holyhead, the nearest part of which, consisting of small houses, is quite 350 yards away. The cups of the instrument are about 15 feet above the ground, and although they are at a lower level than the cups of the Robinson instrument, yet, owing to the remoteness of anything likely to obstruct the wind, they, without doubt, possess a very much better exposure.

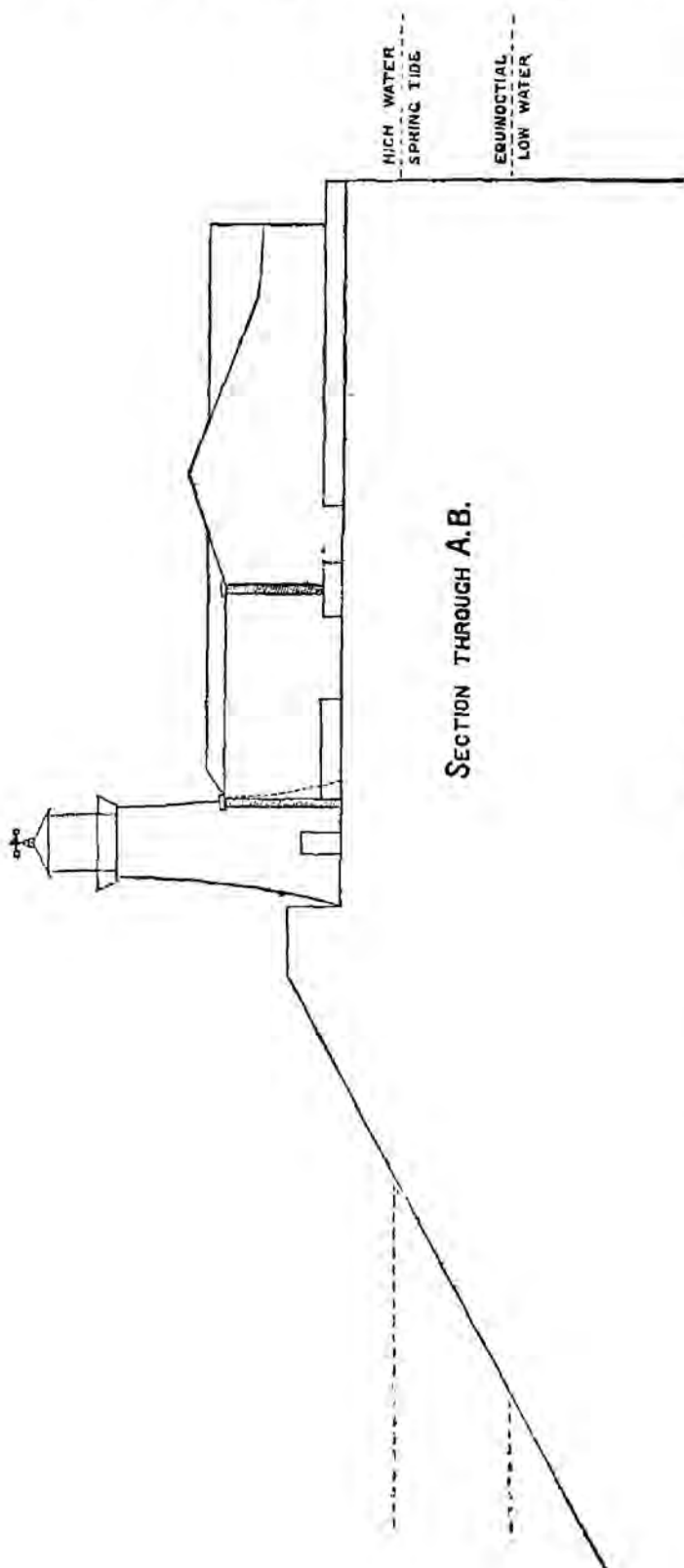


FIG. 3.
SECTIONAL ELEVATION OF JETTY AND LIGHTHOUSE.

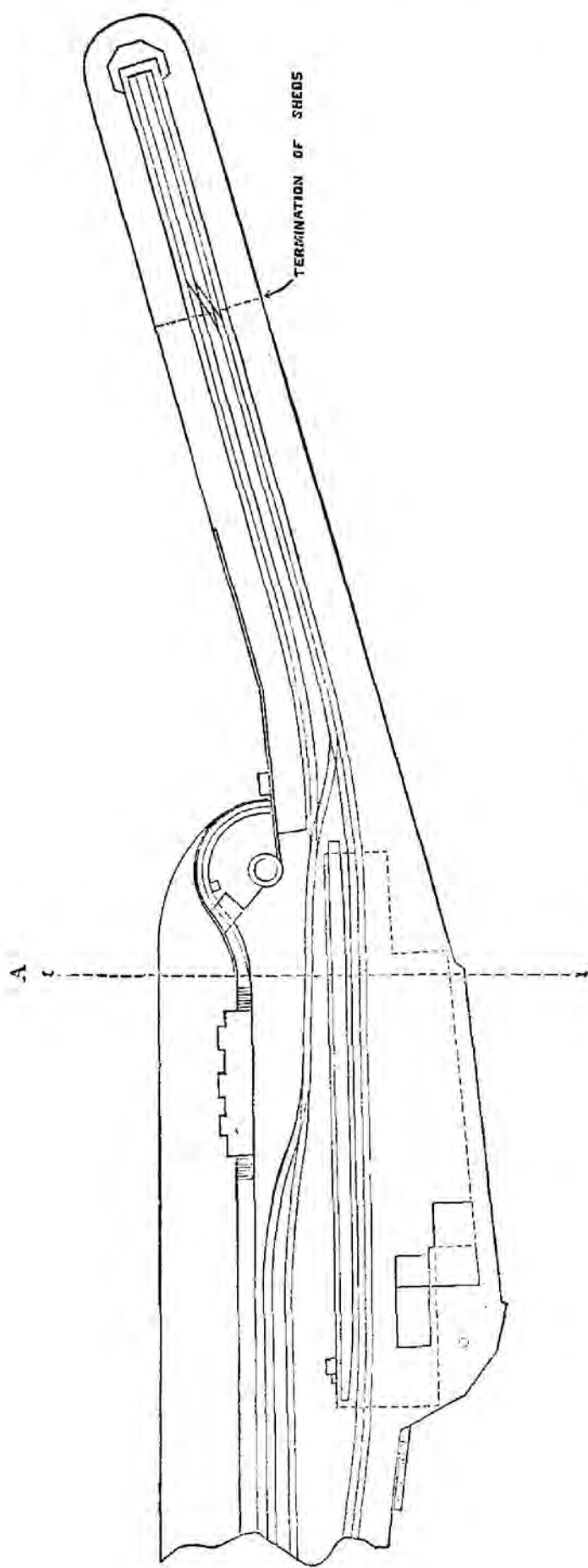


FIG. 4.
PLAN OF MAIL STEAM SHIP JETTY, HOLYHEAD.

It should be mentioned that at the time of the gale both these instruments were in excellent working order, each having only a short time before been thoroughly overhauled and cleaned.

The record yielded by the bridled anemometer, unlike that of the Robinson instrument, showed the gale to have been at Holyhead one of exceptional violence, and in this respect it confirmed the evidence obtained from other sources, and agreed with the anemometrical record obtained from Fleetwood and elsewhere.

It was therefore determined to compare all the available Robinson and bridled records in order to see whether, upon the assumption that the bridled instrument gave a correct record of wind-force, the result would confirm the supposition that the Robinson records were affected by the position of the instrument.

Assuming this supposition to be correct, the amount of difference between the two records might be expected to show—

- (1.) A direct relation to the *force* of the wind.
- (2.) Some dependence upon the *direction* of the wind, since the obstructions around the base of the tower are distributed somewhat irregularly.

Some alterations having been made in the bridled instrument in September 1894 it was not thought advisable to use the records prior to that date, but hourly measurements were made of all the subsequent curves, and the differences obtained between them and the corresponding measurements of the Robinson indications; the velocities of the latter instrument having been computed with the factor 2·2 instead of 3·0, in order to make them comparable.

These differences were first of all grouped according to the velocity of the wind from which they were obtained, *i.e.*, all those got from velocities of from 26 to 35 miles per hour were put together under 30, those from 36 to 45 miles under 40, and so on. The results are shown in the following table:—

TABLE I.

Velocities from which Mean was obtained.	No. of Observa- tions.	Mean Velocity by		Diffe- rence. R. - B.	Per-centage of Difference to Mean Velocity by Bridled Instrument.
		Robinson Instrument.	Bridled Instrument.		
		Miles.	Miles.	Miles.	Per cent.
26-35 miles - -	808	25·4	30·1	- 4·7	15·6
36-45 „ - -	284	31·3	39·7	- 8·4	21·2
46-55 „ - -	106	37·5	49·2	- 11·7	23·8
56-65 „ - -	30	40·9	58·9	- 18·0	30·6
Above 66 miles -	12	44·9	71·0	- 26·1	36·8

The bridled anemometer does not record lower velocities than 20 miles per hour, and when the pen of the instrument is near its inferior limit its action is doubtful, and there is always a liability for the readings to be too high. It has therefore been thought right in the above comparison to omit all readings below 25 miles per hour.

The increase in the per-centage with increase of force shown in the last column of this table is very striking, and, so far as it goes, entirely confirms the supposition as to the effect of the surroundings of the tower; but in this grouping no account was taken of the direction of the wind, and therefore, to test the effect of this, the differences were re-arranged under eight points of the compass, but this time without reference to the force of the wind. The results are shown in Table II.

TABLE II.

Direction of Wind.	No. of Observations.	Mean Velocity by		Difference R. - B.	Per-centage of Difference to Mean Velocity by Bridled Instrument.
		Robinson Instrument.	Bridled Instrument.		
		Miles.	Miles.	Miles.	Per cent.
North	247	29·6	34·8	- 5·2	14·9
N.E.	153	28·4	31·6	- 3·2	10·1
East	127	25·9	30·4	- 4·5	14·8
S.E.	45	29·0	31·6	- 2·6	8·2
South	247	29·0	32·4	- 3·4	10·5
S.W.	146	26·5	35·8	- 9·3	26·0
West	113	23·8	39·0	-15·2	39·0
N.W.	162	31·6	43·9	-12·3	28·0

This table brings out clearly the fact that the amount of difference between the two instruments depends very much upon the direction from which the wind is blowing and not alone upon its force. It is worth noting, however, that the largest divergence between the two records is experienced, not when the wind is blowing at a right angle to the run of the pier and of the sheds, but when it is blowing from the westward, or along its length, suggesting that possibly the sheds form a large ventiduct into which the wind is sucked, and drawn down, away from the cups. Still assuming that the bridled instrument gives the true force of the wind, the figures given in the table appear to show that the Robinson record is affected with all winds, but more particularly when they blow from between South-west and North-west.

The differences were now once more re-arranged in a manner that should show how much of the difference is due to the direction and how much to the force of the wind:—

TABLE III.

	North.	N.E.	East.	S.E.	South.	S.W.	West.	N.W.
Mean velocity by— Robinson - - -	25.1	27.2	25.1	28.2	27.6	23.6	17.7	19.4
Bridled - - -	30.0	30.2	29.7	30.7	30.2	29.7	30.4	31.0
Difference, R.—B. - -	-4.9	-3.0	-4.6	-2.5	-2.6	-6.1	-12.7	-11.6
Per-centage of difference to Bridled.	16.3	9.9	15.5	8.1	8.6	20.5	41.8	37.4
No. of observations - -	146	129	116	40	204	90	54	29
Mean velocity by— Robinson - - -	35.2	34.7	34.2	35.2	33.3	28.8	24.0	28.1
Bridled - - -	40.0	38.6	37.4	39.2	39.2	40.6	39.7	40.1
Difference, R.—B. - -	-4.8	-3.9	-3.2	-4.0	-5.9	-11.8	-15.7	-12.0
Per-centage - - -	12.0	10.1	8.6	10.2	15.1	29.1	39.5	29.9
No. of observations - -	82	23	11	5	32	35	32	64
Mean velocity by— Robinson - - -	40.4	40.0	—	—	41.6	33.0	31.2	38.6
Bridled - - -	48.6	46.0	—	—	47.4	49.6	49.2	49.7
Difference, R.—B. - -	-8.2	-6.0	—	—	-5.8	-16.6	-18.0	-11.1
Per-centage - - -	16.9	13.0	—	—	12.2	33.5	36.6	22.3
No. of observations - -	18	1	—	—	8	13	14	52
Mean velocity by— Robinson - - -	45.0	—	—	—	44.0	37.8	38.9	43.2
Bridled - - -	59.0	—	—	—	60.0	58.5	57.9	59.8
Difference, R.—B. - -	-14.0	—	—	—	-16.0	-20.7	-19.0	-16.6
Per-centage - - -	23.7	—	—	—	26.7	35.4	32.8	27.8
No. of observations - -	1	—	—	—	1	6	9	15
Mean velocity by— Robinson - - -	—	—	—	—	41.5	43.0	45.8	46.8
Bridled - - -	—	—	—	—	60.5	68.0	72.0	72.3
Difference, R.—B. - -	—	—	—	—	-28.0	-25.0	-26.2	-25.5
Per-centage - - -	—	—	—	—	40.3	36.8	36.4	35.3
No. of observations - -	—	—	—	—	2	2	4	4

The fact brought out here that generally the difference increases with the increase of velocity quite justifies the conclusion that the mass of the pier, with the lighthouse tower, and the buildings surrounding it, together form an obstacle sufficient to cause a great deflection of the wind away from the cups of the anemometer, whilst the further fact, again shown in this table, that the defect of the Robinson instrument is largely increased when the wind gets sufficiently to the westward as to allow it to blow *through* the sheds, in the line of their length, greatly supports the suggestion already made that the air is under those circumstances sucked into the sheds as into a large conduit, and with sufficient strength to seriously modify the action of the cups.

Taking these results as a whole there appears to be no room for doubt that—

- (1.) The record yielded by the Robinson instrument is materially affected by the various obstructions to the wind which

surround the tower on which it is placed and possibly also by the tower itself.

- (2.) That the Robinson record is always too low, but that the amount of its defect depends both upon the direction and the force of the wind.
- (3.) That with strong winds blowing from between S.W. and N.W. the velocity of the wind as shown by the Robinson instrument may amount to only about two-thirds of the true velocity.

After these conclusions had been obtained they were tested by the following comparison, which appears to supply a further confirmation of them. During the gale of December 22nd, to which reference has already been made, a very high velocity was recorded at Fleetwood, where the Robinson anemometer is well exposed not far from the seashore; the mileage recorded was indeed the highest ever registered in the British Islands in 60 consecutive minutes, being no less than 107 miles, as compared with 71 miles by the Robinson instrument at Holyhead; yet from various considerations it seemed pretty certain that the gale must have been equally severe at both places.

But if the corrections indicated by the above tables are applied to the Holyhead record the discrepancy at once disappears, and a remarkably close agreement is obtained between the two Robinson records, and also the bridled anemometer record, as will be seen from the following table:—

TABLE IV.

—	Maximum.			Mean.		
	Recorded Movement in One Hour.	Corrected to Factor 2·2.	Corrected for Exposure.	Velocity during Gale 22 Hours.	Corrected to Factor 2·2.	Corrected for Exposure.
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
Fleetwood -	107	78	78	79	58	58
Holyhead -	71	52	78	57	42	60
„ bridled	—	—	79	—	—	59

Without seeking to emphasise too much the very close agreement shown here, which, remembering the distance apart of the two stations, may be to some extent fortuitous, it is yet evident that it affords very strong support to the conclusions stated above.

APPENDIX.

APPENDIX I.

LIST of CAPTAINS and OFFICERS who have sent in Logs classed as "Excellent" during the year ending March 31, 1895. 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.
Alford, F. - - -	2	S.S. "Monarch."
Andersen, O. E. - -	12	S.S. "Longhirst."
Angus, T. S. - - -	11	S.S. "Ballaarat."
Atkinson, G. W. - -	10	S.S. "Ganges" and S.S. "Valetta."
Balfour, Comr. A. F., R.N. -	25	H.M.S. "Penguin."
Blackburne, H. S. - -	13	S.S. "Malwa."
Bolton, S. H. - - -	18	S.S. "El Dorado."
Bright, H. - - -	9	Barque "Beltana."
Cameron, J. G., R.N.R. -	11	S.S. "Teutonic."
Campbell, J. - - -	10	"Balmoral."
Cheshire, G. H. - - -	3	S.S. "Aldgate."
Cromarty, D. S. - - -	6	"Cambuskenneth."
Crowley, C. - - -	9	"Verajean."
Darby, H. G. - - -	2	S.S. "Ormuz."
Davidson, D. C. - - -	2	Barque "Loch Rannoch."
De Horne, M. - - -	5	S.S. "Carthage."
Docherty, H. - - -	6	Barque "Tinto Hill."
Dulling, G. - - -	1	S.S. "Strathelyde."
Dyke, H. W. - - -	11	Barque "General Roberts."
Elliott, Mr. C. - - -	4	S.S. "Wilcannia."
Elliott, W., R.N.R. - -	8	S.S. "Clan Murray."
England, T. - - -	15	Barque "Glen Grant."
Exham, T. K., F.R.A.S. -	16	S.S. "Elbe" and S.S. "Tamar."
Field, Comr. A. M., R.N. -	15	H.M.S. "Egeria."
Free, T., R.N.R. - - -	1	S.S. "Port Chalmers."
Gibson, J. H. - - -	1	S.S. "Wydale."
Gubbins, Lieut. G. W., R.N. -	1	H.M.S. "Penguin."
Hepworth, M. W. C., R.N.R. -	13	S.S. "Port Albert" and S.S. "Port Victor."
Kemp, A. H. - - -	7	Barque "Hudson."
McGregor, J. - - -	1	S.S. "Glenartney."
Millican, J. W. - - -	9	S.S. "Loughrigg Holme."
Milne, W. F. - - -	11	S.S. "Eclipse."

Name of Captain or Officer.	Number of "Ex- cellent" Logs.	Ship.
Milner, W. H. - - -	19	S.S. "Pará."
Murdoch, Peter - - -	15	"Sierra Lucena."
Norman, F. - - -	8	"Milton Stuart."
Peebles, R. - - -	17	Barque "Carradale."
Pentin, W. - - -	4	S.S. "Wilcannia."
Price, J. H. - - -	8	"Othello."
Purey-Cust, Comr. H. E. -	3	H.M.S. "Dart."
Randall, W. - - -	15	"Laomene."
Rosseter, W. L. - - -	17	"Sheila."
Sargent, A. H. - - -	8	"Pleione."
Scott, G. P., F.R.Met.Soc. -	12	Barque "Crompton."
Seaton, W. A., R.N.R. -	1	S.S. "Thames."
Simpson, Alexander - - -	18	S.S. "Thermopylæ."
— Alexander - - -	24	S.S. "Traveller."
Smith, J. - - -	4	S.S. "Dunera."
Spalding, T. F. - - -	7	S.S. "Australasian."
Streater, R. - - -	5	"Euterpe."
Thomas, H. G. - - -	2	S.S. "Yarrowonga."
Thorpe, V. G. (Surgeon) -	1	H.M.S. "Penguin."
Trott, S., F.R.Met.Soc. -	28	S.S. "Minia."
Walker, H., R.N.R. - - -	19	S.S. "Etruria."
Walton, R. - - -	1	S.S. "Port Victor."
Wilson, J., R.N.R. - - -	12	S.S. "Ethiopia."

APPENDIX II.
LIST of DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Voyage.	Year.
¹ Adamson, A. W.	S.S. Victoria -	Australia, viâ Suez - - -	1894
² Alford, F. -	H.M.T.S. Monarch -	Off British Isles - - -	1893-94
Alsop, J. J. -	Barque Brussels -	New Zealand - - -	1894
Andersen, O. E. -	S.S. Longhirst -	Continental Ports - - -	1894
"	"	Quebec, Gibraltar and Fiume -	1894-95
³ Angus, T. S. -	S.S. Ballarat -	Australia, viâ Suez - - -	1894
³ " " -	" -	" " - - -	1894
³ " " -	" -	" " - - -	1894-95
Asquith, W. -	S.S. Bellerophon -	Batavia, viâ Suez - - -	1892
⁴ Atkinson, G. W. -	S.S. Ganges -	China, viâ Suez - - -	1894
⁵ " " -	S.S. Valetta -	Australia, viâ Suez - - -	1894
⁶ Balfour, Comr. A. F., R.N.	H.M.S. Penguin -	At China and Australia Stations -	1893-94
⁷ Barker, D. W. -	School Ship Worcester -	Off Greenhithe, Kent - -	1894
Barr -	S.S. Orestes -	China, viâ Suez - - -	1891-92
Barwise, J. -	S.S. Sarpedon -	Java, viâ Suez - - -	1891-92
Batt, H. E. -	S.S. Hector -	" " - - -	1891-92
Bell, C. H. -	S.S. Laconia -	Odessa - - -	1894
Blackburne, H. S. -	S.S. Malwa -	Bombay to China - - -	1893
Bolton, S. H. -	S.S. El Dorado -	Continental Ports - - -	1893-94
"	" -	" " - - -	1894-95
Boyd, James -	Barque Brodick Bay -	Mauritius - - -	1893-94
⁸ Brabender, H. -	Barque Selkirkshire -	New York, Sydney and Antwerp -	1893-94
⁹ Brander, J. -	S.S. Magdalena -	East Coast of S. America -	1894
Bright, H. -	Barque Beltana -	Adelaide - - -	1894-95
Brown, R. J. -	S.S. Titan -	China, viâ Suez - - -	1891-92
¹⁰ Bulkeley, Sir R. W. Bt.	Steam yacht Speranza -	Mediterranean - - -	1894
¹¹ Burgess, Arthur, R.N.R.	S.S. Bungaree -	Australia, viâ Cape, Bombay, and home viâ Suez.	1894
¹² Cameron, J. G., R.N.R.	R.M.S. Teutonic -	New York - - -	1894
Campbell, James -	Balmoral -	Philadelphia, Calcutta - -	1893-94
¹³ Chesshire, G. H. -	S.S. Aldgate -	Bombay, viâ Suez - - -	1894
¹⁴ Clunie, James -	S.S. Transvaal -	India, viâ Cape Town, and home, viâ Suez.	1893-94
¹⁵ Conby, H. B. -	Garfield -	San Francisco - - -	1893-94
Cook, Thomas J. -	Oronsay -	Melbourne - - -	1894
Cromarty, D. S. -	Cambuskenneth -	Rio Janeiro, Newcastle (N.S.W.) and Portland (Or.).	1893-94
Crowley, C. -	Verajeau -	New York and Shanghai - -	1893-94
"	" -	Shanghai to Vancouver and Alex- andria.	1894-95
¹⁶ Darby, H. G. -	S.S. Ormuz -	Sydney, viâ Suez - - -	1894
"	" -	Australia, viâ Suez - - -	1894-95
¹⁷ Davidson, D. C. -	Barque Loch Rannoch -	Melbourne - - -	1893-94
Davis, G. W. -	S.S. Alberta -	China, viâ Suez, and Australia, viâ Suez.	1893-95
"	" -	Bombay, viâ Suez - - -	1894
¹⁸ " " -	" -	Calcutta, viâ Suez - - -	1894-95
Day, Robert -	S.S. Achilles -	China, viâ Suez - - -	1890-92
¹⁹ De Horne, M. -	S.S. Carthage -	Bombay, viâ Suez - - -	1894
¹⁹ " " -	" -	" " - - -	1894
¹⁹ " " -	" -	" " - - -	1895
Dickens, E. G. -	S.S. Diomed -	China, viâ Suez - - -	1891-92
²⁰ Dickinson, L. R. -	R.M.S. Medway -	West Indies - - -	1894
Docherty, Hugh -	Barque Tinto Hill -	Monte Video and Melbourne -	1894-95
²¹ Dulling, George -	S.S. Strathclyde -	Colombo, viâ Suez, Madras and Perim.	1894
²¹ " " -	" -	Calcutta, viâ Suez - - -	1894-95
Dyke, H. W. -	Barque General Roberts -	San Francisco - - -	1893-94

Captain's Name.	Ship.	Voyage.	Year.
Elliott, Wm., R.N.R.	S.S. Clan Murray	Cape Town, &c., Galle, Madras, and home, viâ Suez.	1894
" "	" "	Calcutta, viâ Suez	1894
England, Thomas	Barque Glen Grant	Apalachicola	1893-94
²² Exham, T. K.	S.S. Tamar	Brazil	1893-94
²² " "	S.S. Elbe	"	1893-94
Field, Comr. A. M., R.N.	H.M.S. Egeria	China Sea	1893
" "	"	Penang and Suez	1894
" "	"	Perim, viâ Suez	1894
²³ Free Thomas, R.N.R.	S.S. Port Chalmers	Australia, viâ Cape, and home, viâ Suez.	1893-94
" "	" "	Melbourne, viâ Cape, and home, viâ Suez.	1894
Gibson, J. H.	S.S. Wydale	East Coast of North America	1894-95
Gracie, G. S.	Holyrood	Portland (Oregon)	1892-94
Gregory, S. M.	S.S. Menelaus	Java, viâ Suez	1891-92
Grier John	S.S. Antenor	Batavia, viâ Suez	1891-92
Guthrie, W. E.	S.S. Bellerophon	China, viâ Suez	1892
²⁴ Harvey, R.	S.S. Massilia	Sydney, viâ Suez	1894
²⁵ Henderson, J.	Prince Oscar	Valparaiso	1893
²² Hepworth, M. W. C.	S.S. Port Albert	Adelaide, viâ Cape and Yokohama.	1894
²⁶ Horsfall, F. P., R.N.R.	S.S. Port Victor	Sydney, viâ Cape	1894
"	Travancore	Cape Town, Newcastle (New South Wales), and San Francisco.	1893-94
Hutchinson, J. W. P.	S.S. Stentor	Java, viâ Suez	1892
Jackson, C.	S.S. Palamed	China, viâ Suez	1892
" M. H. F.	S.S. Telamon	China, viâ Suez, and New York	1891-92
" T. S.	S.S. Palinurus	China, viâ Suez	1891-92
²⁷ Jamieson, D. E.	S.S. Port Pirie	Australia, viâ Cape, and home, viâ Suez.	1894
Jones, Henry	S.S. Telemachus	China, viâ Suez	1892
Kemp, A. H.	Barque Hudson	New Zealand	1892-94
²⁸ Kraemar, Soren	Yacht Siggen	Spitzbergen	1894
²⁹ Lace, E.	S.S. Elvira	Wilmington, Savannah, and Monte Video.	1893-94
Leader, W. C.	S.S. Anglian	Cape Town	1894
Lee, W.	S.S. Polyphemus	China, viâ Suez	1891-92
McGregor, J.	S.S. Glenartney	" "	1894
McKinnon, W. C.	Barque Port Glasgow	Sydney	1892
Martin, John B.	Opawa	New Zealand	1893-94
⁷ Miller, A. T., R.N.	School Ship Conway	Off Rock Ferry, Cheshire	1894
³⁰ Millican, J. W.	S.S. Loughrigg Holme	Quebec and Alexandria	1893-94
³¹ Milne, W. F.	S.S. Eclipse	Davis Straits	1894
Milner, W. H.	R.M.S. Pará	West Indies	1894
" "	" "	" "	1894
Mitchell, George	S.S. California	New York and Mediterranean Ports.	1893-94
" "	" "	Mediterranean Ports, New Orleans and New York.	1894
³² Moseley, F. J., R.N.R.	R.M.S. Anglian	Cape Town, &c.	1894
³³ " "	" "	" "	1894
Mullan, F. C.	S.S. Romney	Batavia, viâ Suez, Shanghai	1893-94
Murdoch, Peter	Sierra Lucena	Bombay and Rangoon	1893-94
Nelson, Robert	S.S. Myrmidon	China, viâ Suez	1892
²⁹ Niles, W. H.	Ben Cruachan	Monte Video	1893-94
Nish, H.	S.S. Cyclops	China, viâ Suez	1891-92
Norman, Francis	Milton Stuart	Calcutta	1893-94

Captain's Name.	Ship.	Voyage.	Year.
Pattman, R.	Loch Torridon	Melbourne	1894-95
Peebles, R.	Barque Carradale	"	1893-94
³⁴ Penten, Walter	S.S. Wilcannia	Australia, viâ Cape, and home, viâ Suez.	1893-94
" "	" "	Adelaide, viâ Cape and home, viâ Suez.	1894
³⁵ Philip, —	Pericles	Sydney, viâ Cape	1893-94
Price, J. H.	Othello	Melbourne	1893-94
Pulford, J.	S.S. Patroclus	Batavia, viâ Suez	1891-92
Purdy, Thomas	S.S. Dardanus	China, viâ Suez	1891-92
Purey-Cust, Lieut. and Comr. H. E.	H.M.S. Dart	At New Hebrides	1893
" "	" "	In Norfolk Bay, Tasmania	1894
Randall, W.	Laomene	Calcutta	1893
³⁶ " "	" "	Calcutta and San Francisco	1894-95
Rawlings, E. S.	S.S. Ajax	China, viâ Suez	1891-92
³⁷ Rigaud, H. C.	R.M.S. Magdalena	Monte Video, &c.	1893-94
" "	" "	East Coast of S. America	1894
Riley, J.	S.S. Teucer	China, viâ Suez, and New York	1892
³⁸ Robertson, Thomas	S.S. Active	Greenland	1894
Rorison, J.	S.S. Anchises	China, viâ Suez	1892
" "	S.S. Bellerophon	" "	1891-92
Rosseter, W. L.	Sheila	Calcutta and Demerara	1894-95
Russell, E.	Barque Routenbeck	Australia, Honolulu, Victoria, B.C.	1892-94
²² Sargent, A. H.	Pleione	New Zealand	1893-94
²² Scott, G. P.	Crompton	Cape Town, Newcastle (N.S.W.), and San Francisco.	1893-94
²² " "	" "	San Francisco	1894-95
Scougall, H.	Barque Closeburn	Rio de Janeiro, Rangoon, and Talcahuano.	1892-94
³⁹ Seaton, W. A., R.N.R.	S.S. Thames	China, viâ Suez	1893-94
Simpson, Alexander	Barquentine Traveller	Ivigtut	1894
Simpson, Alexander	S.S. Thermopylæ	Australia, viâ Cape	1894
" "	" "	Melbourne, viâ Cape Town	1894
⁴⁰ Simpson, Lieut. and Comr. C. H., R.N.	H.M.S. Stork	At Malta	1894
⁴⁰ " "	" "	" "	1894
⁴¹ Smith, James	S.S. Dunera	Calcutta and Madras, viâ Suez	1894
⁴¹ " "	" "	India, viâ Suez	1894
Smyth, W. H.	SS. Pretoria	Cape Town, &c.	1894
⁴² " "	" "	Cape Town and Zanzibar	1894-95
⁴³ Spalding, T. F.	S.S. Australasian	Australia, viâ Cape Town	1893-94
⁴³ " "	" "	" "	1894
⁴³ " "	" "	" "	1894-95
Stenhouse, James	Anaurus	Cape Town, Newcastle, N.S.W., and San Francisco.	1894-95
Streater, R.	Euterpe	New Zealand.	1893-95
Thomas, H. G.	S.S. Yarrawonga	Australia, viâ Cape, and home, viâ Suez.	1894
" "	" "	" "	1894-95
Towell, William	S.S. Jason	China, viâ Suez, and Java, viâ Suez.	1891-92
⁴⁴ Trench, F. P., R.N.	H.M.S. Royal Arthur	Off W. Coast of South America	1894
⁴⁵ Trott, Samuel	S.S. Minia	At Halifax	1893-94
" "	" "	Halifax and in North Atlantic	1894
" "	" "	On east coast of North America	1894
⁴⁶ Tyson, John	S.S. Arab	Cape Town	1894
⁴⁶ " "	" "	Zanzibar, viâ Cape Town	1894
⁴⁷ " "	" "	Cape Town, &c.	1894

Captain's Name.	Ship.	Voyage.	Year.
Walker, Henry, R.N.R.	R.M.S. Etruria	New York - - -	1894
⁴⁸ Walton, R. -	S.S. Port Victor -	Sydney, via Suez - - -	1894
Webster, I. K. -	S.S. Prometheus -	China, via Suez, and New York -	1891-92
⁴⁹ Wibmer, L.M., R.N.R.	S.S. Massilia -	Sydney, via Suez - - -	1894
Wilding, J. -	S.S. Priam -	China, via Suez - - -	1891-92
Wilkin, T. G. -	Mylomene -	Rio Janeiro, and Australia -	1893-94
⁵⁰ Williams, John -	Barque Elissa -	Monte Video - - -	1893-94
" O. P. -	S.S. Agamemnon -	China, via Suez - - -	1891-92
Williamson, J. C. -	S.S. Argyll -	China, Japan, via Suez, and New York.	1895-94
Wilson, John, R.N.R.	S.S. Ethiopia -	New York - - -	1894
" " -	" -	" - - -	1894
Worcester, W. D. G., R.N.R.	S.S. Victoria -	Bombay, via Suez - - -	1894
" " "	" -	" " - - -	1895

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

- ¹ Kept by J. Stuart Wilde, 2nd Officer.
- ² Kept by W. C. Hart, Chief Officer, A. Broadbridge, 2nd Officer, and F. Bourdeaux, 3rd Officer.
- ³ Assisted by F. W. Vibart, 1st Officer, W. J. Scott, 2nd Officer, and E. J. Finlinson, 3rd Officer.
- ⁴ Assisted by Messrs. Bracken and Mockler.
- ⁵ Assisted by Messrs. Keay and Cribb.
- ⁶ Kept by Vidal G. Thorpe, Surgeon R.N., and Lieut. G. W. Gubbins, R.N.
- ⁷ Kept by the Cadets.
- ⁸ Kept by R. Purdy.
- ⁹ Kept by R. A. Ellis and Thomas McDougall.
- ¹⁰ Kept by Gregory Stapleton.
- ¹¹ Assisted by Mr. Gregory, R.N.R., 4th Officer.
- ¹² Kept by L. T. Gaskill, 4th Officer.
- ¹³ Kept by G. H. Watt.
- ¹⁴ Kept by William M. Wright and William Hildyard.
- ¹⁵ Kept by G. B. Whiting.
- ¹⁶ Kept by Bertram L. Gace, 2nd Officer, assisted by L. W. J. Fairlie, 1st Officer, F. W. Kershaw, 3rd Officer, and H. L. Bennett, 4th Officer.
- ¹⁷ Assisted by Messrs. P. Merrilees and Owen.
- ¹⁸ Assisted by Hector Adam, Chief Mate.
- ¹⁹ Kept by F. L. Miller, 5th Officer.
- ²⁰ Kept by R. A. E. Sampson, G. Bingham Powell, and L. G. Tebbs.
- ²¹ Kept by G. S. Hamilton, Second Mate.
- ²² Assisted by Officers.
- ²³ Kept by William Matthew, 2nd Officer.
- ²⁴ Kept by Junior Officers.
- ²⁵ Kept by R. H. W. Hughes, 1st Mate.
- ²⁶ Kept by R. Walton, Chief Officer, G. Patrick, Chief Officer, F. E. Cope, 2nd Officer, and J. Sandison, 3rd Officer.
- ²⁷ Kept by Herbert S. Brading.
- ²⁸ Kept by A. Pike.
- ²⁹ Kept by Alan B. Harper.
- ³⁰ Assisted by Messrs. Hohn, Martin, Dawson, and Eland.
- ³¹ Kept by Ellis Nilson.
- ³² Kept by William H. Marklew, 4th Officer.
- ³³ Kept by J. Vessey Lawther, 4th Officer.
- ³⁴ Kept by Coulton Elliott.
- ³⁵ Kept by F. F. Henderson, R.N.
- ³⁶ Assisted by G. W. Smith.
- ³⁷ Kept by R. A. Ellis, 5th Officer.
- ³⁸ Kept by Alex. M. Rodgers, Surgeon.
- ³⁹ Kept by Sidney G. D. Andrews, Chief Officer.
- ⁴⁰ Kept by Lieut. Lewis D. Penfold, R.N.
- ⁴¹ Assisted by E. H. Garland, H. M. Sperling, and A. Aiken.
- ⁴² Kept by A. Hamilton Thacker, 2nd Officer.
- ⁴³ Kept by Charles E. Pyke.
- ⁴⁴ Kept by Lieut. A. G. Moggridge, R.N.
- ⁴⁵ Kept by Wm. Geo. Squares.
- ⁴⁶ Kept by Bernard Burt, 4th Officer.
- ⁴⁷ Kept by Messrs. G. R. Pictou and Thwaites.
- ⁴⁸ Kept by G. Patrick, Chief Officer, F. E. Cope, 2nd Officer, and J. Sandison, 3rd Officer.
- ⁴⁹ Kept by C. Pickering, 4th Officer, A. A. Mellin, 5th Officer, and F. G. Cadiz, 6th Officer.
- ⁵⁰ Kept by John M. Arnaud.

APPENDIX III.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.		Baro- meters.	Ane- roids.	Thermometers.				Hydro- meters.
				Ordinary.	Max.	Min.	Screens.	
April 1st, 1894, afloat -	-	242	573	1,443	344	354	197	90
Issued since -	-	88	132	384	89	69	31	4
Returned since -	-	330	705	1,827	433	423	228	94
	-	87	116	402	79	63	25	26
April 1st, 1895, afloat -	-	243	589	1,425	354	355	203	68

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

April 1st, 1894, in use -	-	77	65	236	32	39	9	11
Issued since -	-	3	7	32	3	4	1	1
Returned since -	-	80	72	268	35	43	10	12
	-	3	1	31	2	2	—	1
April 1st, 1895, in use -	-	77	71	237	33	41	10	11

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1895.

Afloat in Royal Navy -	-	243	589	1,425	354	355	203	68
In use at stations -	-	77	71	237	33	41	10	11
In store at M.O. -	-	22	128	185	118	120	35	40
„ Chatham -	-	18	52	106	27	32	24	15
„ Sheerness -	-	6	20	39	15	16	10	6
„ Portsmouth -	-	19	55	133	49	52	27	9
„ Devonport -	-	21	47	125	38	40	19	16
„ Queenstown -	-	2	1	15	3	3	—	4
„ Gibraltar -	-	2	3	9	3	3	—	4
„ Malta -	-	7	16	43	3	8	1	6
„ Bombay -	-	4	2	2	2	3	1	4
„ Halifax -	-	3	4	22	5	4	2	7
„ Bermuda -	-	4	2	5	4	9	2	4
„ Jamaica -	-	2	3	27	2	2	1	3
„ Cape of Good Hope* -	-	4	7	19	4	4	3	4
„ Trincomalee -	-	3	7	20	4	4	1	4
„ Hong Kong -	-	21	13	27	9	12	2	20
„ Coquimbo -	-	3	6	16	4	3	1	19
„ Sydney -	-	7	9	23	9	6	1	11
„ Esquimalt -	-	4	7	19	3	6	—	—
Total, April 1st, 1895 -	-	472	1,042	2,497	690	723	343	255
Lost, &c. since April 1st, 1894 -	-	—	11	252	25	16	17	7
Under repair April 1st, 1895 -	-	30	4	12	—	—	—	—

* To January 1st, 1895.

APPENDIX IV.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1894, afloat -	106	—	627	—	1	106	340
Issued since -	50	—	304	—	—	37	157
	156	—	931	—	1	143	497
Returned since -	51	—	313	—	—	47	171
April 1st, 1895, afloat -	105	—	618	—	1	96	326

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

April 1st, 1894, in use -	285	2	267	59	69	56	10
Issued since -	17	1	30	3	9	3	4
	302	3	297	62	78	59	14
Returned since -	12	1	25	4	4	1	1
April 1st, 1895, in use -	290*	2	272	58	74	58	13

DISPOSITION of Board of Trade Instruments on April 1st, 1895.

In merchant ships -	105	—	618	—	1	96	326
In use at stations -	290	2	272	58	74	58	13
In store at M.O. -	39	3	257	19	24	29	100
At Liverpool Agency -	7	—	33	—	—	12	35
„ Aberdeen „ -	4	—	27	—	3	4	23
„ Glasgow „ -	2	—	9	—	—	3	10
„ Dundee „ -	18	—	45	—	—	15	41
„ Hull „ -	2	—	9	—	—	1	4
„ Cardiff „ -	2	—	18	—	—	2	10
„ Southampton „ -	5	—	29	—	—	5	23
Total, April 1st, 1895 -	474	5	1,317	77	102	225	585
Lost, &c. since April 1st, 1894 -	3	—	102	—	1	22	41
Under repair April 1st, 1895 -	7	—	—	1	1	—	—

* Of these barometers 202 are lent for use of seafaring communities at fishing villages and ports.

APPENDIX V.

REPORT OF INSPECTIONS IN IRELAND AND WALES, 1894.

I have to report that I have completed my inspections, with the exception of the following places which were left unvisited :—

Telegraphic stations.—Donaghadee and Roche's Point.

Weekly Weather Report stations.—Foynes, Kilkenny, and Llandovery.

Station of the Second Order.—St. David's.

The following is the report of my visits :—

Holyhead, visited September 19th.—The new observer, Mr. Chope, had his station in very good order. He seems attentive and careful, and promises to be a good reporter.

Dublin, Phoenix Park, visited September 20th.—The observer was on leave, but the substitute, Corporal Blight, seemed competent and intelligent. The station was, as usual, in good order.

Dublin, Fitzwilliam Square, visited September 21st.—This station was, as usual, in perfect order.

Dublin, Glasnevin Gardens, visited September 21st.—The station is in good order, but I have had to request the Superintendent to inclose with railings a space larger than the present area, cases having occurred of instruments being lifted from outside and therefore of probable disturbance of thermometer indices.

Lissan, visited September 22nd.—The station was in good order. Sir N. Staples takes the barometer readings himself.

Armagh, visited September 22nd.—This station calls for no remark : it was in the usual good order.

Colebrooke, visited September 24th.—This station is in good order, but there is no substitute in case of illness of the observer.

Londonderry, visited September 25th.—The station was in good order, but I fear the observer will shortly leave the locality, as he is resigning his appointment.

Malin Head, visited September 26th.—The observer is fairly good, but has not, as yet, made proper use of the self-recording aneroid I left there in 1893. I fear he may, probably, leave the station on the ground of health and exposure in winter.

Edenfel, visited September 27th.—This weekly weather report station was in good order.

Markree, visited September 28th.—This station was in good order. I tested the assistant and found her able to read the instruments quite correctly.

Belmullet, visited October 1st.—The station was in good order. Difficulty has been found in obtaining correct telegrams when the observer is on leave, but there is a prospect of an improvement in this, as one of the younger sisters shows considerable aptitude in the work.

Currygrane, visited October 3rd.—The former observer, S. Lecky, had left in August without sufficiently instructing his brother, W. Lecky, who succeeded him. I had, therefore, to instruct him carefully, and I hope he may turn out satisfactory.

Arley Cottage, visited October 4th.—The instruments are in good order, and the observations carefully kept.

Valencia, visited October 10th.—I have found this station, as regards the telegraphic reports, in good order. I am glad to say that the telegraphic service from Cahirciveen is more prompt and regular than it was from the Island.

Parsonstown, visited October 12th.—I am sorry to say that the reports from this station during the past year have been very unsatisfactory, the observer having been very careless. I have, with Lord Rosse's approval, dismissed him, and appointed another youth in his place for the telegraphic work, and yet another for the climatological observations. These two boys appear intelligent and willing, and Dr. Bøddicker, the astronomical assistant, has kindly promised to see to their further instruction. The instruments were clean and in good order.

St. Anne's Head, visited October 15th.—The observer here is a new man, but had been well instructed by his predecessor. There is a difficulty about finding a substitute in case of illness. There are two lighthouses and four keepers, but most of these men are anxious to leave the station owing to its loneliness, and are not willing to undertake the work. The instruments are all in very good order.

TELEGRAPHIC, WEEKLY WEATHER REPORT, and SECOND ORDER STATIONS, 1894.

Corrections to be applied to the readings of :—

STATIONS.	Dry Bulb.	Wet Bulb.	Spare Therm.	Max. Therm.	Min. Therm.	Grass Min.
Armagh	-0°3	-0°2	°	-1°1	°	+0°1
Belmullet	-0°2	-0°1	—	-0°1	-0°1	—
Brookeborough	-0°5	-0°6	—	+0°1	-0°3	—
Dublin (City)	-0°3	-0°3	—	-1°0	+0°2	—
Dublin (Glasnevin)	-0°2	-0°1	—	-0°3	+0°5	+0°9
Dublin (Phoenix Park)	-0°4	-0°2	-0°7	-0°1	-0°1	+0°3
Edenfel (Omagh)	—	—	—	+0°4	+0°2	—
Edgeworthstown	-0°3	-0°3	—	+0°7	+0°7	+0°7
Holyhead	-0°5	-0°2	—	-0°5	+0°3	-0°3
Lissan	-0°1	-0°1	—	+0°1	+0°1	—
Londonderry	-0°1	-0°1	—	+0°3	+0°3	—
Malin Head	-0°2	-0°1	-0°3	+0°1	-0°5	—
Markree Castle	-0°1	-0°1	—	-0°5	+0°5	—
Mount Nugent	-0°1	-0°1	—	+0°4	+0°4	+0°3
Parsonstown	-0°3	+0°2	—	+0°1	+0°1	—
Valencia Tel. Report	-0°6	-0°5	—	-0°4	+0°4	—

(Signed) ROBERT H. SCOTT.

REPORT of INSPECTION of SCOTTISH STATIONS for YEAR 1894.

BAROMETERS.

The barometers at the stations were compared with inspector's standard No. 690, which was in good order throughout the inspection as shown by comparisons with the standard in Edinburgh at the beginning and again at the end of the inspection. I have to report that the barometers continue to be correct, and are kept in the same good order as stated in last year's report. Table I. gives the comparisons, with corrected readings, of No. 690, the readings of the station barometer not being corrected.

TABLE I.

STATIONS.	Inspector's Standard No. 690 corrected.	Reporting Barometer uncorrected.	Check Barometer uncorrected.	REMARKS.
Fort William - -	Inches, 29·515	Inches, 29·520	—	Check barometer at higher level.
Deerness - -	29·740	29·762	—	
Dunrossness - -	29·407	29·396	29·402	
Wick - -	29·984	29·980	29·920	
Dunrobin - -	30·048	30·048	—	
Lairg - -	29·512	29·496	—	
Stornoway - -	29·855	29·850	29·850	
Glencarron - -	29·572	29·576	—	
Nairn - -	30·192	30·182	30·190	
Gordon Castle - -	30·207	30·208	—	
Aberdeen - -	30·260	30·264	30·264	
Lednathy - -	29·406	29·408	—	
Dundee - -	30·030	30·030	—	
Marchmont - -	29·156	29·160	—	
Ladylaw - -	29·930	29·930	—	
Wolfelee - -	29·763	29·760	—	
Glenlee - -	30·276	30·280	—	
Ardrossan - -	30·504	30·505	—	
Rotheray - -	30·260	30·200	—	
Poltalloch - -	30·318	30·290	—	
Leith - -	30·097	30·038	30·100	
Ochtertyre - -	29·932	29·950	—	

THERMOMETERS.

The minimum thermometers were carefully examined with the result that all were found in good order with the exception of the Stornoway minimum, which was badly out of order, as explained in special report of this station. It reflects much credit on the observers that this important thermometer, so liable to go wrong, is so constantly watched and kept in order.

TABLE II.

STATIONS.	Standard Ther- mometer, No. 4433.	Dry Bulb.	Wet Bulb.	Spare Ther- mometer.	Max. Ther- mometer.	Min. Ther- mometer.	Time in Water in Minutes.	Change of Tempera- ture.
Fort William - - -	60°4	+0°2	+0°2	—	+0°1	0°0	180	+0°2
Do. Observatory - -	60°4	—	—	—	0°0	-0°6	180	+0°2
Deerness - - -	58°6	+0°1	+0°1	—	-0°9	-0°3	85	Uniform
Dunrossness - - -	57°0	+0°6	+0°3	+0°6	0°0	-0°2	150	Do.
Wick - - -	56°0	-0°4	-0°5	—	0°0	0°0	80	Do.
Dunrobin - - -	59°4	0°0	+0°1	—	+0°1	-0°3	120	-0°2
Lairg - - -	58°0	+0°3	+0°3	—	-0°1	+0°1	75	+0°3
Stornoway - - -	56°2	+0°6	+0°6	—	-0°4	-0°6	165	+0°3
Glencarron - - -	53°9	+0°1	+0°1	—	0°0	0°0	90	+0°3
Nairn - - -	55°6	+0°7	+0°8	+0°2	+0°1	-0°1	90	+0°4
Gordon Castle - -	55°2	+0°1	-0°1	—	+0°1	-0°2	105	Uniform
Aberdeen - - -	57°0	+0°3	+0°3	—	+0°2	+0°3	105	Do.
Lednathy - - -	53°4	+0°2	+0°2	—	+0°2	-0°4	100	Do.
Dundee - - -	57°0	-0°5	-0°3	—	+1°4	-0°4	80	+0°2
Marchmont - - -	52°0	0°0	-0°1	—	0°0	0°0	240	+0°5
Ladylaw - - -	60°4	0°0	0°0	—	0°0	+0°1	165	+0°3
Wolfelee - - -	51°0	-0°2	-0°2	—	+0°2	-1°0	100	+0°4
Glenlee - - -	52°8	+0°2	+0°2	—	-0°1	0°0	120	+0°2
Ardrossan - - -	60°1	+0°2	+0°2	—	-0°2	-0°2	80	Uniform
Poltalloch - - -	57°5	+0°3	+0°3	—	+1°0	0°0	90	Do.
Rothsay - - -	52°9	0°0	-0°1	—	-0°1	-0°1	110	Do.
Leith - - -	54°7	+0°1	+0°1	—	-0°1	-0°2	75	Do.
Ochertyre - - -	57°6	0°0	-0°1	—	0°0	0°0	160	Do.

HYGROMETERS.

The dry and wet bulbs were in very good order at all the stations, as shown by the readings made immediately on opening the screens at the time of inspection, and compared with the hygrometric conditions of the atmosphere at the time of inspection.

NOTES of INSPECTION of the STATIONS.

Fort William, August 8th, 1894.—The instruments are in excellent order, and the observations are made with strict punctuality and correctness.

A new Stevenson's screen was got to replace the old one, to which the thermometers were shifted on July 19th. The seismometers were set up in the autumn of last year. Several changes have been made with regard to Beckley's gauge, with the result that more satisfactory readings are now obtained. The standard barometer was sent to Kew in March to be overhauled, and was returned to Fort William on July 19th. While at Kew, inspector's standard, No. 690, was used instead.

Deerness, August 11th.—The instruments are in excellent order, and the observations are made with great care and intelligence.

Dunrossness, August 16th.—The instruments are in very good order, and much care is given by the observers to secure punctuality and correctness. The small barograph is in good order, and the readings required by the office will be forwarded in a fuller manner than heretofore.

Wick, August 17th.—The instruments are in remarkably good order, and much intelligence and care is manifested by the observer. Improvement as regards an earlier despatch of the daily telegram is promised.

Dunrobin, August 18th.—A new hygrometer with opal scales was added in June, this, owing to close proximity to the sea, being very desirable. The instruments are all in good order, and the observations are made with care and intelligence.

Lairg, August 20th.—The instruments are well attended to, and the new observer understands the work of observing well.

Stornoway, August 22nd.—The minimum thermometer was found with about 10°·0 of the spirit lodged near the top of the column, which was stated to have been seen two days previously, but the observer delayed putting it right till the time of the inspection, otherwise the instruments were in good order, and the observations appear to have been made with care. As Mr. Forbes, the observer, is leaving Stornoway some time was spent in making inquiries and personally seeing the different applicants for the post.

Glencarron, August 23rd.—The instruments continue to be kept in excellent order, and the observations made with much intelligence and with scrupulous care.

Nairn, August 24th.—The instruments are in good order, and the observers make all endeavours to secure correctness and uniformity in the readings.

Gordon Castle, August 24th.—The instruments are all in good order, and the observations made with much care and intelligence.

Aberdeen, August 25th.—The Stevenson's screen has been painted. The instruments at this station and observatory are in excellent order, and the observations are made with exemplary care and exactness.

Lednathy, August 27th.—The instruments are in very good order, and the observer is remarkably shrewd, accurate, and intelligent.

Dundee, August 28th.—The instruments continue to be kept in very good order, and much intelligence and care is shown in the observations.

Marchmont, September 27.—The instruments are in remarkably good order and correctly read by the new observer, except the barometer, which, however, was read in a way by which the correct reading is easily ascertained.

Ladylaw, September 27th and 28th.—The instruments are in excellent order, and much enthusiasm, care, and intelligence is manifested in carrying on the work of observing.

Wolfelee, September 28th.—The instruments continue to be well kept and carefully and correctly observed. At this station the observations were interrupted for two or three months in 1893, but were resumed under the same observer, and with the same instruments, in the autumn of that year.

Glenlee, September 29th.—The instruments are in excellent order, and the work of observing is well carried out.

Ardrossan, October 1st.—The instruments are in good order, and the observations are carefully made. The heights of two bench marks, between which Mayes' house is situated, have been sent, with an instruction to have the height of the barometer measured from one or other of them.

Poltalloch, October 2nd.—The instruments are in very good order, and the observations are carefully and intelligently made by the new observers.

Rothsay, October 3rd.—The instruments are all in very good order, and much care is given to secure accuracy and punctuality in making the observations.

Leith.—The instruments are all in very good order, and much care is given by the observers to give satisfaction with the observations. The additional notes asked for will in future be added to the daily telegram.

Ochertyre, October 11th.—The instruments are all in excellent order, mostly in duplicate, and much enthusiasm is displayed in the whole work, which is well done. A new set of underground thermometers at depths of from 3 to 48 inches has recently been added.

(Signed) A. BUCHAN.

REPORTS OF INSPECTION OF THE STATIONS IN ENGLAND.

1. TELEGRAPHIC REPORTING STATIONS.

Hurst Castle.—The present observer has been in charge for only a few months, the former observer having been pensioned off by the Trinity House. The thermometers and rain gauge are in the garden, and are attended to by the chief lightkeeper and his wife. Barometers were in good order, but in a bad light, and I saw no probability of any improvement. The thermometers were well exposed, but the screen needed repairs, and the wet-bulb was very badly mounted. Wind direction was magnetic, not true, and rain-gauge was much too near a hedge. The station is a very open one. I re-mounted the wet-bulb, and gave minute instructions as to its management, and spent four hours in explaining the action of the various instruments to the observer, who, while affecting to understand what was said, was nevertheless, in my opinion, by no means quick at comprehending. Errors in reducing his barometer readings were numerous, and I am sorry to say, that since the inspection the said errors have been frequently repeated.

Jersey.—Visited during heavy rain and strong winds. Barometers in observer's house at St. Aubin's, clean, and apparently well managed. Thermometer screen and rain-gauge on an unused platform of the railway station, well exposed as a whole, but the gauge was partially affected by a flag-staff, which was much too near to it, and the thermometer screen needed considerable repairs. Wet-bulb badly mounted, but clean. Remounted it and gave necessary instructions. Position is bad for observations of wind (when northerly) and of sea disturbance. Sunshine recorder is at Fort Regent, near St. Helier's; it is firmly fixed and exposure is perfect.

With regard to the proposal to shift the instruments to the Jesuit College at Maison St. Louis, and to supply the Rev. M. Dechevrens with other instruments, I beg to report that I visited the College and saw M. Dechevrens, and spent about three hours with him inspecting his grounds (in heavy rain) and discussing the question generally. First of all, M. Dechevrens was prepared, and anxious, to take over the telegraphic

reporting instruments and to send telegrams at once; but as part of a more general arrangement, which was to include the grant to the College of a self-registering anemometer, rain-gauge, and sunshine recorder. The grounds of the College are extensive, and there is abundant room for such instruments. Fresh buildings of considerable size are being constructed for astronomical work, and on one of these it was proposed to place the anemometer. I very much doubt, however, whether the position is at all likely to prove a good one for anemometry, as it is on the side of a steep hill, which could not fail to affect the wind's record. M. Dechevrens would prefer anemometer, rain-gauge, &c. of some generally approved type to any novel invention, but would be willing to conduct experiments with any new form, if wished. He, however, made one condition, viz., that the instruments must be presented to the College without any reserve—he would not undertake to receive them at all if required to send the original traces, or, indeed, anything more than an occasional (weekly or monthly) summary to the Meteorological Office. The instruments and all their records must be the property of the College, and completely within the control of himself or his successors. I do not think, however, that the telegraphic reporting instruments should be transferred to this new position at present, although I think a better position for them should be found before long, as we get really no correct idea of sea disturbance and a very poor one of wind in the present position of the observer.

Dungeness.—Instruments at this station were in good order, excepting the wet bulb, which had two thicknesses of coarse calico on it, and was consequently of little good. Re-mounted it and gave instructions. Wind direction had hitherto been magnetic, and height of barometer above sea is certainly 7 feet greater than has hitherto been accepted. Observer is anxious to report well, and took readily all the suggestions made to him. Thermometer screen needs repairs generally, and re-painting inside. I gave careful attention to the question of the barometric readings, and hope some improvement in them may be found in future.

North Foreland.—At this station the reporting barometer was in good order and well read. Wet-bulb mounting defective (two thicknesses of muslin, and dirty), and wind direction was magnetic. The new minimum thermometer supplied in the spring had not been taken into use, and the old one was defective. I spoke very strongly about the neglect thus shown. Observer seemed to me to have exaggerated the force of Northerly winds when at all strong. I therefore drew his attention to the matter. As a whole, however, he is a competent man, and takes considerable interest in his work.

Cambridge.—The new observer at this station is Miss Walker, one of the assistants in the Astronomical Observatory. She appears to me to be very competent, and earnest in trying to do the work well. The wet-bulb thermometer was too thickly covered with calico, but was clean; though I fear it had been neglected by previous observer, as the bulb had a very thick covering of lime, &c. on it. Re-mounted the instrument gave all necessary instructions, and left a supply of proper muslin and wick for future use. The bushes, &c. surrounding the inclosure in which the thermometers and rain-gauge are placed have grown very much, and need to be well cut back and lowered, or they may vitiate the readings of the rain-gauge seriously. The position, even then, will not be thoroughly good, as tall trees abound in that region; but no better site can at present be found.

Sunshine recorder was on a stand on the roof of the observatory, excellently placed, with perfect exposure.

Yarmouth.—Instruments in same position as for many years past, and carefully managed. Wet-bulb thermometer wrongly mounted, but in all other respects instruments were in good order. Re-mounted wet-bulb, and left proper muslin, &c. with observer. Corrections to wet bulb and maximum are high.

The yard in which the instruments are placed is smaller than could be wished, but I know of no better site, and certainly of no better observer.

2. SECOND ORDER STATIONS.

Southampton.—The instruments at this station are at the Ordnance Survey Office, and are in charge of the librarian. They are all in excellent order, and are most carefully attended to. Barometer in good light; thermometers in an enlarged "Stevenson" screen, but the inclosure in which they were placed is certainly rather small. It is, however, adjacent to a wide road and large open spaces, so that the indications probably represent the temperature of the locality fairly well. I fear, however, that, in the case of rain with high winds, the rain-gauge may get some drops of water from the shrubs which are in different parts of the inclosure. Wet-bulb thermometer was very clean and properly moistened. Sunshine recorder is on top of one of the gables of the buildings; the exposure is perfect, but instrument was slightly out of the level in an E. to W. direction. This was rectified, and I recommended that it should be cemented into its improved position.

Eastbourne.—Instruments at this station are in various parts of the town; barometer (out of order) is in one of the shelters under a terrace facing the sea; thermometers are in a Stevenson screen in a large open space near the sea; rain-gauge is in a triangular space in a more central part of the town, while the sunshine recorder is on top of the Grand Hotel. Observer's method of setting the barometer is not at all satisfactory, but improvement was promised. Wet-bulb was most unsatisfactory, the bulb being simply smothered with cotton wick. The other instruments were well managed, but the position of the sunshine recorder I consider to be one of extreme danger to the observer when changing the card on dark stormy evenings. The observations are taken with great regularity. I re-mounted the wet-bulb, and gave observer careful instructions as to the proper method of managing all of the instruments.

St. Leonards.—Excellent instruments, and, as a whole, well exposed. Mounting of wet-bulb thermometer, however, very defective; muslin bad, and too much both of it and of the wick (or, rather, the brown worsted) with which it was mounted. Re-mounted it in proper manner, gave instructions for future, and left supply of proper muslin, &c. Sunshine recorder was slightly out of level in N. to S. direction, and a building recently erected, was likely to vitiate the indications for about an hour in the early mornings in autumn and spring. Found new position for the instrument, which observer promised to have removed at once. The building referred to was erected so recently that no harm had resulted at time of inspection.

Uppingham.—An excellent station, and observations taken with scrupulous care and promptitude. The thermometer screen (a modified "Glaisher") having become too much sheltered by some trees, the observer proposes to remove it on the 1st January next to a more open space. Instruments are good.

Belvoir Castle.—This station has not yet been fully installed, but observer (Mr. Divers, head gardener) hopes to begin reporting on 1st January 1895. At present he needs further instruction with regard to wind

and cloud observations. Instruments are very accurate. Thermometers are on a very large "Glaisher's" stand. Rain-gauge, a new eight-inch of "Glaisher" pattern, but with a long tube extending to nearly bottom of collecting can, is very well exposed. Sunshine recorder is slightly sheltered to westward and west-north-westward, perfectly open elsewhere. It is a "twin" photographic recorder by Jordan. Bearings are true. Barometer, a Fortin's standard, has been recently repaired, but verified only by maker (Negretti and Zambra). Observer is ready to make every arrangement for having a good and continuous "Second Order" Station.

3. THIRD ORDER STATIONS.

Sandgate.—This is a rainfall station only, and the observer does not at present see his way to increasing the work of observing. Gauge is an ordinary 5-in. metal gauge in good order, and situated near the edge of a kind of terrace (undercliff) overlooking the main street of the town and facing the sea. It is about on a level with the tops of the houses in the lower street, and the effect of currents of wind blowing up the side of the cliff is thus cancelled. Rim was 1 ft. above the ground and about 47 ft. above sea, but Mr. Stilgoe (the observer and town surveyor) promised to level it accurately and send the results to the Meteorological Office.

Kearsney Abbey (near Dover).—Rainfall station only, and observer does not propose to make any increase in meteorological work. Gauge, a 5-in. ordinary metal gauge, was very badly placed, catching the droppings from several bushes, &c., with the branches of which it was largely covered. Found a better (but not excellent) position for the instrument, and Mr. Curtis (the owner of the estate), whose gardener takes the observations, promised that it should be at once shifted. I do not think the records hitherto recorded are fit to be published, owing to the very bad position of the gauge.

* *Ketton Hall.*—Full set of instruments, but observations made only once daily. Mr. Divers (late head gardener) has now gone to Belvoir Castle, but the new one (Mr. Drabble) appears to read the instruments correctly, and Mr. Coventry, the owner of the instruments, applies all the corrections accurately. The instruments are in a hollow. Dry, wet, maximum, and minimum thermometers are in a Stevenson's screen fairly well exposed, but grass thermometer not at all well exposed, and reading about 1.5 too low. Gave instructions to cut the grass, &c. as necessary. Rain-gauge badly placed, being dominated by an apple tree to south-westward of it, the tree having grown gradually during several past years. Mr. Coventry has agreed to shift the instrument to a better position on January 1st, 1895. Mr. Coventry is not inclined to take evening observations.

* *The Holmes, Ketton.* (Mr. Coventry's private house.)—Rainfall stations only. Gauge, a 5-in. Snowdon pattern, not very well exposed, in a kitchen garden on east side of house. Exposure would be good but for some trees to the northward of gauge which dominate it too much. Observations are very regularly made, but observer will not do more than at present.

* *Colley Weston.*—Rainfall station only. Observations taken by Miss Amy Tasker. Gauge belonging to Mr. Coventry, of the Holmes, Ketton. The instrument is a 5-in. Snowdon gauge, very well placed near the church, at an altitude of about 270 feet above mean sea level. Exposure could hardly be better, and readings are taken regularly.

* It is highly probable that Mr. Coventry will be removing in about 12 or 18 months' time, and he will take all his instruments with him.

Chatham.—Observer is the Instructor in Surveying. Barometer, a very good Fortin standard, not in a good light; recently cleaned and verified at Kew. Thermometers—dry, wet, maximum, and minimum, very good instruments, well exposed in a Stevenson's screen. Solar radiation read six degrees too low (new one at once put in its place). Rain-gauges, three in number, are in 8-in. "Glaisher's"; are too near the open fence of the inclosure, but, on application, the fence will be thrown back 5 ft., which will make the exposure very good. Observer cannot take more than one set of observations per day.

Rothamsted (Harpenden).—Barometer good; dry and wet maximum and minimum thermometers, in a Stow's screen, slightly sheltered by trees, but fairly well exposed for all that. Solar radiation in good position; terrestrial radiation utterly useless hitherto, being thoroughly screened by surrounding objects from radiation of any kind. Instrument to be moved at once. Sunshine recorder very well exposed, but slightly out in azimuth lately (to be rectified). Rain-gauge well exposed. Observations now intelligently made by man named Reed, one of the assistants. Cannot take more than one observation a day. Arrears of returns to be dealt with at once.

TABLE of CORRECTIONS necessary to bring the READINGS of the THERMOMETER into agreement with the INSPECTOR'S STANDARD.

Names of Stations.	Corrections.					Reading of Inspector's Standard (corrected).	Notes.
	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare.		
1. TELEGRAPHIC REPORTING STATIONS.							
Hurst Castle	-0.7	+0.1	-0.7	-0.4	—	62.1	
Jersey	-0.1	-0.3	-0.1	-0.3	—	61.7	
Dungeness	-0.1	-0.1	0.0	-0.1	—	61.9	
North Foreland	-0.4	-0.1	+0.5	+0.6*	-0.4	59.6	* Out of order, new one substituted.
Cambridge	-0.3	-0.2	-0.5	+0.7	—	59.8	
Yarmouth	-0.5	-1.0	-1.0	0.0	—	60.0	Substituted dry for wet and vice versa.
2. SECOND ORDER STATIONS.							
Southampton	-0.1	-0.3	+0.1	+0.2	+0.2*	60.2	* Grass Min. Ther.
Eastbourne	-0.1	-0.1	0.0	+0.1	—	68.0	
St. Leonards	-0.4	-0.6	0.0	0.0	0.0*	65.0	* A Kew Standard.
Uppingham	-0.2	0.0	-0.4	-0.3	—	59.5	
Belvoir Castle	0.0	0.0	0.0	0.0	+0.6*	52.0	* Grass Min.
3. THIRD ORDER STATIONS.							
Ketton Hall	-0.2	-0.4	+0.1	-0.2	+0.3*	51.1	* Grass Min.
Chatham	-0.3	-0.2	+0.5	-0.1	+5.8*	53.8	* Solar Max. in Vac. (changed immediately) new one + 0.5.
Harpenden	+0.2	+0.1	-0.6	+0.1	+1.7*	52.0	* Spherical bulb grass min.

In each case the thermometers were in water for more than 60 minutes before being read.

(Signed) FREDC. GASTER.

SIR,

October 16, 1894.

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

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

I am, &c.
(Signed) R. H. CURTIS.

Newquay, September 3rd.—The sunshine recorder here has not been attended to of late as carefully as could have been wished, and I pointed out to the observer the necessity for more punctual and careful attention to the changing of the cards. The wooden stand having become warped, I readjusted the recorder and secured it in its position.

Scilly, September 6th.—The instruments were in good order except that the wet-bulb had too thick a covering upon it. The observer read his instruments and reduced his barometer reading quickly and correctly. As requested, I directed his attention to the use of the self-registering aneroid, and I have reason to think a more intelligent use will be made of that instrument in the future. I also gave him some instruction on the subject of upper clouds, which I found he much needed. The sunshine recorder has a perfect exposure.

Plymouth, September 8th.—The minimum thermometer had half a degree of spirit at the top of the tube; but, with this exception, the instruments were all in good order, and they are carefully attended to. I dislodged the spirit before leaving. Since the last inspection the barometer had been removed to the observer's new residence; I found it hung in a bad light, and therefore arranged for its removal to a better light on the opposite side of the room. The observer expects the Corporation will shortly procure a self-recording anemometer, and, at his request, I visited two alternative sites proposed for its erection, either of which would be very good. The observer also hopes to shortly commence daily observations of sea temperature from a hospital hulk moored in the Sound.

Prawle, September 11th.—The observer here had been changed since the station was last inspected. The wet bulb was very badly mounted, and the bulb was immersed in a vessel containing fully half-a-pint of water; with this exception, the instruments were in good order. The observer read correctly, and reduced his barometer reading properly, although not very quickly; his deputy also did the work accurately, but was very slow. I found that hitherto the wind directions reported have been "magnetic" instead of "true," but this will in future be altered. I also gave the observer some instruction in the matter of upper clouds. The observer appeared to me to be anxious to understand his work, and to do it satisfactorily.

Arlington Court, September 12th.—The wet bulb at this station was badly mounted, and *twine* was in use instead of cotton wick, the result being that the bulb was not kept properly moistened. The maximum thermometer read half a degree too high, and the minimum as much too low, but in neither case could I detect any apparent cause for the large errors. The observer read correctly, and appears to do his work carefully and neatly.

Montpelier, Bristol, September 13th.—The instruments here were in excellent order, and Mr. Jones is a very good observer. As requested, I examined very carefully the maximum thermometer, which I found to

be a very good instrument. The site of the station is, however, not the best for temperature or rainfall observations.

Cirencester, September 14th.—Except that the thermometer stems were absolutely devoid of any black in the divisions, the instruments were all in good order. The sunshine recorder was in no way fastened to its stand, and was, therefore, always liable to be moved in changing the cards, or by wind; and the assistant observer, whom I saw (Prof. Ohm being absent on vacation), promised to have it at once secured by a couple of iron cramps.

Stokesay, September 15.—The instruments here were in fairly good order except the solar radiation thermometer, which had become useless. The barometer was tested by my standard, with which it very closely agreed. The thermometer screen is in a dilapidated state, and Mr. La Touche has promised to have another substituted for it. This station is very badly situated for wind observation.

Llandudno, September 17th.—A new position has recently been found for the sunshine recorder, which is now under the care of Mr. MacMaster, at West Bay. The situation is an excellent one, the instrument having a very good exposure at all seasons, and the observer is very punctual and careful in attending to the changing of the cards.

STATIONS.	Reading of Stand-ard.	Corrections to be applied to the Readings of the						REMARKS.
		Dry Bulb.	Wet Bulb.	Spare Therm.	Max. Therm.	Min. Therm.	Grass Min.	
Scilly -	60.0	-0.7	-0.2	0.0	-0.7	0.0	—	* No spare Thermometer.
Prawle Point -	59.6	-0.5	0.0	*	+0.2	0.0	—	
Stokesay -	58.7	-0.2	-0.3	—	-0.7	+0.8	+1.1	
Plymouth -	57.8	0.0	-0.1	—	0.0	+0.5	+0.5	
Arlington Court	60.3	0.0	-0.1	—	-0.5	+0.5	—	
Bristol -	58.0	0.0	0.0	—	+0.2	0.0	—	
Cirencester-	55.0	0.0	0.0	—	+0.1	+0.1	—	

(Signed) R. H. CURTIS.

SIR,
 Meteorological Office,
 October 16, 1894.
 I BEG to submit herewith the report of my inspection of various English stations.

I am, &c.
 (Signed) JOHN A. CURTIS.
 To
 R. H. Scott, Esq., M.A., F.R.S.

TELEGRAPHIC REPORTING STATIONS.

North Shields, September 4th.—The outdoor instruments have been removed to the opposite side of the Dockway Square inclosure, in order to lessen the risk of accidental damage by children at play. There is,

however, still some liability in this direction, and I suggest that a letter be written to the Secretary of the committee having control of the square asking him to use his influence to prevent such damage as far as possible. The instruments were all in good order, except the rain-gauge, which needed repair.

York, September 7th.—I formed a favourable impression of Mr. Wright, the observer, who read the instruments accurately and quickly, and who appeared to me to be anxious to do well. The wet-bulb, though properly mounted, was coated with deposit. The most serious defect at this station is the position of the thermometer screen, which ought, in my opinion, to be removed about 20 yards to the south-east where it will have a much freer exposure.

STATIONS of the SECOND ORDER.

Aysgarth, September 6th.—The thermometer screen is now much sheltered by a shrubbery to the west, but I did not think it advisable to recommend any change. The outfit of this station is admirable, and the observations are carefully taken.

Bramley, August 22nd.—This is a new station, the instruments at which are the property of Mr. C. Bell, of Lockner Holt, Chilworth, who is obliged to discontinue observing for the present. The observer at Bramley is Mr. J. Bartlett, M.A. He is most enthusiastic in the work, and the station promises very well indeed. I found the wet-bulb thickly coated, and requested that rain water only be used in future to moisten it. A hill rises immediately behind the stations which must affect the direction of the surface wind when from any point between South and West. The thermometer screen is on the Stevenson principle, but not of the standard pattern. The rain gauge is not quite satisfactory.

Cronkbourne, Isle of Man, August 29th.—This is an excellent station alike for position, outfit, and management. The only faults I noticed were that the wet-bulb had too much muslin upon it, and that on the day of my visit the sunshine card was not quite accurately set in the groove.

Durham, September 5th.—Mr. Carpenter is a very competent and careful observer. Everything was in good order except that the rain-gauge was rather loose, and that the grass minimum thermometer had about 1° of separated spirit. This last defect I rectified and Mr. Carpenter promised to fix the rain-gauge firmly. There is a large shrub on the south of the thermometer stand (which is one of the "Glaisher" pattern) and close to it, but I do not think the readings are much affected by it, if at all.

Epsom, July 27th.—The observers at this station have recently been changed. Those now appointed, who are students at the college, are intelligent lads, with, however, no knowledge of meteorology. I spent a considerable time with them, and went as fully as possible into the details of the work. The wet-bulb was very improperly mounted and the grass minimum had spirit separated, which, with some difficulty, I corrected. The other instruments were in good order. Both the observers set and read the instruments accurately and quickly.

Gilesea, near Maryport, September 1st.—This is a new station. The barometer has a large error, but a new one has since been purchased

from the Office, and is now in use. The outdoor instruments are good, and are well exposed in a garden at the back of the house. There is a difficulty about the 9 p.m. readings, but I hope this may be overcome. Mr. Monkhouse is not, at present, sure of being able to observe later than 8 p.m. The observer is most enthusiastic in the work. He reads the instruments accurately and quickly, and I think useful observations may be expected from this station. The rain-gauge was not quite firmly fixed.

Heysham Hall, August 31st.—The exposure of the outdoor instruments at this station is not quite satisfactory. The thermometer screen is in a kitchen garden, rather too near a greenhouse, and on the day of my visit was sheltered by some tall chrysanthemums, in pots, which it was promised should be removed. The screen is too small, and I gave instructions that the dry-bulb and wet-bulb thermometers should be brought away from the back louvres, against which they at present rest. The screen was placed over fine cinders, but Mr. Lomas promised to replace these with grass. The observer has been in the habit of setting the barometer from .02 to .03 in. too low, but this error will not, I think, be repeated.

Manchester, August 28th.—This station was in excellent order. Mr. Hazzlewood, the manager of the Corporation Dépôt, in the Oldham Road, where the observations are taken, was absent from Manchester, but I saw the deputy observer, and went over the details of the work carefully with him, giving such instructions as were necessary.

It is a misfortune that arrangements cannot be made for evening readings at this very well managed station.

Prestwich, August 27th.—At this station the position of the out door instruments has been entirely changed. They now stand in the front of the asylum, perhaps a quarter of a mile away from the old site, and on the ground about 15 feet higher. The present position is exceedingly good, the instruments were in excellent order, and the observations appear to be very carefully attended to. A new thermometer screen is now in use. The sky was quite overcast at the time of my visit, and I was unable, therefore, to test the adjustment of the sunshine recorder. There are some newly-planted shrubs near the instruments, but these Dr. Clunn promised should be kept low.

St. Helens, August 28th.—All the instruments were in good order and the observations are taken with care. The thermometer screen, however, stands over limestone chippings, and I requested that these might be replaced by turf. This Dr. Robertson (who personally takes the observations) promised to try and get done. The observer hopes soon to obtain a sunshine recorder.

Seaham, September 5th.—All the instruments, including the barometer, are at the cemetery, and Mr. Leith, the superintendent of the cemetery, takes the observations, while Mr. Aird fills up the sheets. I met both gentlemen and carefully tested Mr. Leith's readings. He read the barometer a little in error at first, but this, I think, will not be repeated. The thermometer screen was so much sheltered by a young tree to the south of it (and right over it) that I advised its removal to a better site which I pointed out. Mr. Aird promised to have the change made at once. The grass under the thermometer screen was quite long, and the wet-bulb was coated with deposit.

Sheffield, September 8th.—Everything was in excellent order at this station, and the observations are made with great care and intelligence. The thermometer screen is very well exposed on a lawn in front of the museum, but a flagstone is placed underneath it. This I recommended should be covered with a mat, so as to reduce as far as possible the effect of radiated heat. The barometer is a Fortin, and the surface of the mercury was rather dull. Pipe water has sometimes been used to moisten the wet-bulb, but it was promised that in future only rain water or distilled water should be employed for this purpose.

Tealby, September 11th.—I spent a considerable time at this station and went into details of the work pretty fully with the observer, Rev. S. Lewin, M.A. The worst feature about the station is the frequent unpunctuality of the evening observations, but this I fear cannot be wholly avoided. The wet-bulb was dirty and not quite properly mounted.

York, September 7th.—The thermometer screen at this station is sheltered by trees growing to the south and south-west which cut off the sun's rays from the screen from about 1 p.m. In consequence, the afternoon maximum is, I believe, often missed. A much better site for the screen is available nearer the rain-gauge, and I recommend that efforts be made to effect a change. The screen is overcrowded with instruments and in consequence the maximum temperatures reported by telegraph are usually higher than those shown in the monthly reports, sometimes by as much as 3° or 4°. The wet-bulb was dirty. The rain-gauges are 1 foot 9 inches high, but being informed they had always been at the same height I recommended no change. Mr. Wright seemed anxious to do well.

STATIONS of the THIRD ORDER.

Alnwick Castle, September 3rd.—The temperatures hitherto sent us are from a large Six's thermometer hung outside the library window, 22 feet above the ground. I dismounted this instrument, and on testing it in water in the usual way, found it to be sensibly correct. There are however, other thermometers well exposed in a Stevenson screen in the garden, near the rain-gauge. I tested these also and found them to be excellent instruments. I was informed that there would probably be no difficulty in having the observations from these instruments sent to us instead of those from the "Six," and I strongly recommend that Mr. Willyams be asked to make this change. The temperatures at present reported certainly do not correctly represent the climate of the station. I requested that the long grass around the rain-gauge might be cut short, and this it was promised should be done.

Bawtry (Hesley Hall), September 10th.—The instruments used for the observations sent to the Office were in good order. Mr. Whittaker thinks of purchasing a sunshine recorder and an anemometer, and at his request, I advised as to the positions for these instruments.

Durham.—Everything was in good order at this station except that the rain-gauge was rather loose, and that the grass minimum thermometer had about 1° of separated spirit.

Market Rasen, September 11th.—This station supplies only rainfall observations. I found the rain-gauge loose and not quite level, but these

defects I corrected. The exposure is not quite satisfactory, the gauge being sheltered to some extent by the garden walls, &c.

North Allerton, September 6th.—This station supplies only rainfall observations. The rain-gauge in its present position is much sheltered, but there is a much better site available which I pointed out, and which I hope may be adopted. The measuring glass needs a correction of + '01 inch, which Mr. Stead regularly applies.

PROPOSED STATION.

Solihull, near Birmingham, September 12th.—This is a new station, not yet accepted by the Office; Mr. Boothroyd, the observer, has bought a good set of outdoor instruments, but has, as yet, no barometer. The exposure of the instruments is good, and I think the observations are very carefully taken. The thermometer screen at present is rather too near the house, and I selected a better site, to which it was promised the screen should be at once removed. Mr. Boothroyd cannot, at present, promise 9 p.m. observations, but I recommend the station be accepted as one of the Third Order, or for Weekly Weather Report purposes.

BAROMETER COMPARISONS, 1894.

STATIONS.	Inspector's Standard Barometer corrected (Adie, B. T. 779).	Reporting Barometer un- corrected.	Check Barometer un- corrected.	Reporting Barometer.		REMARKS.
				Correction required to reduce to Inspector's Standard.	Correction hitherto used.	
Aysgarth -	29'525	29'534	—	—'009	—'017	
Bawtry (Hesley Hall).	30'390	30'416	—	—'026	—	
Bramley -	29'815	29'814	—	+ '001	+ '002	
Cronkbourne -	30'200	30'200	—	'000	'000	
Durham -	29'795	29'788	—	+ '007	—'002	
Gilcrux -	29'905	29'790	—	+ '115	+ '068	Mercury had es- caped during transit of inst. from Kew.
Heysham Hall -	30'120	30'122	—	—'002	—'005	
Manchester -	30'115	30'104	—	+ '011	+ '001	
North Shields -	30'055	30'038	30'028	+ '017	—	
Prestwich -	29'840	29'830	—	+ '010	'000	Comparison not very reliable owing to diffi- culty in hanging standard.
St. Helens -	30'180	30'188	—	—'008	—'009	
Seaham -	29'995	29'996	—	—'001	—'014	
Sheffield -	29'545	29'542	—	+ '003	+ '001	
Tealby -	30'095	30'086	—	+ '009	+ '004	
York -	29'930	29'984	29'986	+ '006	+ '007	

THERMOMETER COMPARISONS, 1894.

Corrections to be applied to the readings of—

STATIONS.	Standard corrected (Neg. B. T. 5012).	Dry Bulb.	Wet Bulb.	Spare Therm.	Max. Therm.	Min. Therm.	Gross Min.	REMARKS.
Alnwick Castle—	—	—	—	—	0·0	0·0	—	Six's maximum and minimum. Instruments in Stevenson screen.
Aysgarth -	61·8	-0·5	-0·5	—	-0·8	-0·3	—	
Bawtry (Hesley Hall).	52·8	—	—	—	—	0·0	—	
Bramley -	57·3	-0·7	-0·2	—	-0·5	+0·1	—	
Cronkbourne -	60·1	+0·1	+0·1	—	-0·2	+1·1	—	Before spirit was got back correction was + 1·4°.
Durham -	63·2	-0·5	-0·5	—	-0·2	+0·4	—	
Epsom -	53·7	-0·6	-0·6	—	-0·4	+0·4	+0·1	
Gilcrux -	64·6	-0·2	-0·2	—	-0·1	-0·2	0·0	
Heysham Hall -	58·2	-0·2	-0·2	—	-0·3	-0·1	+0·2	Earth thermometers, 1 ft. + 0·2; 4 ft. + 0·2. Six's thermometer in garden stand.
Manchester -	64·2	-0·4	-0·2	—	-0·3	+0·3	-0·1	
North Allerton -	57·5	+0·3	+0·2	—	+0·4	+0·4	+0·6	
North Shields -	56·2	—	—	—	-0·1	+0·7	—	
Prestwich -	57·6	-0·3	0·0	—	-0·4	+0·8	—	Maximum and minimum thermometers for Second Order Return. Ditto for Telegraphic Reports.
St. Helens -	61·8	-0·3	-0·2	—	0·0	-0·1	—	
Seaham -	58·7	-0·2	-0·2	—	-0·1	+0·4	—	
Sheffield -	56·0	-0·7	-0·6	—	+0·4	+0·5	—	
Solihull -	53·4	-0·3	-0·4	—	-0·2	+0·1	—	Maximum and minimum thermometers for Second Order Return. Ditto for Telegraphic Reports.
Tealby -	56·8	-0·1	+0·1	—	+0·2	+0·8	—	
York -	59·6	-0·2	-0·2	-0·2	-1·2	+0·5	—	
					-0·3	+0·4	—	
					-0·9	+0·4	—	
	54·3	-0·7	-0·6	—				

(Signed) JOHN A. CURTIS.

INSPECTION of ANEMOMETERS at SCILLY and HOLYHEAD.

SIR,

October 11th, 1894.

I BEG to submit herewith reports of my inspection last month of the anemometers at Scilly and Holyhead.

I am, &c.

(Signed) R. H. CURTIS.

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

Scilly, September 4th-7th.—The anemometer had been partially dismantled on August 18th, and the pencils sent to Mr. Munro to have silver helices substituted for the brass ones hitherto used. (Minutes, p. 84, 1893.)

I found those portions of the instrument awaiting me at Scilly, Mr. Munro having returned them just prior to my arrival.

I at once got the pencils into their places, and by the evening of the 4th had the instrument again at work, deferring the overhaul of the bearings, &c., until the 5th.

I found the anemometer in a much better condition than it was in last year, and Mr. Hicks had apparently kept the bearings properly oiled, and followed the instructions which I gave him on that occasion. A mixture of paraffin and sperm oil which I then used had kept fluid and clean, and seemed to have answered very well; but the paint used last year had not stood well, and the whole of the exterior of the instrument again required to be painted, and this I requested should be done.

I dismantled the whole of the instrument, and carefully examined every part of it. A little adjusting was required with the new pencils, and I also made a small alteration in setting up the clock, by which its going was improved. Asbestoline was used to all the bearings, and the brake box was also filled with it, all the old oil being first removed. The observer complained that it was difficult to entirely prevent the rain from reaching the recording apparatus during south-easterly gales, and I therefore tried to improve the fitting of the door, and I think successfully.

Since the inspection the instrument has gone most satisfactorily. The silver helices answer very well indeed, the traces being black and distinct and thus far without the least sign of a faint trace, although some damp weather has been experienced.

Holyhead, September 18th-22nd.—The Robinson anemometer at work here was made by Beck, and has been in use since 1869. Some of the external parts have been renewed, and they are now all in good condition, but the recording portion of the instrument, besides being less conveniently arranged than in more modern instruments, is, after its 25 years' constant work, in a less satisfactory state.

The anemometer is, however, carefully looked after by Mr. Davies, the attendant, under Mr. Cotton's direction.

I had been asked to look specially for the cause of the occasional failure of the velocity trace, and also to try and ascertain the cause of a large time-error commonly shown by the traces. The first fault I found to be due to the construction of the instrument, but I was able to show the observer how to prevent it in future; whilst the second was due to the fact that the diameter of the cylinder was too small, and it could only be got over by causing the clock to gain about 10 minutes in the 24 hours, which was therefore done.

The entire instrument was dismantled and carefully examined and cleaned, and was left in good order.

I would beg to suggest that the recording portion of the instrument, including the clock and cylinder, should be returned to Munro for renewal and repair. The arrangement for raising the pencils is a bad one, and the cause of the occasional loss of trace; the time pricker is useless, and gives much trouble in setting the sheets; one of the pencils has been locally repaired, and the spiral is not quite true, and there is a large amount of "backlash" in the gearing. The rods connecting the reducing gear with the pencils are about 11 feet long, and I think it would be an improvement to cut them, and insert a Hook's joint in the middle of each; and some of the pivot holes of the clock require to be re-bushed.

The exterior portions of the anemometer need re-painting, and the cap which fits upon the top of the lantern, and which carries the pillar, required to be caulked; Mr. Cotton promised to have both done.

Before leaving Holyhead I noticed that the vane did not appear to be pointing truly into "the eye of the wind," and I made some experiments which I repeated with Mr. Cotton to test the truth of the supposition. There appeared to be no doubt that the vane was not correct, and that with a fresh wind from E. it pointed to E.N.E.; the velocity being about 30 miles per hour.

I found, however, that the tower, and the curved top of the lantern, caused some local eddies which I was not sure I could properly guard against without a better appliance than was ready to my hand; but Mr. Cotton has promised to test the matter again more fully with such an appliance shortly, and any alteration of the pencils has been deferred until that has been done.

Bridled Anemometer.

The bridled anemometer had not been dismounted for the purpose of being cleaned for several years, and some parts of it were, therefore, as might have been expected, in a very unsatisfactory state.

The oil in the upper box, containing a set of friction balls which carried the entire weight of the cups and the shaft, had become of the consistence of glue, and consequently the balls could not revolve and were useless for the purpose they were intended to serve. Congealed oil had also to be cut off the spindle, and in addition a good deal of oil, in a very sticky condition, was on the cords which carried the weights, at the part where they wound round the pulleys.

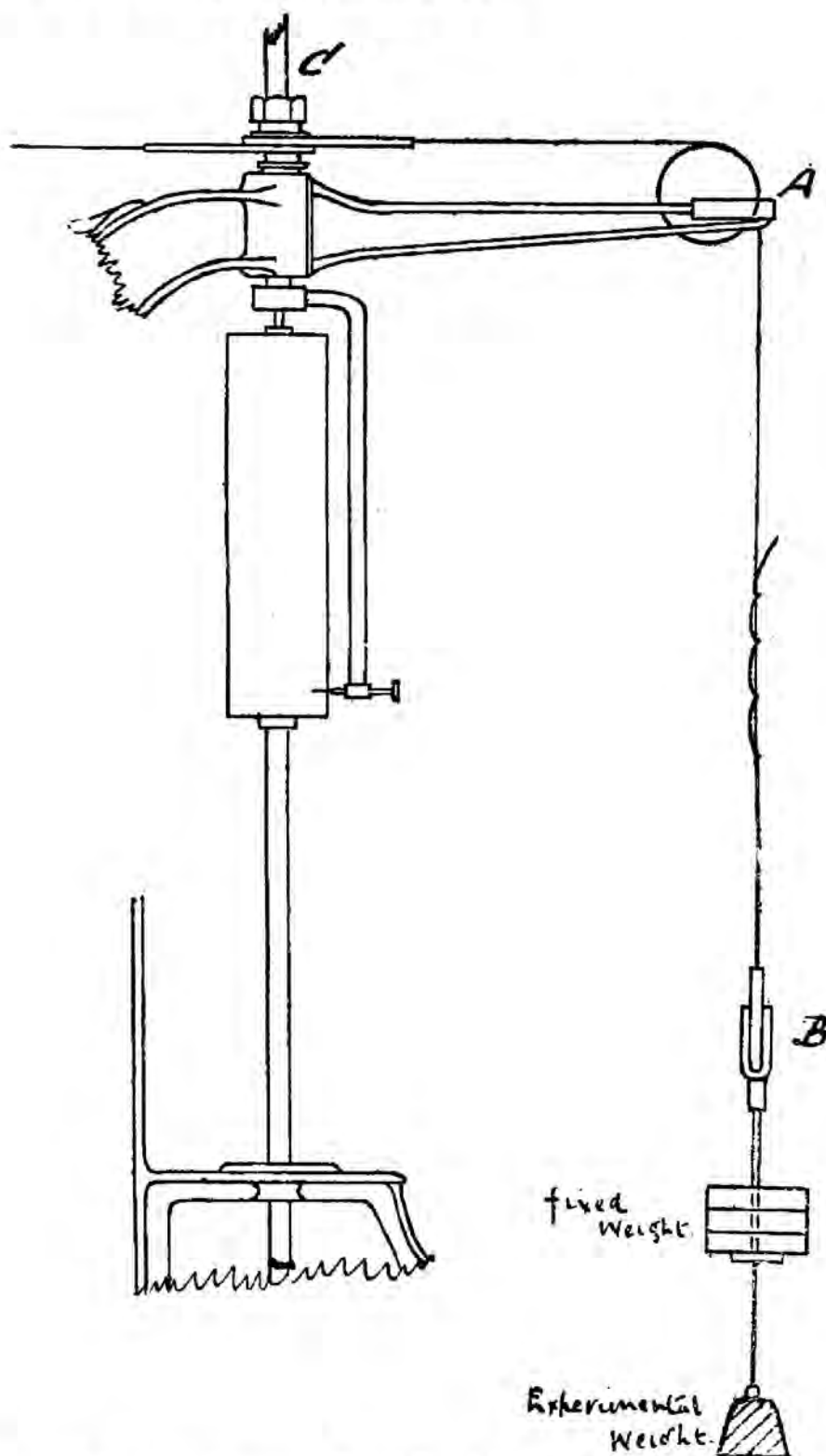
I first of all dismounted the instrument entirely, and had every part thoroughly cleaned and properly oiled. Some of the cups were badly dented, apparently by stones thrown by boys, and these I restored to their proper shape before replacing them. I found also that the friction balls in the upper bearing fitted too tightly, and by removing one ball I greatly improved the bearing.

After refitting the instrument, I proceeded to determine the true zero point of its scale. I was shown a mark upon the base of the cylinder which I was told had always been regarded as the zero, although it did not appear to me to be such a mark as an instrument maker would have put for the purpose. I think it most probable that originally a zero was omitted, and that the mark I was shown was made empirically by those who first had charge of the instrument; or it may even have been a casual mark found there and adopted as the zero. Before leaving I cut it into the metal more sharply.

The "snails" of the instrument having been designed to give a record of velocity, and not of pressure, any force applied to the spindle should move the pencil through a distance proportional to its square root.

I therefore placed upon the cylinder a sheet of paper, setting it to the mark used as zero, and then applied to the cord coming from the pulley upon the spindle (C) a series of weights, attaching them to the cord at a point about midway between the fixed pulley at the end of the arm (A) and the movable pulley (B) carrying the weights which form part of the instrument.

The method I adopted was as follows :—



The weights I used were $\frac{1}{4}$ lb., 1 lb., 4 lbs., 9 lbs., 16 lbs., and 25 lbs., which (with the exception of the $\frac{1}{4}$ lb. weight) should have given me a series of equal distances between the points at which the pencil came to rest. The experiment was made with the pulley on each side of the instrument separately. I took great care to apply the weight gradually, and to remove it in the same way ; noting the point at which the pencil came to rest when the weight was removed as well as when it was applied. The cylinder was moved, between every operation so as to secure a distinct record of each.

The true zero should be five times the mean distance between the points, below the indication made by the pencil when the 25 lb. weight was applied; and this I find places it 0.7 inch below the mark hitherto used. In other words, the velocities hitherto measured are all about four miles too low.

I found that there is a very large amount of friction to be overcome in the instrument. The $\frac{1}{4}$ lb. weight produced no effect upon the pencil at all. When the 1 lb. weight was applied, no movement took place until the instrument had been well tapped, to overcome the friction. With the 4 lb. weight the pencil stopped at a point equal to about two miles on the scale below the position it assumed after being tapped; but with the heavier weights used, tapping produced no change at all in the position of the pencil.

The point to which the pencil returned, when the weights were removed, and without tapping the instrument, was practically always the same, and was equal to the position to which a pull of a little less than 2 lbs., applied to the spindle, should have raised it.

The cord used for supporting the working weights of the instrument is, without any doubt, a principal cause of the excessive friction. It is too thick for the pulley (a grooved one) upon which it is wound, and I could distinctly feel the "bite" of the double cord upon itself as the weights were removed. The effect was no doubt increased also by the fact that the cord was wet with oil. As I have already stated, I found the portion of the cord around and near the pulley covered with *sticky* oil, and although I removed this, and had it well washed with paraffin, it of course remained quite wet.

To remove this source of error, I beg to propose that a *wire* cord be substituted for the one now in use. I have obtained and tried two or three samples of wire cord, and have found one which possesses quite enough flexibility, with plenty of strength, for the purpose, and as it is of only about one-half the diameter of the present cord, there would be ample room for it on the pulleys. In addition to this, it could be kept clean from oil, which is always liable to find its way down the spindle from the bearings above.

I re-weighed and plainly marked all the weights used for loading the instrument; as also the movable pulleys, which form part of the load.

I found that the load hitherto used, and which amounted on both pulleys to 16 lbs. 14 ozs., was not distributed on both sides as equally as was desirable; and I therefore readjusted the weights so that the pull on each pulley should be practically the same. To do this, I was obliged to increase the total load to 18 lbs. 5 ozs., which will necessitate making another scale for future anemograms; this, however, can be readily done.

I also instructed the observer, in the case of exceptionally heavy gales, to increase the gross load to 25 lbs. 8 ozs., in order to prevent the spindle from making a complete revolution, which would render the record useless. The extra load will not be used for moderate gales, and is to be removed as soon as the weather moderates.

With regard to the time scale, I found that the reason why the hydraulic arrangement for lowering the cylinder could not be got to act less quickly (it now takes 20 minutes to run down) is because of leakage past the piston. This could be got over by re-packing; or it should be a very inexpensive matter to obtain from the clock a more open scale than that now in use, by adding another wheel and pinion to the present spindles, to lower the cylinder in six hours.

I took with me an arrangement to fix to the arm of the instrument, to enable a pen to be used for the trace instead of a pencil. I found that the wire arm for carrying the pen had been made so long that it vibrated too much, when moved by the wind, to allow of a steady trace being obtained. I had not time to alter it myself, but I explained what was required, and Mr. Cotton undertook to see the alteration made, when I think it will act satisfactorily.

(Signed) R. H. CURTIS.

REPORTS of INSPECTION of the OBSERVATORIES and
ANEMOGRAPH STATIONS.

Kew Observatory, Richmond, Surrey,

October 16th, 1894.

DEAR MR. SCOTT,

I BEG to forward you the reports by Mr. Constable and myself on the observatories and anemometer stations we have inspected, with list of expenses, &c.

I am, &c.

(Signed) CHARLES CHREE.

Aberdeen Observatory, visited August 14th and 15th.—The anemometer has been recently painted. It was dismounted, cleaned, and freshly lubricated. The sheet showing results of orientation is attached. The barograph and thermograph clocks were oiled; they appeared clean and were working satisfactorily. The surface of the mercury in the standard barometer is a little dirty, but Mr. Boswell does not find this interfere with his readings. The thermograph screen has been protected with wire netting, according to recent instructions from the Meteorological Office. By comparison with my Kew standard in water at 60°, the following corrections were found for the thermometers:—

				Correction.
Dry standard, 597	-	-	-	-0·1
Wet „ 395	-	-	-	-0·7
Maximum, 1002	-	-	-	+0·1
Minimum, 5056	-	-	-	+0·3

The tube from the funnel to the receiver of the Beckley rain-gauge was in a somewhat patched condition; it was, however, intended, I was told, to fit a new tube shortly. Otherwise the instrument appeared in a satisfactory condition.

Glasgow Observatory, visited August 16th.—The anemometer was shifted in spring on to an iron framework, a little to the east of the dome, the cups being now some 3½ feet higher above the ground than previously. The instrument had been thoroughly seen to before its re-erection, and, as the lubricant appeared in good condition, I judged it unnecessary to dismount it. The sheet with the results of the orientation is attached. Advantage was taken of the presence in the observatory of an experienced clockmaker to have the anemograph, barograph, and thermograph clocks all thoroughly cleaned. A comparison with my Kew standard in water at 56½° gave the following corrections to the thermometers:—

				Correction.
Dry standard, 708	-	-	-	0·0
Wet „ 711	-	-	-	+0·1
Maximum, 45904	-	-	-	+0·1
Minimum, 63942	-	-	-	+0·1

The Beckley rain-gauge appeared in good order. The assistant, however, pointed out that discharge occurred when by the trace considerably less than 0·2 inch rain had fallen. This appeared due to the pencil pressing too heavily on the paper, as on reducing the pressure fair results were obtained.

Kew Observatory.—All the self-recording instruments have been cleaned and attended to as usual.

(Signed) CHARLES CHREE.

Alnwick Castle, visited July 30th and August 1st.—The anemometer is kept well oiled, and an examination of the bevelled wheels and bearings of the shafting showed that their lubrication was properly attended to.

I found that a blade of one of the direction fans was broken off at the collar. This quite destroyed the balance of the fan and made the action very sluggish.

It had been proposed to have it removed from the spindle and sent to the maker to be put in proper order, and advantage was taken of my visit to dismount it for this purpose. The exposure of the instrument is very good, except from the N.E., where the wall at that angle of the tower rises above the other portions, and in high winds from that quarter must cause strong eddies and sudden oscillations in the direction.

Verification of the orientation is difficult owing to the very large amount of shafting employed, but I returned again on August 1st and further improved the general working of the instrument, and the orientation is now fairly good.

The advantage of having the exact times of changing entered on the sheets was pointed out, and it was readily agreed that these entries should be made on future curves.

North Shields, visited July 31st.—All exterior parts of the instrument which can be readily reached are kept carefully oiled, but owing to its position surmounting chimneys on the lighthouse it soon becomes covered with soot, &c., and I took the opportunity of obtaining regular assistance here, to entirely dismount and thoroughly overhaul every part, both exterior and interior.

The orientation was checked and found good, and the check marks will be found on the anemograph curve for July 31st–August 1st, which was sent to the Meteorological Office next day.

Captain Harrison was instructed to check the orientation regularly, and to duly forward the oriented sheets.

Yarmouth, visited August 3rd.—The anemometer appears to be systematically lubricated and attended to, and was in good order. All necessary cleaning, &c., was done, the orientation was found to be satisfactory and the check lines will be found on the anemograph curve for August 3rd–4th.

This sheet also shows three curves of complete revolutions of the velocity spiral, made after taking down the recording part, and improving the irregular marking which often occurs here.

Considerable time was given to this, and the action is now much better, but I am afraid there will always be a tendency to a recurrence of this uneven marking of the velocity trace. I drew attention to the absence of “pricker” marks, but to make these distinct with the present

pricker is difficult, as it is an old type made of soft steel, and the long arm bends over if much pressure is used, but I made it as firm as possible, and improved the point.

Falmouth, visited August 8th-10th.—The barograph and thermograph were in good order, but the clock escapements of both instruments required cleaning and fresh oiling, which was done, and all lenses carefully wiped.

The dials of both of these clocks have been re-plated since my last inspection, and are very much improved.

The "air-hole" of barograph was found quite clear.

Anemograph.—All exterior parts are kept well lubricated where possible, but I found the oil in the container in which the direction rollers work was rather thick and dirty. The whole was removed, rollers, &c., washed in paraffin, and the container filled up with new asbestos lubricant.

All other parts were thoroughly overhauled, and clock, &c., cleaned.

The orientation was checked and found good.

The Beckley rain-gauge was also dismantled and cleaned.

The tops of some of the wooden stakes securing the check rain-gauge were found to have perished, these were replaced, and gauge carefully levelled.

The scale-values at present in use are—

Dry-bulb, upper zero	-	82°·5	Lower zero	-	16°·5
Wet "	"	81°·0	" "	"	18°·0
and the values engraved on the ivory scales are—					
Barograph 1 inch	-	-	-	=	1·525 inches.
Thermograph, dry-bulb 10°	-	-	-	=	0·734 "
" wet "	-	-	-	-	No value given.

The thermometers were compared with my Kew standard at 62°, and the following corrections determined:—

Dry bulb, 383	-	-	-	-	=	-0°·55
Wet " 383	-	-	-	-	=	-0°·30
Maximum, M.O. 104	-	-	-	-	=	-0°·40
Minimum, M.O. 308	-	-	-	-	=	0°·00

Radcliffe Observatory, Oxford, visited August 30th.—I examined the various self-recording meteorological instruments and clocks, and found everything in first-class order. The working of the exterior portions of the anemograph was also examined and proved very satisfactory.

The following corrections to the thermometers in use were determined by comparison with my standard at 60° F.:—

Thermograph, wet-bulb standard, 575	-	-	=	-0°·15
" dry " 576	-	-	=	-0°·10
Wet-bulb thermometer, B.T. 1709	-	-	=	-0°·20
Dry " " 1710	-	-	=	-0°·20
Maximum " M.O. 356	-	-	=	-0°·30
Minimum " " 363	-	-	=	+0°·10
Grass minimum " 70852	-	-	=	0°·00

(Signed) E. G. CONSTABLE.

Kew Observatory,
October 27th, 1894.

DEAR SIR,

I HAVE the honour to submit herewith my report to the Meteorological Council regarding their self-recording instruments at the observatories and anemograph stations inspected on the days named.

Stonyhurst, September 18th-19th.—Since the last inspection (September 25th-26th, 1823) the anemometer at this observatory has been refitted with new recording apparatus. My attention, however, was called by the Reverend W. Sidgreaves to the direction trace, which was not altogether satisfactory, being at times very faint. I accordingly dismounted the pencil, and found that the spindle upon which it turned was gritty and the oil rather thick; this was cleaned, and afterwards the action of the pencil was much improved.

The external parts of the instrument were examined and found to be well lubricated, and in every way satisfactory.

The orientation was duly examined.

Both the barograph and thermograph clocks were taken to pieces and cleaned, and new cords attached to the weights.

The clock dials having become tarnished through age, it was difficult to distinguish either the figures or graduations, and in consequence the observer experienced considerable difficulty in correctly setting the hand to time. Advantage was taken of the instruments being dismounted to remove the dials and send them to Mr. Munro for re-silvering.

Wire netting has been fitted to the thermograph screen in accordance with the instructions issued by the Council.

The rain-gauge was dismounted, and the new *Stonyhurst* lifter (which had recently been supplied by the Meteorological Office) fitted and adjusted to the instrument, the clock was also cleaned and a new line attached to the weight.

The various thermometers were compared with the Kew standard No. 682 and found to have the following corrections at 55° Fahr. :—

Dry-bulb standard, No. 619	-	-	0.0
Wet „ „ No. 382	-	-	-0.3
Maximum, 1525	-	-	0.0
Minimum, B.T., 501	-	-	+0.3

I also tested the maximum and minimum thermometers on the Glaisher stand and found the corrections to be—

Maximum, 7310	-	-	-0.5
Minimum, 48587	-	-	-0.1

Fleetwood, September 20th-21st.—Here the anemometer was working well, and on dismounting the external parts the oil was found in a satisfactory state; all parts of the instrument were cleaned, and the bearings replenished with fresh asbestos lubricant.

On examining the direction fans, two of the blades were discovered to be loose, but these I had re-soldered before leaving. The cup arms and stays did not show any signs of wear.

The clock was taken to pieces and cleaned, and the direction pencil also carefully examined and adjusted in order to remedy, if possible, the failure of the pencil in marking continuously. Some difficulty was experienced by the observer in clamping the cylinder, which would account for the differences shown between the curves and the times

noted of starting the instrument. I had an extra washer fitted to the clamp, so that the cylinder does not now slip, and at the same time a new pin was fitted to the driving wheel on the clock spindle.

On the 25th of March last, a flagstaff about 95 feet in height, was erected by the Town Commissioners on the "Mount," some 30 feet to the E.N.E. of the anemograph, but as the halliards are at least 25 feet above the cups, I do not think that the results will be materially affected when the wind is blowing from that direction.

The orientation was duly examined and found correct, and Mr. Gaulter was asked to forward from time to time an "Orientation" paper to the Meteorological Office.

Fort William, September 24th-25th.—All the instruments at this observatory were in good order.

The barograph and thermograph clocks were cleaned, as well as the lenses and condensers, and new lines fitted to the weights. Some little difficulty was experienced in adjusting the thermograph light stop, but by adding an additional weight to the lever, its action was much improved, and it has since worked satisfactorily.

The rain-gauge was examined, but as it had only quite recently been put together by Mr. Omond the clock did not require cleaning.

In order to slightly extend the range of the float, a little mercury was added to the cistern, and the pencil readjusted.

Squeezes of both the self-recording and check rain-gauge funnels were taken, and are sent herewith.

The following were found to be the corrections at 55° Fahr. to the various thermometers in use:—

Dry-bulb standard, 671	-	-	0.0
Wet „ „ 672	-	-	-0.2
Maximum, 1092	-	-	+0.1
Minimum, 1322	-	-	+0.8
Barograph thermometer, K.O., 6-90	-	-	-2.1
Attached thermometer (to the standard barometer), No. 72222	-	-	-0.2

As the minimum thermometer read suspiciously low it was taken off the scale, and the chamber warmed by means of a lamp. It was then placed in a vertical position for some two hours, when the following correction was determined:—

Minimum, No. 1322	-	-	+0.4
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Deerness, Orkney, September 28th-29th.—The anemograph here was found to be maintained in excellent order, the bearings of all parts being well oiled and in good condition.

Mr. Spence reported that the external parts of the anemograph as well as the hut had been recently painted.

I had the instrument dismounted and carefully examined the cup, arms, and fans, but these did not show any marked signs of wear. Two oil screws, however, are missing.

After cleaning and replenishing the bearings with fresh asbestos lubricant the orientation was examined, and the observer was instructed to orientate the instrument once a month and forward the results to the Meteorological Office.

The clock was also cleaned and the whole of the recording apparatus dismantled and attended to.

Armagh, October 5th-6th.—At this observatory the anemograph was much in need of cleaning, as it had not been dismantled since the spring of 1892.

All the external portions of the instrument were taken to pieces and the thick oil removed, after which asbestos lubricant was supplied to all the bearings. The recording pencils were also examined and cleaned, and endeavours were made to improve the action of the velocity pencil, which does not mark satisfactorily in light winds, but I fear the defect is inherent in the instrument. The clock having comparatively recently been cleaned it only required oiling, but Dr. Dreyer stated that it occasionally stopped. On examination, I found that it had been geared up too tightly to the recording cylinder, this was put right.

The orientation was tested and found correct, and the sheet is sent with this report.

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

Mountjoy Barracks, Dublin, October 8th-9th.—The lubrication of the external parts of the anemograph was not satisfactory, the instrument not having been dismantled since March 1892, the oil had become viscous and the friction balls much impeded, so that all parts had to be taken to pieces and well cleaned with paraffin.

The box containing the oil dampers, to which the direction shaft is geared, was also taken to pieces and the reservoir filled with asbestos lubricant, afterwards the apertures at the ends of the brass cylinders through which the oil passes were carefully adjusted, so as to keep the vane steady to the wind's direction.

The clock was cleaned and the orientation tested, and the observer was instructed to perform the operation monthly and send the result to the Meteorological Office.

The time of starting and stopping the instrument noted on the sheets is *local* and not G.M.T.

Valencia, October 11th-13th.—As in the case of Armagh and Mountjoy, the instruments here greatly needed cleaning, not having been dismantled since their erection in March 1892, at the new observatory.

The clocks of both barograph and thermograph were overhauled and cleaned, and new lines attached to the weights, also the lenses, condensers, &c. received the usual attention, and the position of the zero dots was changed to the winter values.

Mr. Cullum drew my attention to some stray light which fell upon the thermograph cylinder. On examination I found that it came through a certain part of the wet-bulb tube, the black of which had flaked off. This part was re-blackened and some cardboard shields fitted to both lenses as a further protection to keep out reflected light. Subsequent photographic sheets showed that the stray light had been effectually blocked out.

In both instruments special attention was given to the light shutters, which had not been working well. These were cleaned and the lever weights carefully adjusted, after which their action was greatly improved, and it is hoped that they will now work satisfactorily.

The thermometers were compared and found to require the following corrections at 55° Faht. :—

Dry-bulb standard, 399	-	-	-	-	-	-0.7
Wet „ „ 473	-	-	-	-	-	-0.3
Maximum, M.O., 1003	-	-	-	-	-	0.0
Minimum „ 2497	-	-	-	-	-	+0.4*
Standard barometer, attached thermometer, 71062	-	-	-	-	-	-0.1
Barograph thermometer (no number)	-	-	-	-	-	-2.0

*As the correction to the minimum thermometer was rather large the tube was dismantled and the chamber end warmed over a lamp. It was then placed in a vertical position for some time, when the following correction was obtained :—

Minimum, 2497	-	-	-	-	-	0.0
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Wire netting has been fitted to the thermograph screen in accordance with the instructions issued by the Meteorological Council.

The rain-gauge was examined and a slight adjustment made in the fall of the float.

On dismantling the anemograph, I found that the oil in the direction bearing had become very viscous, this was removed and fresh asbestos lubricant added. The other parts of the instrument were also cleaned, but we were unable to disconnect the cups from the velocity spindle, as the collar through which the spindle passes had become so incrustated with rust, &c. After repeated efforts, the cups and spindle were taken to the local blacksmith, who succeeded, after making the collar and shaft red hot, in removing the cups.

The instrument was put together and re-started between 7 and 8 p.m., but the orientation was not examined till the next morning (October 13). when it was found correct.

The recording parts were generally examined, and the pencil bearings oiled.

The direction fans are a good deal corroded and new ones will be required before long. I would respectfully suggest that, perhaps, copper fans would be an improvement, as sheet iron so rapidly corrodes.

(Signed) T. W. BAKER.

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

APPENDIX VI.

METHOD OF DEALING WITH TELEGRAPHIC WEATHER
INTELLIGENCE.

THE operations connected with the preparation and issue of the Forecasts and Storm Warnings have not undergone any material change. Full details will be found in Appendix X. to the Report for 1891.

DAILY WEATHER REPORT.

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

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

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

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

The subscription for the Report is—

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

An early issue of 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 8*h.* a.m. or 6*h.* p.m. observations, such as appear in the "Times."

WEEKLY WEATHER REPORT.

The Weekly Weather Report, which has appeared since February 1878, and was re-arranged at the commencement of 1890, is prepared for the calendar week, Sunday to Saturday. It is published regularly on Thursdays and is illustrated by three maps for each day. These, like the Daily Reports, show the outline of the land and sea in blue, but the information in black. The 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 consists of observations of Temperature and Rainfall made at 77 stations, the individual values for which are given on the second page of the Report, and of Sunshine records taken at 49 stations.

Tables of *Accumulated Temperature*, 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, are still published on the first and second pages, and show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively, of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard, or *base temperature*. The base value adopted is 42° Fahr.

Accumulated Temperature is expressed in *Day-degrees*; a Day-degree signifying 1° F. of excess or defect of temperature above or

below the base (42° F.) continued for 24 hours, or any other number of degrees for an inversely proportional number of hours. An explanation of the rules by which it is obtained will be found in the Annual Report for 1889, while full details as to the facts on which the rules are founded are published in Appendix II. to the Quarterly Weather Report for 1878.

In addition to the reports from the Telegraphic Reporting Stations, and the returns from certain self-recording Observatories, weekly schedules from 56 volunteer observers are used, the names of the stations and observers being given in Appendix XI., p. 84.

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

Appendices, &c. to the Weekly Weather Reports.

Two Appendices, I. and II., have appeared, similar to those for recent years. The Monthly Summary Supplement gives the average values for Pressure, Temperature, Rainfall, and Bright Sunshine of the current month, and the difference between these values and the means for the corresponding months in a long series of years, together with the number of days on which rain, snow, hail, thunder &c., &c. occurred, and the number of days on which the wind blew from the eight principal points of the compass.

ISSUE OF FORECASTS.

There was an important development in this work in 1894, the Board of Agriculture having forwarded the 3.30 p.m. daily forecasts to the rural parts of six counties as explained at p. 12.

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

*On Week Days.**

- (1.) At 11 a.m. (from the morning reports), for the 24 hours ending at Noon on the day following the date of issue. These are intended especially for the early editions of the evening papers, for the clubs, and for exhibition at certain selected stations. See page 9.
- (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, and during the Hay Harvest they were telegraphed to about 28 well-known agriculturists, to be made known in their neighbourhoods (see p. 10), and to the Board of Agriculture for transmission to certain counties in England (see p. 12).
- (3.) At 8.30 p.m. (from the 8 a.m., 2 p.m., and 6 p.m. reports), for the civil day following that of issue. These are supplied gratis to any newspaper or news agency which may apply for them, and send for them regularly. A very large number of the more important papers and news agencies avail themselves of this advantage.

* Good Friday and Christmas Day are reckoned as Sundays.

The forecasts are made for the following districts :—



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

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

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

FORECASTS FOR SUBSCRIBERS.—Any person can be supplied with a copy of the 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 one of the districts and for any of the hours mentioned above 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 by hand to Clubs situated in or near Pall Mall. Special arrangements can be made for delivery at a greater distance by hand or by post.

FORECASTS FOR HAY AND CORN HARVESTS, OR FOR PUBLIC USE.—Special facilities are offered for the transmission of Forecasts for these purposes, a nominal fee of 2s. 6d. being charged for an official quarter or any part thereof, in addition to the cost of the telegrams.

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

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

* Good Friday and Christmas Day are reckoned as Sundays.

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 one shilling in addition to the cost of a telegram and reply to any post office. The telegram containing the inquiry must be addressed as follows :

To

WEATHER,

LONDON.

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

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

CHECKING of FORECASTS and STORM WARNINGS.

The forecasts and storm warnings issued by the Office are carefully checked by being compared with the conditions actually experienced during the time to which they refer. The method adopted was fully explained in the Annual Report for 1891, and the results for 1894 will be found on pp. 10 and 14.

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

* Good Friday and Christmas Day are reckoned as Sundays.

		Per-centages.			
		Wind.	Weather.	Average.	a + b.
The entire year	a	52	60	56	83
	b	28	26	27	
	c	14	9	12	
	d	6	5	5	

APPENDIX VIII.

TELEGRAPHIC WEATHER INTELLIGENCE.

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

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

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

The Meteorological Office supplies the canvas cone, but does not undertake to supply the lanterns. In all cases the local authorities must undertake the charges incidental to the hoisting of the signal, such as flagstaff and gear, oil, &c., and also as to the keeping of the apparatus in repair, painting, &c.

The following is a list of the stations at which the signals are hoisted :—

[Continued.]

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

[Continued.]

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

APPENDIX IX.

FISHERY BAROMETERS.

LIST OF PLACES supplied with FISHERY BAROMETERS.

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

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

Scotland, east coast.—Duncansbay, Freswick, Auchengill, Keiss, Ackergill, Staxigoe, Wick, 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, Burnt-island, Newhaven.

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

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

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

Wales.—Briton Ferry, Swansea, Angle, Milford, Aberystwyth, Nevin, Carnarvon.

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

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

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

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

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

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

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

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

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

APPENDIX X.

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

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

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.

Results of examination and report to Council.

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.

General supervision of observatory work.

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.

Interpolations.

The records having been made as complete as possible, are then used for the calculation of daily and hourly mean values, for periods of five days, calendar months, and for the year; which, together with other data obtained from the same source, are published under the title of "Hourly Means of the Readings obtained from the Self-recording Instruments at the Five Observatories under the Meteorological Council." The volume for 1891 is almost ready for issue, and that for the year 1892 is also in the press. See p. 19.

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

The anemograms received from Alnwick Castle, Deerness, Dublin, Fleetwood, Holyhead, North Shields, Scilly, and Yarmouth 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 various Reports issued by the Office. They are also regularly used in the checking of the Storm Warnings.

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

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

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

Sunshine records.

The daily records of sunshine which are now received from 48 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.

Weekly totals.

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

V.—*Telegraphic Reporting Stations.*

These are 30 in number, and the particulars as to the observations taken at them, and the methods adopted in dealing with them, will be found fully detailed in Appendix VII. to the Report for 1888-89.

VI.—*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 March 1895 the total number of stations was 74, including 15 belonging to the Royal Meteorological Society and 19 belonging to the Scottish Meteorological Society.

The stations are distributed as follows: 36 in England, 3 in Wales, 23 in Scotland, and 12 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 those for later years. These refer to the barometer readings, which are now given at station-level instead of being reduced to the mean sea-level; and to the humidity, where the depression of wet-bulb is shown, the international forms A and B being modified accordingly.

The volume for 1891 contains returns from 70 stations.

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

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

When an application for the adoption of a new station is received, a *New stations.* 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.

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

These are 53 in number. The information supplied from them is, in some cases, similar to that supplied by a station of the second order, but taken only once daily, or at irregular hours, or perhaps less complete. At other stations less detail is given; for instance, 25 stations furnish only the daily rainfall. All the information thus afforded is utilised in some way or other, though it is not all included in the Office publications. The rainfall values are copied and supplied to Mr. Symons, F.R.S., for publication in "British Rainfall."

INSPECTION.

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

LIST OF STATIONS.

In Appendix XI., page 84, is given a complete list of the stations supplying information to the Office.

APPENDIX XI.

LIST of STATIONS in the BRITISH ISLANDS from which INFORMATION has been received at the METEOROLOGICAL OFFICE during the year ending March 31st 1895.

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

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

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

A. *Observatories*.—Continuous record of pressure, temperature, wind, sunshine and rain, with eye observations of the amount, form, and motion of the clouds, and notes on the weather.

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

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

D. *Second Order Stations*.—Regular observations at 9 a.m. and 9 p.m. each day, local time, of pressure, temperature (dry-bulb and wet-bulb), wind, cloud, and weather, with the daily maxima and minima of temperature, the daily rainfall, and general remarks on the weather.

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

F. *Climatological Stations*.—The maximum and minimum temperature and the rainfall for each day, with remarks on the weather. This information is sent to the Meteorological Office each week for use in the “Weekly Weather Report.”

G. *Third Order Stations*.—Observations of the same kind as at Second Order Stations, but either :—

- (a) less full.
- (b) taken only once daily.
- (c) taken at irregular hours.

R. *Rainfall Stations*.—Daily observations of the amount of rainfall, with remarks on the weather.

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

T. *Telegraphic Stations*.—Regular observations at 8 a.m. and 6 p.m. G.M.T. (and from some stations at 2 p.m. in addition), of pressure, temperature, wind and weather, with the daily maxima and minima of temperature, the daily rainfall, and, where possible, the sea-disturbance at 8 a.m. each day and the daily amount of bright sunshine. This information is sent to the Meteorological Office each day by telegraph, for use in the “Daily Weather Report” and, as required, for use in the “Weekly Weather Report.”

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

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.
Aberdeen (Observatory) -	57° 10' N.	2° 6' W.	46	Prof. C. Niven	A. T. O.
" (Cove Bay) -	57° 9' "	2° 5' "	—	Coastguard -	W.
Alnwick Castle -	55° 25' "	1° 43' "	210	Humphry Wiliams, for the Duke of Northumberland.	B. F.
Ardrossan, Ayrshire -	55° 38' "	4° 50' "	15	J. W. Mayes	T.
Arlington Court, Barn- stable.	51° 8' "	3° 58' "	613	W. Stewart, for Lady Chichester.	F.
Armagh Observatory -	54° 21' "	6° 39' "	196	J. L. E. Dreyer	B. D. F. S.
Arran, North, Galway -	53° 6' "	9° 40' "	—	Coastguard -	G. W.
Aysgarth Vicarage, Yorks -	54° 18' "	1° 58' "	646	Rev. F. W. Stow	D.
Bahama Bank Lightship	54° 20' "	4° 13' "	—	Light-keepers	W.
Ballantrae, Ayrshire -	55° 6' "	5° 0' "	—	Coastguard -	W.
Ballydonegan, Co. Cork -	51° 38' "	10° 3' "	—	" -	W.
Ballyglass, Co. Mayo -	54° 17' "	9° 52' "	—	" -	W.
Baltimore, Co. Cork -	51° 28' "	9° 22' "	—	" -	G.
Bantry -	51° 41' "	9° 27' "	—	R. Brennan -	R.
Bawtry (Hesley Hall), Notts.	53° 26' "	1° 2' "	65	B. I. Whitaker	F.
Belmullet, Co. Mayo -	54° 13' "	9° 59' "	40	Miss M. J. Tolan	T.
Belvoir Castle, Grantham -	52° 54' "	0° 47' "	269	W. H. Divers	D.
Ben Nevis -	56° 48' "	5° 0' "	4,406	R. T. Omond, for Directors Ben Ne- vis Observatory.	A.
Bennington, Herts. -	51° 54' "	0° 5' "	407	Rev. J. D. Parker	E.
Berkhamstead -	51° 46' "	0° 34' "	400	E. Mawley	E.
Bidston Observatory, Liver- pool.	53° 24' "	3° 4' "	158	W. E. Plummer	D. T.
Blackpool -	53° 48' "	3° 3' "	31	A. J. Anderson	F. S.
Blacksod Point, Co. Mayo -	54° 6' "	10° 4' "	—	Coastguard -	W.
Bolton (Chadwick Museum)	53° 35' "	2° 27' "	389	W. W. Midgley	G.
Bournemouth -	50° 43' "	1° 53' "	—	Messrs. Primavesi for Town Council.	S.
Braemar -	57° 0' "	3° 24' "	1,111	J. Aitken	D. F. S.
Bramley, Surrey -	51° 11' "	0° 33' "	148	J. Bartlett	D.
Bray, Co. Wicklow -	53° 12' "	6° 6' "	—	Coastguard -	G.
Brighton -	50° 49' "	0° 8' "	—	A. Newsholme	S.
Bristol -	51° 28' "	2° 35' "	92	J. Harvey Jones	F.
Broadford (Hurdlestown), Co. Clare.	52° 48' "	8° 38' "	157	Maj. W. O. Bentley, R.A.	R.
Brookeborough (Colebrooke Park), Co. Fermanagh.	54° 21' "	7° 22' "	271	M. Ferguson, for Sir A. D. Brooke, Bt.	D. F.
Burnmouth, Ayton, Berwick	55° 51' "	2° 4' "	—	Coastguard -	W.
Burntisland -	56° 4' "	3° 14' "	—	" -	W.
Buxton -	53° 14' "	1° 54' "	987	E. J. Sykes	E.
Caernarvon Bay Lightship	53° 6' "	4° 45' "	—	Light-keepers	W.
Cambridge -	52° 13' "	0° 6' E.	88	Miss A. Walker	T. S.
Cardigan Bay Lightship -	52° 25' "	5° 1' W.	—	Light-keepers	W.
Cargen -	55° 2' "	3° 37' "	72	P. Dudgeon (the late) and A. Peacock.	E.
Cardmarthen -	51° 52' "	4° 18' "	188	G. J. Hearder	D.
Carrigallen, Co. Leitrim -	53° 58' "	7° 38' "	2350	Mrs. J. Godley	R.
Castletownshend, Co. Cork	51° 32' "	9° 11' "	—	Coastguard -	G.
Chatham -	51° 23' "	0° 32' E.	136	The Instructor in Surveying.	G.
Cheadle -	52° 58' "	1° 57' W.	646	J. C. Phillips	E. F.
Cheltenham -	51° 54' "	2° 3' "	184	R. Tyrer	E.
Chester -	53° 12' "	2° 54' "	59	Rev. J. Cairns Mitchell.	D.
Churchstoke -	52° 31' "	3° 5' "	538	P. Wright	D. F. S.
Cirencester -	51° 43' "	1° 57' "	446	Prof. Ohm	F. S.
Cleggan, Co. Galway -	53° 33' "	10° 8' "	—	Coastguard -	W.
Coningbeg Lightship -	52° 2' "	6° 40' "	—	Light-keepers	W.
Cooper's Hill, Egham -	51° 26' "	0° 34' "	279	Prof. H. McLeod	G.
Cromarty -	57° 41' "	4° 0' "	—	Coastguard -	W.
Crookhaven -	51° 28' "	9° 43' "	—	" -	G.
Crosshaven -	51° 48' "	8° 18' "	—	" -	G.
Cuckfield, Sussex -	51° 1' "	0° 9' "	389	John Howe	R.
Cullompton -	50° 51' "	3° 23' "	202	T. Turner	F. S.
Daunt's Rock Lightship -	51° 43' "	8° 16' "	—	Light-keepers	W.
Deerness, Orkney Islands -	58° 56' "	2° 45' "	169	M. Spence	B. D. S.
Donaghadee -	54° 38' "	5° 32' "	26	T. MacGowan	T.
Doneraile, Co. Cork -	52° 13' "	8° 34' "	—	Captain Evans	R.
Douglas (Cronkbourne) Isle of Man.	54° 10' "	4° 29' "	137	A. W. Moore	D. F. S.
Dublin (Botanic Gardens, Glasnevin).	53° 23' "	6° 16' "	67	F. W. Moore	D.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.
Dublin (City) - - -	53° 20' N.	6° 15' W.	47	J. W. Moore -	D. F.
Dublin (Mountjoy Obser- vatory, Phoenix Park). -	53° 22' "	6° 21' "	155	Lt. Col. Kirkwood, R.E. -	B. D. S.
§ Dundee - - -	56° 28' "	2° 56' "	160	J. Carnochan -	D.
Dunfanaghy (Sheephaven) -	55° 11' "	7° 58' "	—	Coastguard -	W.
Dungeness - - -	50° 55' "	0° 59' E.	26	W. Batton -	T.
§ Dunrobin Castle - - -	57° 59' "	3° 56' W.	12	D. Melville, for the Duke of Sutherland.	D.
Durham - - -	54° 46' "	1° 35' "	336	H. J. Carpenter -	D. F. S.
Dursley (Farnley), Glos. -	51° 41' "	2° 21' "	—	R. W. Pinney -	R.
Eastbourne - - -	50° 46' "	0° 17' E.	38	R. Sheward -	D. S.
East Goodwin Lightship -	51° 13' "	1° 36' "	—	Light keepers -	W.
Edgeworthstown (Curry- grane). - - -	53° 45' "	7° 39' W.	267	J. M. Wilson -	D. F.
Edinburgh - - -	55° 57' "	3° 12' "	253	R. C. Mossman -	D. S.
English and Welsh Grounds Lightship. - - -	51° 27' "	3° 0' "	—	Light-keepers -	W.
Ennis, Co. Clare - - -	52° 51' "	8° 59' "	18	P. L. K. Dobbin -	R.
" (Roslevan) - - -	52° 51' "	8° 59' "	40	Mrs. J. W. Scott -	R.
Epsom (Royal Medical College). - - -	51° 20' "	0° 14' "	294	C. I. Gardiner -	D.
Falmouth - - -	50° 9' "	5° 4' "	167	E. Kitto -	A. F.
Fleetwood - - -	53° 56' "	3° 1' "	—	M. S. Gaultier -	B.
Forquardenny, Perth - -	56° 21' "	3° 29' "	175	C. L. Wood -	C.
§ Fort Augustus - - -	57° 8' "	4° 40' "	68	Rev. M. Wall -	E. F. S.
Fort William - - -	56° 48' "	5° 6' "	32	R. T. Omond, for Directors, Ben Nevis Observatory.	A. F.
Foynes, Co. Limerick - -	52° 37' "	9° 7' "	108	Lord Monteaigle -	F.
Fulbeck, Lincolnshire -	53° 3' "	0° 37' "	180 ?	Rev. Vere F. Willson -	R.
Geldeston, Beccles - - -	52° 28' "	1° 31' E.	37	E. T. Dowson -	D. F. S.
Gilecrux, Maryport - - -	54° 44' "	3° 23' W.	261	J. Monkhouse -	D.
Glasgow - - -	55° 53' "	4° 18' "	180	Prof. L. Becker -	A. D. F.
§ Glencarron - - -	57° 30' "	5° 14' "	489	D. D. Munro -	E. F.
§ Glendee - - -	55° 5' "	4° 12' "	203	W. Melville -	E. F.
§ Gordon Castle - - -	57° 37' "	3° 5' "	101	J. Webster (for the Duke of Richmond and Gordon, K.G.).	E.
Gorleston, Suffolk - - -	52° 35' "	1° 43' E.	—	R. J. C. Day -	G.
Guernsey (St. Peter's) -	49° 32' "	2° 32' W.	—	F. E. Carey -	S.
Harpندن, Herts. - - -	51° 49' "	0° 20' "	419	T. Wilson -	G.
Haslar Hospital, Hants -	50° 47' "	1° 7' "	—	T. Rogers -	G.
Hawes Junction - - -	54° 19' "	2° 18' "	1135	W. H. Bunce -	G.
§ Hereford - - -	52° 5' "	2° 45' "	274	T. A. Chapman -	F.
Heysham Hall, Lancashire	54° 3' "	2° 54' "	95	S. Lomas, for Miss L. Grafton.	D.
§ Hullington - - -	52° 48' "	0° 33' E.	88	Rev. H. E. B. Ffolkes -	D. F. S.
Holyhead (Harbour Office)	53° 18' "	4° 39' W.	57	F. M. Cotton -	B. W.
" (Sailors' Home) - -	53° 18' "	4° 39' "	48	T. Chope -	T.
Hurst Castle - - -	50° 42' "	1° 33' "	12	E. T. Tremble -	T.
Jersey (St. Aubins) - - -	49° 12' "	2° 11' "	25	J. Fisher -	T.
" (St. Heliers) - - -	49° 11' "	2° 6' "	—	Signal Officer, Fort Regent.	S.
Kearsney Abbey, Dover -	51° 8' "	1° 17' E.	100 ?	C. W. Curtis -	R.
Ketton, Stamford - - -	52° 38' "	0° 32' W.	—	F. Coventry -	F. G.
" (The Holmes) - - -	52° 38' "	0° 32' "	—	—	R.
" (Colley Weston) - -	52° 37' "	0° 31' "	270	Miss A. Tasker -	R.
Kew Observatory - - -	51° 28' "	0° 19' "	18	C. Chree -	A.
Kilcreedane, Co. Clare -	52° 35' "	9° 47' "	—	Coastguard -	W.
Kilkenny - - -	52° 39' "	7° 14' "	212	H. Carlton, for the Marquis of Or- monde.	C. F.
§ Killarney - - -	52° 4' "	9° 30' "	86	Ven. Archdeacon Wynne.	E. F.
Killiney (Cloncvin), Co. Dublin. - - -	53° 16' "	6° 7' "	—	R. O'Brien Furlong -	R.
Kirkwall - - -	58° 5' "	2° 57' "	—	Coastguard -	W.
Kish Bank Lightship -	53° 1' "	5° 55' "	—	Light keepers -	W.
Ladylaw (Hawick) - - -	55° 28' "	2° 47' "	439	W. R. Wilson -	C. D.
§ Lairg - - -	58° 1' "	4° 22' "	335	J. McLeod -	E. F.
Lamlash, Isle of Arran, Scotland. - - -	55° 32' "	5° 8' "	—	Coastguard -	W.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Informa- tion supplied.
Laudale, Argyleshire	56° 41' N.	5° 41' W.	14	A. Fletcher, for T. H. G. Newton.	D. F.
§ Lednathie	56° 45' "	3° 7' "	710	W. Morrison (for Stormonth Dar- ling).	E.
Leith	55° 58' "	3° 10' "	20	T. Richardson	T.
Leman and Ower Lightship	53° 8' "	2° 2' E.	—	Light-keepers	W.
Lerwick	60° 9' "	1° 8' W.	—	Coastguard	W.
§ Lissan, Co. Tyrone	54° 41' "	6° 45' "	305	Sir Nathaniel Staples, Bart.	E.
Llandinam, Montgomery	52° 29' "	3° 26' "	406	Edward Davies	R.
Llandoverly	51° 59' "	3° 43' "	217	J. Watkins	F.
§ Llandudno	53° 21' "	3° 50' "	89	J. Nicol	E. F.
"	53° 21' "	3° 51' "	220	J. McMaster	S.
London (Brixton)	51° 29' "	0° 7' "	77	F. Gaster	T.
" (City)	51° 32' "	0° 5' "	80	Messrs. de la Rue	S.
" (Pall Mall)	51° 32' "	0° 8' "	—	Athenæum Club	C.
" (Stamford Hill)	51° 36' "	0° 5' "	275	Rev. J. Seymour St. John.	R.
" (Westminster)	51° 31' "	0° 8' "	76	The Staff of the Met. Office.	B. S.
Londonderry	55° 0' "	7° 19' "	67	J. Conroy	D. F.
Loughborough	52° 47' "	1° 12' "	169	W. Berridge	T.
Lowestoft	52° 29' "	1° 44' E.	—	J. Moore	G.
Malin Head, Co. Donegal	55° 23' "	7° 24' W.	230	O. O'Doherty	T. C.
Manchester	53° 29' "	2° 13' "	190	J. Tatham	G. S.
§ Marchmont	55° 44' "	2° 25' "	498	J. A. Wood	E. F. S.
§ Margate	51° 24' "	1° 24' E.	83	J. Stokes	D. S.
Market Rasen	53° 23' "	0° 20' W.	83	W. B. Jevons	R.
Markree Castle, Co. Sligo	54° 11' "	8° 27' "	122	A. Marth, for Col. Cooper.	D. F. S.
Minard, Co. Kerry	52° 7' "	10° 8' "	—	Coastguard	W.
Mold (Penbedw)	53° 12' "	3° 11' "	650	H. W. Buddicom	C.
Morpeth	55° 11' "	1° 40' "	—	Captain H. Terry	G. C.
Mount Nugent (Arley Cottage).	53° 50' "	7° 18' "	262	Major Somerset H. Maxwell.	D. S.
Nairn	57° 36' "	3° 52' "	84	Miss Penny	T.
Newcastle-on-Tyne	54° 58' "	1° 37' "	152	N. H. Martin	G. S.
Newarp Lightship	52° 45' "	1° 53' E.	—	Light-keepers	W.
Newquay, Cornwall	50° 25' "	5° 4' W.	2250	J. Pearce	S.
"	50° 25' "	5° 5' "	—	Coastguard	W.
Northallerton	54° 20' "	1° 26' "	130	W. Stead	R.
North Foreland	51° 23' "	1° 27' E.	115	A. Cox	T.
North-West Lightship Liverpool.	53° 31' "	3° 31' W.	—	Light-keepers	W.
§ Ochtertyre	56° 23' "	3° 53' "	320	G. Croucher, for Sir P. K. Murray, Bart.	E. F.
Omagh (Edenfel)	54° 36' "	7° 19' W.	300	Col. Buchanan	F.
Oswaldkirk, Yorks.	54° 12' "	1° 3' "	—	R. Thompson	S.
Outer Dowsing Lightship	53° 27' "	1° 5' E.	—	Light-keepers	W.
Owers Lightship	50° 39' "	0° 41' W.	—		W.
Oxford	51° 46' "	1° 16' "	208	W. Wickham, for E. J. Stone.	T. S.
Parkstone, Dorset	50° 43' "	1° 56' "	197	R. H. Barnes	D.
Parsonstown (Birr Castle)	53° 6' "	7° 55' "	175	O. Boeddicker, for Earl of Rosse.	D. S. T.
Pennant Bay, Aberdour	57° 40' "	2° 16' "	—	Coastguard	W.
§ Pinnore Girvan	55° 12' "	4° 49' "	197	P. Donald, for Capt. Hamilton.	E.
Plymouth (The Hoe)	50° 22' "	4° 8' "	116	H. Victor Prigg	D. F. S.
" (Freedom Fields)	50° 24' "	4° 8' "	207		R.
§ Poltalloch	56° 8' "	5° 30' "	132	J. Russell, for John Malcolm of Pol- talloch.	E.
Portrush	55° 13' "	6° 40' "	—	Coastguard	W.
Prawle Point	50° 12' "	3° 43' "	332	M. Holmes	T.
Prestwich	53° 32' "	2° 17' "	294	T. R. H. Clunn	D. F. S.
Roche's Point, Cork	51° 47' "	8° 19' "	42	W. Kennedy	T.
Rochford, Tenbury	52° 18' "	2° 36' "	316	John Tomson	R. C.
§ Rosewell	53° 51' "	3° 7' "	690	R. W. D. Cameron	E.
Rothamsted	51° 48' "	0° 22' "	368	Sir J. B. Lawes and Sir J. H. Gilbert.	F. S.
§ Rothesay	55° 50' "	5° 4' "	115	J. Kay	E.
§ Rounton, Yorkshire	54° 24' "	1° 13' "	249	Sir L. L. Bell, Bart.	E.
§ Rousdon, Devon	50° 42' "	3° 0' "	523	C. E. Peck	E.
Roxborough, Co. Limerick	52° 39' "	8° 36' "	—	A. W. Shaw	R.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.
Royal Sovereign Light-ship.	50 43 N.	0 27 E.	—	Light-keepers	W.
Rugby	52 22 "	1 15 W.	379	H. P. Righton	G.
St. Ann's Head, Pembroke	51 41 "	5 11 "	150	H. T. Knott	T. S. W.
St. David's, Pembrokeshire	51 53 "	5 16 "	215	W. P. Probert	D.
St. Helen's, Lancashire	53 28 "	2 45 "	151	J. Robertson	G.
St. Leonards	50 51 "	0 33 E.	129	H. Colborne	D. F. S.
Salcombe, Kingsbridge	50 14 "	3 46 W.	—	Coastguard	W.
Sandgate, Kent	51 4 "	1 9 E.	56	H. E. Stilgoe	R.
Scarborough	54 17 "	0 23 W.	159	H. G. H. Monk	D. F.
Schull	54 17 "	0 23 "	—	Coastguard	W.
Silly Islands (St. Mary's)	51 32 "	9 32 "	—	—	G.
	49 56 "	6 18 "	80	A. Hicks	B.S.T.W.
Seafeld, Miltown Malbay	52 48 "	9 30 "	—	Coastguard	W.
Co. Clare.					
Seaham Harbour	54 50 "	1 19 "	148	G. H. Aird	D.
Sedburgh	54 19 "	2 32 "	400	A. P. Burra	E.
Seven Stones Lightship	50 4 "	6 5 "	—	Light-keepers	W.
Shambles Lightship	50 31 "	2 20 "	—	—	W.
Sheffield	53 23 "	1 29 "	429	E. Howarth	D.
Shields, North	55 0 "	1 27 "	97	J. W. Irvine	T.
Shields, North, High Light-house.	55 0 "	1 27 "	—	Captain Harrison	B.
Shipwash Lightship	52 2 "	1 38 E.	—	Light-keepers	W.
Solihull, Birmingham	52 28 "	1 48 W.	459	B. Boothroyd	G. F.
Solway Lightship	54 48 "	3 32 "	—	Light-keepers	W.
Southampton	50 55 "	1 24 "	78	J. T. Cook, for Dir. Gen. of Ordnance Survey.	D.F.S.
South Rock Lightship	54 25 "	5 22 "	—	Light-keepers	W.
Spidall, Co. Galway	53 15 "	9 17 "	—	Coastguard	G.
Spurn Head	53 34 "	0 7 E.	19	G. Freeman	T.
Spurn Lightship	53 34 "	0 13 "	—	Light-keepers	W.
Stokesay, Craven Arms	52 26 "	2 52 W.	370	Miss M. A. Dugges La Touche.	D.
Stonyhurst College	53 51 "	2 28 "	375	Rev. W. Sidgreaves	A.D.F.
Stornoway	58 11 "	6 22 "	28	J. Mackenzie	T.S.C.
"	58 11 "	6 22 "	—	Coastguard	W.
Stowell, Sherborne, Dorset-Stranraer	50 57 "	2 31 "	376	Rev. H. J. Poole	F.
"	54 54 "	5 2 "	—	Coastguard	G.
Strathfield Turgiss, Hants	51 20 "	1 0 "	195	Rev. C. H. Griffith	F.
Strathpeffer-Spa, N.B.	57 34 "	4 34 "	253	J. Tregelles Fox	D.
Sumburgh Head (Duurossness).	59 51 "	1 17 "	126	Rev. W. Brand	T. C.
Sunderland	54 54 "	1 23 "	—	Coastguard	W.
Sutton Coldfield	52 34 "	1 49 "	392	C. F. Marston	S.
Symbister, Shetlands	60 14 "	1 25 "	—	J. S. Nicolson	G.
Tealby, Lincolnshire	53 24 "	0 16 "	251	Rev. S. Lewin	D.
Teelin, Donegal	54 38 "	8 39 "	—	Coastguard	W.
Tenby	51 41 "	4 42 "	79	J. E. Gower	S.
Thurcaston, Leicester	52 42 "	1 10 "	253	Rev. T. A. Preston	S.
Torquay	50 28 "	3 31 "	—	A. Chandler	S.
Totland Bay, Isle of Wight	50 41 "	1 33 "	84	J. Dover	G.
Union Hall, Co. Cork	51 33 "	9 8 "	—	Coastguard	G.
Uppingham	52 35 "	0 44 "	484	Rev. G. H. Mullins	D.
Uzon (Montrose)	56 40 "	2 28 "	—	Coastguard	W.
Valencia Observatory,	51 56 "	10 15 "	30	J. E. Cullum	A. T.C.
Cahirciveen.					
" Island (Glanleam)	51 56 "	10 20 "	—	Miss E. FitzGerald	B.
" (Knightstown)	51 55 "	10 20 "	—	Coastguard	G.
Wakefield	53 41 "	1 36 "	96	H. Clarke	E.
Waterford (Brook Lodge)	52 14 "	7 6 "	104	C. P. Bolton	F.
Waterford	52 16 "	7 7 "	—	Harbour Authorities	C.
Westbourne, Sussex	50 52 "	0 55 "	—	Rev. L. B. Birkett	S.
Westray, Orkney	59 17 "	3 0 "	—	J. Hewison	G.
Wick	58 27 "	3 6 "	80	J. Sinclair	T.
"	58 27 "	3 6 "	—	Coastguard	W.
Wolfelee	55 23 "	2 39 "	587	W. Cockburn	D.
Workop	53 18 "	1 8 "	—	H. Mellish	S.
Yarmouth	52 37 "	1 43 E.	10	G. T. Watson	B.T.C.
Ynis-y-bro, Newport	51 38 "	3 3 W.	115	F. W. Houghton	R.
York (Boothgate)	53 57 "	1 5 "	—	J. E. Clark	S.
" (The Museum)	53 57 "	1 5 "	51	H. M. Platnauer	D. T.

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

Station.	Authority.	Station.	Authority.
Haparanda - - -	} Meteorological Office, Stock- holm.	†The Helder - - -	} Bureau Central Météorologique, Paris.
Hernösand - - -		Cape Gris Nez - - -	
†Stockholm - - -		†Brest (S.t. Mathieu) - - -	
Wisby - - -		Lorient (Ile de Groix) - - -	
Karlstad - - -	} Meteorological Institute, Christiania.	*†Rochefort (Ile d' Aix) - - -	} Cent. Met. Inst. of Germany.
Bodö - - -		†Biarritz - - -	
†Christiansund - - -		†Paris - - -	
*†Skudesnaes - - -		Belfort - - -	
Færder - - -	} Meteorological Institute, Copenhagen.	Lyons - - -	} Observatory, Lisbon.
†The Scaw - - -		Nice - - -	
Fanö - - -		Perpignan - - -	
Cuxhaven + - -		Berlin - - -	
	} Deutsche See- warte, Ham- burg.	Wiesbaden - - -	} Cent. Met. Inst. of Germany.
		Munich - - -	
		Corunna - - -	
		†Lisbon - - -	
		Azores (P. Delgada) - - -	

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 4h. p.m. instead of 6h. p.m.
The Helder does not send reports at 6 p.m. on Sundays.

APPENDIX XII.

List of Documents received from FOREIGN LAND STATIONS during the year ending 31st March 1895.

Place.	Observer.	Nature of Observations.
Abaco (Bahamas)	T. R. Thompson, Sen., Lightkeeper	Lighthouse Register, 1894, January to December.
Antigua	Francis Watts	Two observations daily, 1894, March to December; 1895, January, February.
Beyrout (Lee Observatory)	R. H. West, M.A.	Two observations daily, 1894, March to December; 1895, January, February.
Breaksea Island (King George's Sound).	J. A. Symonds	Lighthouse Register, 1894, January to June.
British Guiana, "Encore" Mine	G. G. Dixon	Daily observations, 1893, January to December; 1894, January to March.
Cape Juby (N.W. Africa)	F. S. Zaytoun, O. Kloster and L. C. Carter.	Two observations daily, 1894, February to December; 1895, January, February.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper	Lighthouse Register, 1894, January to December.
Cape Spartel (Tangier)	E. C. Hathaway, Lloyd's Signalman.	Two observations daily, 1894, March to December; 1895, January, February.
Cay Lobos (Bahamas)	Lightkeeper	Lighthouse Register, 1894, January to December.
Cay Sal (Bahamas)	J. A. Williams, Lightkeeper	" " " " June.
Famagusta (Cyprus)	G. Eliades	Two observations daily, 1893, June to December; 1894, January to December.
George Town (British Guiana)	Robert Ward	Two observations daily, 1894, January to December; 1895, January.
" " "	"	Daily record of sunshine, 1894, February to December; 1895, January.
Gibraltar	Staff-Sergeant R. Scott, and Sergeant A. W. Harwood, Med. Staff Corps.	Two observations daily 1894, March to December; 1895, January, February.
Hawaii, Paauilo, Hamakua	Rev. Eric Lewis	Two observations daily, 1894, February, May, and June.
Inagua (Bahamas)	Lightkeeper	Lighthouse Register, 1894, January to December.
Kyrenia (Cyprus)	P. Michaelides	Two observations daily, 1893, June to December; 1894, January to December.
Lagos	Wm. A. Coie and J. Julius Apena	" " " 1894, February to December; 1895, January.

List of Documents—continued.

Place.	Observer.	Nature of Observations.
Larnaca (Cyprus)	C. Perini	Two observations daily, 1893, June to December; 1894, January to December.
Limassol (Cyprus)	Luigi Béraud	" " " " " " " "
Mojanga (Madagascar)	Stratton C. Knott, F.R.Met.Soc. Vice-Consul.	" " " " " " " "
Malden Island	"	Three " " " " " " " "
Nicosia (Cyprus)	G. Stephen	Two " " " " " " " "
Nyassa Lake	Comr. C. H. Robertson, R.N., C.M.G.	Observations on board H.M.S. "Adventure," 1894, August to November.
Papho (Cyprus)	E. A. Malliotis	Two observations daily, 1893, June to December; 1894, January to December.
Point King (King George's Sound).	S. Mitchell	Lighthouse Register, 1893, November to December; 1894, January to June.
Rarotonga	J. Seard	Two observations daily, 1894, January to November.
St. Helena	H. S. Hands	One observation daily, 1894, January to December.
"	"	Continuous record of wind (direction and velocity), 1894, March, June to December.
" (Jamestown)	"	Observations of Rollers, 1893.
Sultan Tehair (Asia Minor)	C. Z. Bunning	Two observations daily, 1894, March, April, May.
Suva (Fiji)	J. D. W. Vaughan, F.R.Met. Soc., F.R.G.S.	One observation daily, 1893, November, December; 1894, January to July, September to December.
Teneriffe (Sitio de Cullen)	A. F. Perry	Two observations daily, 1894, March to December; 1895, January.
"	"	Continuous record of pressure and temperature, 1894, March to December; 1895, January.
Tonga (New Hebrides)	A. Cronstedt	Two observations daily, 1894, January to December.
Trinidad	J. H. Hart, Supt. Botanic Gardens	" " " " " " " "
Watling Island (Bahamas)	T. R. Thompson, jun., Lightkeeper	Lighthouse Register, 1893, July to December; 1894, January to December.
Zomba, British Central Africa	John McClounie	Two observations daily, 1894, September to December.

APPENDIX XIII.

ACCESSIONS TO THE LIBRARY DURING THE YEAR ENDING
31ST MARCH 1895.

* **Abney, [W. de W.] and Festing, [E. R.]**—The influence of water in the atmosphere on the solar spectrum and solar temperature. 8°. (*Proc. R. Soc.*, xxxv., 1893, p. 328.)

* **Aeronautics.**—Published by the American Engineer and Railroad Journal. Vol. i., 1893-94. 1a. 4°. New York, 1893-94.

Aitken, James.—Meteorological table for the years 1887-89, 1891-94. Compiled from observations taken at Braemar, Aberdeenshire. Oblong sm. f°. Sheets.

|| **John.**—On the number of dust particles in the atmosphere of certain places in Great Britain and on the Continent, with remarks on the relation between the amount of dust and meteorological phenomena. Part iii. 1a. 4°. Edinburgh, 1894. (*Trans. R. Soc. Edinb.*, xxxvii., Part iii., p. 621.)

[**Algiers, Service Météorologique du Gouvernement Général de l'Algérie.**]—Bulletin météorologique de l'Algérie. 1894, Jan. 1-Dec. 31. sm. f°. Sheets.

[**Allahabad, Meteorological Office.**]—Brief sketch of the meteorology of the North-Western Provinces and Oudh and adjacent parts of Rajputana and the Panjab for the years 1886, 1890, 1893. 3 vols., sm. f°. s.l.e.a.

American Meteorological Journal.—A monthly review of meteorology. Vol. x., 1893-94. 1a. 8°. Boston, s.a.

* **Amontons, [G.]**—Discours sur quelques propriétés de l'air, et le moyen d'en connoître la température dans tous les climats de la terre. 4°. (*Mém. Acad. R. Sc.*, Paris, 1702, p. 155.)

Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap.—Tijdschrift. Tweede serie. Deel xi. 2 vols. 8°. Leiden, 1894.

Angot, A.—Les aurores polaires. 8°. Paris, 1895.

Arcimis, A.—La circulación atmosférica. sm. 8°. Madrid, 1895.

* **Atmometer.**—[*Encycl. Brit.*, ? date, p. 131.]

Azambuja, G. A. de.—Anuario do Estado do Rio Grande do Sul. 1894, 1895. Annos, x., xi. 2 vols., sm. 8°. Porto Alegre, 1893-94.

Baltimore, Maryland State Weather Service.—The climatology and physical features of Maryland. First biennial report of the Maryland State Weather Service for the years 1892 and 1893. 1a. 8°. Baltimore, 1894.

——— Monthly summary, 1891, May to Nov. (except Oct.). 1a. 8°. s.l.e.a.

——— Monthly report. Vols. ii., iii., 1892-94. 4°. s.l.e.a.

Bangalore, Mysore Government Meteorological Department.—Report on rainfall registration in Mysore for 1893, by J. Cook. 1a. 4°. Bangalore, 1894.

* **Barnard, C.**—Talks about the weather in its relation to plants and animals. sm. 8°. New York, 1894.

|| **Barnes, R. H.**—Some remarks on [the weather of] 1893. f°. Sheet. (*Parkstone Reminder*, Feb. 17th, 1894.)

* **Barois, J.**—Notice sur le climat du Caire. 1a. 8°. pp. 78-212.
[? Where from.]

Bartoli, A.—Influenza del pulviscolo atmosferico sulla trasmissibilità delle radiazioni solari. 1a. 8°. (*Riv. Scient. Industr.*, Firenze, xxvi., 1894, p. 141.)

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, Magnetical and Meteorological Observatory.—Observations. Vol. xvi., 1893. 1^o. Batavia, 1894.

[— **Observatorium.**]—Regenwaarnemingen in Nederlandsch-Indië. xv. Jaarg. 1893. 8^o. Batavia, 1894.

Title and Preface in the English language also.

|| **Batchelder, S. F.**—A new series of isanomalous temperature charts, based on Buchan's isothermal charts. 8^o. (*Amer. Meteor. Journ.*, 1894, *Mch.*, p. 451.)

Bathurst, Gambia.—Comparative rainfall, Colony of the Gambia, 1889–93, and meteorological observations, 1893. sm. 1^o. Sheet.

— Meteorological observations. 1894. sm. 1^o. Sheet.

Bauer, L.—Beiträge zur Kenntniss des Wesens der Säcular-Variation des Erdmagnetismus. sm. 1^o. Berlin, 1895.

Baxendell, J.—Abstracts of observations at the Southport meteorological observatory for the weeks ending Jan. 5, 1894 to Jan. 4, 1895. Slips.

|| **Bebber, W. J. van.**—Häufigkeit und Tiefe der barometrischen Minima sowie Bahnen der Maxima und stationäre Maxima in dem Zeitraum vom Winter 1883–84 bis Ende Herbst 1887. 1a 8^o. (*Ann. Hydr. mar. Meteor.*, 1894, *Juni*.)

Belize.—Summary of meteorological observations at St. Joseph's Observatory during the months of Jan.–Dec. 1894. 4^o. Sheets. (*The Angelus, Belize*, 1894–95.)

Berlin, Deutsche Meteorologische Gesellschaft.—Berliner Zweigverein der deutschen meteorologischen Gesellschaft. 12. Vereinsjahr, 1895. 8^o. Berlin, 1895.

— **Königlich Preussisches Meteorologisches Institut.**—Bericht über die Thätigkeit . . . im Jahre 1893 von W. von Bezold. 1a. 8^o. Berlin, 1894.

— — — — — Ergebnisse der magnetischen Beobachtungen in Potsdam in den Jahren 1890 und 1891. 1a. 4^o. Berlin, 1894.

— — — — — Ergebnisse der Niederschlags-Beobachtungen im Jahre 1892. 1a. 4^o. Berlin, 1894.

|| — — — — — Witterung nach den Beobachtungen des königlichen meteorologischen Instituts. 1894, Jan.–Dec. 1a. 4^o. (*Statist. Korresp.*)

* **Bertelli, P. T.**—Appunti storici intorno all' antica "Rosa nautica" italiana. 1a. 8^o. (*Riv. Marittima, Roma*, xxvi., 1893, p. 221.)

|| **Bezold, W. v.**—Ueber Wolkenbildung. Vortrag, gehalten in der Urania am 29 Nov. 1893. Sammlung populärer Schriften herausgegeben von der Gesellsch. Urania zu Berlin. 1a. 8^o. Berlin, 1894. (*Himmel und Erde*, vi., Heft 5.)

Bibliothèque Universelle [et Revue Suisse]. Archives des sciences physiques et naturelles. Troisième période. Tomes xxxi.–xxxii. 2 vols. 8^o. Genève, 1894.

* **Blagden, C.**—History of the congelation of quicksilver. 4^o. (*Phil. Trans. abridged by Hutton, &c.*, xv., 1809, p. 431.)

Bombay, Government Observatory.—Magnetical and meteorological observations made at the Government Observatory, Bombay, in the year 1893, under the direction of C. Chambers and C. Chambers, jun. 1^o. Bombay, 1894.

(— — — — —) Report on the condition and proceedings of the Government Observatory, Colába, for the year which ended with the 30th June 1894. 1^o. s.l.e.a.

[**Bombay, Meteorological Office.**]—Brief sketch of the meteorology of the Bombay Presidency in 1893–94. 1^o. s.l.e.a.

* **Booth, W. B.**—Journal of meteorological observations, made in the garden of the Horticultural Society at Chiswick, during the years 1826–29. 4 parts. 4^o. (*Trans. Hortic. Soc.*, vii., 1827–28, pp. 102, 346; i., 2nd. ser., pp. 111, 171.)

For 1825, see LONDON, R. HORTIC. SOC.

For continuation, see BOOTH, W. B., AND THOMPSON, R.

* **Booth, W. B., and Thompson, R.**—Journal of meteorological observations made in the garden of the Horticultural Society at Chiswick, during the year 1830. 4^o. (*Trans. Hortic. Soc.*, i., 2nd. ser., p. 297.)

For previous years, see BOOTH, W. B.

For continuation, see THOMPSON, R.

|| **[Boston, Mass., Weather Bureau.]**—Annual summary of the New England Weather Service for the year 1893. la. 4°. Cambridge, Mass., 1894. (*Ann. Astr. Obs. Harvard Coll.*, xli., No. 2, p. 33.)

——— Bulletin of the New England Weather Service. 1894, Jan.–Dec. 4°. s.l.e.a.

Bremen, Meteorologische Station I. Ordnung.—Deutsches meteorologisches Jahrbuch für 1893. Ergebnisse der meteorologischen Beobachtungen. Herausgegeben von Dr. P. Bergholz. Jahrg. iv. la. 4°. Bremen, 1894.

Brisbane, Post and Telegraph Department, Meteorological Branch.—Table of rainfall. 1891, 1892. Jan.–Dec. f°. Sheets.

British Honduras.—Annual report for 1893. Colonial reports (annual), No. 116. la. 8°. London, 1894.

British New Guinea.—Annual report on British New Guinea, from 1st July 1891 to 30th June 1892; with appendices. sm. f°. Brisbane, 1893.

——— Meteorological observations taken at Port Moresby. July 1892 to Dec. 1893. f°. sheets. (*Suppl. to British New Guinea Gov. Gaz.*, vols. vi.–vii., 1893–94.)

British North Borneo Herald and Official Gazette. Vol. xii. 1894. Nos. 1–12. f°. Sandakan, 1894.

Contains occasional meteorological observations.

* **Brooke, C.**—On the automatic registration of magnetometers, and meteorological instruments, by photography. No. iii. Read June 21, 1849. la. 4°. (*Phil. Trans.*, 1850, p. 83.)

Broounof, P.—Orages dans le bassin du Dniéper en 1893. Travaux du réseau météorologique du bassin du Dniéper. Tome i., N° 9. la. 8°. [Kieff], 1893.
Text in the Russian language.

Brussels, Observatoire Royal.—Bulletin météorologique. 1894, Jan. 1–Dec. 31. f°. Sheets.

Buchan, A.—Report on oceanic circulation.

See EDINBURGH, CHALLENGER OFFICE.

|| **Buchanan, J.-Y.**—Sur la densité et l'alcalinité des eaux de l'Atlantique et de la Méditerranée. 4°. (*Compt. rend.*, cxvi., 1893, p. 1321.)

Bucharest, Institutul Meteorologic al Romaniei.—Analele . . . de S. C. Hepites. Tom. viii., 1892. la. 4°. Bucuresti, 1894.

In the French language also.

——— Buletinul observatiunilor meteorologice din Romania publicat de S. C. Hepites. Anii ii.–iii., 1893–94. 2 vols. sm. f°. Bucuresti, 1893, 1895.

|| ——— Resumat al observatiunilor meteorologice făcute la Bucuresti (Filaret) în anii 1891 și 1892 și în perioada de la 1885 la 1890. la. 4°. Bucuresti, 1894. (*Anal. Inst. Meteor. Roman.*, viii., 1892, p. C 317.)

In the French language also.

——— Al seaptelea raport asupra lucrărilor Institutului Meteorologic în anul 1893. Part i. la. 4°. (*Anal. Inst. Meteor. Roman.*, viii., 1892.)

Buenos Ayres, Oficina Meteorológica Argentina.—Anales. Tomo ix. Parts 1–2. la. 4°. Buenos Aires, 1893–94.

Cairo, Ministère de l'Intérieur. Administration des Services Sanitaires et d'Hygiène Publique.—Bulletin hebdomadaire. 9^{me} année 1894, Nos. 1–52. Suppl. au Journ. Officiel, 1894–95. la. 4°.

[Calcutta, Meteorological Office, Bengal.]—Bay of Bengal weather chart 1894, Jan. 1–Dec. 31. sm. f°. Sheets.

——— Bengal daily weather report. 1894. sm. f°. Sheets.

These reports are only published during the rainy season.

(———) Meteorological and rainfall table of the Province of Bengal for the weeks ending January 6 to December 29, 1894. f°. Sheets.

(———) Meteorological and rainfall table of the Province of Bengal for the months of January to December 1894, with annual tables. sm. f°. Sheets.

——— Meteorological summary for the monsoon period of 1894. sm. f°. s.l.e.a.

[———] Summary of the meteorology of Bengal for the year 1893. sm. f°. s.l.e.a.

Calcutta, Meteorological Office, India.—Abstract of the results of the barometric and thermometric observations taken at the Meteorological Office, Chowringhee. 1894, Jan.–Dec. sm. f°. Sheets.

— Abstract of the results of the meteorological observations taken at the Alipore Observatory in the months of Jan.–Dec. 1894. sm. f°. Sheets.

— India daily weather report. 1894. Jan. 1–Dec. 31. f°. Sheets.

[— —] Instructions to observers of the India Meteorological Department. By J. Eliot. la. 8°. Calcutta, 1894.

[— —] Memorandum on the snowfall in the mountain districts bordering Northern India, and the abnormal features of the weather in India during the past five months, with a forecast of the probable character of the south-west monsoon rains of 1894. f°. (Simla, 1894.)

[— —] Meteorological observations recorded at seven stations in India in the year 1893, corrected and reduced. f°. Calcutta, 1894.

(— —) Rainfall of India. Third year. 1893. sm. f°. Calcutta 1894.

(— —) Report on the administration of the Meteorological Department of the Government of India in 1893–94. f°. s.l.e.a.

— Results of the barometrical and thermometrical observations taken at the Meteorological Office, Chowringhee, from 31st December 1893 to 29th December 1894. sm. f°. Sheets.

— Results of the meteorological observations taken at the Alipore Observatory, from 31st December 1893 to 29th December 1894. sm. f°. Sheets.

[— —] Tables for the reduction of meteorological observations in India: to accompany the "Hand-book of Instructions to Meteorological Observers." By H. F. Blanford. 2nd ed. la. 8°. Calcutta, 1889.

[— —] Weather chart of the Indian monsoon area. 1893. Jan. 1–Dec. 31. f°. Sheets.

Cambridge (Mass.), Astronomical Observatory of Harvard College.—Annals. Vol. xl., Part iii. Observations made at the Blue Hill Meteorological Observatory, Mass., U.S.A., in the year 1893. Under the direction of A. L. Rotch. a. 4°. Cambridge, 1894.

Carlsruhe, Centralbureau für Meteorologie und Hydrographie.—Deutsches meteorologisches Jahrbuch für 1893. Grossherzogthum Baden. Die Ergebnisse der meteorologischen Beobachtungen im Jahre 1893. Bearbeitet von C. Schultheiss. Zugleich ii. Theil des Jahresb. . . . für 1893. la. 4°. Karlsruhe, 1894.

— Jahresbericht . . . mit den Ergebnissen der meteorologischen Beobachtungen und der Wasserstandsaufzeichnungen am Rhein und an seinen grossern Nebenflüssen 1887–1891 and 1893. 6 vols. la. 4°. Karlsruhe, 1888–1892, 1894.

— Niederschlagsbeobachtungen der meteorologischen Stationen im Grossherzogthum Baden. 1889, 1–2 Halb. 1893, 1–2 Halb. 1894, 1 Halb. 5 vols. la. 4°. Karlsruhe, 1892, 1894.

— Uebersicht der Ergebnisse der an den badischen meteorologischen Stationen angestellten Beobachtungen, nebst Wasserstandsaufzeichnungen an den wichtigsten Hauptpegeln des Rheins. 1894. Jan.–Dec. f°. Sheets.

* **Carpenter, W. B.**—Report on scientific researches carried on during the months of August, September, and October, 1871, in H.M. Surveying-ship "Shearwater." 8°. London, 1872. (*Proc. R. Soc.*, xx., No. 138, 1872, p. 535.)

* **Cassini, [J.]**—Observations météorologiques faites à Aix par M. de Montvalon, Conseiller au Parlement d'Aix, comparées avec celles qui ont été faites à Paris en 1730. 4°. (*Mém. Acad. R. Sc., Paris*, 1731, p. 1.)

* — Réflexions sur la hauteur du baromètre observée sur diverses montagnes. 4°. (*Mém. Acad. R. Sc., Paris*, 1733, p. 40.)

* — Réflexions sur les règles de la condensation de l'air. 4°. (*Mém. Acad. R. Sc., Paris*, 1705, p. 61.)

* **Cavendish, H.**—An account of the meteorological instruments used at the Royal Society's House. 4°. (*Phil. Trans., abridged by Hutton, &c.*, xiv., 1809, p. 49.)

* — Observations on Mr. Hutchins's experiments for determining the degree of cold at which quicksilver freezes. 4°. (*Phil. Trans., abridged by Hutton, &c.* xv., 1809, p. 420.)

* **Chambers, C.**—Sunspots and terrestrial phenomena :—I. On the variations of the daily range of atmospheric temperature, as recorded at the Colaba Observatory, Bombay. II. On the variations of the daily range of the magnetic declination, as recorded at Colaba Observatory, Bombay. 2 papers, 8°. (*Proc. R. Soc.*, xxxiv., 1882, pp. 231 and 247.)

Chandler, A.—Abstract of meteorological observations made at Torquay during the year 1894. oblong la. 8°. Sheet.

* **Chappell, Edward.**—Narrative of a voyage to Hudson's Bay in His Majesty's ship "Rosamond," containing some account of the North-eastern coast of America and of the tribes inhabiting that remote region. 8°. London, 1817.

Chemnitz, K. **Sächsisches meteorologisches Institut.**—Deutsches meteorologisches Jahrbuch für 1893. Beobachtungssystem des Königreiches Sachsen. Jahrbuch des Königlich sächsischen meteorologischen Institutes. 1893. Jahrg. xi. der neuen Reihe. la. 4°. Chemnitz, 1894.

[— — —] Wetterbericht. 1894, Jan.—Dec. la. 4°. (*Wissensch. Beil. der Leipziger Zeitung*, 1894–95.)

Chicago.—Report of the International Meteorological Congress held at Chicago, Aug. 21–24, 1893.

See WASHINGTON, DEPARTMENT OF AGRICULTURE, WEATHER BUREAU. Bulletin No. 11.

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IV. Sind die Winter im Norden wärmer geworden?

V. Kontinentales und ozeanisches Klima.

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APPENDIX XIV.

ACCOUNT of RECEIPTS and PAYMENTS for the year ending 31st March 1895.

RECEIPTS.			PAYMENTS.		
	£	s. d.		£	s. d.
Balance from year 1893-94 -	1,517	12 11	ADMINISTRATION:		
Parliamentary Vote -	15,300	0 0	Payment of Council -	987	10 0
Repayment of expenses charged under—			Secretary -	800	0 0
(1.) Incidental expenses -	3	7 9	Salaries and wages -	891	6 9
(2.) Observatories -	31	17 4	Rent, fuel, and lighting	696	12 4
	35	5 1	Incidental and contingent expenses -	194	15 8
SUPPLY OF INFORMATION:			Furniture and fittings	110	12 8
Daily Weather Charts and Forecasts -	293	12 5	Pensions -	159	3 3
6 p.m. Charts -	25	0 0	Expenses incidental to International Meteorological Congress -	30	13 2
Reports for Press Agencies, &c. -	96	3 10			3,870 13: 10
Telegrams -	200	11 10	SPECIAL RESEARCHES:		
	615	8 1	Salaries and other charges -	-	-
SALE OF INSTRUMENTS, &c.:			LAND METEOROLOGY:		
Royal Navy -	4	11 2	Observatories and stations, including remuneration of observers -	2,259	5 4
Mercantile Marine account -	9	16 0	Salaries: —Discussion and reduction of observations, &c. -	1,370	10 3
M.O. (Stations) account -	29	4 11			3,629 15 7
	43	12 1	WEATHER INFORMATION AND FORECASTS:		
Repayment of Miscellaneous Commissions executed for Colonial and Foreign Institutions, &c. -	23	18 0	Telegraphic reports and storm warnings, remuneration of observers, &c. -	2,538	10 0
Commission charged on work done for Colonies, &c. -	3	16 6	Salaries: — Preparation and issue of reports and forecasts -	1,861	13 9
					4,400 3 9
			INSPECTIONS:		
			Salaries and travelling expenses -	-	-
			OCEAN METEOROLOGY:		
			Salaries: —Discussion and reduction of observations -	1,590	16 0
			Expenses incidental to the supply of instruments:—		
			Proportion for care and issue of instruments -	200	0 0
			Royal Navy -	879	17 11
			Mercantile Marine -	154	8 1
			Distant island and coast stations -	10	0 0
					2,835 2: 0
			Miscellaneous Commissions executed for Colonial and Foreign Institutions, &c. -	-	-
					41 9 0
			BALANCE:		
			Cash at Bank -	1,393	9 4
			„ at Office -	49	1 7
					1,442 10 11
£ 17,539 12 8					£ 17,539 12 8

In the year 1894-95 the sum of 1,528*l.* 0*s.* 10*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires, &c.

APPENDIX XV.

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

I.—DAILY WEATHER REPORT.

Year.	Page.	—
1891 (July to Dec.).	1	Mean Values of Barometric Pressure for each Month and for the Whole Year—derived from Observations made at 8 a.m. daily during the 20 Years 1871-90.
1891	2 and 3	Mean Values of the Dry Bulb and Wet Bulb Temperatures for each Month and for the Whole Year, derived from Observations made at 8 a.m. daily during the 20 Years 1871-90.
„	4 and 5	Mean Values of the Daily Maximum and Minimum Temperatures, and of the Maximum and Minimum combined, for each Month and for the Whole Year—derived from Observations extending over the 20 Years 1871-90.
„	6	Mean Rainfall for each Month and for the Whole Year—derived from Observations extending over the 25 Years 1866-90.

II.—WEEKLY WEATHER REPORT.

Year.	Page.	—
1884	V.	Table A.—Showing for each Degree of Latitude, from 49° N. to 58° N. the Total Number of Hours during which the Sun is above the Horizon, in each Month of the Four Quarters of the Year.
„	VI.	Table B.—Showing for each Degree of Latitude, from 49° N. to 58° N. the Total Number of Hours during which the Sun is above the Horizon, in each Week of the Year.
1889	[1-9]	Summaries of Rainfall and Mean Temperature, for the First, Second, Third, and Fourth Quarters, and for the whole Year, during the Twenty-four Years, 1866 to 1889. [Contains Separate Yearly Values from the year 1866.]
1890	[17]	Table I.—Showing for each District, during the Thirteen Years 1878-90, the Mean Aggregate Numbers of Rainy Days, from the beginning of the Year to the end of each Week in the Year.
„	[18]	Table II.—Showing for each District, during the Thirteen Years 1878-90, the Mean Aggregate Amounts of Rainfall, from the beginning of the Year to the end of each Week in the Year.
„	[19]	Table III.—Showing for each District, during the Thirteen Years 1878-90, the Mean Aggregate Values for Accumulated Heat above 42° F., from the beginning of the Year to the end of each Week in the Year.
„	[20]	Table IV.—Showing for each District, during the Thirteen Years 1878-90, the Mean Aggregate Values for Accumulated Heat below 42° F., from the beginning of the Year to the end of each Week in the Year.
„	[21]	Table V.—Showing for each District, during the Ten Years 1881-90, the Mean Aggregate Numbers of Hours of Bright Sunshine, from the beginning of the Year to the end of each Week in the Year.
„	[22]	Table VI.—Showing for each District, during the Ten Years 1881-90, the Mean Per-centages of the Possible Amount of Bright Sunshine, from the beginning of the Year to the end of each Week in the Year.
„	[23]	Table I.—Showing in Degrees Fahrenheit for each District, and for the Thirteen Years 1878-90, the Mean Temperature of the Air for each Week in the Year.

Year.	Page.	—
1891	VI.-VII.	Table I.—Showing for the Stations included in the Weekly Weather Reports and Monthly Summaries, the Mean Values of the Daily Maximum and Minimum Temperatures, and of the Maximum and Minimum combined, for each Month and for the whole Year, derived from Observations extending over the Twenty Years 1871-90.
"	VIII.	Table II.—Showing for the Stations included in the Weekly Weather Reports and Monthly Summaries, the Mean Rainfall for each Month and for the whole Year, derived from Observations extending over the Twenty-five Years 1866-90.
"	IX.	Table III.—Showing, for each Month and the Whole Year, for certain Stations included in the Weekly Weather Reports and Monthly Summaries, the Mean Numbers of Hours of Bright Sunshine, together with the Per-centages of the Possible Duration, in each instance, derived from Records extending over the Ten Years 1881-90.
1894	[1-9]	Summaries of Rainfall and Mean Temperature, for the First, Second, Third, and Fourth Quarters, and for the Whole Year, during the Twenty-nine Years, 1866 to 1894. [For Separate Yearly Values for 1866-89, see 1889 [1-9].]

III.—MONTHLY WEATHER REPORT.

Year.	Page.	—
1884	[i.]	On London Rain. By W. J. Russell, Ph.D., F.R.S.
"	[ii.]	On the Amount of Carbonic Acid in London Air. By W. J. Russell, Ph.D., F.R.S.
1885	[i.]	On the Impurities in London Air. By W. J. Russell, Ph.D., F.R.S.
"	[ii.]	Table showing the Mean Monthly and Annual Rainfall at the Weekly and Monthly Weather Report Stations for the 20 Years 1866 to 1885.

IV.—QUARTERLY WEATHER REPORT.

Year.	Page.	—
1869	43	Factors for Calculation of Gradients.
"	[1]	Notes on Easterly Gales, by R. H. Scott.
1870	iii.	Description of Observatories, with illustrations of thermometer screens.
"	[7]	Mean Barometrical Pressure at Telegraphic Reporting Stations, 1866-70.
"	[11]	Rainfall at Telegraphic Reporting Stations, 1866-70.
"	[23]	Bessel's Paper on the Determination of the Law of a Periodical Phenomenon. (Translation).
1871	[7]	Discussion of Anemometrical Results for Orkney, 1863-68.
"	[57]	Mean Monthly Rainfall at several stations.
"	[59]	Constants for Bessel's Formula for 1869-70.
1872	[13]	Discussion of the Anemometrical Results at Bermuda from 1st April 1859 to 31st March 1863.

Year.	Page.	—
1873	[13]	Rainfall of the London District for Sixty Years, 1813-72. By G. Dines, F.M.S., with diagram.
"	[17]	Results of Observations taken at certain Stations of the Second Order in connection with the Meteorological Office, 1873.
1874	[13]	Results of Observations taken at Stations of the Second Order, 1874.
"	[26]	On the Winds at Liverpool, by W. W. Rundell.
1875	[1]	Observations taken at Nine Stations of the Second Order, 1875.
"	[89]	Mean Monthly Results for the seven Observatories for the Lustrum, 1871-75.
"	[123]	Particulars of Telegraphic Stations.
"	[126]	Mean Rainfall at Telegraphic Stations for the 5 Years, 1871-75.
"	[131]	" " " " " 10 Years, 1866-75.
"	[132]	Mean Barometrical Pressure at Telegraphic Stations for the 5 Years, 1871-75.
"	[132]	Mean Barometrical Pressure at Telegraphic Stations for the 10 Years, 1866-75.
"	[133]	Mean Temperature at Telegraphic Stations for the 5 Years, 1871-75.
"	[134]	Extreme Temperatures at Telegraphic Stations for the 4 Years, 1872-75.
1876	[13]	Report on the Reduction of Greenwich Curves for 1875 to a Common Standard with those of Kew (with 25 plates).
"	[20]	Results of Observations made at the Pagoda, Kew Gardens, to determine the Influence of Height on Temperature, &c. (4 plates). By R. H. Scott, F.R.S.
"	[39]	Comparison of Results obtained by means of the Harmonic Analyser, with similar Results got from Measurement and Numerical Calculation.
1877	[13]	On the Diurnal Range of Rainfall at the Seven Observatories in connection with the Meteorological Office, 1871-80. By R. H. Scott, F.R.S. (5 plates).
"	[35]	Report on Evaporimeters, by W. N. Shaw, M.A. (2 plates).
1878	[13]	On the Computation of the Quantity of Heat in excess of any Fixed Base Temperature, received at any place during the course of the Year, &c. By Lieut.-Gen. Strachey, R.E., F.R.S.
1879	[13]	Report on Experiments made at Strathfield Turgiss in 1869 with Thermometer Stands or Screens of various patterns, &c. By F. Gaster.
"	[41]	Report on Hygrometric Methods, &c. Part I. By W. N. Shaw, M.A.
1880	[13]	Report on Experiments made at the Kew Observatory with Thermometer Screens of different patterns during 1879, 1880 and 1881. By G. M. Whipple.
"	[19]	Tables and Diagrams illustrating the Diurnal Range of Barometric Pressure in the British Isles during the Years 1876-80. By F. C. Bayard, L.L.M. (5 plates.)

V.—REPORT OF THE METEOROLOGICAL COMMITTEE OF THE ROYAL SOCIETY.

Year.	Page.	—
1867	27	A Description of the Self-Recording Instruments recently erected by the Meteorological Committee of the Royal Society in various parts of the United Kingdom, with plates.
1869	25	Note upon a Self-registering Thermometer adapted to Deep-Sea Soundings, by W. A. Miller, M.D., Treasurer and V.P.R.S., extracted from Proceedings of Royal Society, vol. XVII., p. 482.
"	32	On the Principle of the Pantagraph, designed by F. Galton.
"	36	Description of a Self-Recording Rain-gauge, invented by Robert Beckley, of the Kew Observatory; made by James Hicks, London.
1870	31	Description of the Pantagraph, designed by Mr. Galton.
1871	24	" " Trace Computer, designed by Mr. Galton.
"	28	Summary of the Results obtained for Square 3 for January.
1872	27	A Summary of the Results obtained from the Discussion of the Information for Square 3, being the Region of the Doldrums in the Atlantic. By Capt. H. Toynbee, Marine Superintendent.
1873	26	Summary of the General Course of Action taken at the Meteorological Congress at Vienna in 1873.
1874	33	The International Maritime Conference.
1876-77	31	Index of the Information existing in the Office for the entire Ocean, with charts.

VA.—REPORT OF THE METEOROLOGICAL COUNCIL.

Year.	Page.	—
1877-78	21	Account of the Experiments on Atmospheric Electricity, conducted at Kew Observatory. By Prof. J. D. Everett.
1879-80	28	On the Effect of Sluggishness on the Readings of Marine Barometers on Shore, by Prof. Stokes, F.R.S.
"	32	Description of the Card Supporter for Sunshine Recorders adopted at the Meteorological Office, by Prof. Stokes, F.R.S.
"	43	On the Methods available for the Determination of the Humidity of the Atmosphere; by W. N. Shaw, M.A.
"	46	Memorandum as to the Employment of the Harmonic Analyser in the Meteorological Office, by Prof. Stokes, F.R.S.
1880-81	25	On the Working of the Harmonic Analyser (by Prof. Stokes)
"	27	Report on Fogs. (W. J. Russell.)
"	28	" " Hygrometers and Evaporimeters, presented to the Meteorological Council, May 10, 1881. (W. N. Shaw.)
"	31	Ad-interim Report on the Observation of Clouds of the "Cirrus" Type. (F. Gaster.)
"	33	Preliminary Report on the Photo-Nephograph. (W. de W. Abney.)

Year.	Page.	
1881-82	25	On Fogs. (W. J. Russell.)
"	25	Preliminary Report on Hygrometry. (W. N. Shaw.)
"	29	Report on the Results of a Tentative Reduction of a Year's Electrograms at the Kew Observatory. (G. M. Whipple.)
1882-83	27	On the Results obtained by the use of the Harmonic Analyser.
1884-85	22	Note on Work done with the Harmonic Analyser.
"	130	Maps showing information existing in the Office for the Ocean.
1885-86	22	Memorandum on Cloud Photography, by Prof. Stokes, F.R.S.
1886-87	21	On the Distribution of Gales round the Coasts of the British Isles, for the 15 years 1871-85.
"	23	Report on Occasional Telegrams received from Ben Nevis, by F. Gaster.
"	24	Report on the Daily Weather Messages received from the United States (via Paris) during the three months January to March, 1887, by F. Gaster.
1887-88	22	On the History of the Severe Storms which visited the British Isles between August 1, 1882, and September 3, 1883, as traceable from the Atlantic Charts published by the Office. By Robert H. Scott, F.R.S., Secretary.
"	26	Report on the severe partial Gales experienced on the Coasts of the British Islands during the 15 years 1871-85, by F. J. Brodie.
"	30	Abstract of Report on Hygrometric Methods, by W. N. Shaw, M.A., reprinted from the "Proceedings of the Royal Society," No. 262.
1888-89	22	Notes of some Results of an Examination of the Atlantic Charts published by the Office, by R. H. Scott, F.R.S., Secretary.
"	27	Memorandum on the Measurement of Squalls shown on the Traces yielded by Robinson Anemometers of the "Standard" Pattern, by R. H. Curtis.
1889-90	36	Note on Experiments on Pressure of Wind made by W. H. Dines, B.A.
"	46	Experiments with Violle's Actinometer Apparatus.
"	47	On the Work done with the Harmonic Analyser at the Meteorological Office.
1890-91	22	On Mr. Dines's Anemometer Experiments.
1891-92	23	On Anemometer Comparisons carried out by the aid of a Grant from the Meteorological Council by W. H. Dines, B.A.
1892-93	21	On the Construction of the Anemometer recently erected for trial on the roof of the Meteorological Office, by W. H. Dines, B.A.
"	27	On the Harmonic Analysis of Hourly Observations of Air Temperatures at British Observatories, by Lieut.-Gen. R. Strachey, F.R.S.
1893-94	20	Report on the Performance of the Pressure-Tube Anemometer on the Roof of the Meteorological Office, by R. H. Curtis.

VI.—HOURLY READINGS of the SELF-RECORDING INSTRUMENTS of
the OBSERVATORIES in connexion with the METEOROLOGICAL
OFFICE.

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1883	[1]	Constants of formulæ expressing the mean daily range of temperature obtained by the use of the Harmonic Analyser.
1884	[1]	Tables and formulæ to facilitate the computation of harmonic coefficients. By Lieut.-General Strachey, R.E.

APPENDIX XVI.

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

OFFICIAL.

- No. 1. Report of the Meteorological Committee for 1867. 1*s*.
2. Instructions for Meteorological Telegraphy. New Edition, 1891. Prepared for the use of observers exclusively.
3. Fishery Barometer Manual. (New edition, 1887.) 6*d*.
4. Charts showing the Surface Temperature of the South Atlantic Ocean in each Month of the Year. 2*s*. 6*d*.
5. Report of the Meteorological Committee for 1868. 5*d*.
6. Report of the Meteorological Committee for 1869. 10*d*.
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5*s*. each.
8. Barometer Manual. (Out of print. See Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5*s*. each.
10. Report of the Meteorological Committee for 1870. 10*d*.
11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2*s*. 6*d*.
12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2*s*. 6*d*.
13. A Discussion of the Meteorology of that Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February 1870. With Book of Charts, 5*s*.
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5*s*. each.
15. Report of the Meteorological Committee for 1871. 10*d*.
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5*s*. each.
17. Report of the Meteorological Committee for 1872. 1*s*.
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2*s*.
19. Quarterly Weather Report for 1873.—Parts I. to IV. 5*s*. each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20°—30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20*s*.
21. Report of the Proceedings of the Meteorological Congress at Vienna, 1873. 1*s*.
22. Report of the Meteorological Committee for 1873. 4*d*.
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2*s*.
24. Instructions in the Use of Meteorological Instruments. [Reprinted 1892.] (New edition in course of preparation.) 2*s*. 6*d*.
25. Quarterly Weather Report for 1874.—Parts I., II., and IV., 5*s*. each. Part III., 5*s*. 9*d*.
26. Report of the Meteorological Committee for 1874. 6*d*.

- 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. Contribution to the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger*. 1s.
29. Report of the Meteorological Committee for 1875. 4d.
30. Quarterly Weather Report for 1875.—Parts I.—IV. 5s. each.
31. Report of the Meteorological Committee for 1876-7. 3s. 5d.
32. The Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. With Book of Charts. 15s.
33. Quarterly Weather Report for 1876 (New Series).—Part I., 6s.; Parts II., III., and IV., 5s. each.
- *33A. Meteorological Observations at Stations of the Second Order for the year 1876.
- 33B. Meteorological Observations at Stations of the Second Order for the year 1877.
34. Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Vol. I.: Part I., 2s.; Part II., 10s.; Part III., 6s.; Part IV., 5s.; Part V., 6s.
35. Report of the Meteorological Council for 1877-8. 1s.
36. Report of the Proceedings of the Second International Meteorological Congress at Rome, 1879. 1s. 6d.
37. Report on the Meteorology of Kerguelen Island. By Rev. S. J. Perry, S.J., F.R.S. 3s.
38. Report of the Meteorological Council for 1878-9. 5d.
39. Meteorological Observations at Stations of the Second Order for the year 1878. 20s.
40. Aids to the Study and Forecast of Weather, by W. Clement Ley, M.A. 1s.
41. Report of the Meteorological Council for 1879-80. 1s.
42. Report of the Meteorological Council for 1880-81. 1s. 2d.
43. Meteorological Charts for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Charts, 25s.; Remarks, 7s.
44. Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope, between Lat. 30° and 50° S., and Long. 10° and 40° E., by Capt. H. Toynbee, F.R.A.S. 7s. 6d.
45. Meteorological Observations at Stations of the Second Order for the year 1879. 20s.
46. Report on the Storm of October 13-14, 1881. By Robert H. Scott, F.R.S. 1s. 6d.
47. Rainfall Tables of the British Isles for 1866-80. Compiled by G. J. Symons, F.R.S. 7s. 6d.
48. Report of the Meteorological Council for 1881-2. 1s.
49. Quarterly Weather Report for 1879. (New Series.) Parts I., II., and III., 6s. each; Part IV., 5s. 6d. Appendices and Plates. 27s.
50. Quarterly Weather Report for 1880. (New Series.) Parts I. and II., 6s. each; Part III., 4s.; Part IV., 6s. Appendices and Plates. 28s.

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

LIST OF PUBLICATIONS, &c.—continued.

- No. 51.* Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1881. (New Series.) Part I., 10s. 6d. Parts II., III., and IV., 21s. each.
52. Quarterly Weather Report for 1877. (New Series.) Part I., 10s.; Part II., 5s.; Part III., 4s. 6d.; Part IV., 6s. Appendices and Plates. 27s.
53. Meteorological Atlas of the British Isles. 5s. 6d.
54. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1882. Parts I. and II., 20s. each; Part III., 22s. 6d.; Part IV., 26s.
55. Quarterly Weather Report for 1878. (New Series.) Parts I., II., III., and IV., 6s. each. Appendices and Plates. 28s.
56. Sunshine Records of the United Kingdom for 1881. 4s.
57. Meteorological Observations at Stations of the Second Order for the year 1880. 34s. 6d.
58. Report of the Meteorological Council for 1882-3. 10½d.
59. Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. 21s.
60. Principles of Forecasting by means of Weather Charts. By the Hon. Ralph Abercromby, F.R.Met.Soc. (Second edition.) 2s.
61. A Barometer Manual for the Use of Seamen. (Second edition.) 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 from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1883. Parts I., II., and III., 21s. each; Part IV., 30s.
64. Report of the Meteorological Council for 1883-4. 1s. 2d.
65. Monthly Weather Reports for 1885. Jan. to Dec., 1s. 6d. each.
66. Meteorological Observations at Stations of the Second Order for the year 1881. 35s.
67. Report of the Meteorological Council for 1884-5. 4s. 4d.
68. Monthly Weather Reports for 1886. Jan. to Dec., 1s. 6d. each.
69. Meteorological Observations at Stations of the Second Order for the year 1882. 35s.
70. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1884. Part I., 12s.; Part II., 10s.; Part III., 10s. 6d.; Part IV., 15s.
71. Synchronous Weather Charts of the North Atlantic and the adjacent Continents. Aug. 1, 1882, to Sept. 3, 1883. Parts I. to IV. (33 sheets each.) 17s. each.
72. Report of the Meteorological Council for 1885-86. 8d.
73. Meteorological Observations at Stations of the Second Order for the year 1883. 30s.
74. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1885. Parts I. and II., 11s. each; Part III., 10s. 6d. Part IV., 12s.

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

- No. 75. Report of the Meteorological Council for 1886-87. 8*d*.
 76. Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. 10*s*. 6*d*. Supplementary Chart, 6*d*.
 *77. Monthly Weather Reports for 1887. January to April, 1*s*. 6*d*. each. May to December, in wrapper, 12*s*.
 78. Meteorological Observations at Stations of the Second Order for the year 1884. 32*s*.
 79. Report of the Meteorological Council for 1887-88. 1*s*.
 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. 10*s*.
 81. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1886. Parts I., II., and III., 10*s*. 6*d*. each. Part IV., 12*s*. 6*d*.
 82. Meteorological Observations at Stations of the Second Order for the year 1885. 31*s*.
 83. Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers and the Army Medical Department. 1852-1886. 23*s*.
 84. Report of the Meteorological Council for 1888-89. 5½*d*.
 †85. Weekly Weather Report for the year 1888. Vol. V. Second Series. 4*d*. per week. With Appendices and Monthly Supplements, priced separately.
 86. Weekly Weather Report for the year 1889. Vol. VI. Second Series. 6*d*. per week. With Appendices and Monthly Supplements, priced separately.
 87. Weekly Weather Report for the year 1890. Vol. VII. Third Series. 6*d*. per week. With Appendices and Monthly Supplements, priced separately.
 88. Meteorological Observations at Stations of the Second Order for the year 1886. 25*s*.
 89. Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo. 1886-88. By the late W. Reid, M.D. 8*s*. 6*d*.
 90. Cyclone Tracks in the South Indian Ocean. From information compiled by Dr. Meldrum, C.M.G., F.R.S. 7*s*.
 91. Report of the Meteorological Council for 1889-90. 7½*d*.
 92. Meteorological Charts of the portion of the Indian Ocean adjacent to Cape Guardafui and Ras Hafún. 6*s*.
 93. Harmonic Analysis of Hourly Observations of Air Temperature and of Pressure at British Observatories. 12*s*.
 94. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1887. 16*s*.
 95. Meteorological Observations at Stations of the Second Order for the year 1887. 24*s*.
 96. Weekly Weather Report for the year 1891. Vol. VIII., Third Series. 6*d*. per week. With Appendices and Monthly Supplements, priced separately. Annual subscription, including Supplements and Appendices, post paid 30*s*.

* Publication continued after this year as a Supplement to the Weekly Weather Report.

† The publication of the Weekly Weather Report began in February 1878. Annual subscription, 1878-1883, 12*s*. 6*d*.; 1884-1887, 21*s*. 2*d*.

LIST OF PUBLICATIONS, &c.—continued.

- No. 97. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1888. 20s.
98. Ten Years Sunshine in the British Isles, 1881-90. 2s.
99. Report of the Meteorological Council for 1890-91. 5½d.
100. Weekly Weather Report for the year 1892. Vol. IX., Third Series. 6d. per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, Post paid, 30s.
101. Meteorological Observations at Stations of the Second Order for the year 1883. 22s.
102. Report of the International Meteorological Conference at Munich in 1891. 1s. 6d.
103. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1889. 15s.
104. Report of the Meteorological Council for 1891-92. 6d.
105. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1890. 20s.
106. Meteorological Charts of the Red Sea. 21s.
107. Weekly Weather Report for the year 1893. Vol. X., Third Series. 6d. per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30s.
108. Meteorological Observations at Stations of the Second Order for the year 1889. 34s.
109. Report of the Meteorological Council for 1892-93. 8d.
110. Meteorological Observations at Stations of the Second Order for the year 1890. 34s.
111. Weekly Weather Report for the year 1894. Vol. XI., Third Series. 6d. per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30s.
112. Report of the Meteorological Council for 1893-94. 7½d.
113. Hourly Means of the Readings obtained from the Self-recording Instruments at the Five Observatories under the Meteorological Council, 1891. 32s. 6d.
114. Rainfall Tables of the British Isles for 1881-90. (In the Press.)
115. Report of the Meeting of the International Meteorological Committee at Upsala, 1894. 1s.
116. Weekly Weather Report for the year 1895. Vol. XII., Third Series. 6d. per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30s.
117. Meteorological Observations at Stations of the Second Order for the Year 1891. (In the Press.)
118. Hourly Means of the Readings obtained from the Self-recording Instruments at the Five Observatories, for the year 1892. (In the Press.)
119. Report of the Meteorological Council for 1894-95.
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NON-OFFICIAL.

- No. 1. Report of an Inquiry into the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6*d*.
 2. Report to the Committee of the Meteorological Office on the Meteorology of the North Atlantic.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s*.
 3. Report to the Committee of the Meteorological Office on the Use of Isobaric Curves.—By Captain H. Toynbee, F.R.A.S., 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 First International Meteorological Congress at Vienna for 1874. 1*s*. 6*d*.
 10. On the Physical Geography of the part of the Atlantic which lies between 20° N. and 10° S. and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875.—By Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1*s*. 6*d*.
 11. Report of the Permanent Committee of the First International Congress at Vienna for 1876. With Supplement. 2*s*.
 12. Reports to the Permanent Committee of the First International Meteorological Congress at Vienna on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2*s*.
 13. Report of the Permanent Committee of the First International Congress at Vienna for 1878. 6*d*.
 14. Report of the International Meteorological Committee. Meeting at Berne, 1880. 1*s*.
 15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen, August 1882. 2*s*. 6*d*.
 16. Report of the Third Meeting of the International Meteorological Committee, held at Paris, September 1885. 1*s*.
 17. Report of the Fourth Meeting of the International Meteorological Committee, held at Zürich, September 1888. 4*d*.
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