

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

For the Year ending 31st of March 1887.

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



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1888.

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THE METEOROLOGICAL COUNCIL,

1886-87.

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

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

R E P O R T

OF THE

M E T E O R O L O G I C A L C O U N C I L

TO THE

ROYAL SOCIETY,

For the Year ending March 31, 1887.

No change has taken place in the Council during the year, and its executive officers continue as before :—

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

Captain H. Toynbee, F.R.A.S., Marine Superintendent.

Navigating-Lieutenant C. W. Baillie, F.R.A.S., Assistant do.

The present Report is as usual arranged under three headings :—

I. Ocean Meteorology.

II. Weather Telegraphy.

III. Land Meteorology of the British Isles.

PART I.

OCEAN METEOROLOGY.

Collection of Information.—The practice followed by the Office as regards its dealing with observers at sea has not been changed, and is described in former Reports. Collection of information.

Appendix I. (p. 31) contains a list of all the observers who have contributed "excellent" logs during the past year. Some of them have regularly co-operated with the Office for many years; the names which now appear in the list for the first time are as follows :— Recognition of "excellent" observers.

Captain's Name.	Ship.
Barrett, T. - - -	" Craighburn."
Baxter, A. S. - - -	" City of York."
*Blackburne, Mr. H. I. - - -	S.S. " Brindisi."
Bright, H. - - -	" Beltana."
Chaddock, G. A. - - -	" Elissa."
Crichton, A. T. - - -	S.S. " Colina."
Crowley, C. - - -	" Lucia."
Dawson, Comr. L. S., R.N. - - -	H.M.S. " Sylvia."
Douglas, Lieut. H. H., R.N. - - -	Do.
Draper, R. - - -	S.S. " Monarch."

* Chief Officer.

Captain's Name.	Ship.
*Evans, Mr. E. J. - - -	S.S. "Tainui."
Gray, H. W. - - -	"Pleione."
King, J. W. - - -	"Philomene."
*Lancaster, Mr. C. - - -	S.S. "Germanic."
Machugh, R. H. - - -	S.S. "Ching-Wo."
Smith, Sub.-Lient. F. Bowden, R.N. -	H.M.S. "Myrmidon."
Trunks, H. - - -	"Aldborough."
West, F. - - -	S.S. "Port Adelaide."
Williams, H. - - -	"Dynomene."

The Council regret to have to record the death of Captain T. Barrett, Mr. R. Ladd, F.R.A.S., and Captain J. Smith, who were "excellent" observers.

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

The following is the total number of logs received from April 1, 1886, to March 31, 1887, and the number of logs which have been classed as "excellent":—

Total No. of Logs received.	No. of Excellent Logs.	Per-centage of Excellent Logs.
182	129	70

The average number of logs received annually during the five years, 1881–85, was 170, and the per-centage of excellent logs among these was 73.

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

Districts from
which obser-
vations are
obtained.

On the 31st of March 1887 the ships observing for the Office were pursuing the following voyages:—

To Baffin's Bay or Greenland	-	-	-	5
„ North America, East Coast	-	-	-	9
„ „ „ West „	-	-	-	9
Off East Coast of North America	-	-	-	4
To South America, East Coast	-	-	-	9
„ „ „ West „	-	-	-	1
„ Australia and New Zealand, viâ Cape of Good Hope	-	-	-	32
„ „ „ „ Suez	-	-	-	4
„ India, viâ Suez	-	-	-	7
„ India, viâ Cape of Good Hope	-	-	-	28
„ China Seas, viâ Cape of Good Hope	-	-	-	2
„ „ „ Suez	-	-	-	5
„ West Coast of Africa	-	-	-	1
„ Mediterranean Ports	-	-	-	2
„ Cape of Good Hope	-	-	-	3
„ West Indies	-	-	-	11
Between British Ports	-	-	-	6
Unknown	-	-	-	5
Total number of ships	-	-	-	143

Appendix II. (p. 34) supplies a list of the logs and of all the documents from stations abroad received at the Office during the year.

North Atlantic Weather Charts.—The investigation of the weather over the North Atlantic Ocean for the 13 months, beginning August 1st, 1882, and ending August 31st, 1883, the period during which the International System of Circumpolar Observations was carried out, has continued, during the interval covered by this Report, to employ nearly the whole Marine Branch of the Office, and steady progress has been made with the work. Nearly 3,000 ships co-operated, and 11,236 forms have been received, yielding an average of 864 for each of the 13 months, and upwards of 400 observations for each day. These figures are exclusive of the returns from land stations, which number about 300, so that there are in all about 700 sets of observations for each day. As seven of the circumpolar stations fell within the limits of the area dealt with (30° E. to 120° W.), their observations have been incorporated, and have rendered the charts for the higher latitudes far more complete than they would otherwise have been.

The principal features of the method adopted for carrying out the investigation, with specimen charts, will be found at pp. 8–10 of the Report for 1883. The series of these daily charts is published on a reduced scale in pairs, one chart representing the pressure and wind, the others the air and sea temperature, for each day, together with the record of weather (rain, &c.) which is reproduced on each chart, and the first two parts of this publication, containing 66 sheets, have already appeared. The charts for three consecutive days appear on each sheet.

The labour and time occupied in preparing the charts, and in carrying out this investigation, have been very great, and it is confidently hoped that the value of the results obtained from it will more than justify the expenditure which has been incurred.

The following statement shows the stage at which the work had arrived by the end of March 1887:—

The charts for April were in the lithographer's hands, and those for May were almost ready to be forwarded to him.

The reduced drawings from which the lithographed charts are produced, by the help of photography, have now to be prepared for the three remaining months, June, July, and August 1883, but beyond this there remains but little to be done to complete the work.

Red Sea Charts.—As the Atlantic work has advanced towards completion, the discussion of the Meteorology of the Red Sea has been taken up. Specimen charts for two months have been drawn, illustrating the barometrical pressure, the air and sea temperature, the winds, the currents, and the specific gravity of the sea.

In order to render these charts as complete as possible application has been made for additional information to the Admiralty, the Royal Meteorological Institute of the Netherlands, and the Peninsular and Oriental Steamship Company.

The request was cordially granted in each case, and the results of a preliminary comparison of the charts prepared from each

Red Sea charts. source of information separately, has shown that there exists a most satisfactory accordance between them, so that the observations may be at once combined for the final charts.

The tracks of steamers through the Red Sea are confined to such a narrow strip that it has been thought best to represent the instrumental data by curves along the margins of the chart, while the winds and currents are shown in position on the sea.

Pressure charts. *Charts of Barometric Pressure for the Atlantic, Pacific, and Indian Oceans.*—These charts, which were referred to in late Reports are still in the hands of the engraver, they are, however, in an advanced state, and will probably be ready for issue in the course of the summer.

Current charts. *Current Charts for the Atlantic, Pacific, and Indian Oceans.*—These charts (*see* Report, 1886, p. 8) are in progress; numerous observations contained in the Office logs have been dealt with, and the plotting of the currents in the Pacific Ocean for the months of February, May, and August have been completed. The paucity of data, more especially for the central part of the Pacific, is severely felt, and the Office has applied to several of the large steamship companies for the loan of the logs of their steamers, and the ready response with which the request has been met, leads the Office to expect that it will obtain much valuable material for the construction of the charts. The currents in the China Sea, as also along the west coasts of North and South America, are fairly represented.

Special attention has been directed to the currents, temperature of the sea and air, wind, weather, and the direction of the sea or swell, in the neighbourhood of Cape Guardafui during the South-west Monsoon, in the months of June, July, and August, these being the months in which the greatest number of casualties to shipping are reported to have occurred in this locality. The whole of the above elements are shown on large-scale charts, but it is feared that the result of the investigation will disprove the assertions that have been made that the differences in the meteorological conditions over different areas near this dangerous point are sufficiently marked to serve as a complete guide to the seaman. Northwards of Cape Guardafui, in the months referred to, the rise in temperature of the sea surface is very decided, but the reports received, stating that warm water (80° and upwards) is not found to the southward of the Cape, do not appear to be confirmed.

Charts of the Aden cyclone. *The Aden Cyclone of June 1885.*—At the suggestion of Dr. Meldrum, of the Mauritius, the Council are collecting from all available sources information as to the weather over the North Indian Ocean in the month of June 1885, in order to prepare synchronous charts of that ocean for the space of about one month, with the hope of throwing some light on the causes which gave rise to this storm, and to its unusual course across the Arabian Sea, and in entering the Gulf of Aden.

Instruments belonging to the Office. *Supply and Stock of Instruments.*—In Appendix III. (p. 48) will be found a list of the meteorological instruments supplied by

the Office to ships in the Royal Navy during the year, with a statement of the entire stock and distribution of instruments standing on the books, to the account of the Admiralty, on the 31st March 1887.

Instruments belonging to the Office.

Appendix IV. (p. 49) gives similar information with regard to the disposal of the other instruments belonging to the Office, which are mainly supplied to the Mercantile Marine.

PART II.

WEATHER TELEGRAPHY.

The service has been conducted without any serious interruption to its efficiency during the year.

The Council have to regret the death of Mr. D. MacDonald, who had been their observer at Stornoway for four years. At Prawle Point there has also been a change, owing to the promotion of Mr. John, who has been the reporter for six years.

A list of the telegraphic reporters will be found in Appendix V. (p. 50).

Inspection of the Telegraphic Reporting Stations.—The telegraphic reporting stations have been inspected during the year, in England (including Jersey and the Isle of Man) by the Rev. W. Clement Ley; in Scotland by Mr. Buchan; and in Ireland and Wales by Mr. Scott. The reports submitted by the Inspectors to the Council, which are printed in Appendix VI. (p. 51), show that the efficiency of the service has been fairly maintained.

Inspection of the stations.

Discussion and Publication of the Information received.—A description of the practice of the Office in the collection, discussion, and dissemination of the meteorological information received by telegraph is given in Appendix VII. (p. 65). A list of the institutions and persons who received the Daily Weather Reports and Charts free of cost in 1886-7 forms Appendix VIII. (p. 76).

Discussion of the reports.

Weather Forecasts.—There has been no material change in the system of preparation and issue of the forecasts during the year.

Forecasts.

Forecasts are prepared three times a day, at 11h. a.m., and at 3h. 30m., and 8h. 30m. 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 day following, and are publicly posted up in several places in London,* and supplied to the afternoon editions of the news-

* Viz., in the City, at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's, Cornhill, and Messrs. Thos. de la Rue & Co.'s, Bunhill Row; in the West End, in the Libraries of the House of Lords and House of Commons, at Messrs. Elliot's, St. Martin's Lane; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; and Messrs. Pastorelli's, New Bond Street.

papers. The forecasts prepared at 8h. 30m. p.m. are intended primarily for the newspapers, but any of the forecasts are available for the information of persons requiring them.

Inquiries at the Office.

The inquiries received through the Post Office for special forecasts during the year amounted to 53, and the personal applications to 33. The rules of the Office relating to such inquiries continue the same as in previous years, and are given in Appendix VII. (p. 75).

Testing of the forecasts.

The results of a comparison of the Forecasts issued at 8 p.m. during the year with the weather actually experienced is given in Appendix XI. (p. 82), and the following summary of successes and failures, estimated in the manner explained in that Appendix, shows that the average of success over the whole United Kingdom has been 81 per cent., the figure being slightly lower than that for the previous year, 83 per cent.

The district for which the forecasts have been least successful is Scotland, West. The same fact has been noticed during the last three years.

SUMMARY OF RESULTS of 8 p.m. FORECASTS, 1886.

Districts.	Percentages.				Total percentage of Success.
	Complete Success.	Partial* Success.	Partial* Failure.	Total Failure.	
SCOTLAND, N. - -	51	31	11	6	82
„ E. - -	52	29	12	7	81
ENGLAND, N.E. - -	52	32	10	6	84
„ E. - -	49	33	11	6	82
MIDLAND COUNTIES -	48	35	11	6	83
ENGLAND, S. - -	50	32	11	7	82
SCOTLAND, W. - -	42	33	13	11	75
ENGLAND, N.W. - -	48	32	12	8	80
„ S.W. - -	48	31	12	9	79
IRELAND, N. - -	48	34	10	7	82
„ S. - -	47	34	10	9	81
Summary - -	49	32	11	8	81

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

Hay Harvest Forecasts.

Hay Harvest Forecasts.—The Council renewed in 1886 the offer made in the four previous years to the Royal Agricultural Society, the Royal Dublin Society, and the Highland Society to send daily Forecasts *gratis* during the hay season to a number of observers selected by the Councils of those Societies, on the two conditions, that the information should be made known as widely as possible, and that a record should be kept of the weather experienced and be sent in weekly to the Office. The Societies again

cordially accepted the proposal, and the following list of recipients was prepared:—

Hay Harvest
Forecasts.

LIST of those who received HAY HARVEST FORECASTS
in 1886.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass - Major Smith -	Golspie. Munlochy, Inverness.
1. SCOTLAND, E.	G. Johnstone - W. S. Macdonald - A. F. Leslie - C. W. L. Forbes -	Glamis, by Forfar. Craigielaw, Longniddry. Braco, Keith. Aberfeldy.
2. ENGLAND, N.E.	J. Wilson - J. Turner -	Chillingham Barns, Belford, Northumberland. The Grange, Ulceby.
3. ENGLAND, E.	W. Birkbeck - Sir J. B. Lawes, Bt., and J. H. Gilbert, Ph.D.	High House, Thorpe, Norwich. Rothamsted, Harpenden.
4. MIDLAND COUNTIES	Royal Agricultural College. E. E. Harcourt-Vernon	Cirencester. Grove Hall, East Retford.
5. ENGLAND, S.	C. Whitehead - E. P. Squarey - G. M. Allender -	Barming House, Maidstone. The Moot, Downton, Wilts. Stammerham, Horsham.
6. SCOTLAND, W.	W. Calder - M. J. Stewart - J. S. R. Ballingal -	Castle Hill, Dalreoch, Dum- barton. Ardwell, Stranraer. Eallabus House, Islay.
7. ENGLAND, N.W.	G. W. Wray - The Earl of Derby - The Lord Egerton of Tatton.	Leyburn, Yorkshire. Knowsley Hall, Prescott. Tatton Park, Knutsford.
8. ENGLAND, S.W.	Colonel J. B. Turbervill The Earl of Ducie - T. Dyke - R. Neville-Grenville -	Ewenny Priory, Bridgend, Glamorganshire. Whitfield, Falfield, R.S.O. Long Ashton, Clifton, Bristol. Butleigh Court, Glastonbury.
9. IRELAND, N.	Rev. A. Brown - E. F. Farrell -	The Manse, Hollymount, Co. Mayo. Moynalty, Co. Meath.
10. IRELAND, S.	D. A. M'Cready - D. A. Milward - W. Talbot Crosbie, D.L.	Larchvale, Moneygall, King's Co. Lavistown, Kilkenny. Ardfert Abbey, Tralee, Co. Kerry.

The issue of the forecasts commenced June 17th with those for England, E., the Midland counties, and England, S., and later those for other districts were added. The forecasts were issued daily (excepting on Sundays), and in most instances they were continued for about five weeks.

Hay Harvest
Forecasts.

The general result of this repetition of the issue of these forecasts, which began in 1879, is shown by the subjoined table, which has been compiled solely from the reports of the above-mentioned gentlemen, and is entirely independent of any estimate formed within the Office itself:—

SUMMARY OF RESULTS. HAY HARVEST FORECASTS, 1886.

Districts.	Names of Stations.	Percentages.				Total percentage of Success.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
SCOTLAND, N.	Golspie and Munlochy - - -	62	24	11	3	86
" E.	Braco, Glamis, Aberfeldy, and Longmaddy.	46	41	7	6	87
ENGLAND, N.E.	Belford and Uleeby - - -	52	33	14	1	85
" E.	Thorpe and Rothamsted - -	47	42	9	2	8
MIDLAND COUNTIES	Cirencester and East Retford - -	43	39	18	—	82
ENGLAND, S.	Horsham, Maidstone, and Downton -	49	38	12	1	87
SCOTLAND, W.	Dumbarton, Islay, and Stranraer -	66	20	13	1	86
ENGLAND, N.W.	Leyburn, Prescot, and Knutsford -	57	27	14	2	84
" S.W.	Bridgend (Glanorgan), Falfield, Clifton, and Glastonbury.	57	26	14	3	83
IRELAND, N.	Moynalty, and Hollymount - -	48	26	14	12	74
" S.	Moneysgall, Kilkenny, Ardferf Abbey -	54	31	13	2	85
Mean for all districts, 1886 - -		53	31	13	3	84
" " 1885 - -		56	26	15	3	82

The result of this year's checking shows that the general percentage was a little higher than in the preceding year. The largest general per-centage (89) was reached in England, E while the smallest (74) was in Ireland, N.

Independent testimony as to the correctness of the forecasts during the summer of 1886, and as to their value to, and appreciation by, the agricultural community was borne by Major Smith, Mr. Stewart, and Mr. Johnstone in Scotland, Mr. McCready in Ireland, and Mr. Birkbeck in England.

In addition to the gentlemen who acted as recipients of these forecasts in 1886, and whose names are given on page 11, six large landowners residing in different parts of the country applied for and received the forecasts at their own expense.

Storm warn-
ings.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix X. (p. 80) will be found the names of the stations which are furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade issued in February 1874.

Hay Harvest
Forecasts.

The general result of this repetition of the issue of these forecasts, which began in 1879, is shown by the subjoined table, which has been compiled solely from the reports of the above-mentioned gentlemen, and is entirely independent of any estimate formed within the Office itself:—

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Districts.	Names of Stations.	Percentages.				Total percentage of Success.
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" E.	Braco, Glamis, Aberfeldy, and Longniddry.	46	41	7	6	87
ENGLAND, N.E.	Belford and Ulceby - - -	52	33	14	1	85
" E.	Thorpe and Rothamsted - - -	47	42	9	2	8
MIDLAND COUNTIES	Cirencester and East Retford - - -	43	39	18	—	62
ENGLAND, S.	Horsham, Maidstone, and Downton - - -	49	38	12	1	87
SCOTLAND, W.	Dumbarton, Islay, and Stranraer - - -	66	20	13	1	86
ENGLAND, N.W.	Leyburn, Prescott, and Knutsford - - -	57	27	14	2	84
" S.W.	Bridgend (Glamorgan), Falfield, Clifton, and Glastonbury.	57	26	14	3	83
IRELAND, N.	Moynalty, and Hollymount - - -	48	26	14	12	74
" S.	Moneygall, Kilkenny, Ardfer Abbey - - -	54	31	13	2	85
Mean for all districts, 1886 - - -		53	31	13	3	84
" " 1885 - - -		56	29	15	3	82

The result of this year's checking shows that the general percentage was a little higher than in the preceding year. The largest general per-centage (89) was reached in England, E while the smallest (74) was in Ireland, N.

Independent testimony as to the correctness of the forecasts during the summer of 1886, and as to their value to, and appreciation by, the agricultural community was borne by Major Smith, Mr. Stewart, and Mr. Johnstone in Scotland, Mr. McCreedy in Ireland, and Mr. Birkbeck in England.

In addition to the gentlemen who acted as recipients of these forecasts in 1886, and whose names are given on page 11, six large landowners residing in different parts of the country applied for and received the forecasts at their own expense.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix X. (p. 80) will be found the names of the stations which are furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade issued in February 1874.

Storm warn-
ings.

These stations were, at the end of March 1887, 141 in number, Storm warn
ings.
situated:—

69 in England, 14 in Wales, 39 in Scotland, 15 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

The usual comparison has been instituted in the Office between the warnings issued in 1886 and the weather experienced on our coasts, the warnings being tested by the method explained in Appendix VII. (p. 65). The results of the comparison are shown in the following tables:—

RETURN of the Result of the Comparison between the Warnings issued and the
Weather experienced in 1886.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent Gales. Force 8 and upwards.	Warnings justified by subsequent strong Winds. Force 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.
Ireland, South -	61	35	13	10	—	3	April 7.
" East -	76	33	28	14	—	1	—
Scotland, East -	56	38	7	9	1	1	May 15, June 15,* Dec. 8.†
" West -	59	30	11	17	—	1	—
England, North-west -	67	40	13	13	1	—	Jan. 13, Nov. 6.
" West -	51	24	22	5	—	—	Jan. 13.
" South-west -	48	26	18	3	1	—	Dec. 12.
" South -	50	33	12	5	—	—	Jan. 30, Sep. 27, Dec. 12.
" South-east -	36	17	12	7	—	—	Dec. 12.
" East -	38	24	10	3	—	1	—
Totals -	542	300	146	86	3	7	
Per-centages -	—	55·3	26·9	15·9	0·6	1·3	

* This gale was not felt south of Aberdeen.

† The northern part of the district was warned in time, but for the southern part the warnings were too late to be of any value.

NOTES, as to the GALES for which WARNINGS were not issued
in 1886.

January 13th, England, N.W. and W.—At 6 p.m. 12th there was a large depression in the far N., passing away to the eastward, and moderate to fresh Westerly breezes prevailed over the British Isles. In the night, however, a subsidiary disturbance was developed over the North Sea, causing North-westerly gales on the coast named. It is not seen how this was to be foretold from the information available.

January 30th, England, S.—This gale was "strong" in the Solent only. It was caused by the extension of a large depression in the far N., and was increased by a small and very shallow subsidiary system which came up the Channel. Perhaps this latter deserved more attention than it received.

April 7th, Ireland, S.—The depression causing this gale advanced so rapidly, that it is remarkable that the signals did not fail on more of the coasts. At 6 p.m. 6th, the barometer was still rising, even at Valencia, and there was nothing but an

unreliable "cirrus" observation at Valencia to show that any depression was approaching.

May 15th, Scotland, E.—North-westerly and Northerly gale, caused by the spreading westwards of an apparently unimportant depression which was moving northwards over the North Sea, and a simultaneous temporary rise of the barometer in the N.W. Only one station (Aberdeen) reported force 9, and even there the anemometer registered only 42 miles per hour.

June 15th, East of Scotland, northern part.—A moderate gale from W. was already blowing in this region at 8 a.m. 15th, and as the barometer had begun to rise, it was anticipated that the depression in the far N. was passing off and that no stronger wind would be experienced. In the end, however, this proved to be an error.

September 27th, England, S.—Very similar to that of January 30. Caused by the spreading southwards of a gale which had been duly warned for in the more northern regions. It was "strong" in the Solent only. Strong squally breezes had been anticipated and forecasted.

November 6th, England, N.W.—This gale was caused by the sudden deepening of a depression which had been formed over Ireland early on the 6th. There was no gale at 6 p.m. 5th, and by 8 a.m. next day it was too late to warn this coast. Our other coasts were warned in time.

December 8th, Scotland E. (south of Moray Firth).—The depression which caused this gale was exceptionally deep; had it not been so this coast would not have suffered. Although the observations at 6 p.m. 7th showed no gale, all our other coasts were successfully warned.

December 12th, England, S.W., S., and S.E.—West-south-westerly gale caused by the development of a depression over the North Sea early on 12th. Of this there was no indication whatever at 6 p.m. on 11th.

Comparison of
results for
1886 with
previous years.

The following table contains a comparative statement of the storm warnings and their results in 1886, and in the ten preceding years. It will be seen that the percentage of warnings justified is 3 per cent. higher than in the preceding year:—

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
1876	265	61·1	21·5	82·6	11·7
1877	475	53·3	25·9	79·2	16·4
1878	485	56·7	20·8	77·5	17·9
1879	509	50·5	25·1	75·6	20·6
1880	390	58·2	24·6	82·8	13·3
1881	454	58·6	23·3	81·9	14·8
1882	503	61·4	21·1	82·5	14·9
1883	610	56·2	21·6	77·8	20·8
1884	461	66·4	20·0	86·4	12·1
1885	591	55·3	24·0	79·3	19·5
1886	542	55·3	26·9	82·2	15·9

The Prevalence of Gales on different Parts of the Coast.—At the suggestion of the Hydrographer tables giving the relative frequency of gales in the four quadrants respectively (N. to E., E. to S., &c.) on different districts of the coast, accompanied by illustrative diagrams, have been prepared. The tables refer to the period of 15 years, 1871–1885. An abstract is given in Note A, p. 21.

Fishery Barometers.—In connexion with the subject of storm warnings the supply of public barometers to fishing stations and other places on the coast may be mentioned. The whole number of stations supplied with these instruments by the Office is at present 169, being the same as in the previous years. Of these stations, 60 are in England, 5 in Wales, 46 in Ireland, 54 in Scotland, 3 in the Isle of Man, and 1 in Jersey. The list is given in Appendix IX., p. 79.

A new edition of the Barometer Manual, designed for the information of the classes who will have access to the fishery barometers, is now under preparation.

Observations on Ben Nevis.—The arrangements with the Directors of the observatory established on the summit of Ben Nevis, at a height of 4,000 feet above the sea, detailed in the Report for 1885, have been continued during the year. The Council have continued the annual grant of 100*l.* towards the expenses of the observatory, and have received MS. copies of all the meteorological observations taken, and in addition occasional telegrams, 19 in number. A report on the practical value of these telegrams as aids to the service of forecasting, will be found in Note B., p. 23.

Atlantic Telegrams.—The service of occasional ship reports of storms met with west of the meridian of 45° W. was continued during the first half of the year, but in the month of November the new daily service, indicated in the last Report, was commenced. These telegrams give a general summary of the principal features of the atmospherical conditions over the United States, supplemented by ship reports.

The service is still carried on conjointly by the Central Meteorological Office in Paris and the Meteorological Council, the telegrams are received in Paris, and their contents are, for the present, transmitted to London by post. As in previous years, the collection of the information and transmission of the telegrams is undertaken by the Chief Signal Office, Washington, whose staff in New York and Boston are charged with the execution of the duty. A report on the results of this service during the three months January to March 1887, will be found at Note C., p. 24.

Weather Reports.—The Daily Weather Report has appeared regularly, and has been largely added to, and its general arrangement improved. For details, see Appendix VII., p. 69. The Weekly Weather Report has appeared in its enlarged form, as explained in the last Report, and has been further improved by the addition since 1st January 1887, of four new columns on the first page of

Publications. each report, giving the difference between the weekly values for Accumulated Heat and Rainfall, and the means for the corresponding periods during the eight years 1878-85. The Quarterly Summary, issued as Appendix I., gives the Weekly and Progressive values of the same elements for all the districts in each month of the current year—in continuation of the Tables published in Appendices I. and II. for 1884, while Appendix II. gives the Weekly and Progressive values for Accumulated Heat, Rainfall and Bright Sunshine during the two years 1885 and 1886 (in continuation of Appendix II. for the year 1884), and Appendix III. gives the *Mean* Weekly values for the following number of years:—

Accumulated Heat and Rainfall, 8 years, 1878 to 1885.
Bright Sunshine - - - 5 „ 1881 „ 1885.

The Monthly Weather Report has also appeared regularly.

Simultaneous observations. *Simultaneous Observations.*—The Office has continued its co-operation in the system of simultaneous observations, taken once in every 24 hours, which was organised in 1874, at the request of the Chief Signal Officer of the United States.

The list of observers on this system at land stations for 1886 is given in Appendix XII., p. 87.

A form for the entry of the simultaneous observations is bound up with every ship's log issued by the Office. In previous Reports it has been stated that the Lords Commissioners of the Admiralty had, at the request of the Council, issued instructions for these observations to be taken (in addition to those made by the Service Regulations) on board each detached ship-of-war on foreign service; or, in the case of a squadron acting together, on board the ship of the senior officer. The number of these observations which have been received during the year from the Royal Navy has been 7,740, and from the Mercantile Marine, 6,570.

PART III.

LAND METEOROLOGY OF THE BRITISH ISLES.

Observatories and Stations.—Records of the climate of the British Isles are received by the Office from certain stations with different degrees of fulness of organisation, which may be arranged in five classes.

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

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

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

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

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

A continuous record of the amount of bright sunshine is also received from 35 stations in the British Isles, some of which are first or second order stations, whilst from others the sunshine record is alone received. See p. 96. Sunshine stations.

A fuller account of these several stations and of the methods employed by the Office in dealing with the records they respectively furnish will be found in Appendix XIII., p. 88.

Appendix XIV., p. 92, contains a list of all documents relating to the land meteorology of the British Isles received at the Office during the year. Documents received.

The only changes in the self-recording stations during the year has been that the anemometer formerly at Seaham has been repaired and re-erected at Fleetwood at the suggestion of Mr. L. J. Crossley, to whom the instrument belongs, and who has kindly lent it to the Office. In addition, another similar instrument has been erected on the disused High Lighthouse, North Shields.

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 before mentioned (p. 9). The extra stations (Class 5) are inspected as opportunity offers. Of the Stations of the Second Order (Class 3), some belong to the Royal Meteorological Society; these are visited by an Inspector appointed by the 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, which are in immediate connexion with the Meteorological Office, are visited at least once in every two years by the Inspectors of the Office. The Superintendent of the Kew Observatory, Mr. G. M. Whipple, is specially employed to inspect and report on the self-registering apparatus, and on the photographic processes at the observatories. Extracts from the Reports of the Inspectors will be found in Appendix VI., p. 51. Inspection of Stations.

Minuteness of
Barometer
Readings.

Degree of Minuteness of Barometer Readings.—After consultation with the most eminent authorities both at home and abroad, as to the degree of minuteness to which it was desirable to read and record the height of the barometer, the Council resolved that, except in the case of the Standard Barometers used at the principal observatories, the readings should be made directly from the graduations of the verniers, without attempting to estimate smaller quantities.

Also, that the verniers of marine barometers belonging to the Office used at ordinary stations and supplied to ships be altered gradually, as they come in for repair, so as to read to 0·005 in. instead of 0·002 in. as at present.

And, that the registers of individual observations be printed to hundredths only, the readings to thousandths being limited to the mean values. This would not apply, however, to the hourly readings of the principal observatories.

It may be noted that ·004 of an inch corresponds nearly to one tenth of a millimetre, the degree of minuteness commonly adopted on the Continent.

Reports supplied to
Registrar
General for
Ireland.

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

Publications.

Quarterly Weather Report.—Part IV., completing the volume for 1878 in the old form, is in an advanced stage, and good progress has been made with that for 1879. This form of Report will end with the publication of the results for 1880.

The volume of the *Monthly Weather Report* for 1886 has been published and the parts of that for 1887 are in preparation. This publication takes the place of the Quarterly Weather Report.

The publication of the *Hourly Readings* obtained from the records of the self-registering instruments at the four principal observatories for 1884, is nearly completed.

Reports from Stations of the Second Order.—The volume for 1882 has appeared, and that for 1883 is in hand.

Electric
Anemometer.

Electric Anemometer.—This instrument has now been erected at Kilbeg Hill, situated above and at a distance of about a mile from the observatory at Valencia, but unforeseen difficulties have arisen, and it has not yet been brought into operation.

Harmonic
Analyser.

The Harmonic Analyser.—The results of the analysis of the thermograms for the 12 years 1871–82 appeared as an appendix to the volume of Hourly Readings for 1883. They are given in three tables, of which the first two contain, in different forms, the harmonic coefficients of the formulæ expressing the daily march

of temperature; while the third, by a comparison of the monthly mean values obtained from the hourly values by computation with those derived from the analyser, supplies a means of testing the accuracy with which the machine works. The barograms are now being dealt with and are finished up to the end of 1875.

As it seemed desirable that the success of the Harmonic Analyser should be generally known, a paper describing the principal results obtained, and a determination of the trustworthiness of the computations was read before the Royal Society. (R. Soc. Proceedings, Vol. xli., p. 382.)

Records from Foreign Military Stations.—During the year the Office has received a very valuable contribution to its records of the climatology of the globe in the shape of the complete series of observations made by the officers of the Army Medical Department, at both home and foreign stations, during the years 1866–1884. These returns, taken together with those made by the Royal Engineers in the years 1852–1862, which were received from the Office of the Ordnance Survey in 1879, afford important information as to the climate of many parts of the world about which comparatively little is at present known, and the Council has, therefore, decided to publish the returns from all the foreign stations on a definite system, in the form of monthly means and summaries, so that this information may be generally accessible to meteorologists.

Records from stations of the Army Medical Department.

This work is now in hand and will be completed during the present year.

LIBRARY.

The library contains standard works on Meteorology and the allied sciences. It consists at present of nearly 10,500 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men.

Library.

Appendix XV., p. 97, contains a list of the additions to the library during the year. These have been catalogued upon cards as before, besides being entered in the reference catalogues under (1) Authors, and (2) Subjects.

EXPENDITURE.

Appendix XVI., p. 123, shows the receipts and payments during the year ending 31st March 1887. The amount voted by Parliament was 15,300*l.*, as in the previous year.

Financial.

The following abstract of expenditure shows the amount *properly chargeable* to the year in question, and its distribution under the

Financial.

various heads, together with the increase or decrease in 1886-87, as compared with the previous year :—

NET EXPENDITURE.	1885-86.			1886-87.			Increase.			Decrease.		
<i>General Administration.</i>	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Payment of Council -	1,000	0	0	1,000	0	0	—	—	—	—	—	—
Secretary -	800	0	0	800	0	0	—	—	—	—	—	—
Office -	769	19	0	792	12	0	22	13	0	—	—	—
Rent, fuel, and lighting -	707	5	10	721	6	1	14	0	3	—	—	—
Alterations to premises, attendance, and contingencies -	403	14	8	596	19	1	193	4	5	—	—	—
Expenses incidental to International Meteorological Congress -	17	13	4	11	0	0	—	—	—	6	13	4
Pensions -	42	16	4	42	16	4	—	—	—	—	—	—
Special Researches -	728	7	6	494	12	3	—	—	—	233	15	3
Land Meteorology -	3,160	1	6	3,207	15	4	47	13	10	—	—	—
Weather Information -	3,984	15	7	3,681	6	5	—	—	—	303	9	2
Inspections -	549	9	9	559	16	9	10	7	0	—	—	—
Ocean Meteorology -	2,845	18	3	2,924	8	1	78	9	10	—	—	—
Total	£	15,010	1 9	14,832	12 4		366	8 4		543	17 9	

(Signed) RD. STRACHEY.
Chairman of the Council.

NOTE A.

On the DISTRIBUTION of GALES round the COASTS of the
BRITISH ISLES.

The subjoined table gives the total number of general gales reported in each of the 10 districts into which the coasts of the United Kingdom have been divided. The figures refer to the period of 15 years, 1871-85 inclusive. The table also gives the percentage proportions of the general gales in each district for each month, and for the four quadrants.

The term "General gales" implies that the gale has been reported from more than half the stations situated in the district.

	Monthly per-centages of the Total Number of General Gales reported in each District in the 15 years, 1871-1885 inclusive.												Total Number of General Gales.	Per-centages of the Total Number of General Gales reported in each District, arranged according to the Four Quadrants.			
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		N.E.	S.E.	S.W.	N.W.
The Shetlands -	16	13	11	3	1	1	2	3	6	13	14	15	281	14	29	30	26
Scotland, East -	15	13	12	4	1	—	—	3	6	15	16	13	229	9	23	33	35
Scotland, North-west -	17	14	15	3	1	—	1	1	5	13	16	13	275	7	16	44	33
Ireland, North -	16	14	15	3	1	1	1	2	4	13	15	13	198	6	18	42	34
Ireland, South-west -	21	14	10	5	2	1	1	2	6	10	15	12	277	5	16	62	17
The Irish Sea -	18	10	10	3	1	1	1	3	6	14	17	14	265	7	14	50	28
England, North-east -	16	9	16	4	1	3	3	3	5	14	15	11	172	17	18	40	25
England, East -	22	8	10	4	—	—	—	3	4	14	18	14	160	15	11	57	16
England, South -	15	8	8	5	2	1	1	7	7	14	17	16	190	8	5	54	33
England, South-west -	15	12	10	6	2	2	1	5	6	13	15	13	328	6	15	46	32

NOTE B.

REPORT ON OCCASIONAL TELEGRAMS received from BEN NEVIS.
MEMORANDUM.

THE primary object which has been kept in view while checking the telegrams received from Ben Nevis during these 16 months has been to ascertain how far the telegrams, as at present sent, have been of service as aids to the issue of storm warnings from the Meteorological Office.

To make this clear a table (annexed) has been prepared, showing the time of receipt of all the messages which arrived from Ben Nevis between 1st January 1886 and 30th April 1887, together with a brief statement as to the atmospheric conditions prevailing at the time when the telegram arrived, and the steps taken with regard to the issue of warnings to our coasts.

The messages received consisted of observations of pressure, temperature, wind, and weather made on the summit at two distinct hours, supplemented occasionally by a word or two as to the general appearance, &c.

During this period we issued from the Meteorological Office 86 warnings to the Scotch coasts, but we received from Ben Nevis only 19 telegrams. Of these two arrived before we issued the warnings, and on those occasions the receipt of the telegrams in no way influenced us in determining to warn.

When the observations made on Ben Nevis shall have been thoroughly discussed, and inferences deduced from them by the Ben Nevis Committee, it is possible that a new system of telegrams may be arranged, which should be of practical value to the Meteorological Office; at present, however, no such discussion has been published, and in their existing form the telegrams have given us no assistance.

(Signed) FREDC. GASTER.

To R. H. Scott, Esq.,
Secretary.

TELEGRAMS received at the METEOROLOGICAL OFFICE from
BEN NEVIS between January 1st, 1886, and April 30th, 1887.

Date of receipt of Telegrams.	Condition of Atmosphere about Time of Receipt of Telegram.	Warnings issued by the Office on other information.	Whether the receipt of the Ben Nevis Telegram was before or after issue of Warnings.
1886. January. 7th, 6.47 p.m.	Depression in far north	S. cone had been re-hoisted in N. and N.W. for 8 hours.	After
13th, 8.56 a.m.	Deep depression in far north and subsidiary.	N. cone had been re-hoisted in N. and N.W. for 2½ hours.	"
14th, 7.12 p.m.	New depression advancing from N.W.	N. cone was still up	"
16th, 5.14 p.m.	Depression approaching W. of Scotland.	N. cone hoisted northern coasts 7.15 p.m. (W. and S.W. had been warned in afternoon.)	Before
20th, 9.5 a.m.	Deep depression in N.W.	S. cone had been hoisted previous day.	After

Date of receipt of Telegrams.	Condition of Atmosphere about Time of Receipt of Telegram.	Warnings issued by the Office on other information.	Whether the receipt of the Ben Nevis Telegram was before or after issue of Warnings.
1886. February. 5th, 6.42 p.m.	Depression off Wn. coasts moving North-eastwards.	S. cone had been hoisted in morning.	After
March. 26th, 6.50 p.m.	Large depression in N.W.	No signals hoisted. No gale Scotland. Fresh S.S.W. gale on W. coasts <i>before</i> message arrived.	"
27th, 8.40 a.m.	Subsidiary depression in N.W.	S. cone hoisted in W. and S. at 10 a.m., 27th. No gale in Scotland.	Before
30th, 2.57 p.m.	Deep depression in N.W.	S. cone had been hoisted for above 4 hours.	After
April. 1st, 6.55 p.m.	Deep depression off W. coasts.	S. cone had been re-hoisted for many hours.	"
7th, 2.56 p.m.	Deep depression off W. coasts.	S. cone had been hoisted since 10 a.m.	"
8th, 8.44 a.m.	Yesterday's depression over Scotland, subsidiary Irish sea.	S. cone still up - - -	"
May. 17th, 6.40 p.m.	Depression in N.W. moving North-eastwards.	S. cone had been hoisted W. Scotland since 4 p.m. (In Ireland it had been up much longer.)	"
18th, 8.48 a.m.	Yesterday's depression now over Scotland, and grown complex.	We had lowered cone again N. and N.W., and no gale came.	"
September. 9th, 6.45 p.m.	Depression in W. moving N.E.W.	S. cone had been hoisted since 10 a.m.	"
October. 9th, 6.48 p.m.	Depression in W. moving N.E.	S. cone had been hoisted since 10 a.m.	"
December. 8th, 8.30 a.m.	Exceptionally deep depression in N.W.	S. cone had been hoisted in W. and N.W., 7.15 p.m., 7th, and on other coasts next morning.	"
8th, 7.25 p.m.	Exceptionally deep depression in N.W.		
1887. January. 11th, 8.45 a.m.	Deep depression in N.	S. cone had been hoisted previous day.	"

NOTE C.

REPORT on the DAILY WEATHER MESSAGES received from the UNITED STATES (via Paris) during the three months January to March 1887.

THE following report on the telegrams received at the Meteorological Office daily from the United States (via Paris) is made in order to show how far the telegrams have been of service to the Meteorological Office as aids to the issue of forecasts or storm warnings. In order to do this those cases have been selected in which a well-formed depression was shown over the United States or the adjacent parts of the Atlantic, having a motion in a more or less easterly direction. These have been tabulated and compared with the depressions which reached the shores of north-western Europe from the Atlantic, and caused gales on some part

Date of receipt of Telegrams.	Condition of Atmosphere about Time of Receipt of Telegram.	Warnings issued by the Office on other information.	Whether the receipt of the Ben Nevis Telegram was before or after issue of Warnings.
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May. 17th, 6.40 p.m.	Depression in N.W. moving North-eastwards.	S. cone had been hoisted W. Scotland since 4 p.m. (In Ireland it had been up much longer.)	"
18th, 8.48 a.m.	Yesterday's depression now over Scotland, and grown complex.	We had lowered cone again N. and N.W., and no gale came.	"
September. 9th, 0.45 p.m.	Depression in W. moving N.Ewd.	S. cone had been hoisted since 10 a.m.	"
October. 9th, 6.48 p.m.	Depression in W. moving N.E.	S. cone had been hoisted since 10 a.m.	"
December. 8th, 8.30 a.m.	Exceptionally deep depression in N.W.	S. cone had been hoisted in W. and N.W., 7.15 p.m., 7th, and on other coasts next morning.	"
8th, 7.25 p.m.	Exceptionally deep depression in N.W.		"
1887. January. 11th, 8.45 a.m.	Deep depression in N.	S. cone had been hoisted previous day.	"

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of the coasts. The coasts on which gales occurred were noted in all cases in which they were partial.

Appended is a copy of the table referred to, and to it have been added columns showing (1) the position in which the depressions were observed on the western side of the Atlantic; (2) the dates on which we received information of their existence—whether of an indefinite or uncertain kind, or of a definite or certain kind; and (3) as to the date on which it was reckoned that the system would be due in our neighbourhood supposing it to cross the Atlantic at all.

Some remarks are added where deemed necessary, and finally a column has been inserted showing the character of the information when looked upon as an indication of the weather on our coasts, as follows:—

A = complete success; B = partial success; C = total failure.

From the last column we gather that, out of the 20 depressions reported on the western side of the Atlantic during the three months:—

5 were classed A, or completely successful, as indications of weather in north-western Europe.

4 were classed B, or partially successful, as indications of weather in north-western Europe.

11 were classed C, or failures, as indications of weather in north-western Europe.

In addition to these there were seven depressions, causing gales, which reached our coasts, and which I fail to connect with any depression known to have occurred previously over the United States or the western Atlantic.

In some of the cases which have been classed A or B (*e.g.*, that shown at midnight of January 29th and at noon on February 1st), the telegrams which gave definite information as to the disturbance did not reach us until after the system had actually arrived. In others the gales which occurred were so partial and felt at ports lying so far to the north-westward that, to the coasts of the British Islands, the warnings may be considered as of little value.

Referring now to the character of the telegrams, it may be said:—

(1.) That the system hitherto in use of showing the distribution of pressure over continental America has not answered, the information being much too scanty. It is proposed by M. Mascart, on the recommendation of Mr. Finley (U.S.), to substitute for this a new system of reporting by which the form and (approximately) the intensity of the depressions observed over the United States and the times of their exodus to the Atlantic, will be better indicated. This, if successful, will be a very decided improvement, but is likely to involve a much larger expense, unless it is accompanied by a considerable reduction in the quantity of information transmitted from ships. It should, however, be observed that, under present arrangements, information from ships

often arrives so late that it is of little value as a warning, while a large proportion of the depressions reported do not come from the American Continent at all. It is a question whether these latter do not cross the Atlantic more frequently than those which come from off the land, so that if the reporting of ships' observations could be accelerated, some improvement might result.

(2.) The number of observations obtained from ships has often been far greater in quiet weather than was necessary. This might with advantage be curtailed, as the object of these messages is to serve as warnings of storms which appear to be on their way towards us from the Western Atlantic.

(3.) The barometrical readings reported are unsatisfactory often being irreconcilable one with another. But how far this is due to errors in the telegraphy is not known.

(4.) The observations of ice and of derelict ships are probably very useful, and are being transmitted to Lloyd's immediately they come to hand.

I cannot help thinking that in the form hitherto adopted, these reports are of no practical value whatever for the purpose of forecasting, and unless much more money is available, I do not see how they are to be materially improved.

Under any circumstances, in the present state of our knowledge the aid derived from such transatlantic messages must be very slight, and at times the knowledge that a deep depression has left the United States has caused the premature issue of warnings to our coasts, and a consequent failure which would otherwise have been avoided.

To R. H. Scott, Esq.,
Secretary.

(Signed)

FREDC. GASTER.
18th May 1886.

TABLE showing what STORM SYSTEMS were observed over the UNITED STATES and WESTERN ATLANTIC during the three months January-March 1887, and how far the Telegrams containing Information as to their Existence might have been of Use, as Aids to the Issue of Storm Warnings to the British and Irish Coasts.

Date of Observation. 1887.	Approximate Position of Centre of Depression.	Date when Report of Depression was received in London.		When estimated to be due off Coasts of N. Wn. Europe.	Depressions (causing Gales) which appeared on the Coasts of N. Wn. Europe.	Remarks.	Whether the Report was, or was not, received in time for use as Warning.
		Of an Uncertain character.	Of a Certain character.				
January.	Lat. N. Long. W.	January.	January.	January.			
2nd, Noon -	42 65	6th	6th, 7th	7th	Did not arrive	-	No.
7th, " -	44 63	-	13th	11th to 12th	Rather deep depression, Hebrides, 11th; "V"-shaped subsidiary. Rather deep off the Hebrides, but at great distance to N.Wd. 13th; Southerly gales in extreme W. only.	-	No warning.
10th, } & 11th, }	48 67	-	16th	15th	Depression in N.W. on 16th; Southerly gales in extreme N.W. and N.	-	Yes.
		-	-		Deep large depression in W. and N.W.; strong Southerly gales on 17th.	-	No warning.
18th, " -	43 68	-	23rd	24th (moving fast).	Depression in W. evening of 18th; S.S.E. to S.W. gales. Large and deep in W. on 24th—26th; Gales Westerly and Northerly.	-	No warning.
		-	-			-	No.

TABLE showing what STORM SYSTEMS were observed over the UNITED STATES and WESTERN ATLANTIC—continued.

Date of Observation. 1887.	Approximate Position of Centre of Depression.	Date when Report of Depression was received in London.		When estimated to be due off Coasts of N. Wn. Europe.	Depressions (causing Gales) which appeared on the Coasts of N. Wn. Europe.	Remarks.	Whether the Report was, or was not, received in time for use as Warning.
		Of an In certain character.	Of a Certain character.				
January.	Lat. N. Long. W.	January.	January.	January.			
22nd, Noon	43 63 (small and doubtful).	-	25th	28th	Large system far away to the N.W. of our Islands on 27th and in N. on 28th. Southerly gales in W. and N.W. of our Islands.	- - -	No.
25th, "	48 63 (Very large system and moving S.E.)	28th & 29th.	30th	29th to 31st	A similar disturbance on 28th—29th. Deep and large in N.W. on 31st. Southerly gales. Subsidiary in S.E. on Feb. 1st.	- - - The motion of this system on other side of Atlantic makes it very doubtful whether it and the one which reached our shores are identical.	No warning. No.
29th, Midt. - 30th, " - February. 1st, Noon -	45 83 47 70 48 53	30th 31st -	Feb. 7th-8th	February. ? 3rd (moving very fast).	Large and deep, in N.W. on 2nd, moving very fast. Strong Southerly gales.	The "Certain" intelligence arrived nearly a week too late.	No.
3rd, Midt. -	46 65	4th	8th, 9th	? 10th (moving fast).	Did not arrive -	- - -	No.
4th, Noon -	43 60	10th	11th	12th	Did not arrive -	- - -	No.
7th, " -	47 67	9th	11th-14th	14th	Did not arrive -	- - -	No.

TABLE showing what STORM SYSTEMS were observed over the UNITED STATES and WESTERN ATLANTIC—continued.

Date of Observation 1887.	Approximate Position of Centre of Depression.	Date when Report of Depression was received in London.		When estimated to be due off Coasts of N.W. Europe.	Depressions (causing Gales) which appeared on the Coasts of N.W. Europe.	Remarks.	Whether the Report was, or was not, received in time for use as Warning.
		Of an Uncertain character.	Of a Certain character.				
February.	Lat. N. Long. W.	February.	February.	February.			
10th, Midt.	45 75	} 11th	15th & 16th.	16th	Large, in extreme N.W. on 16th Moderate gales only, in extreme N.W.	This disturbance was too far away for its intensity to be known. The "Certain" information arrived too late to be of much use.	No.
11th, " -	45 64						
14th, Noon	43 55	-	20th	18th or 19th	Large, in N.W. on 20th, but <i>no gales</i> . Very large, in N.W. on 22nd and 24th, S.Wly. gales in W. and N.	Information received too late, even if the gales had arrived.	No.
23rd, " -	40 58	-	28th	28th	Large in far W. on 26th. Moderate, but deep, over N.W. of Norway on 28th. S.W. gale in far north.	- - - - Our coasts little affected by gale. Information rather too late.	No warning. No warning.
23rd, Midt.	40 85	24th	-	} March. 1st	Moderate, deep, in N. of Norway on March 2nd. Gales at Christiansund only. Our Islands not affected.	The telegram conveying "Certain" information arrived too late.	No.
24th, " -	45 65	25th	March. 3rd				
26th, Noon	47 55	-	-	} ? 5th (See remarks).	Sn. portion of a large system reached the N. of Norway early on 6th. (No gales.)	The movement of this system over Maine and Labrador seemed to indicate that it might probably not reach our coasts at all.	No.
26th, Midt.	47 65	27th	-				
27th, " -	52 62	28th	2nd & 3rd				

TABLE showing what STORM SYSTEMS were observed over the UNITED STATES and WESTERN ATLANTIC—*continued*.

Date of Observation. 1887.	Approximate Position of Centre of Depression.	Date when Report of Depression was received in London.		When estimated to be due off Coasts of N. Wn. Europe.	Depressions (causing Gales) which appeared on the Coasts of N. Wn. Europe.	Remarks.	Whether the Report was, or was not, received in time for use as Warning.
		Of an Uncertain character.	Of a Certain character.				
March.	Lat. N. Long W.	March.	March.	March.			
1st, Midt. -	47 88	2nd 3rd	— } 7th	6th (Moving very fast.)	-	Had the system reached us the "Certain" information would have arrived too late.	No.
2nd, " -	44 65						
10th, " -	42 65	11th	16th	Uncertain. Movements very peculiar and irregular.	-	-	No.
11th, Noon							
12th, " -	42 62						
13th, " -	42 55	—	—	—	-	-	No warning.
-	-						
21st, Noon	43 53	25th	27th	Uncertain; moving very rapidly.	Moderate (increasing) in N. on 26th. Gales in north.	Information received much too late.	No.
21st, Midt.	36 75	22nd	— } 25th & 27th	28th	-	-	No.
22nd, " -		23rd					
23rd, Noon & Midt.	45 68	—	30th	30th moving fast.	Small, but deep; off Nn. coasts on 30th, whence it moved S. E. wds.	The telegram conveying "Cer- tain" information arrived too late.	No.
24th, Midt.	42 47	25th	30th				

APPENDIX.

APPENDIX.

APPENDIX I.

LIST of CAPTAINS (and Officers) who have sent in Logs classed as "Excellent" during the year ending March 31, 1887. 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.

Captain's Name.	Number of "Excellent" Logs.	Ship.
Adamson, A. W.	4	S.S. "Brindisi."
Balfour, Lieut. Andrew, R.N.	19	H.M.S. "Rambler."
Barker, D. W., F.R.Met.Soc.	10	S.S. "International" and S.S. "Buccaneer."
Barlow, B. J., R.N.R.	13	S.S. "Tainui."
Barrett, T.	1	"Craigburn."
Baxter, A. S.	2	"City of York."
Bennett, E. C.	12	"Thessalus."
Blackburne, Mr. H. J.	1	S.S. "Brindisi."
Blake, E. J.	11	"Tilkhurst."
Bolton, S. H.	7	S.S. "Helen Newton."
Bright, H.	1	"Beltana."
Buchan, James	19	"Coppename."
Campbell, Archibald	17	S.S. "Circassia."
Campbell, James	5	"Saint Patrick."
Carr, H. C.	2	"Superb."
Chaddock, G. A.	1	"Elisa."
Clapp, Staff Comm. E. S., R.N.	3	L.H. Tender "Richmond."
Clarke, James	7	S.S. "Olbers."
Cooke, C. F., F.R.Met.Soc.	3	"Melbourne."
Crichton, A. T.	1	S.S. "Colina."
Crotty, F. H.	3	"Evesham Abbey."
Crowley, C.	1	"Lucia."
Crutchley, William Cairns, R.N.R.	12	S.S. "Kaikoura."
Dart, Leonard C.	7	"Alcester."
Davies, Joseph	2	S.S. "Flaxman."
Dawson, Comm. L. S., R.N.	2	H.M.S. "Sylvia."
Denham, George	9	S.S. "Ocean King."
Deuchars, William	5	S.S. "Jan Mayen."
Dobson, C. M.	11	S.S. "Durham."
Douglas, Lt. H. H., R.N.	2	H.M.S. "Sylvia."
Draper, R.	2	S.S. "Monarch."
Dunbar, John Ivor	8	S.S. "Atracan."
Ellery, William	16	"Tabookdar."
England, Thomas	5	"Jane."
Evans, Mr. E. J.	4	S.S. "Tainui."
Flinton, Benjamin	2	"Dartmouth."
Gordon, James	11	S.S. "City of Agra."
Graham, W. Vincent	3	"Majestic."
Gray, David	13	S.S. "Eclipse."
Gray, H. W.	1	"Peleone."
Gray, John	19	S.S. "Hope."

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Captain's Name.	Number of "Excellent" Logs.	Ship.
Adamson, A. W. - -	4	S.S. "Brindisi."
Balfour, Lieut. Andrew, R.N. -	19	H.M.S. "Rambler."
Barker, D. W., F.R.Met. Soc.	10	S.S. "International" and S.S. "Buccaneer."
Barlow, B. J., R.N.R. -	13	S.S. "Tainui."
Barrett, T. - - -	1	"Craigburn."
Baxter, A. S. - - -	2	"City of York."
Bennett, E. C. - - -	12	"Thessalus."
Blackburne, Mr. H. J. -	1	S.S. "Brindisi."
Blake, E. J. - - -	11	"Tilkhurst."
Bolton, S. H. - - -	7	S.S. "Helen Newton."
Bright, H. - - -	1	"Beltana."
Buchan, James - - -	19	"Coppename."
Campbell, Archibald - -	17	S.S. "Circassia."
Campbell, James - - -	5	"Saint Patrick."
Curr, H. C. - - -	2	"Superb."
Chaddock, G. A. - - -	1	"Elissa."
Clapp, Staff Comr. E. S., R.N.	3	L.H. Tender "Richmond."
Clarke, James - - -	7	S.S. "Olbers."
Cooke, C. F., F.R.Met.Soc. -	3	"Melbourne."
Crighton, A. T. - - -	1	S.S. "Colina."
Crotty, F. H. - - -	3	"Evesham Abbey."
Crowley, C. - - -	1	"Lucia."
Crutehley, William Caius, R.N.R.	12	S.S. "Kaikoura."
Dart, Leonard C. - - -	7	"Alcester."
Davies, Joseph - - -	2	S.S. "Flaxman."
Dawson, Comr. L. S., R.N. -	2	H.M.S. "Sylvia."
Denham, George - - -	9	S.S. "Ocean King."
Deuchars, William - - -	5	S.S. "Jan Mayen."
Dobson, C. M. - - -	11	S.S. "Durham."
Douglas, Lt. H. H., R.N. -	2	H.M.S. "Sylvia."
Draper, R. - - -	2	S.S. "Monarch."
Dunbar, John Ivor - - -	8	S.S. "Arracan."
Ellery, William - - -	16	"Talookdar."
England, Thomas - - -	5	"Jane."
Evans, Mr. E. J. - - -	4	S.S. "Tainui."
Flinton, Benjamin - - -	2	"Dartmouth."
Gordon, James - - -	11	S.S. "City of Agra."
Graham, W. Vincent - - -	3	"Majestic."
Gray, David - - -	13	S.S. "Eclipse."
Gray, H. W. - - -	1	"Pleione."
Gray, John - - -	10	S.S. "Hope."

APPENDIX.

APPENDIX I.

LIST of CAPTAINS (and Officers) who have sent in Logs classed as "Excellent" during the year ending March 31, 1887. 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.

Captain's Name.	Number of "Excellent" Logs.	Ship.
Adamson, A. W. - -	4	S.S. "Brindisi."
Balfour, Lieut. Andrew, R.N. -	19	H.M.S. "Rambler."
Barker, D. W., F.R.Met. Soc.	10	S.S. "International" and S.S. "Buccaneer."
Barlow, B. J., R.N.R. -	13	S.S. "Tainui."
Barrett, T. - - -	1	"Craigburn."
Baxter, A. S. - - -	2	"City of York."
Bennett, E. C. - - -	12	"Thessalus."
Blackburne, Mr. H. J. -	1	S.S. "Brindisi."
Blake, E. J. - - -	11	"Tilkhurst."
Bolton, S. H. - - -	7	S.S. "Helen Newton."
Bright, H. - - -	1	"Beltana."
Buchan, James - - -	19	"Coppename."
Campbell, Archibald - -	17	S.S. "Circassia."
Campbell, James - - -	5	"Saint Patrick."
Curr, H. C. - - -	2	"Superb."
Chaddock, G. A. - - -	1	"Elissa."
Clapp, Staff Comr. E. S., R.N.	3	L.H. Tender "Richmond."
Clarke, James - - -	7	S.S. "Olbers."
Cooke, C. F., F.R.Met.Soc. -	3	"Melbourne."
Crighton, A. T. - - -	1	S.S. "Colina."
Crotty, F. H. - - -	3	"Evesham Abbey."
Crowley, C. - - -	1	"Lucia."
Crutehley, William Caius, R.N.R.	12	S.S. "Kaikoura."
Dart, Leonard C. - - -	7	"Alcester."
Davies, Joseph - - -	2	S.S. "Flaxman."
Dawson, Comr. L. S., R.N. -	2	H.M.S. "Sylvia."
Denham, George - - -	9	S.S. "Ocean King."
Deuchars, William - - -	5	S.S. "Jan Mayen."
Dobson, C. M. - - -	11	S.S. "Durham."
Douglas, Lt. H. H., R.N. -	2	H.M.S. "Sylvia."
Draper, R. - - -	2	S.S. "Monarch."
Dunbar, John Ivor - - -	8	S.S. "Arracan."
Ellery, William - - -	16	"Talookdar."
England, Thomas - - -	5	"Jane."
Evans, Mr. E. J. - - -	4	S.S. "Tainui."
Flinton, Benjamin - - -	2	"Dartmouth."
Gordon, James - - -	11	S.S. "City of Agra."
Graham, W. Vincent - - -	3	"Majestic."
Gray, David - - -	13	S.S. "Eclipse."
Gray, H. W. - - -	1	"Pleione."
Gray, John - - -	10	S.S. "Hope."

Captain's Name.	Number of "Ex- cellent" Logs.	Ship.
Hayward, G. O. - -	4	S.S. "Dunrobin Castle."
Holdich, John Peack, R.N.R. -	11	"British Envoy."
Hoskyn, Comr. R. F., R.N. -	13	H.M.S. "Myrmidon."
Hughes, W. P. - -	8	"Laomene."
Irving, P. J. - - -	4	S.S. "Republic."
Jones, S. Griff - -	6	"Hermine."
Kennedy, C. W. - -	6	S.S. "Germanic."
King, J. W. - - -	1	"Philomene."
Ladd, Mr. Richard, F.R.A.S., F.R.Met.Soc. - -	16	S.S. "Minia."
Lailey, William Nicholson -	8	S.S. "Boyne."
Lambert, H. M., Sub-Lieut., R.N.R. - - -	5	S.S. "Brindisi."
Lancaster, Mr. C. - - -	4	S.S. "Germanic."
Leportier, T. - - -	2	S.S. "Mira."
Lyne, Lieut. W. O., R.N. -	5	H.M.S. "Flying Fish."
Machugh, R. H. - - -	1	S.S. "Ching Wo."
McLean, Archibald - - -	2	S.S. "Concordia."
Macleay, J. F. L. P., R.N. -	16	H.M.S. "Flying Fish."
Marshall, Frederick - - -	2	"Wiltshire."
Maxwell, Joseph - - -	2	"Oamaru."
Mesnard, Thomas - - -	5	"Sierra Miranda."
Metcalf, John - - -	10	S.S. "Oceanic."
Milne, W. F. - - -	4	S.S. "Esquimaux."
Moore, Comr. W. U., R.N. -	9	H.M.S. "Rambler."
Murdoch, H. - - -	5	"Penthesilea."
Murdoch, Peter - - -	8	"Sierra Estrella."
Murray, Alexander - - -	5	"Perseverance."
Norman, Francis - - -	5	"Polestar."
North, W. G. - - -	4	S.S. "Tiger."
Parry, Moses, F.R.Met.Soc. -	10	S.S. "Prydain."
Parsell, Henry - - -	11	S.S. "Adriatic."
Parson, George Fry - - -	6	"Earnock."
Pearson, Charles William -	26	S.S. "Strathleven."
Potter, Thomas - - -	5	S.S. "Salina."
Price, J. H. - - -	2	"Viola."
Prout, John Cawse - - -	5	"Cape St. Vincent."
Quaile, D. W. A. - - -	2	"Orissa."
Randall, William - - -	9	"Earl of Shaftesbury."
Renaut, Charles Henry - -	16	"Pleione."
Ross, Alexander - - -	2	"Berbice."
Rosseter, William Lawrence -	7	"St. Kilda."
Russell, Charles James - -	6	"Khyber."
Sargent, A. H. - - -	2	"Glenlora."
Scott, William - - -	18	"Commewyne."
Shearer, G. - - -	8	"Thetis."
Sheldrake, J. W. - - -	2	"Iron Cross."
Simpson, Alexander - - -	5	S.S. "Australasian."
Simpson, Alexander - - -	17	"Traveller."
Smith, Sub-Lt. F. Bowden, R.N. - - -	3	H.M.S. "Myrmidon."

Captain's Name.	Number of "Ex- cellent" Logs.	Ship.
Smith, W. C., F.R.Met.Soc. -	10	"John R. Worcester."
Spratly, W. - - -	9	S.S. "Mozart."
Sturdee, H. King - - -	6	L.H. Tender "Richmond."
Thomson, A. S., F.R.Met.Soc.-	8	S.S. "Silvertown" and S.S. "Buc- caneer."
Trott, Samuel, F.R.Met.Soc. -	8	S.S. "Minia."
Trunks, H. - - -	1	"Aldborough."
Walker, Henry - - -	7	S.S. "Cephalonia."
West, F. - - -	1	S.S. "Port Adelaide."
Wheaton, N. J. - - -	5	"Eliza."
Williams, H. - - -	1	"Dynomene."
Wilson, William - - -	3	"Horsa."
Youlden, H. - - -	6	"May Hulse."

Names of observers deceased printed in italics.

APPENDIX II.—SHIPS SUPPLIED AND DOCUMENTS RETURNED DURING THE YEAR ENDING 31st MARCH 1887.

The number of merchant ships supplied with standard instruments and meteorological logs during the above period was 164.

The number of meteorological logs, and documents from Foreign Stations, received during the same period, and registered in the Office, amounted altogether to 346, of which 186 were returned from ships, and the remainder from land stations, outside the British Isles.

LIST OF DOCUMENTS RECEIVED FROM FOREIGN LAND STATIONS.

Place.	Observer.	No. of Documents.	Nature of Observations.
Abaco (Bahamas) -	G. L. Nairn and C. H. Bode, Lightkeepers.	2	"Lighthouse" Register, July 1885 to June 1886.
Ascension -	Capt. J. W. East, R.N.	1	Observations of Rollers, 1876-1877.
Barbados (Commercial Hall) -	T. L. Ince -	1	"Lighthouse" Register, January to December 1886.
" (Joe's River House) -	R. B. Walcott, M.D., F.R. Met. Soc.	1	" " " " "
Bermuda -	Sergt. J. Given, Medical Staff Corps.	8	Anemograms, January 1886 to February 1887.
Beyrout (Lee Observatory) -	R. H. West, M.A. -	12	Two observations daily, March 1886 to February 1887.
Cape Juby (North-West Africa) -	S. Morris, for the North-west African Co., Limited.	12	" " " " "
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper -	2	"Lighthouse" Register, January to December 1886.
Cay Lobos (Bahamas) -	R. A. A. Espie, Lightkeeper	2	" " " " " January to June 1885, and January to June 1886.
Cay Sad (Bahamas) -	T. R. Thompson, Lightkeeper	1	" " " " " January to June 1886.
Famagusta (Cyprus) -	G. Eliades -	13	Two observations daily, July 1883 to July 1886.
George Town (British Guiana) -	Robert Ward -	1	" " " " " January and February 1887.

APPENDIX II.—SHIPS supplied and DOCUMENTS returned during the year ending 31st March 1887.

The number of merchant ships supplied with standard instruments and meteorological logs during the above period was 164.

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Place.	Observer.	No. of Documents.	Nature of Observations.
Abaco (Bahamas)	G. L. Nairn and C. H. Bode, Lightkeepers.	2	" Lighthouse " Register, July 1885 to June 1886.
Ascension	Capt. J. W. East, R.N.	1	Observations of Rollers, 1876-1877.
Barbados (Commercial Hall)	T. L. Ince -	1	" Lighthouse " Register, January to December 1886.
" (Joe's River House)	R. B. Walcott, M.D., F.R. Met. Soc.	1	" " " " " "
Bermuda -	Sergt. J. Green, Medical Staff Corps.	8	Anemograms, January 1886 to February 1887.
Beyrout (Lee Observatory)	R. H. West, M.A. -	12	Two observations daily, March 1886 to February 1887.
Cape Juby (North-West Africa) -	S. Morris, for the North-west African Co., Limited.	12	" " " " " "
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper -	2	" Lighthouse " Register, January to December 1886.
Cay Lobos (Bahamas) -	R. A. A. Espie, Lightkeeper	2	" " " " " " January to June 1885, and January to June 1886.
Cay Sal (Bahamas) -	T. R. Thompson, Lightkeeper	1	" " " " " " January to June 1886.
Famagusta (Cyprus) -	G. Eliades -	13	Two observations daily, July 1883 to July 1886.
George Town (British Guiana) -	Robert Ward -	1	" " " " " " January and February 1887.

List of Documents—continued.

Place.	Observer.	No. of Documents.	Nature of Observations.
Gibraltar -	Privates E. Irvine and E. Herrick, Med. Staff Corps.	12	Two observations daily, March 1886 to February 1887.
Heligoland -	Lightkeepers -	11	Eight observations daily, March 1886 to February 1887.
Inagua (Bahamas) -	N. H. E. Garner, Lightkeeper	2	" Lighthouse " Register, July 1885 to June 1886.
Kyrenia (Cyprus) -	E. Joannides and C. Natai	13	Two observations daily, July 1883 to July 1886.
Larnaca (Cyprus) -	A. Tsepis and I. Laftan	13	" " " " " "
Limasol (Cyprus) -	Luigi Bétaul	13	" " " " " "
Nicosia (Cyprus) -	A. Kyriakides, P. Joannides, G. Stephen, N. Yerenias, R. Joannides, and J. Elliot.	13	" " " " " " (except March, June, and September 1885.)
Papho (Cyprus) -	E. A. Malliotis -	13	" " " " " "
Sombrero -	J. A. Richardson, Lightkeeper	2	" Lighthouse " Register, December 1885 to November 1886.
Suva (Fiji) -	J. D. W. Vaughan, F.R.Met. Soc.	11	One observation daily, January to November 1886.
Tangier (Morocco) -	Sir J. Drummond Hay, K.C.B.	1	Three observations daily, October 1836 to November 1838.

List of Documents received from SHIPS.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
¹ Adamson, A. W.	S.S. Brindisi	2,143	P. & O. Steam Navigation Co., London.	To and from Calcutta, via Suez	1886
² " "	"	"	"	To and from China, via Suez	1886
³ " "	"	"	"	To Calcutta, Marseilles, and home, via Suez	1886-87
Alderton, T.	S.S. Nepal	1,988	"	To and from China, via Suez	1885-86
Armour, William	County of Aberdeen	—	Robert Craig, Glasgow	To Buenos Ayres, Calcutta, and home	1883-84
Auld, John H.	Loch Broom	2,075	James Aitken, Glasgow	To Melbourne, Calcutta, and home	1885-86
Balderston, R. J.	Bactria	2,122	Sir Thomas Brocklebank, Bart., Liverpool.	To and from Calcutta	1885-86
⁴ Barker, D. W., R.N.R., F.R.G.S., F.R. Met. Soc.	S.S. International	1,014	India Rubber, Gutta Percha, and Tel. Works Co., London.	To and from Key West, U.S.A., and laying cable in Florida Straits and off Cuba	1886
" "	S.S. Buccaneer	460	"	To West Coast of Africa and laying cable	1886
⁴ Barlow, B. J., R.N.R.	S.S. Tainui	3,231	Shaw Savill and Albion Co., Lim., London.	To Cape Town, Hobart, New Zealand, Rio Janeiro, Teneriffe, and home	1886
⁵ Barrett, Thomas	Barque Craighurn	1,997	"	To and from Lyttelton, via Cape	1886-87
Barrette, J. C.	Cesarea	1,257	R. Shankland, Greenock	To and from Calcutta	1885-86
Baxter, A. S.	City of York	1,195	W. Pellier, St. Heliers, Jersey	"	1885-86
" "	"	"	G. Smith & Son, Glasgow	To Sydney, San Francisco, and home	1886-87
Bennett, E. C.	Thessalus	1,782	"	To and from San Francisco	1886-87
⁶ Black, Donald	Loch Ryan	1,307	T. Carmichael, Greenock	To Sydney, San Francisco, and Havre	1884-85
Blake, Edwin John	Talkhurst	1,527	James Aitken, Glasgow	Home from San Francisco	1885-86
	Talkhurst		"Talkhurst" Ship Co., Lim., London.	To Singapore, and home from Calcutta	

LIST of DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
1 Adamson, A. W.	S.S. Brindisi	2,143	P. & O. Steam Navigation Co., London.	To and from Calcutta, via Suez	1886
2 " "	"	"	"	To and from China, via Suez	1886
3 " "	"	"	"	To Calcutta, Marseilles, and home, via Suez	1886-87
Alderton, T.	S.S. Nepal	1,988	Robert Craig, Glasgow	To and from China, via Suez	1885-86
Armour, William	County of Aberdeen	—	James Aitken, Glasgow	To Buenos Ayres, Calcutta, and home	1883-84
Auld, John H.	Loch Broom	2,075	"	To Melbourne, Calcutta, and home	1885-86
Balderston, R. J.	Bactria	2,122	Sir Thomas Brocklebank, Bart., Liverpool.	To and from Calcutta	1885-86
2 Barker, D. W., R.N.R., F.R.G.S., F.R. Met. Soc.	S.S. International	1,014	India Rubber, Gutta Percha, and Tel. Works Co., London.	To and from Key West, U.S.A., and laying cable in Florida Straits and off Cuba	1886
"	S.S. Buccaneer	460	"	To West Coast of Africa and laying cable	1886
4 Barlow, B. J., R.N.R.	S.S. Tainui	3,231	Shaw Savill and Albion Co., Lim., London.	To Cape Town, Hobart, New Zealand, Rio Janeiro, Teneriffe, and home	1886
"	"	"	"	To and from Lyttelton, via Cape	1886-87
5 Barrett, Thomas	Barque Craigburn	1,997	R. Shankland, Greenock	To and from Calcutta	1885-86
Barrette, J. C.	Cesarea	1,257	W. Pellier, St. Heliers, Jersey	To Sydney, San Francisco, and home	1885-86
Baxter, A. S.	City of York	1,195	G. Smith & Son, Glasgow	To and from San Francisco	1886-87
Bennett, E. C.	Thessalus	1,782	T. Carmichael, Greenock	To Sydney, San Francisco, and Havre	1886-87
Black, Donald	Loch Ryan	1,207	James Aitken, Glasgow	Home from San Francisco	1884-85
Blake, Edwin John	Tilkhurst	1,527	"Tilkhurst" Ship Co., Lim., London.	To Singapore, and home from Calcutta	1885-86

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
Bolton, S. H.	S.S. Helen Newton	1,330	A. J. Newton, London	To Rio Janeiro, Buenos Ayres, and home	1886
"	"	"	"	To Stockholm, Alexandria, and home.	1886-87
Brehant, G. J.	Barque Achievement	499	J. Barker, Liverpool	To Alexandria, Sulina, &c., and Havre	1886
Bright, Henry	Beltana	741	A. Lang Elder, London	To and from Autofagasta	1886-87
Brolly, R. H.	S.S. John Knox	1,351	Neil McLean, Glasgow	To and from Adelaide	1886-87
Brown, E.	Barque Moorhill	484	E. Brown, Liverpool	To Singapore, China Ports, Port Said, and home; and from Hamburg to Montreal, and home	1885-86
Brown, James	S.S. Olympia	1,416	T. Henderson & Co., Glasgow	To Buenos Ayres, Galveston, and home	1886-87
Browne, W. G.	S.S. Neto	1,091	G. Page, Liverpool	Two voyages from Gibraltar to New York, and home	1886
Buchan, James	Barque Coppename	316	J. C. Pearson, Glasgow	To and from Charleston	1886-87
Callaghan, M.	S.S. Lara	471	Waterford S.S. Co., Lim., Waterford.	To Surinam, Barbadoes, Jamaica, and home	1886
"	"	"	"	Trading between Waterford, Liverpool, and Bristol	1885
"	"	"	"	"	1886
"	"	"	"	"	1886
"	S.S. Reginald	516	"	"	1886
Cameron, John	S.S. Ivanhoe	599	J. P. Macleay & Co., Glasgow	To and from Cape of Good Hope, and from Cardiff to Spanish Ports and home	1885-86
Campbell, Archibald	S.S. Circassia	4,272	The Barrow Steam Ship Co., London.	Five voyages to and from New York	1885-86

List of Documents, &c.—continued.

Captain's Name,	Ship.	Tons.	Owners.	Voyage.	Year
s Campbell, Archibald	S.S. Circassia	4,272	The Barrow Steam Ship Co., London.	Five voyages to and from New York	1886
Campbell, James	Saint Patrick	992	"Saint Patrick" Shipowning Co., Lim., Liverpool.	To Cape Town, Calcutta, New York, and home	1885-86
Carr, H. C.	Superb	1,451	H. Green, Blackwall	To and from Melbourne	1885-86
Chaddock, George A.	Barque Elissa	409	H. F. Watt, Liverpool	To Paysandu, Galveston, and Pensacola	1886
a Clapp, Staff Commr., E. S., R.N.	Schooner Richmond	183	Board of Trade, London	At the Bahamas, and voyage to Bermuda	1886
"	"	"	"	At the Bahamas	1886
Clarke, James	S.S. Others	2,168	Liverpool, Brazil, and River Plate Steam Navigation Co., Liverpool.	Two voyages to Lisbon, Bahia, Rio Janeiro, New York, and home	1886
Clarke, S.	Loch Carron	2,075	"	To Sydney, Newcastle (N.S.W.), San Francisco, and home	1886-87
Cooke, Charles F., F.R.Met.Soc.	Melbourne	1,857	H. Green, London	To and from Melbourne	1885-86
Crighton, A. T.	S.S. Colma	2,001	Donaldson Bros., Glasgow	Five voyages from and four to Quebec	1886
m Cromarty, D. S.	Barque Cassandra	711	J. Steel & Son, Liverpool	To Coimbatore, Portland (U.S.), Valparaiso, &c., and home	1884-86
Croft, F. H.	Evesham Abbey	1,613	Jacques Poole, Liverpool	To and from Calcutta	1885-86
n Crutchley, W., C., R.N.R.	S.S. Kaikoura	2,885	New Zealand Shipping Co., Christchurch, N.Z.	To New Zealand, via Cape of Good Hope, Rio Janeiro, and home	1886
"	"	"	"	To New Zealand, via Cape, Rio Janeiro, and home	1886
Dart, L. C.	Alcester	1,597	R. C. Haws, Liverpool	To Negapatam, and from Calcutta	1885-86
Davies, Joseph	S.S. Flaxman	1,418	Liverpool, Brazil, and River Plate Steam Navigation Co., Lim., Liverpool.	Two voyages to and from River Plate	1885-86

List of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year
* Campbell, Archibald	S.S. Circassia -	4,272	The Barrow Steam Ship Co. London.	Five voyages to and from New York -	1886
Campbell, James	Saint Patrick -	992	"Saint Patrick" Shipowning Co., Lim., Liverpool.	To Cape Town, Calcutta, New York, and home -	1885-86
Carr, H. C. -	Superb -	1,451	H. Green, Blackwall -	To and from Melbourne -	1885-86
Chaddock, George A.	Barque Elissa -	409	H. F. Watt, Liverpool -	To Paysandu, Galveston, and Pensa- cola -	1886
* Clapp, Staff Comr., E. S., R.N.	Schooner Richmond -	183	Board of Trade, London -	At the Bahamas, and voyage to Bermuda	1886
" "	" "	"	" "	At the Bahamas	1886
Clarke, James	S.S. Olbers -	2,168	Liverpool, Brazil, and River Plate Steam Navigation Co., Liverpool.	Two voyages to Lisbon, Bahia, Rio Janeiro, New York, and home -	1886
Clarke, S. -	Loch Carron -	2,075	James Aitken, Glasgow -	To Sydney, Newcastle (N.S.W.), San Francisco, and home -	1886-87
Cooke, Charles F., F.R.Met.Soc.	Melbourne -	1,857	H. Greer, London -	To and from Melbourne -	1885-86
Crighton, A. T. 10 Cromarty, D. S.	S.S. Colina - Barque Cassandra	2,001 711	Donaldson Bros., Glasgow J. Steel & Son, Liverpool	Five voyages from and four to Quebec To Coquimbo, Portland (U.S.), Val- paraiso, &c., and home -	1886
Crotty, F. H. 11 Crutchley, W. C., R.N.R.	Evesham Abbey S.S. Kaikoura	1,613 2,885	James Poole, Liverpool - New Zealand Shipping Co., Christchurch, N.Z.	To and from Calcutta - To New Zealand, via Cape of Good Hope, Rio Janeiro, and home -	1884-86 1885-86
" "	" "	"	" "	To New Zealand, via Cape, Rio Janeiro, and home -	1886
Dart, L. C. - Davies, Joseph	Alcester - S.S. Flaxman	1,597 1,418	R. C. Haws, Liverpool - Liverpool, Brazil, and River Plate Steam Navigation Co., Lim., Liverpool.	To Negapatam, and from Calcutta Two voyages to and from River Plate -	1885-86 1885-86

List of Documents, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
¹¹ Dawson, Comr. L. S., R. N.	Sylvia -	1,050	H.M.S. -	From Gibraltar to East Coast of Africa and back, and surveying off coast -	1886
¹² " "	" -	"	" -	Surveying off coast of Spain -	1886
¹³ Denham, George	S.S. Ocean King	1,606	W. Ross, Glasgow	To and from Quebec; to and from New Orleans; to and from Montreal -	1885-86
"	"	"	"	Three voyages to and from Montreal -	1886
¹⁴ Leuchars, William	S.S. Jan Mayen	469	The Dundee Polar Fishing Co., Dundee.	Voyage to Davis Straits. (Ship lost) -	1886
¹⁵ Dobson, C. M.	S.S. Durham	1,466	Bailey & Leatham, Hull -	To Venice and Rotterdam. To Venice, Bermuda, Philadelphia, and home -	1885-86
¹⁶ Docherty, Hugh	Baron Colonsay	1,632	Jas. Grieve, jun., Greenock	To and from Singapore	1886-87
Donaldson, James	Gareloch	1,177	P. Rintoul, Glasgow	Voyage to and from Rangoon -	1885-86
Donaldson, R. A.	S.S. Glenavon	2,985	J. McGregor, London	To China and Japan, via Suez, New York, and home -	1886
¹⁷ Draper, R.	S.S. Monarch	2,072	H.M. Telegraph Ship	Off coasts of British Isles -	1886
¹⁸ " "	"	"	"	"	1886
Dulling, George	S.S. Port Phillip	1,732	The "Anglo-Australian Steam Navigation Co., Lim., London.	To Sydney, via Cape, Shanghai, Yoko- hama, New York, via Suez, New Orleans, and Bremen -	1885-86
¹⁹ " "	"	"	"	To Australia, via Cape, Calcutta, and home via Suez -	1886
Dunbar, John Ivor	S.S. Arracan	1,856	British and Burmese Steam Navi- gation Co., Glasgow.	To and from Rangoon, via Suez -	1886
" "	"	"	"	"	1886-87
" "	"	"	"	"	1886
Ellery, William	Talookdar	2,053	T. and J. Brocklebank, Liver- pool.	To and from Calcutta -	1885-86

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
England, Thomas	Barque Jane	636	P. Sutherland, Liverpool	One voyage to and from Apalachicola, one to Miramichi, and towards home to Lat. 47° N., Long. 44° West	1885-86
Flinton, Benjamin	Barque Dartmouth	915	Merchant Shipping Co., Lim., London.	To and from Hong Kong	1885-86
¹³ Frampton, Martin	Barque Earls court	1,113	W. J. Kidd, Liverpool	To and from Bassein	1885-86
¹⁸ Gordon, J.	S.S. City of Agra	2,133	G. Smith, Glasgow	To and from Calcutta, via Suez	1886
¹⁸ " "	" "	"	"	"	1886
¹⁹ Graham, W. V.	Majestic	1,884	T. and J. Brocklebank, Liverpool	To and from Calcutta	1886-87
Gray, David	S.S. Eclipse	435	D. Gray, Peterhead	To and from Greenland	1885-86
Gray, H. W.	Pleione	1,072	Shaw, Savill, and Albion Co., Lim., London.	Home from Wellington	1886
Gray, John	S.S. Hope	450	R. Kidd, Peterhead	To and from Greenland	1886
Hannay, Charles E.	Prince Edward	2,180	Robert B. Crowe, Liverpool	To Monte Video, Chittagong, and home	1885-86
²⁰ Hawthorne, R.	Barque Lord Wolseley.	2,517	The Irish Shipowners Co., Lim., Belfast.	To and from Calcutta	1885-86
Hayward, George Olive.	S.S. Dunrobin Castle	1,797	Sir T. Brassey, M.P., Westminster	To Natal, Mauritius, Natal, and home	1886
²¹ Hepworth, C. M. W., F.R. Met. Soc.	S.S. Port Pirie	2,049	W. Milburn, London	To Cape Town, Sydney, Adelaide, and home, via Suez	1886
Holdich, J. P.	British Envoy	1,265	J. Coupland, Leicester	To and from Calcutta	1885-86
Hood, William	County of Edinburgh	2,078	Robert Craig, Glasgow	To Bombay, Calcutta, and home	1885-86
²² Hoskyn, Commr. R. F., R.N.	Myrmidon	877	H.M.S.	Australian Station	1885-86

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
²² Hoskyn, Commr. R. F., R.N.	Myrmidon	877	H.M.S. -	Surveying off Melbourne, Sydney, and Townsville -	1886
²³ " "	"	"	" -	Surveying in Coral Sea, and off Townsville and Sydney -	1886
Houston, John	Fort James	1,687	Robert Clark, Glasgow	To Sydney, Newcastle (N.S.W.), San Francisco, and towards home to Lat. 36° S., Long. 27° W. -	1885-86
Hughes, W. P.	Laomene	1,746	D. Fernie, Liverpool	To Calcutta, Mauritius, Calcutta, and home -	1885-86
Irvine, J. W.	S.S. Tunis	887	R. S. Donkin, Newcastle-on-Tyne	Two voyages to and from Alexandria -	1885-86
²³ Irving, P. J.	S.S. Republic	2,187	Oceanic Steam Navigation Co., Liverpool.	Five voyages to and from New York -	1886
²⁴ Jones, Edward, R.N.R.	S.S. Ceylon	1,277	M. D. Lavin, London	To and from North Cape, and to and from Cronstadt -	1886
²⁵ Jones, S. Griff	Barque Hermine	538	T. H. Jackson, Liverpool	To and from Vancouver Island -	1885-86
²⁶ Kennedy, C. W.	S.S. Germanic	3,150	Oceanic Steam Navigation Co., Liverpool.	Five voyages to and from New York -	1885-86
²⁶ " "	"	"	" "	"	1886
King, J. W.	Philomene	1,423	D. Fernie, Liverpool	From "New York" to Calcutta and Hull	1885-86
Lailey, W. N.	S.S. Boyne	1,306	Mercantile S. S. Co., Lim., London.	One voyage to and from Madras, via Suez, one to Genoa, Sulina, and home	1885-86
Leportier, T.	S.S. Mira	1,669	Star Navigation Co., Lim., Liverpool.	To and from Calcutta, via Suez -	1886-87
Luen, H. C.	Barque Shakespeare	767	E. C. Friend & Co., Liverpool	To Wellington, Astoria, and home -	1885-87
Machugh, R. H.	S.S. Ching Wo	1,556	China Shippers Mutual Stm. Nav. Co., London.	To and from China, via Suez -	1886
McLean, Archibald	S.S. Concordia	1,617	John Donaldson, Glasgow	Five voyages to and four from Montreal	1886

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
²⁷ Maclear, J. F. L. P., R.N., F.R. Met. Soc.	Flying Fish	940	H.M.S.	Surveying in China Sea	1885-86
²⁷ " "	"	"	"	Surveying off Port Darwin	1886
²⁷ " "	"	"	"	Surveying in China Sea, and at Port Darwin	1886
Marshall, Frederick	Wiltshire	1,461	Geo. Marshall, London	To Rio Janeiro, Chittagong, and home	1885-86
Maxwell, Joseph	Oamaru	1,306	Shaw, Savill, and Albion Co., Lim., London.	To and from New Zealand	1886
Melville, W. G. B.	Schooner Matabele	1,005	J. T. Rennie & Co., Aberdeen	To and from Natal	1886
Meredith, John	Brigantine Meg Merrilies	-	-	From Suva to the New Hebrides, & back	1885-86
" "	"	-	-	From Fiji, to and from Solomon Islands, &c.	1886
²⁸ Mesnard, Thomas	Sierra Miranda	1,808	A. M. Anderson, Liverpool	To Madras, Rangoon, and home	1885-86
Metcalf, J.	S.S. Oceanic	2,440	Oceanic Steam Navigation Co., Lim., Liverpool.	Between Hong-Kong, Yokohama, and San Francisco	1885-86
²⁹ Miller, A. T., Nav. Lieut. R.N.	Conway	-	Training Ship	Off Birkenhead	1886
Milne, W. F.	S.S. Esquimaux	466	Dundee Whale and Seal Fishing Co., Dundee.	To Newfoundland, Davis Straits, and home	1886
Mitchell, George	S.S. Trinacria	1,466	T. Henderson, Glasgow	Gibraltar to New York and home. To Mediterranean Ports, New York, and home	1885-86
" "	"	"	"	To Mediterranean Ports, New York, and home. To Mediterranean Ports, New York, and back to Genoa	1886
³⁰ Moore, Comr. W. U., R.N.	Rambler	835	H.M.S.	Surveying in China Sea	1886
³⁰ " "	"	"	"	"	1886
³⁰ " "	"	"	"	"	1886

List of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
Moss, M. T.	S.S. Inchulva -	1,453	Robert Fraser, Liverpool	To and from Bombay, via Suez	1886
Murdoch, H.	Penthesilea -	1,668	W. D. Reid, Liverpool	To and from Bombay -	1885-86
Murdoch, Peter	Sierra Estrella -	1,436	A. M. Anderson, Liverpool	To and from Rangoon -	1886
Murray, Alexander	S.S. Perseverance -	165	R. Kidd, Peterhead	To and from Cumberland Gulf	1885-86
Noble, Thomas	Barque River Ganges -	642	Gavin B. Millar, Glasgow	To Townsville, Columbia River, and home -	1886-87
New, George	S.S. Annie -	1,247	J. Gray, Whitby	To Savannah (U.S.A.), and Bremerhaven. To New Orleans and Antwerp -	1885-86
Norman, F.	Barque Polestar -	625	J. Lyne, London	To and from Valparaiso -	1886
North, W. G.	S.S. Tiger -	510	Wilson & Sons, Hull	Trading between Hull and Hamburg -	1886
"	" -	"	"	Between Hull and Stockholm and Hull and Hamburg.	1886-87
Parry, Moses, F.R. Met.Sec.	S.S. Prydain -	1,252	Prydain S.S. Co., Lim., Nevin	To Savannah, and Bremerhaven to Genoa; from Elba to Philadelphia and home -	1885-86
"	" -	"	"	To Savona, Baltimore, and Dublin. To Savona, Odessa, and Bristol. To Genoa, Palermo, and New York -	1886-87
Parsell, H.	S.S. Adriatic -	2,458	Oceanic Steam Navigation Co., Liverpool.	Five voyages from and to New York -	1885-86
"	" -	"	"	Six voyages to, and five from, New York -	1886
Parson, G. F.	Earnock -	1,198	W. Fraser, London	To Sydney, San Francisco, and home -	1885-87
Pattman, Robert	Barque Loch Torridon -	2,000	James Aitken	To Melbourne, San Francisco, and homewards -	1885-86
Pearson, C. W.	S.S. Strathleven -	2,436	W. Burrell, Glasgow	Gibraltar to China, Japan, via Suez, New York, Savannah, and home -	1886

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
Moss, M. T.	S.S. Inchulva -	1,453	Robert Fraser, Liverpool	To and from Bombay, via Suez	1886
Murdoch, H.	Penthesilea -	1,668	W. D. Reid, Liverpool	To and from Bombay	1885-86
Murdoch, Peter	Sierra Estrella -	1,436	A. M. Anderson, Liverpool	To and from Rangoon	1886
Murray, Alexander	S.S. Perseverance -	165	R. Kidd, Peterhead	To and from Cumberland Gulf	1885-86
Naile, Thomas	Barque River Ganges -	642	Gavin B. Millar, Glasgow	To Townsville, Columbia River, and home	1886-87
New, George	S.S. Annie -	1,247	J. Gray, Whitby	To Savannah (U.S.A.), and Bremerhaven. To New Orleans and Antwerp	1886-87
Norman, F.	Barque Polestar -	625	J. Lyne, London	To and from Valparaiso	1885-86
North, W. G.	S.S. Tiger -	510	Wilson & Sons, Hull	Trading between Hull and Hamburg	1886
"	" -	"	"	Between Hull and Stockholm and Hull and Hamburg.	1886
Parry, Moses, F.R. Met.Soc.	S.S. Prydain -	1,252	Prydain S.S. Co., Lim., Nevin	To Savannah, and Bremerhaven to Genoa; from Elba to Philadelphia and home	1886-87
"	" -	"	"	To Savona, Baltimore, and Dublin. To Savona, Odessa, and Bristol. To Genoa, Palermo, and New York	1885-86
"	" -	"	"	Five voyages from and to New York	1886-87
²¹ Parsell, H.	S.S. Adriatic -	2,458	Oceanic Steam Navigation Co., Liverpool	Six voyages to, and five from, New York	1885-86
²² " "	" -	"	"	To Sydney, San Francisco, and home	1885-87
Parson, G. F.	Earnock -	1,198	W. Fraser, London	To Melbourne, San Francisco, and homewards	1885-86
Pattman, Robert	Barque Loch Torridon -	2,000	James Aitken	Gibraltar to China, Japan, via Suez, New York, Savannah, and home	1886
²³ Pearson, C. W.	S.S. Strathleven -	2,436	W. Burrell, Glasgow		

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
Potter, Thomas	S.S. Sulina	1,568	W. S. Bailey, Hull	One voyage to and from Sulina; one to and from Port Said; one to Philadelphia	1885-86
"	"	"	"	From Porman (Spain) to Philadelphia and Rotterdam. From Swansea to Baltimore and Rotterdam. To and from Cronstadt. From Antwerp to Boston	1886
Price, J. H.	Barque Viola	595	C. T. Bowring, Liverpool	To and from Vancouver Island	1885-86
Prout, John Cawse	Cape St. Vincent	1,422	A. P. Lyle, Greenock	To and from Singapore	1885-86
34 Pullen, Lieut. and Comr. T. F., R.N.	Lark	—	H.M.S.	At Sydney, Brisbane, and New Guinea	1885
Quaile, D. W. A.	Orissa	1,199	R. Kerr, Greenock	To Adelaide, San Francisco, and home	1885-87
Randall, W.	Karl of Shaftesbury	2,005	The "Karl of Shaftesbury" Ship Co., Lim., London.	To and from Calcutta	1886
Read, G. W., F.R.G.S.	S.S. Aurette	1,720	Aurette Steam Ship Co., Lim., London.	To Bombay, Moulmein, Bombay, and home, via Suez	1885-86
35 " "	"	"	"	To Mediterranean Ports, Philadelphia, and Rouen	1886
35 " "	"	"	"	To Bombay, via Suez, Genoa, Odessa, and Antwerp	1886-87
Renact, Charles H.	Pleione	1,092	The Shaw, Savill, and Albion Co., Lim., London.	To Wellington	1885
Richardson, W.	S.S. Circassian	2,356	R. G. Allan, Liverpool	Towards Quebec	1886
Ritchie, Alexander	Four Winds	1,799	J. J. Gardiner, Liverpool	To and from San Francisco	1885-86
Ross, Alexander	Borbice	717	D. Kerr, Greenock	To Buenos Ayres, Java, and home	1885-86

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
Potter, Thomas	S.S. Sulina	1,568	W. S. Bailey, Hull	One voyage to and from Sulina; one to and from Port Said; one to Port Said, and thence to Philadelphia	1885-86
"	"	"	"	From Porman (Spain) to Philadelphia and Rotterdam. From Swansea to Baltimore and Rotterdam. To and from Cronstadt. From Antwerp to Boston	1886
Price, J. H.	Barque Viola	595	C. T. Bowring, Liverpool	To and from Vancouver Island	1885-86
Prout, John Cawse	Cape St. Vincent	1,422	A. P. Lyle, Greenock	To and from Singapore	1885-86
34 Pullen, Lieut. and Comr. T. F., R.N.	Lark	—	H.M.S.	At Sydney, Brisbane, and New Guinea	1885
Quaile, D. W. A.	Orissa	1,199	R. Kerr, Greenock	To Adelaide, San Francisco, and home	1885-87
Randall, W.	Earl of Shaftesbury	2,005	The "Earl of Shaftesbury" Ship Co., Lim., London.	To and from Calcutta	1886
Read, G. W., F.R.G.S.	S.S. Aurette	1,729	Aurette Steam Ship Co., Lim., London.	To Bombay, Moulmein, Bombay, and home, via Suez	1885-86
35 " "	"	"	"	To Mediterranean Ports, Philadelphia, and Rouen	1886
35 " "	"	"	"	To Bombay, via Suez, Genoa, Odessa, and Antwerp	1886-87
Renact, Charles H.	Pleione	1,092	The Shaw, Savill, and Albion Co., Lim., London.	To Wellington	1885
Richardson, W.	S.S. Circassian	2,356	R. G. Allan, Liverpool	Towards Quebec	1886
Ritchie, Alexander	Four Winds	1,799	J. J. Gardiner, Liverpool	To and from San Francisco	1885-86
Ross, Alexander	Berbee	717	D. Kerr, Greenock	To Buenos Ayres, Java, and home	1885-86

List of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
Ross, James	S.S. Ben Alder	1,331	W. Thomson, Jun., Leith	To and from China and Japan, via Suez	1886
Rosseter, W. L.	Barque St. Kilda	865	A. T. Parker, Liverpool	To and from Demerara	1886
Russell, C. J.	Khyber	1,967	Ralph Brocklebank, Liverpool	To and from Calcutta	1885-86
Sargent, A. H.	Barque Glenlora	774	Shaw, Savill, and Albion Co., Lim., London.	To Nelson (N.Z.), Valparaiso, Iquique, and home	1885-87
Scott, William	Barque Commewyne	315	J. Grierson, Glasgow	To and from Surinam	1885-86
" "	" "	"	"	To and from Paramaribo	1886
Shearer, George	Barque Thetis	1,294	A. Stephen, Dundee	To Adelaide, Astoria, and home	1886-87
Sheldrake, J. W.	Iron Cross	1,508	D. Fernie, Liverpool	To Rangoon, Calcutta, and New York	1885-86
Simpson, Alexander	S.S. Australasian	2,343	W. Henderson, Aberdeen	To Cape Town, Melbourne, Sydney, Bombay, and home via Suez	1885-86
" "	" "	"	" "	To Melbourne via Cape Town, and home via Suez	1886
" "	Barquentine Traveller	196	A. Simpson, Peterhead	To Copenhagen, &c., Cumberland Gulf, and home	1886
Smith, J. H.	Worcester	—	Training Ship	Off Greenhithe	1886
Smith, W. C., F.R. Met.Soc.	Barque John R. Worcester.	844	John Stewart, London	To Newcastle (N.S.W.), Mauritius, Colombo, Cochin, and home	1885-86
Spratt, W.	S.S. Mozart	1,304	Liverpool, Brazil, and River Plate Steam Nav. Co., Liverpool.	Antwerp to Rio Janeiro, Monte Video, New York, and Liverpool. Liverpool to Monte Video and Dunkirk	1885-86
" "	"	"	" "	Monte Video to Dunkirk. Liverpool to Monte Video, Marseilles, and home. Liverpool to Monte Video, and to- wards Antwerp	1886
Stealey, John	Barque Emily Waters	446	G. S. Richardson, Swansea	To and from Valparaiso	1886

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
Thomson, A. S., F.R. Met.Soc.	S.S. Buccaneer	460	W. African Telegraph Co., London.	Cable laying off West Coast of Africa and home	1885-86
" "	S.S. Silvertown	3,724	The India Rubber, Gutta Percha, and Tel. Works Co., Lim., London.	To West Coast of Africa	1885
" "	"	"	"	To and from West Coast of Africa, and observations off the coast	1886
Travers, H. D.	S.S. Tartar	2,755	Union S.S. Co., Lim., Southampton.	Three voyages to and from Cape Town	1885-86
Trott, Samuel, F.R. Met.Soc.	S.S. Minia	1,350	Anglo-American Telegraph Co., London.	At Halifax and other places in Nova Scotia	1886
" "	"	"	"	At Halifax, cable laying in North Atlantic, and home	1886
Trunks, H.	Barque Aldborough	1,425	British and Eastern Shipping Co., Lim., Liverpool.	To Bombay and towards home, to Lat. 35° N., Long. 36° W.	1885-86
Wait, A. McLean, R.N.R.	S.S. Spartan	2,223	Union S.S. Co., Lim., Southampton	To and from Cape Town, &c.	1885-86
" "	"	"	"	"	1886
" "	S.S. Trojan	2,285	The Union Steam Ship Co. Lim., London.	"	1886
Walker, Henry	S.S. Cephalonia	3,490	Cunard S.S. Co., Lim., Liverpool	Four voyages to and from Boston	1885-86
" "	Barque Cottica	"	"	Six voyages to and from Boston	1886-87
Walsh, Maurice	"	319	Jas. Grierson, Glasgow	Home from Bombay	1886
Ward, J.	Pegasus	2,564	T. C. Wilkinson, Liverpool	To and from San Francisco	1885-86
Waring, William	S.S. Benalder	1,331	Wm. Thomson, jun., Leith	To and from China and Japan, via Suez	1885-86
" "	S.S. Breconshire	1,648	D. J. Jenkins, London	"	1886

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
Thomson, A. S., F.R. Met.Soc.	S.S. Buccaneer	460	W. African Telegraph Co., London.	Cable laying off West Coast of Africa and home	1885-86
"	S.S. Silvertown	3,724	The India Rubber, Gutta Percha, and Tel. Works Co., Lim., London.	To West Coast of Africa	1885
13 "	"	"	"	To and from West Coast of Africa, and observations off the coast	1886
Travers, H. D.	S.S. Tartar	2,755	Union S.S. Co., Lim., Southampton	Three voyages to and from Cape Town	1885-86
35 Trott, Samuel, F.R. Met.Soc.	S.S. Minia	1,350	Anglo-American Telegraph Co., London.	At Halifax and other places in Nova Scotia	1886
36 "	"	"	"	At Halifax, cable laying in North Atlantic, and home	1886
Trunks, H.	Barque Aldborough	1,425	British and Eastern Shipping Co., Lim., Liverpool.	To Bombay and towards home, to Lat. 35° N., Long. 36° W.	1885-86
37 Wait, A. McLean, R.N.R.	S.S. Spartan	2,223	Union S.S. Co., Lim., Southampton	To and from Cape Town, &c.	1885-86
"	"	"	"	"	1886
"	S.S. Trojan	2,285	The Union Steam Ship Co. Lim., London.	"	1886
Walker, Henry	S.S. Cephalonia	3,490	Cunard S.S. Co., Lim., Liverpool	Four voyages to and from Boston	1885-86
38 Walsh, Maurice	Barque Côtica	319	Jas. Grierson, Glasgow	Six voyages to and from Boston	1886-87
"	"	"	"	Home from Bombay	1886
39 Ward, J.	Pegasus	2,564	T. C. Wilkinson, Liverpool	To and from San Francisco	1885-86
40 Waring, William	S.S. Benalder	1,331	Wm. Thomson, jun., Leith	To and from China and Japan, via Suez	1885-86
41 "	S.S. Breconshire	1,648	D. J. Jenkins, London	"	1886

List of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
West, Frederick	S.S. Port Adelaide	1,783	Anglo-Australian Steam Co., London.	To Newcastle (N.S.W.) via Cape, Hong-Kong, Nagasaki, New York via Suez, and home -	1886-87
Wheaton, N. J.	Barquentine Eliza	299	J. H. Goodyear, Liverpool	To Demerara, Barbadoes, Progresso, (Yucatan), &c., and home -	1886
"	"	"	"	To and from Demerara -	1886-87
Williams, H.	Dynomene	1,900	D. Fernie, Liverpool	To and from Calcutta -	1885-86
Williams, H. H.	Bankdale	1,306	Leslie C. Elmslie, Liverpool	To and from Coquimbo -	1885-86
Wilson, John	S.S. Ethiopia	2,604	Barrow S.S. Co., Lim., Barrow	Five voyages to and from New York -	1885-86
"	"	"	"	"	1886
Wilson, William	Barque Horsa	1,128	Star Nav. Co., Liverpool	To Colombo, Cochin, and home -	1885-86
Youlden, H.	Barque May Hulse	463	J. Ranson, Southampton	To Buena Ayres, Talcahuano, and home from Coquimbo -	1885-86
Unknown	S.S. Maranoa	805	Queensland Steam Shipping Co., Lim., London.	London to Port Said -	1883

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

- ¹ Kept by Henry M. Lambert, R.N.R., 2nd Officer.
² Kept by H. J. Blackburne, Chief Officer.
³ Assisted by Messrs. Dawson, Lever, and Stanton.
⁴ Kept by E. J. Evans, 2nd Officer.
⁵ Kept by E. S. Vaxon, Mate.
⁶ Kept by Douglas de Blond.
⁷ Kept by William Kelso.
⁸ Kept by M. J. Riva.
⁹ Kept by Henry King Sturdee, Chief Officer.
¹⁰ Assisted by H. G. Conolly, 2nd Officer.
¹¹ Kept by H. J. Blanchard.
¹² Kept by Lieutenant H. H. Douglas, R.N.
¹³ Assisted by Officers.
¹⁴ Assisted by W. H. Ross, 2nd Officer.
¹⁵ Kept by Officers.
¹⁶ Kept by C. J. Hall, 3rd Officer.
¹⁷ Kept by O. W. Read.
¹⁸ Assisted by D. Morrison and W. R. More.
¹⁹ Assisted by 1st and 2nd Officers.
²⁰ Kept by Henry Hayes, 3rd Mate.
²¹ Kept by J. L. V. Millett, 4th Officer.
²² Kept by Sub-Lieutenant R. Bowden Smith, R.N.
²³ Assisted by J. Christie.
²⁴ Kept by E. J. Simmons.
²⁵ Assisted by Messrs. H. L. Calvert, 1st Mate, and H. Dawson, 2nd Mate.
²⁶ Kept by C. Lancaster, 2nd Officer.
²⁷ Kept by Sub-Lieutenant W. O. Lyne, R.N.
²⁸ Kept by J. C. Glover.
²⁹ Kept by the Boys.
³⁰ Kept by Lieutenant Andrew Balfour, R.N.
³¹ Kept by James B. Mackenzie, 3rd Officer.
³² Kept by J. Christie, 3rd Officer.
³³ Assisted by Alexander Keith, 2nd Officer.
³⁴ Kept by Lieutenant George W. Gubbins, R.N.
³⁵ Kept by W. H. Richardson, 2nd Officer.
³⁶ Kept by R. Ladd, F.R.A.S., F.R. Met. Soc.
³⁷ Kept by George F. Weedon, 4th Officer.
³⁸ Assisted by 2nd Mate.
³⁹ Kept by R. S. Tipson, 3rd Officer.
⁴⁰ Assisted by Messrs. Henry Ward and Bolton, 2nd and 3rd Officers.
⁴¹ Kept by Messrs. Lashbrooke and George Cundy, 2nd and 3rd Officers.
⁴² Kept by W. H. Guy and D. E. Jamieson.
⁴³ Kept by C. L. Wragge, F.R.G.S., F.R. Met. Soc.

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Year.
42 West, Frederick	S.S. Port Adelaide	1,783	Anglo-Australian Steam Co., London.	To Newcastle (N.S.W.) via Cape, Hong-Kong, Nagasaki, New York via Suez, and home	1886-87
Wheaton, N. J.	Barquentine Eliza	299	J. H. Goodyear, Liverpool	To Demerara, Barbadoes, Progresso, (Yucatan), &c., and home	1886
"	"	"	"	To and from Demerara	1886-87
Williams, H.	Dynomene	1,900	D. Fernie, Liverpool	To and from Calcutta	1885-86
Williams, H. H.	Bankdale	1,205	Leslie C. Elmslie, Liverpool	To and from Coquimbo	1885-86
Wilson, John	S.S. Ethiopia	2,604	Barrow S.S. Co., Lim., Barrow	Five voyages to and from New York	1885-86
"	"	"	"	"	1886
Wilson, William	Barque Horsa	1,128	Star Nav. Co., Liverpool	To Colombo, Cochín, and home	1885-86
Youlden, H.	Barque May Hulise	463	J. Ransom, Southampton	To Buenos Ayres, Talcahuano, and home from Coquimbo	1885-86
43 Unknown	S.S. Maranoa	805	Queensland Steam Shipping Co., Lim., London.	London to Port Said	1883

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

- 1 Kept by Henry M. Lambert, R.N.R., 2nd Officer.
- 2 Kept by H. J. Blackburne, Chief Officer.
- 3 Assisted by Messrs. Dawson, Lever, and Stanton.
- 4 Kept by E. J. Evans, 2nd Officer.
- 5 Kept by E. S. Yoxon, Mate.
- 6 Kept by Douglas le Blond.
- 7 Kept by William Kelso.
- 8 Kept by M. J. Riva.
- 9 Kept by Henry King Sturdee, Chief Officer.
- 10 Assisted by H. G. Conolly, 2nd Officer.
- 11 Kept by H. J. Blanchard.
- 12 Kept by Lieutenant H. H. Douglas, R.N.
- 13 Assisted by Officers.
- 14 Assisted by W. H. Ross, 2nd Officer.
- 15 Kept by Officers.
- 16 Kept by C. J. Hall, 3rd Officer.
- 17 Kept by O. W. Read.
- 18 Assisted by D. Morrison and W. R. More.
- 19 Assisted by 1st and 2nd Officers.
- 20 Kept by Henry Hayes, 3rd Mate.
- 21 Kept by J. L. V. Millett, 4th Officer.
- 22 Kept by Sub-Lieutenant F. Bowden Smith, R.N.
- 23 Assisted by J. Christie.
- 24 Kept by E. J. Simmonds.
- 25 Assisted by Messrs. H. L. Calvert, 1st Mate, and H. Dawson, 2nd Mate.
- 26 Kept by C. Lancaster, 2nd Officer.
- 27 Kept by Sub-Lieutenant W. O. Lyne, R.N.
- 28 Kept by J. C. Glover.
- 29 Kept by the Boys.
- 30 Kept by Lieutenant Andrew Balfour, R.N.
- 31 Kept by James B. Mackenzie, 3rd Officer.
- 32 Kept by J. Christie, 3rd Officer.
- 33 Assisted by Alexander Keith, 2nd Officer.
- 34 Kept by Lieutenant George W. Gubbins, R.N.
- 35 Kept by W. H. Richardson, 2nd Officer.
- 36 Kept by E. Laird, F.R.A.S., F.R. Met. Soc.
- 37 Kept by George F. Weedon, 4th Officer.
- 38 Assisted by 2nd Mate.
- 39 Kept by R. S. Tipson, 3rd Officer.
- 40 Assisted by Messrs. Henry Ward and Bolton, 2nd and 3rd Officers.
- 41 Kept by Messrs. Lashbrooke and George Cundy, 2nd and 3rd Officers.
- 42 Kept by W. H. Guy and D. E. Jamieson.
- 43 Kept by C. L. Wragge, F.R.G.S., F.R. Met. Soc.

APPENDIX III.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.		Baro- meters.	Ane- roids.	Thermometers.				Hydro- meters.
				Ordinary.	Max.	Min.	Screens.	
April 1st, 1886, afloat -	-	191	397	1,215	203	163	119	134
Issued since -	-	45	117	389	51	54	44	35
		236	514	1,604	254	217	163	169
Returned since -	-	46	101	292	30	35	21	51
		190	413	1,312	224	182	141	118
April 1st, 1887, afloat	-							

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

April 1st, 1886, in use -	-	79	110	259	18	30	7	20
Issued since -	-	8	3	26	3	7	—	1
		87	113	285	21	37	7	21
Returned since -	-	4	4	19	1	9	5	1
		83	109	266	20	28	2	20
April 1st, 1887, in use	-							

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1887.

Afloat in Royal Navy -	-	190	413	1,312	224	182	141	118
In use at stations -	-	83	109	266	20	28	2	20
In store at M.O. -	-	79	66	86	72	92	—	52
" Chatham -	-	3	1	14	4	4	2	4
" Sheerness -	-	6	6	20	5	4	2	9
" Portsmouth -	-	6	14	45	13	13	18	8
" Devonport -	-	4	5	22	4	4	1	24
" Queenstown -	-	3	5	1	1	1	—	8
" Gibraltar -	-	1	4	2	—	—	—	4
" Malta -	-	8	11	46	7	7	1	18
" Bombay -	-	3	5	17	3	3	1	—
" Halifax -	-	4	10	28	5	6	—	14
" Bermuda -	-	6	10	34	2	4	—	15
" Jamaica -	-	2	1	11	2	2	—	—
" Cape of Good Hope -	-	5	10	27	8	7	3	31
" Trincomalee -	-	3	1	12	2	3	—	—
" Hong Kong* -	-	10	12	65	15	14	2	14
" Coquimbo -	-	3	6	17	3	2	19	—
" Sydney -	-	4	4	20	5	5	—	—
" Esquimalt -	-	3	4	5	2	2	—	—
Total, April 1st, 1887 -	-	426	697	2,050	397	383	192	339
Lost, &c. since April 1st, 1886 -	-	1	4	185	10	11	14	12
Under repair -	-	1	—	—	—	—	—	—

* To December 31st, 1886.

APPENDIX III.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.		Baro- meters.	Ane- roids.	Thermometers.				Hydro- meters.
				Ordinary.	Max.	Min.	Screens.	
April 1st, 1886, afloat -	-	191	397	1,215	203	163	119	134
Issued since -	-	45	117	389	51	54	44	35
		236	514	1,604	254	217	163	169
Returned since -	-	46	101	292	30	35	21	51
		190	413	1,312	224	182	141	118
April 1st, 1887, afloat -	-							

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

April 1st, 1886, in use -	-	79	110	259	18	30	7	20
Issued since -	-	8	3	26	3	7	—	1
		87	113	285	21	37	7	21
Returned since -	-	4	4	19	1	9	5	1
		83	109	266	20	28	2	20
April 1st, 1887, in use -	-							

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1887.

Afloat in Royal Navy -	-	190	413	1,312	224	182	141	118
In use at stations -	-	83	109	266	20	28	2	20
In store at M.O. -	-	79	66	86	72	92	—	52
" Chatham -	-	3	1	14	4	4	2	4
" Sheerness -	-	6	6	20	5	4	2	9
" Portsmouth -	-	6	14	45	13	13	18	8
" Devonport -	-	4	5	22	4	4	1	24
" Queenstown -	-	3	5	1	1	1	—	8
" Gibraltar -	-	1	4	2	—	—	—	4
" Malta -	-	8	11	46	7	7	1	18
" Bombay -	-	3	5	17	3	3	1	—
" Halifax -	-	4	10	28	5	6	—	14
" Bermuda -	-	6	10	34	2	4	—	15
" Jamaica -	-	2	1	11	2	2	—	—
" Cape of Good Hope -	-	5	10	27	8	7	3	31
" Trincomalee -	-	3	1	12	2	3	—	—
" Hong Kong* -	-	10	12	65	15	14	2	14
" Coquimbo -	-	3	6	17	3	2	19	—
" Sydney -	-	4	4	20	5	5	—	—
" Esquimalt -	-	3	4	5	2	2	—	—
Total, April 1st, 1887 -	-	426	697	2,050	397	383	192	339
Lost, &c. since April 1st, 1886 -	-	1	4	185	10	11	14	12
Under repair -	-	1	—	—	—	—	—	—

* To December 31st, 1886.

APPENDIX IV.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1886, afloat -	139	—	774	1	1	142	403
Issued since -	98	—	626	—	—	89	323
Returned since -	237	—	1,400	1	1	231	726
	99	—	610	1	—	90	306
April 1st, 1887, afloat -	138	—	790	—	1	141	420

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

April 1st, 1886, in use -	113	4	283	66	61	38	25
Issued since -	*149	—	18	6	4	2	7
Returned since -	262	4	301	72	65	40	32
	12	—	53	10	7	5	11
April 1st, 1887, in use -	250	4	248	62	58	35	21

* Including 140 at Fishing Villages taken into this account.

DISPOSITION of Board of Trade Instruments on April 1st, 1887.

In merchant ships -	138	—	790	—	1	141	420
In use at stations -	250	4	248	62	58	35	21
In store at M.O. -	44	1	270	13	38	45	78
At Liverpool Agency -	5	7	29	—	—	7	19
„ Aberdeen „ -	6	—	18	—	—	3	24
„ Glasgow „ -	6	—	18	—	—	2	4
„ Dundee „ -	13	—	52	—	—	13	42
„ Hull „ -	6	—	30	—	—	8	23
„ Southampton „ -	2	—	18	—	—	5	22
„ Cardiff „ -	3	—	17	—	—	1	7
Total, April 1st, 1887 -	473	12	1,490	75	97	260	660
Lost, &c. since April 1st, 1886	6	—	163	7	1	34	66

APPENDIX V.

LIST of STATIONS reporting Meteorological Observations by Telegraph to the Office on 31st March 1887, with the Names of Observers.

*†Sumburgh Head -	Rev. W. Brand - - -	Minister of Dunrossness.
*†Stornoway - -	D. MacDonald§ - - -	Late Officer S.S. "Great Eastern."
Wick - - -	J. Sinclair - - -	Watchmaker.
Nairn - - -	Miss Penny - - -	School mistress.
*†Aberdeen - -	J. McCormack - - -	Telegraph Clerk.
Leith - - -	W. Hay - - -	Do.
*†Shields - - -	J. W. Irvine - - -	Do.
Spurn Head - -	J. B. Smith - - -	Assistant Lightkeeper.
†York - - -	H. M. Platnauer, F.G.S. -	Curator of Museum.
Loughboro' - -	W. Berridge, F.R.Met.Soc. -	—
†Ardrossan - -	J. W. Mayes - - -	Telegraph Clerk.
Malin Head - -	P. O'D. Farren - - -	Signalman, Lloyd's.
*†Mullaghmore -	K. Kerr - - -	Retired Coastguard Officer.
*†Belmullet - -	Miss M. J. Tolau - - -	Telegraphist.
†Donaghadee - -	T. MacGowan - - -	Postmaster.
Parsonstown - -	B. Budds - - -	Assistant Observer at Lord Rosse's Observatory.
Barrow-in-Furness -	W. S. Whitworth - - -	Engineer, Barrow-in-Furness Railway.
*†Holyhead - -	Capt. Richards - - -	Keeper of Sailors' Home.
Liverpool - - -	J. Hartnup, F.R.Met.Soc. -	Bidston Observatory.
*†Valencia - - -	J. E. Cullum - - -	Superintendent of the Observatory.
†Roche's Point -	W. Kennedy - - -	Telegraph Clerk.
Pembroke - - -	Messrs. Blake and Spicer -	Lightkeepers.
*†Scilly - - -	W. Thomas - - -	Signalman.
Prawle Point - -	J. John - - -	Coastguard Officer.
†Harst Castle - -	G. G. Appleton - - -	Lightkeeper.
†Jersey - - -	J. Fisher - - -	Signalman.
*†Dungeness - -	P. Curnow - - -	Lightkeeper.
*†London - - -	F. Gaster, F.R.Met.Soc. -	Clerk, Meteorological Office.
Oxford - - -	W. Wickham - - -	Radcliffe Observatory.
Cambridge - - -	H. Todd - - -	Observatory.
*†Yarmouth - -	G. T. Watson - - -	Secretary, Sailors' Home.
†Hawes Junction -	W. H. Bunce - - -	Station Master.

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

† This station now reports by post only.

§ Mr. MacDonald died on 12th March 1887; Mr. J. Forbes of Nicolson Institution took charge of the instruments on 21st of May.

|| Since removed to another C. G. station.

APPENDIX VI.

REPORT OF THE INSPECTION OF THE IRISH AND WELSH STATIONS.

GENTLEMEN,

I HAVE to report that I have completed the inspection of these stations, with the exception of four of those which furnish information for the Weekly Weather Report, viz., Foynes, Kilkenny, Killarney, and Llandoverly, which were not considered to require visiting this year.

The stations of Malin Head and Londonderry were visited by Captain Toynbee.

TELEGRAPHIC STATIONS.

Holyhead, visited September 16.—I found that the rain-gauge and thermometer screen were too much overshadowed by shrubs, and directed the observer to have the necessary alterations effected. The station otherwise was in good order. I took down one of the new hand anemometers to this station and instructed the observer in its use.

Donaghadee, visited September 21.—This station was, as usual, in good order, and calls for no remark.

Mullaghmore, visited September 23.—The only defect I discovered at this station was that the index of the minimum thermometer was occasionally left partially dry, so that the indications were incorrect. A new instrument is to be supplied.

Belmullet, visited September 25.—The reports from this station have shown a marked improvement during the last twelve months. A weathercock has been erected, so that the reports of wind direction have been more correct.

Malin Head, visited by Captain Toynbee, July 1.—This station is not perfectly satisfactory, as the reporter, Lloyd's signalman, frequently reads the barometer incorrectly. His brother, who is Lloyd's agent, does the work correctly, but he lives at a distance from the Signal Tower, and so cannot give constant attention to the reports. We must endeavour to effect an improvement by correspondence.

Parsonstown, visited September 30.—This station was satisfactory, as usual.

Roche's Point, visited October 4.—There is nothing particular calling for remark at this station.

Valencia, visited October 6.—The telegraphic reporting duty at this station is satisfactory, except that the observer does not furnish very full cloud reports.

St. Ann's Head, visited October 11.—This station is quite satisfactory, excepting that tourists have again been interfering with the instruments. I have had to direct that a wire cover should be placed over the sunshine recorder.

WEEKLY WEATHER REPORT STATIONS.

The stations of Edgeworthstown (Currygrane), and Waterford (Brook Lodge), were visited September 28 and October 8 respectively; they were both in good order. At the latter station Mr. Bolton the observer was unfortunately absent on the day of my visit.

STATIONS OF THE SECOND ORDER.

Armagh, visited September 22.—The thermometers and rain-gauge have been removed to their new site in the enclosure on the south side of the observatory since the date of my last visit. This is a decided improvement.

Dublin (Fitzwilliam Square), visited September 20.—The station remains as satisfactory as is possible for the locality.

Dublin (Glasnevin), visited September 20.—At this station the thermometer screen and rain-gauge have been slightly moved. The instruments, &c. are in good order.

Dublin (Mountjoy Observatory), visited September 20.—The only matter calling for notice at this station is that the wind reports are unsatisfactory. The instrument is a small anemometer, its indications (means per hour), are converted by James' Table to pressures per square foot, and these again to the figures by Beaufort's scale, with the result that the force reported is much too low. I would recommend that a self-recording instrument be supplied.

Colebrooke, visited September 23.—This station calls for no special remark.

Parsonstown, visited September 30.—See Report above.

Markree, visited September 24.—This station continues in very good order.

St. David's, visited October 9.—At this station the thermometers and rain-gauge have been removed to a fresh site, much more open than that previously available. This station is in very good order.

Londonderry, visited by Captain Toynbee June 30, and found to be in a satisfactory condition.

OBSERVATORY.

Valencia, visited October 6.—There is nothing calling for remark.

The following table shows the results of thermometric comparisons:—
Corrections to be applied to the readings of—

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

Armagh	-0.3	-0.2	-1.1	—	-0.5	
Parsonstown	-0.3	0.0	-0.4	0.0	—	
Brookborough	-0.8	-0.6	-0.4	-0.5	—	
Dublin (City)	-0.4	-0.4	-0.5	0.0	-0.5	
Dublin (Phoenix Park O.S.O.)	-0.2	-0.3	-0.2	+0.5	—	Grass min. -0.1.
Glasnevin	-0.3	-0.5	-0.5	+1.3	—	Do. do.
Markree Castle	0.0	0.0	+0.1	+0.1	—	
St. David's	-0.6	-0.6	-0.2	-0.6	—	Do. -0.4.
Londonderry	-0.4	-0.4	-1.6	-0.2	—	

TELEGRAPHIC REPORTING STATIONS.

Belmullet	-0.4	-0.4	-0.1	-0.3	—
Donaghadee	-0.5	-0.7	-0.1	-0.2	—
Malin Head	-0.4	-0.5	-0.8	-1.8	-0.6
Mullaghmore	-0.2	-0.2	-0.1	+0.2	-0.3
Valencia	-0.7	-0.6	-0.9	+0.4	-1.0
St. Ann's Head	-0.6	-0.2	-1.2	-0.3	-0.7
Holyhead	-0.2	-0.3	-0.4	-0.2	-0.3

WEEKLY WEATHER REPORT STATIONS.

Edgeworthstown	-0.3	-0.3	-0.3	+0.1	—	Grass min. +0.4.
Waterford	-0.6	-0.6	-0.6	-0.2	—	Do. do.

Yours, &c.

(Signed) ROBERT H. SCOTT.

REPORT of the INSPECTION of the ENGLISH STATIONS.

I HAVE the honour to submit the following report of the stations in England inspected by me this year.

TELEGRAPHIC REPORTING STATIONS.

Jersey (Noirmont), June 23.—The observations are excellently conducted at this station, and the instruments are all in good order. I removed the sunshine recorder to this station on April 18.

Hurst Castle, July 3.—The observations at this station are fairly good, but the direction of the winds reported is not reliable. The very high maximum temperatures occasionally reported have been I think due, principally at least, to the extreme mobility of the index column of the maximum thermometer, coupled with a certain amount of unskilfulness in the observer. A new maximum has therefore been sent to this station on the 3rd of August.

The barometers are in good order. I removed them to a position a few yards from that which they have hitherto occupied, in order to obtain a rather better light, and to avoid the afternoon sunshine.

The thermometer screen required repainting and some repairs, about which directions were given.

Dungeness, July 6-9.—The work done at this station has been in several respects unsatisfactory. The light-keepers, four in number, take the readings of the instruments in rotation when on duty, as mentioned in last year's report. They are as yet by no means careful observers.

The low minima of temperature often reported did not appear to me to be attributable to volatilization or to interruption of the thread of spirit in the thermometer, which is a good instrument, but to carelessness, sometimes in reading, and at other times in setting the instrument.

The barometer No. 619, had been moved into the tower by one of the observers, Mr. Curnow. I hung the other barometer, No. 618, by the side of it.

It will be seen in the table that the difference of the readings of the two instruments is rather large. Both the tubes are free from air.

The wet-bulb was much crusted. The remaining instruments were in good order.

Yarmouth, July 12.—I found the instruments at this station in good order, and well attended to, as usual.

I took down to this station a small self-registering anemometer.

The large anemometer was in good order.

Loughborough, July 14.—The observations at this station was exceptionally good, and I found all the instruments in perfect order. I experimented with a small self-registering anemometer in the observer's garden, the estimated wind force being 4 at the time, with unsatisfactory results.

Spurn Head, July 16.—The barometric reports from this station have still appeared to be somewhat low, and this may possibly be due to the observer having set the vernier too low.

The instruments were all in very good order. The great drawback in the instance of this excellently exposed station is the sand-drift. The sand almost constantly coats the wet-bulb, and during the time that I removed the thermometers for comparison (about 80 minutes) the wind, then blowing with the estimated force 4, had filled with sand every interstice in the closed screen, from which I had previously swept the sand. In rainy weather much wet sand occupies the funnel of the rain-gauge.

For wind reports the great superiority of this station over others on our east coast is unquestionable.

York, July 18.—Some improvement is shown in the observations at this station, and the observer reads and reduces correctly. The rain-gauge had now become quite useless, and it had become necessary to employ that which is used for the 9 o'clock observations.

The barometer is now in good order.

North Shields, July 21.—The instruments, with the exception of the small self-registering anemometer (which was out of order), were all in good order, and the observations are, as usual, well attended to.

Barrow-in-Furness, July 26.—Everything at this station appeared to be in good order. The barometer is sluggish, but contains no air.

Scilly (St. Mary's), September 25-27.—I took to this station the self-registering aneroid which was sent back last year for repairs. I left it in good working order, having adjusted it to the mercurial standard, but the clock required a little further regulation.

All the instruments were in excellent order.

The anemometer worked well at the date of inspection. It is a difficult matter to attend to this instrument during a southerly gale with rain, and the observer asks for the erection of some shelter, such as a sheet of galvanized iron with light boardings on the steps of the pillar, but I believe that this would, in all probability, seriously interfere with the motion of the air striking the cups.

Prawle Point, September 28.—The observer, Mr. J. John, was absent on leave at the date of my inspection, and the chief boatman, Mr. McLegen, took the readings, reading the barometers with precision, but the thermometers a little too high. The instruments were all in good order, except that the rain-gauge, which is attached to an extremely firm block, required raising on the south-east, and that the wet-bulb was not quite clean. A very careful look-out for weather is maintained at this station.

STATIONS of the SECOND ORDER and WEEKLY WEATHER REPORTING STATIONS.

Southampton, July 2.—Everything appeared to be in good order, as usual, at the station except that the sunshine recorder (which has a perfect exposure) required a trivial alteration. The maximum appears to give rather high and the minimum rather low readings.

St. Leonard's, July 10.—The station is now an exceedingly good one, the positions of the instruments being admirable. I ascertained, first from barometrical comparisons and secondly by levelling, that the cistern of the barometer is 31·5 feet above an Ordnance mark, which is itself 114·3 above M.S.L. The barometer cistern is thus 145·8 above M.S.L.

Epsom (Royal Medical College), July 11.—This is a new station, which promises well. The returns at the date of my inspection were slightly incomplete, and some reduction errors were noticeable, but great improvement may be anticipated. The Stevenson's screen and rain-gauge have a complete exposure, being in a large lawn on the front or north-west side of the College. There is a gentle fall of the ground towards west-north-west. The outdoor instruments are 272 feet above M.S.L., and the cistern of the reporting barometer 304 feet. The instruments were all in excellent order.

The station appears to be fairly well situated for observations of the wind, but is slightly sheltered from Easterly winds by the Downs.

Geddeson, July 12.—A larger screen was, on January 1st, 1885, substituted for the Stevenson's previously in use at this station, details

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Geldeston, July 12.—A larger screen was, on January 1st, 1885, substituted for the Stevenson's previously in use at this station, details

of previous comparative readings in the two screens being sent to the Meteorological Office. The instruments at this station, including thermograph, barograph, &c., were, as usual, in excellent order. The sunshine recorder required a slight adjustment, the slate by which it was supported on the south-east having been partially displaced.

Leicester, July 13-14.—At this station, the instruments were found to be in tolerably good order. The observer is painstaking, but he fails to read the instruments with complete accuracy. A new grass minimum had been employed since the 10th of July; its readings are somewhat low. The wind-force was over-estimated by the observer on the 14th. The sunshine recorder required re-adjustment.

Sheffield, July 15.—The instruments at this station are most carefully attended to, and the returns are very accurate and full, but it has hitherto been impossible to obtain readings at 9 instead of at 6 p.m. The buildings on the west of the out-door instruments, prospectively alluded to in my last year's report, are now in course of erection, but are not likely to be completed before May 1887. In the meantime it is not certain where the new gravel walks will be laid down, and the instruments have therefore not been shifted. The general exposure in the park is excellent, but for the present the screen and rain-gauge are somewhat sheltered by building sheds. The readings of two earth thermometers are now taken at 9 a.m. There is some hope that when the new Art Gallery is completed, the anemometer, which is now at the Borough Hospital, may be transferred to the Museum, where it could be regularly attended to. The station is altogether an excellent one.

York, July 17-18.—The observations are fairly good. The Bootham Friends' School, on the ridge of the roof of which the sunshine recorder is erected, was closed for the holidays, and I could not learn by whom the cards were now attended to. The instrument was correct as regards level, but quite out of adjustment as regards time. It is erected on a very high thin framework of wood attached by six wires to surrounding chimney-tops, and is by no means easy of access, still less of adjustment.

Whitby, July 19.—The observations at Whitby Lighthouse were commenced at the beginning of 1886. They are conducted very efficiently by Mr. Powell, whose daughter also in his temporary absence takes the observations well. The lighthouse and buildings have the sea on the north-east and are situated close to the edge of the cliff, which is here nearly perpendicular. The barometer cistern is 203 feet above M.S.L. The thermometer screen, which is a Royal Meteorological Society screen, and the rain-gauge, have a complete exposure in the garden to the south-west of the lighthouse. A few hundred yards to the west, the ground rises with a somewhat steep incline to a level of about 65 feet above the garden, while to the north and north-west, there is also a rise of 50 feet or more. Winds from West and North-west will consequently be felt at the station itself with diminished force. The existing instruments were all in excellent order, and the station promises to be a useful one.

Durham, July 20.—Since Mr. Carpenter's appointment, the observations have been very efficiently taken at 9 a.m. and 9 p.m. In March 1886 the rain-gauge had to be slightly lowered, but the instruments are otherwise unchanged. The thermometers read very correctly, but I have not the slightest doubt that the nature of the screen causes the readings to be too high, perhaps by as much as a degree. The observer is most careful and attentive.

Seaham, July 20.—On June 1, 1886, a complete change was made in the position of the outdoor instruments. They were removed into

the south-east corner of the large new cemetery ground, which is distant between 800 and 900 yards from their former site, and is at a somewhat greater elevation. The change of position was most desirable, as the instruments have now a true exposure. They were in fairly good order, but the maximum thermometer read $0^{\circ} \cdot 6$ too low, an error which if the corrections since supplied to the observer were employed, would amount to $0^{\circ} \cdot 9$. Mr. Aird promised me to have the screen at once painted with a light colour. It was painted green in 1885, as mentioned in that year's report.

Penrith (Newton Observatory), July 22.—This is an admirably equipped station, and all the instruments, including barometers, anemometer, sunshine recorder, thermograph, and self-registering aneroid were in excellent order. The thermometer screens and rain-gauges have complete exposure. The returns are very full and correct, Mr. Benn was absent at the time of my visit. His assistant, Mr. Rownsey, took the readings very correctly.

Cronkbourne (Isle of Man), July 25.—I found all the work at this station in its usual unexceptionable condition. The instruments are in excellent order, the observations carefully taken and fully reported.

Douglas (Isle of Man), July 25.—This is a new station. The observer, Mr. T. Keig, appears to be careful and painstaking, and the thermometers are good instruments. The screen is a wall screen, and the boarded flooring which surrounds it is unfavourable for the observations of temperature. The screen is also single louvred. The observations here taken are, I believe, locally published as indicative of the climatology of Douglas. I should say that, on the average, the temperatures reported would be $2^{\circ} \cdot 5$ too high. The rain-gauge, like the thermometer screen, is on a portion of the roof, and has a most indifferent exposure. The barometer, an ordinary Fishery barometer, stands in an adjoining room, and its cistern is 56 feet above M.S.L. The house is in the middle of the town on a considerable slope.

Plymouth, September 23.—I again inspected this Weekly Weather Reporting Station, since on the 1st of January 1887 Dr. Merrifield intends to commence reporting from his new house in Hobart Terrace, and it seemed desirable to report on the nature of the new sites for the instruments. These will be very good, and the rain-gauge especially will have a true exposure, instead of being much sheltered as at present on the south-east. The sunshine recorder will also have an almost if not quite, perfect exposure.

I found the instruments in good order as on all former occasions.

Helston, September 24.—At the date of my visit the last sheet returned from this station was that for September 1883. The observer continues to be in rather weak health, and somewhat overworked in his profession as a schoolmaster. He is desirous of obtaining the assistance of the Meteorological Office in some of the reduction work.

Arlington Court (near Barnstaple), September 29.—The situation of the out-door instruments is good, and the thermometers and rain-gauges are in good order. The barometer is unfavourably placed and is not very accurate.

Chatham, October 14.—The observer was absent at the date of my visit. One of the deputy observers took readings with me correctly. The barometer and thermometers (excepting the minimum, which had 2° of spirit detached which had been unnoticed) were in fairly good order. A new screen is absolutely necessary, and has been ordered. The old Stevenson screen is falling to pieces, and a screen recently sent down to the station is of an obsolete kind and is rejected.

In the last column of the table appended to this report the letters A, B, and C indicate what I consider the quality of the observations taken at the stations, with no reference to the correctness or want of correctness of the instruments employed. A signifies that adequate care is taken by the observers, and that the station is a satisfactory one; B that the observations as taken are not quite satisfactory; C that the present state of the observations taken is unsatisfactory.

(Signed) W. CLEMENT LEY.

October 15, 1886.

BAROMETER and THERMOMETER READINGS, STATIONS IN ENGLAND.

Station.	Reporting Barometer.	Difference of Observer's Readings.	Check Barometer.	Difference of Observer's Readings.	Dry Bulb.			Wet Bulb.			Maximum.			Minimum.			Spare.			Condition of Station.
					Temp. in Water.	Correction to Inspector's Standards.	Correction as supplied.	Temp. in Water.	Correction to Inspector's Standards.	Correction as supplied.	Temp. in Water.	Correction to Inspector's Standards.	Correction as supplied.	Temp. in Water.	Correction to Inspector's Standards.	Correction as supplied.	Temp. in Water.	Correction to Inspector's Standards.	Correction as supplied.	
Ayrington	29.56	+0.02	—	—	58.1	+0.3	—	58.1	+0.3	0.0	58.1	+0.3	—	58.1	+0.3	—	58.1	+0.3	—	C
Barrage-in-Franchess	29.503	+0.003	—	—	58.8	+0.3	—	58.8	+0.3	0.0	58.8	+0.3	—	58.8	+0.3	—	58.8	+0.3	—	A
Chatham	29.611	+0.000	—	—	55.3	+0.0	—	55.3	+0.0	0.0	55.3	+0.0	—	55.3	+0.0	—	55.3	+0.0	—	C
Crookbourne	29.442	+0.004	—	—	60.8	+0.1	—	60.8	+0.1	0.0	60.8	+0.1	—	60.8	+0.1	—	60.8	+0.1	—	A
Douglas	29.608	+0.002	—	—	63.0	+0.1	—	63.0	+0.1	0.0	63.0	+0.1	—	63.0	+0.1	—	63.0	+0.1	—	B
Dunageess	29.092	+0.018	29.100	—	61.5	+0.1	—	61.5	+0.1	0.0	61.5	+0.1	—	61.5	+0.1	—	61.5	+0.1	—	C
Durham	29.189	+0.001	—	—	59.9	+0.0	—	59.9	+0.0	0.0	59.9	+0.0	—	59.9	+0.0	—	59.9	+0.0	—	A
Epsom	29.818	+0.002	—	—	62.1	+0.1	—	62.1	+0.1	0.0	62.1	+0.1	—	62.1	+0.1	—	62.1	+0.1	—	A
Gedeston	29.349	+0.000	—	—	59.9	+0.0	—	59.9	+0.0	0.0	59.9	+0.0	—	59.9	+0.0	—	59.9	+0.0	—	A
Holston	29.092	+0.001	—	—	55.0	+0.1	—	55.0	+0.1	0.0	55.0	+0.1	—	55.0	+0.1	—	55.0	+0.1	—	B
Hurst Castle	29.117	+0.001	29.109	—	64.4	+0.3	—	64.4	+0.3	0.0	64.4	+0.3	—	64.4	+0.3	—	64.4	+0.3	—	B
Jersey, Noirmont	29.802	+0.001	29.805	—	57.6	+0.0	—	57.6	+0.0	0.0	57.6	+0.0	—	57.6	+0.0	—	57.6	+0.0	—	B
Leicester	29.334	+0.004	—	—	59.2	+0.0	—	59.2	+0.0	0.0	59.2	+0.0	—	59.2	+0.0	—	59.2	+0.0	—	A
Loughborough	29.140	+0.000	—	—	56.2	+0.1	—	56.2	+0.1	0.0	56.2	+0.1	—	56.2	+0.1	—	56.2	+0.1	—	B
Newton (Penrith)	29.003	+0.003	—	—	60.3	+0.0	—	60.3	+0.0	0.0	60.3	+0.0	—	60.3	+0.0	—	60.3	+0.0	—	A
Plymouth	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	A
Pringle Point	29.850	+0.000	29.850	—	57.9	+0.1	—	57.9	+0.1	0.0	57.9	+0.1	—	57.9	+0.1	—	57.9	+0.1	—	A
St. Leonards	—	+0.000	—	—	60.1	+0.0	—	60.1	+0.0	0.0	60.1	+0.0	—	60.1	+0.0	—	60.1	+0.0	—	A
Seilly, St. Mary's	29.206	+0.000	29.200	—	57.7	+0.2	—	57.7	+0.2	0.0	57.7	+0.2	—	57.7	+0.2	—	57.7	+0.2	—	A
Seaham	29.508	+0.000	—	—	63.7	+0.2	—	63.7	+0.2	0.0	63.7	+0.2	—	63.7	+0.2	—	63.7	+0.2	—	A
Sheffield	29.556	+0.002	—	—	58.0	+0.1	—	58.0	+0.1	0.0	58.0	+0.1	—	58.0	+0.1	—	58.0	+0.1	—	A
Shoals, North	29.850	+0.000	29.846	—	62.1	+0.1	—	62.1	+0.1	0.0	62.1	+0.1	—	62.1	+0.1	—	62.1	+0.1	—	A
Southampton	29.323	+0.000	—	—	60.1	+0.2	—	60.1	+0.2	0.0	60.1	+0.2	—	60.1	+0.2	—	60.1	+0.2	—	V
Spurn Head	29.701	+0.004	29.704	—	59.2	+0.1	—	59.2	+0.1	0.0	59.2	+0.1	—	59.2	+0.1	—	59.2	+0.1	—	V
Whitby	29.595	+0.001	—	—	60.2	+0.1	—	60.2	+0.1	0.0	60.2	+0.1	—	60.2	+0.1	—	60.2	+0.1	—	V
Yarmouth	29.580	+0.002	—	—	62.5	+0.1	—	62.5	+0.1	0.0	62.5	+0.1	—	62.5	+0.1	—	62.5	+0.1	—	V
York	29.833	+0.001	—	—	60.5	+0.0	—	60.5	+0.0	0.0	60.5	+0.0	—	60.5	+0.0	—	60.5	+0.0	—	A
York (2nd Order)	29.837	+0.001	—	—	60.2	+0.0	—	60.2	+0.0	0.0	60.2	+0.0	—	60.2	+0.0	—	60.2	+0.0	—	B

BAROMETER and THERMOMETER READINGS, STATIONS IN ENGLAND.

Station.	Reporting Barometer.	Difference of Observer's Readings.	Check Barometer.	Difference of Observer's Readings.	Dry Bulb.			Wet Bulb.			Maximum.			Minimum.			Spare.			Condition of Station.
					Temp. in Water.	Correction due to Inspector's Standards.	Correction as applied or supplied.	Temp. in Water.	Correction to reduce to Inspector's Standards.	Correction as applied or supplied.	Temp. in Water.	Correction to reduce to Inspector's Standards.	Correction as applied or supplied.	Temp. in Water.	Correction to reduce to Inspector's Standards.	Correction as applied or supplied.	Temp. in Water.	Correction to reduce to Inspector's Standards.	Correction as applied or supplied.	
Arlington	29.56	+	—	—	58.1	+0.3	—	58.1	+0.3	—	58.0	+0.4	—	57.4	+1.0	—	—	—	—	C
Barnes-in-Furness	29.503	—	—	—	58.7	0.0	—	58.7	0.0	—	58.7	0.0	—	58.8	+0.2	—	—	—	—	C
Chatham	29.613	—	—	—	55.3	0.0	—	55.3	0.0	—	55.3	0.0	—	55.2	0.0	—	55.3	0.0	—	C
Crookbourne	29.442	—	—	—	60.8	0.0	—	60.8	0.0	—	60.8	0.0	—	60.5	+0.2	—	60.3	+0.4	—	C
Douglas	29.008	—	—	—	63.0	0.0	—	63.0	0.0	—	63.0	0.0	—	62.8	+0.1	—	62.5	+0.4	—	A
Durham	29.052	—	—	—	64.5	0.0	—	64.4	0.0	—	64.2	+0.4	—	64.6	0.0	—	64.6	0.0	—	C
Durham	29.689	—	—	—	59.9	0.0	—	59.9	0.0	—	59.9	0.0	—	59.5	+0.4	—	59.9	0.0	—	A
Bishop	29.818	—	—	—	63.0	0.0	—	63.0	0.0	—	63.0	0.0	—	63.2	0.0	—	63.2	0.0	—	A
Gedston	29.649	—	—	—	53.0	0.0	—	53.0	0.0	—	53.0	0.0	—	53.4	+0.5	—	60.0	0.0	—	A
Helston	29.417	—	—	—	53.0	0.0	—	53.0	0.0	—	53.0	0.0	—	53.4	+0.5	—	60.0	0.0	—	A
Harst Castle	29.402	—	—	—	54.4	+0.3	—	54.4	+0.3	—	54.8	+0.1	—	54.4	+0.5	—	60.0	0.0	—	A
Jersey, Noirmont	29.836	—	—	—	57.6	0.0	—	57.6	0.0	—	57.4	+0.2	—	57.2	+0.5	—	—	—	—	B
Leicester	29.803	—	—	—	58.1	0.0	—	58.1	0.0	—	58.1	0.0	—	58.7	+0.4	—	—	—	—	B
Loughborough	29.444	—	—	—	56.7	0.0	—	56.7	0.0	—	56.4	+0.3	—	56.3	+0.4	—	—	—	—	A
Newton (Pentrich)	29.603	—	—	—	60.3	0.0	—	60.3	0.0	—	60.3	0.0	—	60.0	+0.3	—	60.0	0.0	—	A
Plymouth	29.503	—	—	—	57.9	0.0	—	57.8	0.0	—	57.6	0.0	—	57.7	+0.1	—	60.0	0.0	—	A
Prace Point	29.820	—	—	—	57.9	0.0	—	57.8	0.0	—	58.0	0.0	—	57.7	+0.1	—	60.0	0.0	—	A
St Leonards	29.500	—	—	—	66.1	0.0	—	66.1	0.0	—	65.8	+0.2	—	65.8	+0.3	—	65.0	+0.2	—	A
St Mary's	29.200	—	—	—	66.1	0.0	—	66.1	0.0	—	65.8	+0.2	—	65.8	+0.3	—	65.0	+0.2	—	A
Seaford	29.503	—	—	—	65.7	0.0	—	65.6	0.0	—	65.6	0.0	—	65.0	+0.5	—	65.0	+0.2	—	A
Shedden	29.503	—	—	—	65.7	0.0	—	65.6	0.0	—	65.6	0.0	—	65.0	+0.5	—	65.0	+0.2	—	A
Shildon	29.503	—	—	—	65.7	0.0	—	65.6	0.0	—	65.6	0.0	—	65.0	+0.5	—	65.0	+0.2	—	A
Southampton	29.703	—	—	—	66.4	+0.2	—	66.5	+0.1	—	67.0	+0.4	—	66.2	+0.4	—	66.2	+0.4	—	A
Spurn Head	29.704	—	—	—	66.4	+0.2	—	66.5	+0.1	—	67.0	+0.4	—	66.2	+0.4	—	66.2	+0.4	—	A
Whitby	29.503	—	—	—	66.4	+0.2	—	66.5	+0.1	—	67.0	+0.4	—	66.2	+0.4	—	66.2	+0.4	—	A
Warrmouth	29.503	—	—	—	66.4	+0.2	—	66.5	+0.1	—	67.0	+0.4	—	66.2	+0.4	—	66.2	+0.4	—	A
York	29.503	—	—	—	66.4	+0.2	—	66.5	+0.1	—	67.0	+0.4	—	66.2	+0.4	—	66.2	+0.4	—	A
York (Civil Order)	29.503	—	—	—	66.4	+0.2	—	66.5	+0.1	—	67.0	+0.4	—	66.2	+0.4	—	66.2	+0.4	—	B

REPORT OF INSPECTION OF THE SCOTTISH STATIONS.

BAROMETERS.

I did not take with me this year a mercurial standard barometer. As in previous years the aneroid No. 11 was read with the barometers of the stations, with, however, the same experience, viz., that aneroids are of little, if any, use as a control instrument for inspection purposes. The result of the inspection and a comparison of the barometric readings with the isobars of the weather charts warrant me in saying that the barometers at each of the stations continue to be in excellent order.

It is gratifying to report that the difference between the inspector's and observer's, or assistant's, readings in no case exceeded 0·002 inch.

THERMOMETERS.

In comparing the thermometers, inspector's standard thermometer No. 2,522 was first used, but this having been unfortunately broken, the standard thermometer No. 2,395 was thereafter used. The results of the comparisons made with these standards and the thermometers at the different stations and at Aberdeen Observatory are shown in the following table, the readings of the standards being corrected for instrumental errors, but the thermometers at the stations are uncorrected:—

STATIONS.	Standard No. 2,522, Corrected.	STATION THERMOMETER.					Time in Water in Minutes.	Change of Tempera- ture of Water.	Notes.
		Dry	Wet.	Spere.	Max.	Min.			
Laudale -	55·2	+0·1	+0·1	—	+0·1	-0·3	90	-0·2	
Stornoway -	57·8	+0·6	+0·5	+0·3	-0·5	-0·5	100	Uniform	
Swanbister -	59·8	0·0	+0·1	+0·4	0·0	-0·2	180	-0·2	
Dunrossness	55·0	+0·3	+0·3	+0·2	+0·1	-0·8	135	Uniform	
Wick -	58·9	+0·3	+0·3	—	-0·3	-0·1	60	+0·2	
Dunrobin -	61·8	-0·4	-0·6	—	+0·5	-0·6	95	-0·2	
Nairn -	55·1	+0·6	-0·7	+0·1	-0·2	+1·0	110	Uniform	
Aberdeen -	53·1	+0·2	+0·4	—	-0·5	0·0	150	Do.	
Braemar -	52·7	+0·4	+0·5	—	+0·5	-0·1	95	+0·5	
Dundee -	53·1	+0·5	+0·5	—	+1·3	0·2	80	Uniform	
Pinnore -	54·8	+0·3	+0·5	—	-0·1	0·0	45	+0·2	
Ardrossan -	53·4	+0·3	+0·4	—	0·0	-0·3	90	+0·2	
Rothsay -	55·5	-0·1	-0·1	—	-0·1	-0·4	75	Uniform	Min. 1st, 53°·9,
Glenalmond	54·6	+0·2	+0·3	-0·2	+0·3	-0·2	85	Do.	2nd, 54°·4.
Leith -	53·9	+0·1	+0·5	—	0·0	-0·4	60	Do.	
King's Col- lege.	52·0	+0·1	-0·1	—	+0·2	+0·1	30	Do.	} Stevenson's screen Ther- mograph.
Aberdeen -	52·0	-0·3	+0·3	—	+0·2	-0·3	80	Do.	

HYGROMETERS.

Readings were taken of the dry and wet bulb thermometers immediately on opening the thermometer screens, which indicated that the instruments are kept in good order at the stations. The greatest differences, about 7°·0, occurred at Laudale, Wick, Dunrobin, and Braemar; and the smallest, about 1°·0 at Pinnore, Ardrossan, Rothsay, and Glenalmond, the weather on these occasions being close and dull.

NOTES ON THE STATIONS.

Laudale, August 17.—The register for the last twelve months was carefully gone over, with the result that the observations appeared to be made and entered with care. While Mr. Fletcher was making the

observations on the morning of Sunday, previous to my visit, during a strong wind, a sudden gust of some violence occurred, which blew down the minimum thermometer and broke it. A new one had been ordered from London. On the same morning several large ricks of hay were blown into the sea and totally lost. All the instruments were in very good order.

Stornoway, August 23.—The assistant read the instruments and made up the weather telegram correctly. The barograph is carefully attended to and works well. The Stevenson's screen and tall pole on which the sunshine recorder is placed had been re-painted the week before my visit, and all the instruments were in excellent order and well observed.

Swanbister, August 25.—This station was established in the end of 1885, in the place of the station at Sandwick, so long superintended by the late Dr. Clouston. Excellent positions have been secured for the anemometer, the thermometer screen, and the rain-gauge; and these instruments were all in very good order, and observed with much intelligence, and great interest was manifested in the work.

Mr. Fortescue, when at home, makes the observations himself, but otherwise they are made by one of the three assistants he has carefully trained. The observations of two of these assistants, I had an opportunity of examining, and in each case the readings of the barometer and thermometer were exactly the same as my own readings.

Dunrossness, August 27-28.—Miss Brand is being trained as a second assistant at this station. All the instruments were in excellent order and well observed.

I handed over to Mr. Brand the small dial anemometer with a two-minutes sand-glass attached, designed to show from a two minutes observation the rate of the winds velocity per hour. Mr. B. readily understood the instrument, and during my visit numerous observations were made with it. The force of the wind during the first observation was estimated by Mr. B. at 4, and the instruments recorded a rate of 24 miles an hour, which a subsequent examination of the table, p. 58 of *Instructions in the use of Meteorological Instruments*, showed to be a very close approximation.

A number of observations were made as to the number of seconds which elapsed as each mile rate was recorded. The results showed the wind to be more unsteady in force than might have been supposed. On one occasion the following were the minutes which elapsed from mile to mile as marked on the dial, 14, 9, 10, 9, 9, 11, 14, 11, 7, 8, and 14, the mean being $10\frac{1}{2}$ miles.

Wick, August 31.—The instruments were all in very good order, and the observations were made intelligently and with care. The barometer was read correctly by the assistant.

Dunrobin, September 1.—With the exception of a slight deformation of the rain-gauge, the instruments were in good order and carefully observed.

Nairn, September 6 and 14.—Since last inspection, Mr. Penny, the observer for many years, has died, and his daughter, Miss Penny, has been appointed successor. The instruments were in very good order, and the observations made intelligently and accurately. Miss Penny is assisted by her brother and sister, who both read the instruments correctly, and the brother can also make up with despatch and correctness the weather telegram. Each of the sisters makes the observations independently, and compares them before making up the daily telegram.

A considerable additional breadth of the wood has been cut down since last year, and the station is now, except for a narrow strip to the westward, well cleared of the wood.

Aberdeen, September 24.—The rain-gauge was not quite circular, but was put right. The other instruments continued to be kept in excellent order, and observed with much intelligence.

Braemar, September 27.—A Jordan's sunshine recorder, the gift of G. P. Wragge, Esq., Birmingham, has been added to this station since last inspection. It is very well placed to receive the sun's rays at all seasons. The instruments were in very good order and well observed.

Dundee, September 28.—The instruments were all in good order and were observed correctly.

Pinmore, September 30.—The instruments were in excellent order. Both Mr. Donald and his son, who assists in reading the barometer when required, were from home at the time of my visit. The apprentice gardener, who occasionally observes the temperatures and the rainfall, read all these instruments correctly and understands their manipulation.

Ardrossan, September 30.—The thermometer screen, which is again greatly in need of painting, was ordered to be re-painted and generally repaired. The other instruments were in good order and very intelligently and carefully read. The spare barometer will be removed to Mr. Mayes's new house when the height has been ascertained.

Rothsay, October 1.—A new pole, 47 feet high, was erected in the beginning of the year for the vane, which works quite freely. The instruments were in good order, and the observations are made with care and intelligence.

Glenalmond, October 9.—With the exception of the minimum thermometer, the instruments were in excellent order and the observations made with great accuracy.

Leith, October 13.—A new ventilator is required for the thermometer screen, and the screen itself needs to be painted. The other instruments were well kept, and the observations faithfully and carefully made.

The Observatory, King's College, Aberdeen, September 25.—All the instruments, both of the Observatory proper and the Stevenson's screen with the thermometers in the garden, were found to be in excellent order, and the observations made with the greatest care and with much intelligence.

ALEXANDER BUCHAN.

REPORTS ON INSPECTIONS of the OBSERVATORIES, &c., 1886.

Aberdeen, visited August 17-20.—The instruments at this observatory were found carefully tended and all in good order. The barograph and thermograph had their lenses, clocks, and fittings cleaned. A new ratchet spring was fitted to the clock of the latter instrument. The thermometers were all compared both with the Kew standard No. 642, and in melting ice, and their corrections at 32° found to be as follows:—

Dry standard	-	-	-	-0.6
Wet standard	-	-	-	0.0
Maximum M.O. No. 48	-	-	-	-0.5
Minimum No. 5050	-	-	-	-0.3

The anemograph was examined and cleaned and found to be in good order both externally and internally, with the exception of the fans of the direction vane. These are completely worn out and new ones required. I took a pattern of the worn shaft so that new fans may be supplied of the right size. The Beckley rain-gauge was found to be in good order throughout, but the measuring glasses of both the Beckley and the 8-inch gauges are broken and new ones are needed.

Glasgow, visited August 27-28.—The barograph and thermograph were examined and cleaned as usual. The gas-burner of the dry-bulb thermograph was slightly varied so as to enable the zero hole of the screen to be illuminated and its image traced upon the cylinder. The thermometers were compared with the standard, and their corrections found to be as follows :—

Dry standard	-	-	-	-0·1
Wet standard	-	-	-	-0·4
Minimum	-	-	-	+0·2
Maximum	-	-	-	+0·1

The anemograph was cleaned and examined, the screw thread on the fan shaft was found to be very much worn away and the teeth of the worm wheel much cut in places. This wheel was taken off and refitted 120° from its former position, in order to expose a new part of its circumference to the most severe wear.

The Beckley rain-gauge was in good order, and working satisfactorily.

Stonhurst, September 4.—All the instruments were examined and found to be in good order, the action of the thermograph light-shutter was not quite satisfactory, but was improved.

The thermometers were compared and found to require the following corrections :—

Dry Standard	-	-	-	-0·1
Wet Standard	-	-	-	-0·3
Maximum No. 439	-	-	-	-0·2
Minimum No. 501	-	-	-	+0·1

Radcliffe Observatory, September 11, 1886.—The instruments lent by the Meteorological Council to the Radcliffe trustees were found to be all in excellent order, but the photography was in a most unsatisfactory condition; this had been the case for some time. The last supply of paper procured through the Kew Observatory, although apparently of the highest quality and very carefully prepared, has proved most unsatisfactory from a photographic point of view. It is presumed that some foreign ingredient of a deleterious nature has been introduced either into the texture of the paper or the composition of the wax, although both were procured from the best known makers. These have been applied to, but are unable to assign any reason for the failure.

The following were found to be the corrections for the various thermometers in use :—

Standard, dry bulb	-	-	-	-0·2
„ wet „	-	-	-	-0·2
Maximum, M.O. 356	-	-	-	-0·4
Minimum, M.O. 363	-	-	-	0·0
B.T. 1,710	-	-	-	-0·5
B.T. 1,709	-	-	-	-0·3

ANEMOGRAPHS.

Swanbister, Orkney, August 23 and 24.—This instrument, which had formerly been at Sandwick was removed to this station in December last by Mr. Boswell, of Aberdeen. Owing to the extremely inclement weather at the time, he was quite unable to give the instrument the thorough overhauling and cleaning which it required. I accordingly visited Orkney for the purpose of doing this, and having met with an intelligent workman, Alexander Ballantyne, in Kirkwall, took him with me on August 23 to Swanbister.

We found there the anemometer well placed on a low hill-top, distant about half a mile from the sea-beach, but freely exposed on all sides, with the exception of some higher hills a few miles distant to the north and west. It stands on the roof of a hut brought with it from Sandwick, but raised about 3 feet higher above the ground, the hut being built on a stone foundation of that height.

I completely dismounted the instrument, and cleaned it throughout and had the velocity shaft straightened, as well as fitted new bearings, which I took with me, to the vane shaft. I also checked the orientation points, and the south mark of the sunshine recorder.

The observer, Mr. Fortescue, exhibits much interest in the anemometer, and rendered me great assistance.

North Shields, August 11 and August 31—September 3.—I visited this town on August 11th, and was met at the railway station by Mr. Irvine, the observer at that town, and Mr. Spence, one of the Tyne Improvement Commissioners. In the company of these gentlemen I visited the high lighthouse, where we met Mr. Cairn, the assistant engineer of the Commission, with whom we discussed the placing of the anemometer on the lighthouse roof, and the necessary alterations required to the building in order to accommodate it.

I re-visited the lighthouse on August 31, when Mr. Massent, the Tyne engineer, attended with his workmen, and gave orders to proceed with the erection of the anemograph. The instrument was accordingly unpacked, hoisted to its place, put in rough adjustment, and started on September 2nd. The next day its fitting up was completed, Captain Harrison, the light-keeper, and his assistant, instructed in its management, the orientation properly determined, and the instrument left in action.

The anemograph is fixed on the chimney stack, surmounting the roof of the lighthouse, two chimney pots having been removed to afford the necessary space to accommodate the anemometer column, whilst the shafts are suspended in two disused flues, the recorder being placed over the disused fireplace in the light-room. The lighthouse stands on the north edge of the bank of the Tyne, at a height of approximately 90 feet above high water, the tower being about 60 feet high. The anemometer cups stand at an estimated height of 150 feet above the river. The exposure is perfectly free on all sides.

Fleetwood, visited August 12.—In company with Mr. Gaulter, the town surveyor, I inspected the intended site for the anemometer. I found it to be on the roof of an ornamental pavilion in the public gardens, occupying the top of a low sand hill on the sea-shore.

On my return to Fleetwood on September 6 the ornamental finial was removed from the roof, and the conical top cut down until a base sufficiently large to support the anemometer column was obtained; holes were bored down through the roofing timbers and ceiling to permit of the passage of the shafts.

The anemograph was erected in the centre of the pavilion, precautions being taken to prevent children and the numerous visitors tampering with the instrument, for as the building is used as a public refreshment room, it is frequently crowded during fine summer weather. The true south was determined by a solar observation, and a mark made on the roof for orientation of the instrument. Instructions as to changing of papers, necessary oiling, etc., were given to Messrs. Gaultier and Yeo, and the anemograph being completely adjusted, was started on September 8th.

October 1886.

G. M. WHIPPLE.

DEAR SIR,

Kew Observatory, November 9th, 1886.

I BEG leave to hand you herewith my report to the Meteorological Council respecting their self-recording instruments at the Falmouth and Valencia Observatories.

Falmouth.—The instruments were inspected on the following dates.

On October 11th the barograph and thermograph were examined, the clocks taken to pieces and cleaned, as well as the lenses and condensers. A good deal of stray light was observed to fall on the thermograph cylinder, thus discolouring the photographic paper; this was rectified by the re-blackening of both the dry and wet tubes. After cleaning, the action of the barograph light-stop was somewhat uncertain, but this was corrected by adding a small weight to the lever of the shutter.

The photography was excellent. The standard thermometers for the control observations were compared at 50° by means of a Kew standard and the following corrections determined:—

Dry 383 $-0^{\circ}\cdot55$; Wet 388 $-0^{\circ}\cdot35$.

The maximum and minimum thermometers were in good order.

On October 14th the rain-gauge was examined, when it was found that the oil of the friction rollers had become somewhat sticky and so retarded the free action of the float. After cleaning, however, the instrument worked satisfactorily.

The clock was cleaned and a new line attached.

The anemometer was inspected on the 18th and found to be in excellent order, the bearings of all parts being well oiled and in good condition. Mr. Kitto called my attention to the brass tubing of the direction shaft which had split. This I had soldered up again.

Valencia, October 25, 26, and 27.

At the time of my visit to this observatory Mr. Cullum was absent in England.

The whole of the instruments, however, were working satisfactorily, but the usual cleaning was performed of both clocks and instruments generally.

The zero values were changed from the summer to the winter position and the standard thermometers compared at 50° with my standard, the following corrections being found to be requisite:—

Dry bulb 399 $-0^{\circ}\cdot55$; Wet 398 $-0^{\circ}\cdot50$.
Max. 477 $-0^{\circ}\cdot3$; Min. 2407 $-0^{\circ}\cdot1$.

The new pen recently sent out for the self-recording aneroid was attached and adjusted on the 25th, and during my stay the instrument worked well.

On October 26th the electrical and recording parts of the mountain anemometer were erected by kind permission of the Anglo-American Telegraph Company in their workshop at the telegraph station.

Mr. Graves, the Superintendent, most kindly gave me every assistance, and placed a number of batteries at my disposal.

After the various connections had been joined up, both velocity and direction gear acted perfectly.

The working of the apparatus was explained to Mr. Windeler, the mechanician, who now thoroughly understands all the details.

Fuller's mercury-bichromate batteries are now entirely used by the Telegraph Company and are well adapted for the electrical anemometer, as their strength is nearly double that of either Daniell's or Leclanché cells; they also maintain their power for a greater length of time.

It was found by experiment that four of these cells were sufficient to work the direction apparatus on short circuit and 10 for the velocity, whilst 10 others were required for the relay, making 24 in all to work the instrument.

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

T. W. BAKER.

APPENDIX VII.

METHOD OF DEALING WITH TELEGRAPHIC WEATHER INTELLIGENCE.

The operations connected with the preparation and issue of the Forecasts and Storm Warnings have undergone some material changes, not only with regard to the home stations, but also in connection with the information received both from the European Continent, and from the United States. These arrangements are referred to more fully further on. The Daily Weather Report also has been improved by the introduction of the above-mentioned new reports, and by a re-arrangement of the Remarks and Forecasts given on page 3 of each Report.

The Office now receives, when the telegraphic communications are perfect, fifty-nine reports every morning, seventeen every afternoon (except on Sundays), and twenty-seven each evening.

The foreign reporting stations, 28 in number, extend along the entire western coast of the Continent, from Bodö in Lat. 67° N. to Lisbon in Lat. 38° N., and include four stations on the coast of the Baltic, three in Germany, and two in the Mediterranean. The information is received in accordance with arrangements made with the various Meteorological organisations in Portugal, France, Holland, Germany, Denmark, Norway, and Sweden.

At the British and Irish stations the morning observations are taken at 8 a.m. Greenwich time, and most of the telegrams arrive in London at about 9 o'clock, when the Intelligence Department of the Post Office extracts from them the portions required for its wind and weather reports. They are then transmitted to the Meteorological Office by its private wire, where the majority of them usually arrive between 9 a.m. and 10 a.m. No material interruptions have occurred in the communication with Sumburgh Head and Stornoway.

As the reports come in, the information is entered on a chart, showing for each station at 8 a.m. the barometrical and thermometrical readings, with their respective alterations during the preceding 24 hours, the direction and force of the wind, and the state of the

weather, together with any changes of importance which may have been noticed in the course of the preceding day. From this chart, which is preserved in the Office, other charts are drawn for publication in the newspapers, as described further on.

If necessary, telegraphic warnings of storms or of atmospherical disturbance are immediately sent to our own coasts and to foreign countries. A brief telegraphic resumé of the weather is despatched shortly after 11 a.m. to the Harbour Authorities and the Chamber of Commerce in Jersey. Another telegraphic message, of about 75 words, is sent to the Underwriters' Association, Liverpool, containing reports of the pressure, wind and weather at 14 stations on the coasts of the British Islands; and a third message of about the same length is forwarded to the Central News and to the Exchange Telegraph Company for despatch to the provinces. The last of these messages consists of a brief statement of the general condition of weather over Western Europe, as shown by the morning reports. It is, however, not in the morning only that storm warnings are issued to the coasts, a constant watch being kept during the day, and whenever on the receipt of the regular or of special telegrams the condition of the weather appears to be threatening, cautionary messages are at once issued to such parts of the coast as are thought to be menaced by a gale.

During the year 1886 there were prepared each morning, afternoon, and evening, Forecasts of the weather, for a day in advance; these were drawn up for eleven districts in the British Islands, and issued to subscribers, to certain Clubs, and to many of the London and Provincial newspapers in accordance with the arrangements referred to on p. 9. The districts for which the Forecasts were prepared are those into which the returns for the Weekly Weather Report are divided, viz. :—

- | | | |
|-----------------------------------|--|-----------------------------------|
| 0. Scotland, North. | | 4. Midland Counties. |
| 1. „ East. | | 5. England, South. |
| 2. England, N.E. | | 6. Scotland, West. |
| 3. „ East. | | 7. England, N.W. (with N. Wales). |
| 8. England, S.W. (with S. Wales). | | |
| 9. Ireland, North. | | |
| 10. „ South. | | |

About an hour and a quarter is occupied in the preparation and transmission of the provincial and foreign telegrams, and in the drawing up of the "Remarks" and 11 a.m. Forecasts for the London newspapers, so that the MS. copies for the "Times" and other papers are ready for issue soon after 11 a.m.

Charts are prepared daily for newspaper publication as follows :—

- | | | |
|---|---|---|
| For the "Times," - | - | two daily, viz. : for 8 a.m. and 6 p.m. |
| For the Patent Type Found-
ing Company, on behalf of
the "Shipping Gazette,"
and for distribution to the
provincial press - | } | one „ for 8 a.m. |

The 8 a.m. charts are sent out at about 10.15 a.m. and the 6 p.m. chart at about 8.30 p.m. In addition charts are drawn for 8 a.m. and 6 p.m. daily for exhibition at the Office door, together with some remarks, and the latest Forecasts issued.

In addition to the charts here referred to, the Patent Type-founding Company are supplied with various diagrams showing the changes in

weather, together with any changes of importance which may have been noticed in the course of the preceding day. From this chart, which is preserved in the Office, other charts are drawn for publication in the newspapers, as described further on.

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N. Wales). |
| 8. England, S.W. (with S. Wales). | |
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pressure, temperature, rainfall, wind, and weather for the London district. These are engraved *daily* for the "Daily Chronicle," *weekly* for the "Graphic," and *monthly* for the "Miller," and are all accompanied by remarks on the phenomena exhibited.

The draft of the Daily Weather Report, with two charts attached, is drawn on transfer paper, and is ready by noon, when it is at once sent to the lithographer to be printed. The copies for delivery by hand and by early post in London are issued at about 1.30 p.m., while the remainder are received at the Meteorological Office at about 3.30 p.m. whence they are transmitted by post to the subscribers and others.

At about 3 o'clock the 2 p.m. observations, taken at fifteen home stations, and two foreign ones (Skudesnaes and Rochefort) are received. Copies of these reports are issued, together with the 8 a.m. report, to certain newspapers and subscribers, and two copies of the "Remarks" (8 a.m. and 2 p.m.) are sent to the Type-founding Company for issue to provincial newspapers, in order to explain the 8 a.m. charts.

From 7 to 7.30 p.m. the twenty-seven evening (6 p.m.) reports arrive and are charted and discussed for the morning daily papers in accordance with the arrangement referred to on p. 10. The forecasts and remarks are usually ready by 8.30 p.m., but in bad weather, owing to the delay of the reports, and the additional care which is necessary in dealing with them, it is occasionally 9 p.m. before they are issued. The "Times" publishes in its First Edition the map showing the distribution of pressure, the winds, temperature, and weather at 6 p.m. on the previous day, and in its Second Edition a similar map for 8 a.m. on the day of issue.

The official charts for 2 p.m. and for 6 p.m. are still much less complete than that for 8 a.m., notwithstanding the great improvements recently made, especially in that for 6 p.m. That for 2 p.m. is drawn on the information received from fifteen home stations, supplemented by two foreign ones, whenever the latter arrive in time to be used. The material for the 6 p.m. charts is now supplied by reports from twenty stations in the United Kingdom, supplemented by seven* from continental stations, but the latter occasionally arrive late at the very time when they are most wanted, *i.e.*, during bad weather.

The Sunday duty is still conducted as follows:—Two of the clerks attend on Sunday mornings at the Central Telegraph Station from 8.30 a.m. to about 10.15 a.m. By an arrangement with the Post Office these clerks are supplied with the telegrams immediately they arrive in London. These are examined and charted, with the view of issuing, when necessary, warnings of coming storms, to our own and neighbouring coasts. It is necessary that great promptitude should be observed in this service, as the observations must be dealt with and the warnings issued so that the latter may reach the coast before the telegraph offices at the outports close for the day, which is usually at about 10 a.m. No work of any kind is transacted for the newspapers on Sunday mornings, the main object of the service being to give early information of storms to our coasts; but a telegram is sent to Jersey in the same form as on week days, and there is the ordinary interchange of messages with foreign countries. A copy of the Valencia message is sent to Lisbon. At 6 p.m. the same clerks attend at the Meteorological

* Steps are being taken to add another station to the 6 p.m. chart, but these are delayed by difficulties on the Continent.

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Office to receive the evening reports and to prepare the 8.30 p.m. Forecasts, and another opportunity is thus afforded for the correction or extension of any warnings which may have been issued in the morning.

Atlantic Telegrams.

In the course of the year the arrangements for forwarding from the United States occasional reports of gales, icebergs, and derelict ships, which have been met with by passenger steamers of the principal lines running from various European ports to New York or Boston have been entirely re-modelled by the addition of information referring to the distribution of pressure over the American Continent, and the adjacent parts of the Atlantic. This is conveyed by means of a Code, drawn up in the following manner:—

Observations over American Continent.

F.	B.	I.	D.	J.	P.
Lat. 44° N.	Long. 122° W.	Highest Barometer = 30.40.	Lat. 46° N.	Long. 95° W.	Lowest Barometer = 29.20.

Observations at Sea.

Ships	Z.	U.	H.	U.	D.
	Date, 26th.	Barometer, Noon = 30.00.	Lat. 43° N.	Long. 40° W.	Wind, N.E., moderate.

Observations at Sea.

A.	B.	T.	J.	O.	M.
Date, 27th.		Barometer, = 30.00.	Lat. 41° N.	Long. 55° W.	Wind, S., moderate.

Storm at Sea.

Storm	Z.	U.	I.	L.	O.	K.	O.	I.
	Date, 26th.	Hour of lowest Barometer, 8 p.m.	Lat. 42° N.	Long. 58° W.	Value, 20.61.	S.S.W. to W.N.W.	Shift of Wind.	Extreme Force 9 = Strong Gale.
Of lowest Barometer.								

Wreck	J.	B. L.	Iceberg	E.	A. U.
	Lat. 41° N.	Long. 59° W.	Lat. 40° N.	Long. 70° W.	

This arrangement* has been made through M. Mascart, the Director of the French Meteorological Bureau, to whom the messages are telegraphed direct from the United States. At present the messages are forwarded from Paris to this country by post, in order to curtail the cost of transmission until the Council are assured of the practical utility of the reports.

DAILY WEATHER REPORT.

Some considerable change has been made during the past year both in the *form*, and in the matter published in the Daily Weather Report, by the addition of a daily statement as to the weather over Europe on the preceding day, by the insertion of reports from several new continental stations, and by a substitution for the remarks which used to appear on page 3 of each report, of notes descriptive of "the general situation at 8 a.m.," and the "probable changes in system now prevalent." The information now fills four large quarto pages, and is arranged as follows:—

Page 1 contains the whole of the 59 reports from which the maps for the day (given on page 2) are prepared; also the 6 p.m. reports of the previous day, together with the maximum and minimum temperatures of the air, and the Rainfall for the previous 24 hours.

Page 2 contains (1) a map of North-western Europe showing for 8 a.m. on the date of publication, the distribution of pressure, the prevalent winds, and the sea disturbance, with necessary explanations; together with a table showing the mean atmospheric pressure for the month at 22 stations; (2) a similar map showing the distribution of temperature at 8 a.m., the weather at each station, and the distribution of rainfall during the past 24 hours; together with a table of the mean temperature of the air and of evaporation at 8 a.m., the means of the daily maximum and minimum temperatures, and the mean rainfall for the month at the same 22 stations in the United Kingdom.

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

Page 4 contains the reports for 2 p.m. on the previous day, and an account of the distribution of pressure, temperature, wind, and weather experienced over the European Continent on the previous day.

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

WEEKLY SUMMARY.

On Monday in each week a brief Summary of the Weather experienced over our Islands during the preceding week is given on p. 4 of the Daily Weather Report. It refers only to the principal changes which have occurred, and is intended to serve as an aid to the study of the Daily Reports. The main meteorological features of the week are thus presented as a connected story, and afford greater facility for future reference.

* Since the close of the financial year some further improvements have been made in the Code.

Correction and Addition List.

Additional steps are taken to insure accuracy in the Daily Weather Report. At the close of each month a return is received from nearly all of the telegraphic reporting stations, containing a copy of all the observations which have been transmitted to London by wire during the month. These schedules are used for checking the daily telegrams, for the preparation of the average and other values of the different elements, and also as evidence in the case of legal proceedings. About the middle of every month a lithographic sheet has for many years past been issued with the Daily Weather Report, containing corrections for all discrepancies which have been discovered, and supplying any observations which have been omitted in the published reports. This monthly sheet also contains tables showing the mean values for pressure, temperature, and humidity, together with the total rainfall, and the prevalence of various kinds of weather and of winds from each of the eight principal points during the month, for each telegraphic reporting station within our Islands.

WEEKLY WEATHER REPORT.

The Weekly Weather Report, which has appeared since the beginning of February 1878, has been further improved by the insertion on the first page, for each district, of the difference between the number of day-degrees of accumulated heat above and below 42° F., as well as of rainfall for each week, and the means for the corresponding period of the eight years 1878-85.

The tables of Accumulated Temperature are designed to give persons engaged in agriculture better means of estimating the manner in which vegetation is affected by temperature than that afforded by the more usual methods of treating the readings of the thermometer. They show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively, of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard or *base temperature*. The base adopted is 42° F., as being nearly equivalent to 6° Cent. which has been considered by Continental writers on these subjects to be the critical value, the temperature above which is mainly effectual in starting and maintaining the growth, and in completing the ripening of agricultural crops in a European climate. This base is also convenient as being 10° F. above the Freezing Point.

The Report thus contains the average and extreme temperatures and the rainfall values and the total amount of bright sunshine in each week, for seventy stations grouped into twelve districts in Great Britain and Ireland, together with the difference between them and their respective mean values for the corresponding weeks in previous years. In addition to this, the district values for Accumulated Temperature, Rainfall, and Bright Sunshine are given, both for the week and for the whole period since the beginning of the year, with their difference from the average values.

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

It has been ascertained by calculation from a considerable series of hourly observations at various places, that the accumulated temperature

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

It has been ascertained by calculation from a considerable series of hourly observations at various places, that the accumulated temperature

may be computed, with a very tolerable approximation to the truth, from the observed daily maximum and minimum temperatures alone.

When the temperature during any period remains either wholly above or below the base temperature, the difference between the base and the mean temperature gives the correct accumulated value. In other cases this difference gives an approximate value of the accumulated temperature which does not depart greatly from the truth, the deviation depending on the greater or less extent of the daily variations of the temperature above or below the base. Further, since the mean between the maximum and minimum of any day is nearly equal to the mean temperature of the day, the difference of the mean of the maximum and minimum from the base also will give directly a fair approximation to the accumulated temperature for the day.

The following rules, however, supply a still closer approximation to the true values sought, and they have been adopted for the preparation of the table in the Weekly Weather Report. They may be applied to any other base temperature as well as to 42° F., with the slight modification of the numerical coefficients.

RULES for computing for a WEEKLY PERIOD the ACCUMULATED TEMPERATURE above or below 42° F. from the observed MAXIMA and MINIMA.

1. Obtain the mean temperature from the means of the seven observed maxima and minima by multiplying the difference between them by the proper coefficient for the month, and adding the result to the mean of the minima.

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

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

In each case the result will be the mean *daily* value for the week, and must be multiplied by 7 in order to obtain the value for the whole week.

The coefficient varies both with the length of the period and the value of the base line. In the above instance the base is 42° ; when

may be computed, with a very tolerable approximation to the truth, from the observed daily maximum and minimum temperatures alone.

When the temperature during any period remains either wholly above or below the base temperature, the difference between the base and the mean temperature gives the correct accumulated value. In other cases this difference gives an approximate value of the accumulated temperature which does not depart greatly from the truth, the deviation depending on the greater or less extent of the daily variations of the temperature above or below the base. Further, since the mean between the maximum and minimum of any day is nearly equal to the mean temperature of the day, the difference of the mean of the maximum and minimum from the base also will give directly a fair approximation to the accumulated temperature for the day.

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RULES for computing for a WEEKLY PERIOD the ACCUMULATED TEMPERATURE above or below 42° F. from the observed MAXIMA and MINIMA.

1. Obtain the mean temperature from the means of the seven observed maxima and minima by multiplying the difference between them by the proper coefficient for the month, and adding the result to the mean of the minima.

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

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

In each case the result will be the mean *daily* value for the week, and must be multiplied by 7 in order to obtain the value for the whole week.

The coefficient varies both with the length of the period and the value of the base line. In the above instance the base is 42° ; when

it is 32° the coefficient is 0.4; when 52° it is 0.33; and when 62° it is 0.25.

A full explanation of these rules will be found in Appendix II. to the Quarterly Weather Report for 1878.

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

For Temperature	-	-	20 years 1861-80
„ Rainfall	-	-	20 „ 1866-85

These statistics are given on the first page of the publication, the temperature, accumulated heat, rainfall, and sunshine values for *each station** being given on the last page of each report.

In addition to the telegraphic reports, and the returns from the self-recording observatories, weekly returns from 43 volunteer observers are used in preparing this report, the names of the observers at each station being as under—

Names of Stations.				Names of Authorities.
Alnwick Castle	-	-	-	Lient.-Col. F. Holland, for the Duke of Northumberland, K.G.
Arlington (N. Devon)	-	-	-	J. Carter, for Lady Chichester.
Bawtry (Hesley Hall)	-	-	-	B. I. Whitaker, F.R. Met. Soc.
Blackpool	-	-	III	Rev. C. T. Ward, F.R. Met. Soc.
Braemar	-	-	II	J. A. Aitken.
Brookeborough	-	-	-	Mr. Ferguson, for Sir Victor Brooke, Bt., F.L.S.
Cheadle	-	-	III	J. C. Philips.
Churchstoke	-	-	III	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester	-	-	-	The Royal Agricultural College.
Cullompton	-	-	III	T. Turner, J.P., F.R. Met. Soc.
Douglas (Isle of Man)	-	-	-	A. W. Moore, M.A., J.P.
Dublin	-	-	-	J. W. Moore, M.D., F.R. Met. Soc.
Durham Observatory	-	-	-	H. J. Carpenter.
Edgeworthstown (Currygrane)	-	-	-	J. M. Wilson, J.P.
Fort Augustus	-	-	II	Rev. W. M. Wall.
Foynes	-	-	-	T. J. Carey, for Lord Monteagle, K.P.
Geldeston	-	-	-	E. T. Dowson, F.R. Met. Soc.
Glen Carron	-	-	II	D. D. Munro.
Glenlee	-	-	II	G. Maxwell and W. Melville.
Hastings (St. Leonard's)	-	-	-	H. Colborne, M.R.C.S.
Hereford	-	-	III	T. A. Chapman, M.D.
Hillington	-	-	III	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Ingatestone	-	-	-	L. J. Petre, F.R. Met. Soc.
Kilkenny	-	-	-	H. Carlton, for the Marquis of Ormonde.
Killarney	-	-	-	The Ven. Archdeacon Wynne, F.R. Met. Soc.
Lairg	-	-	II	W. Ross, Ground Officer.
Laudale (Loch Sunart)	-	-	-	A. Fletcher, for T. H. G. Newton, F.R. Met. Soc.
Leicester	-	-	-	J. C. Smith, the Museum.
Llandovery	-	-	-	J. Watkins, F.R. Met. Soc.
Llandudno	-	-	III	J. Nicol, M.D., F.R. Met. Soc.
Londonderry	-	-	-	J. Conroy, F.R. Met. Soc.

* The sunshine values are furnished for only a limited number of carefully selected stations. See p. 96.

Names of Stations.				Names of Authorities.
Manchester (Prestwich)	-	-	-	T. R. H. Clunn, M.D., F.R. Met. Soc.
Marchmont	-	-	£	P. Lowry.
Markree Castle (Sligo)	-	-	-	A. Marth, F.R.A.S., for Colonel Cooper, F.R.A.S.
Newton Reigny (Penrith)	-	-	-	T. G. Benn, F.R. Met. Soc.
Ochertyre	-	-	£	G. Croucher.
Plymouth	-	-	-	J. Merrifield, LL.D., F.R.A.S.
Rothamsted	-	-	-	Rainfall by Sir J. B. Lawes, Bart., LL.D., F.R.S., and J. H. Gilbert, Ph.D., F.R.S.; temperature by T. Wilson, F.R. Met. Soc.
Scarborough	-	-	£	A. Rowntree, F.R. Met. Soc.
Southampton	-	-	-	J. T. Cook, R.E., Ordnance Survey Office.
Stowell	-	-	£	Rev. H. J. Poole, F.R. Met. Soc.
Strathfield Turgiss	-	-	£	Rev. C. H. Griffith.
Waterford (Brook Lodge)	-	-	-	C. Percival Bolton.

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

* N.B.—Seven new Scotch stations have been added since January 1st, 1887.

The report is prepared on Wednesday in every week, and is ready for sale early on Saturday morning, but the summary on its first page is sent to the "Times," "Daily News," and some other papers on Wednesday evening.

A *Quarterly Summary* of the Weekly Weather Report has been also issued as Appendix I, giving for each of the 12 districts before referred to (1) the Mean Temperature for each Quarter and for the Whole Year, in each year from 1878 to 1886 inclusive, and the means for certain groups of years; (2) the Total Rainfall for the same periods; and (3) the Accumulated Temperature, Rainfall, and Bright Sunshine for each month in the Quarter.

Appendix II. gives for each district and for the years 1885 and 1886 the weekly and progressive values for (1) Accumulated Heat (above and below 42°); (2) Rainfall (number of rainy days, and amounts in inches); and (3) Bright Sunshine (number of hours and percentage of possible duration).

Appendix III. gives the *Mean Weekly* values for the same phenomena, in the following periods, viz.:—

Accumulated Heat, and Rainfall, 8 years, 1878 to 1885.

Bright Sunshine - - - 5 years, 1881 to 1885.

MONTHLY WEATHER REPORT.

During 1886 the issue of the *Monthly Weather Report* has been continued. It contains, as hitherto, (1) A General Summary for the Month, of the weather experienced over the United Kingdom and its neighbourhood; (2) Tables of the principal Cyclonic and Anticyclonic Systems which have passed over our area during the month; and (3) Tables of Pressure, Temperature, Hygrometric Deductions, Rainfall, Weather, Wind, and Bright Sunshine experienced at a large number of stations scattered over the United Kingdom, together with remarks thereon; it is illustrated by two plates. The report is, therefore, as far as possible, similar to the Quarterly Weather Report, but owing to its prompt issue, cannot contain either the Gale Tables, or the Tables of Mean Values for the Observatories, which are found in its predecessor.

ISSUE OF FORECASTS.

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

On Week Days.

- (1.) At 11 a.m. (from the morning reports), for the 24 hours ending at Noon on the day following the date of issue. This issue is intended especially for the early editions of the evening papers, for the clubs, and for exhibition at certain selected stations. See p. 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.
- (3.) At 8.30 p.m. (from the 6 p.m. reports), for the day following that of issue. These are now supplied gratis to any newspaper or news agency which may apply for them, and send for them regularly. A very large number of the most important papers avail themselves of this advantage.

The forecasts are made for the following districts :—



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

The remarks and forecasts are posted at the doors of the Meteorological Office, 116, 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.

FORECASTS FOR PRIVATE SUBSCRIBERS.—Any person can be supplied with a copy of the 11 a.m. Forecasts, once on each week day,* on payment of a subscription of ten shillings per annum, or 2s. 6d. per official quarter or any part thereof, in addition to the cost of transmission; the charges will therefore be, by letter post, 9s., by book post, 5s. 9d. per quarter.

The forecasts for any of the districts and for any of the hours mentioned above can be forwarded by telegraph daily, on payment of 3d. per day for any definite period of not less than one week, in addition to the cost of telegraphy.

FORECASTS FOR CLUBS.—Forecasts, drawn up at 11 a.m., for all the districts, are supplied to Clubs, for a subscription of ten shillings per

* Good Friday and Christmas Day are reckoned as Sundays.

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1. SCOTLAND, EAST.
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The forecasts for any 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 of not less than one week, in addition to the cost of telegraphy.

FORECASTS FOR CLUBS.—Forecasts, drawn up at 11 a.m., for all the districts, are supplied to Clubs, for a subscription of ten shillings per

* Good Friday and Christmas Day are reckoned as Sundays.

annum. These are delivered free, by hand, to Clubs situated in or near Pall Mall. Special arrangements can be made for delivery at a greater distance by hand or by post.

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

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

DAILY WEATHER REPORTS.—The lithographed Reports will have the 11h. a.m. Forecasts incorporated with them on each week day. The subscription for the Report is—

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

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

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

INQUIRIES as to the WEATHER.

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

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

INQUIRIES BY TELEGRAPH.—Any person may obtain *by telegraph* from the Meteorological Office the latest information as to the weather in any district of the United Kingdom by payment of a fee of 1s. in addition to the cost of a telegram and reply to any post office. The telegram containing the inquiry must be addressed as follows :

WEATHER,
LONDON.

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

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

CHECKING OF FORECASTS.

In order to test the accuracy of the forecasts they have been compared carefully with the weather reported in the various districts on the days to which they referred, and the results of this checking for 8.30 p.m. have been already given in the Report (p. 10).

In carrying out this comparison the portions of the forecasts which referred to wind have been carefully separated from those relating to weather. The detailed results of the comparison will be found in Appendix XI., p. 82.

CHECKING of STORM WARNINGS.

The testing of the warnings is conducted in the following manner. The intelligence issued is compared with the weather experienced on the coasts, as indicated by the various self-recording anemometers, by the telegraphic reporters, and by several gentlemen who have volunteered to observe for the Office, and whose names will be found in Appendix XIV., p. 92.

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

The result of the checking for 1886 will be found on p. 13.

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

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

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

APPENDIX VIII.

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

Newspapers:

Lloyd's Shipping List.
New York Herald.
Times (1st and 2nd editions).

For Exhibition at Seaports:

Banff.
Barrow-in-Furness.
Belfast.
Blackpool.
Bo'ness.
Boscastle.
Brighton.
Briton Ferry.
Broughty Ferry.
Buckie.

Budehaven.
Caernarvon (2).
Cork.
Cowes.
Cromer.
Cullercoats.
Deptford Yard.
Dover.
Dundee.
Exeter.

For Exhibition at Seaports—cont.

Falmouth.	Penarth.
Glasson Dock, Lancaster.	Plymouth.
Great Grimsby (2 copies).	Plymouth G. W. Docks.
Groomsport.	Port Dinorwic.
Hastings.	Porthcawl.
Hayle.	Queenstown.
Holyhead.	St. Leonards.
Kingstown (2 copies).	St. Sennen Cove.
Lancaster.	Scarboro'.
Leith.	Southport.
Margate.	Teignmouth.
Morecambe (2).	Ventnor (2 copies).
Nairn.	Weston-super-Mare.
Newquay.	Wisbech.

In exchange for Observations :

Aird, G. H., Seaham.
 Bellingham, J. G., Saffron Walden.
 Ben Nevis Observatory.
 Benn, T. G., F.R. Met. Soc., Newton Reigny.
 Chatham, The Instructor in Surveying : 2 copies.
 Clark, J. E., B.A., B.Sc., York.
 Colborne, H., M.R.C.S., St. Leonards.
 Conroy, J., F.R. Met. Soc., Londonderry.
 Cooper, Col., F.R.A.S., Markree, near Sligo.
 Dowson, E. T., F.R. Met. Soc., Geldeston, Beccles.
 Durham, University Observatory.
 Eastern Telegraph Co.
 Fleetwood, L. & N.W. Ry. Co.
 Greenwich Observatory.
 Leicester Museum.
 Mellish, H., F.R. Met. Soc., Worksop.
 Moore, A. W., Isle of Man.
 Moore, F. W., Glasnevin, Dublin.
 Moore, J. W., M.D., F.R. Met. Soc., Dublin.
 Mullins, Rev. G. H., F.R. Met. Soc., Uppingham.
 Northumberland, Duke of, Alnwick.
 Ordnance Survey Office (Southampton).
 Prestwich Asylum, near Manchester.
 Propert, W. P., LL.D., F.R. Met. Soc., St. David's.
 Radcliffe Observatory, Oxford : 2 copies.
 Richards, W. H., Penzance.
 Rosse, Earl of, F.R.S., Parsonstown.
 Royal Indian C.E. College, Cooper's Hill.
 Rugby Natural History Society.
 Sheffield Public Museum.
 Southport, Fernley Observatory.
 Stow, Rev. F. W., M.A., F.R. Met. Soc. Aysgarth,
 Bedale.
 Telegraphic Reporters : 25.
 Yorkshire Philosophical Society.

Government Offices, &c.:

Admiralty : 11 copies.
 Aldershot, Garrison Library.
 Army Medical Department.
 " " Woolwich.
 Board of Trade : 3 copies.
 "Britannia," H.M.S., Dartmouth.
 Channel Squadron, Admiral Commanding.
 Commons, House of.
 Devonport Captain of Steam Reserve.
 " Commander-in-Chief.
 " Dockyard : 2 copies.
 " Master Attendant.
 Dublin, General Register Office.
 Farnborough Station, Staff College.
 Greenwich, R.N. College.
 "Indus," H.M.S., Devonport.
 Ireland, Royal College of Science.
 Lords, House of.
 Mann, J. R., Osborne.
 Medical Department of the Navy.
 "Nankin," H.M.S., Milford Haven.
 Portland, Senior Naval Officer.
 Portsmouth, Commander-in-Chief.
 " Dockyard.
 " R. N. College Observatory.
 Queenstown, Rear-Admiral.
 Registrar General.
 " " of Seamen.
 Science and Art Department : 2 copies.
 Sheerness, Commander-in-Chief.
 " Dockyard.
 War Office, Adjutant General, Horse Guards.
 Commander-in-Chief.
 Woolwich Royal Military Academy.

Societies, &c.:

Agents : 2 copies.
 Association of Underwriters, Liverpool.
 " " Lloyd's.
 British Museum.
 Buchan, A., F.R.S.E., Edinburgh.
 Crossley, Mrs., Halifax.
 De La Rue & Co., Messrs.
 Farrer, Sir T. H., Bt.
 Griffith, Rev. C. H., Strathfield Turgiss.
 Jackson, H. Kains, London.
 Ley, Rev. W. C., M.A., Lutterworth.
 Meteorological Council : 2 copies.
 Miller, S. H., F.R.A.S., Lowestoft.
 Observatories : 7 copies.
 Richards, Adm. Sir G. H., K.C.B., F.R.S., London.
 Royal Society : 2 copies.
 " Meteorological Society.
 Scottish Meteorological Society.

Foreign Places—cont.

Algiers, Meteorological Service.
 Amsterdam Meteorological Institute.
 Bombay, Observatory.
 Brussels, Royal Observatory.
 Cairo, Observatoire Khédivial.
 Calcutta, Meteorological Department.
 Chemnitz, Meteorological Service of Saxony.
 Christiania, Meteorological Institute.
 Constantinople, Imperial Meteorological Observatory.
 Copenhagen, Meteorological Institute.
 Cracow, Observatory.
 Florence, Museum.
 Freeden, W. H. von, Bonn.
 Hamburg, Deutsche Seewarte.
 Lisbon, Observatory.
 Madrid, Royal Observatory.
 Melbourne, Observatory.
 Munich Meteorological Office.
 Paris, Central Meteorological Bureau.
 „ Meteorological Society.
 „ Ministry of Marine.
 Rome, Meteorological Institute.
 San Fernando, Observatory.
 St. Petersburg, Central Physical Observatory.
 Stockholm, Meteorological Institute.
 Tiflis, Physical Observatory.
 Tokio, Imperial Observatory.
 Toronto, Meteorological Office.
 Upsala, University Observatory.
 Utrecht, Royal Meteorological Institute.
 Vienna, Imperial Meteorological Institute.
 Washington, Smithsonian Institution.
 „ United States Naval Observatory.
 „ Chief Signal Officer, War Office.
 Zürich, Central Meteorological Institute.

APPENDIX IX.

FISHERY BAROMETERS.

LIST of PLACES supplied with FISHERY BAROMETERS.

Shetland Isles.—Balta Sound, Uya Sound, Lerwick, Sandaigar, Symbister, Scalloway.

Orkney Isles.—Burray. Kirkwall.

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

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

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

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

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

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

Isle of Man.—Douglas, Port St. Mary, Peel.

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

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

Ireland, south coast.—Dunmore, Dungarvan, Crosshaven, Kinsale, Union Hall, Castletownsend, Baltimore, Schull, Crookhaven.

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

Ireland, north coast.—Dunfanaghy, Rathmullen, Buncrana, Greencastle, Portrush, Portstewart.

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

Hebrides.—Stornoway, Cromore, Babye, Obb, Ness.

SUMMARY of STATIONS supplied with INSTRUMENTS.

England and Wales	-	-	-	-	69
Scotland	-	-	-	-	54
Ireland	-	-	-	-	46
					<hr/>
					169
					<hr/>

APPENDIX X.

TELEGRAPHIC WEATHER INTELLIGENCE.

The following stations are supplied with telegraphic information of storms, free of expense, and signal "cones" have been furnished to most of them, all further expenses attendant on the maintenance and repair of the apparatus being borne locally. The stations are situated,

83 in England and Wales, 39 in Scotland, 15 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND. EAST COAST.	ENGLAND, N.W.	ENGLAND, S.W.	ENGLAND, E.
Dunrossness.	Ramsey.	Ilfracombe.	Eyemouth.
Lerwick.	Douglas.	Appledore.	Berwick-on-
Scalloway.	Castletown.	Boscastle.	Tweed.
Kirkwall.	Silloth.	Port Isaac.	Tynemouth.
Holborn Head.	Maryport.	Newquay.	S. Shields.
Wick.	Workington.	Hayle.	Sunderland.
Inverness.	Whitehaven.	Scilly.	Middlesborough.
Nairn.	Barrow.	St. Sennen.	Redcar.
Burghead.	Morecambe.	St. Just.	Whitby.
Lossiemouth.	Fleetwood.	Penzance.	Filey.
Buckie.	Blackpool.	Falmouth.	Bridlington Quay.
Portsoy.	Lytham.	Pendennis.	Hull.
Banff.	Southport.	Mevagissey.	Goole.
Cullen.	Runcorn.	Plymouth.	Grimsby.
Fraserburgh.	Liverpool.	Teignmouth.	Boston.
Peterhead.		Exmouth.	Sutton Bridge.
Aberdeen.	ENGLAND, W.		Lynn.
Stonehaven.	Connah's Quay.		Sheringham.
Montrose.	Port Penrhyn.		Cromer.
Broughty Ferry.	Holyhead.		
St. Andrews.	Port Dinorwic.		
Dundee.	Carnarvon.		
Bo'ness.	Aberystwith.	ENGLAND, S.	ENGLAND, S.E.
Grangemouth.	Milford.	Guernsey.	Yarmouth.
Anstruther.	Pembrey.	St. Helier's	Southwold.
Pittenweem.	Swansea.	(Jersey).	Ipswich.
Burntisland.	Llanelly.	Gorey (Jersey).	Harwich.
Granton.	Briton Ferry.	Weymouth.	Chatham.
Newhaven.	Porthcawl.	Poole.	Sheerness.
Leith.	Penarth.	Cowes.	Faversham.
Fisherrow.	Cardiff.	Ryde.	
Dunbar.	Newport.	Portsmouth.	
Cockburnspath.	Weston-super-	Littlehampton.	
	Mare.	Brighton.	
	Burnham.	Newhaven.	
		Hastings.	
	IRELAND, E.	Rye.	
	Belfast.	Sandgate.	
	Donaghadee.	Dover.	
	Howth.	Margate.	
	Kingstown.		
FIRTH OF CLYDE.	IRELAND, S. and W.		
Glasgow.	New Ross.		
Greenock.	Danmore East.		
Rothesay.	Dungarvan.		
Campbelton.	Youghal.		
Girvan.	Queenstown.		
Ballantrae.	Passage.		
	Kinsale.		
	Cork.		
	Tralee.		
	Limerick.		
	Galway.		

The signals used consist of:—

1. Cone, point downwards for Southerly gales ; S.E. round by S. to N.W.
2. Cone, point upwards for Northerly gales ; N.W. round by N. to S.E.

The signals are to be kept hoisted *during the daylight only*, until 48 hours have elapsed from the time *the telegram was despatched*, unless countermanded. At night, lanterns may be used wherever the local authorities deem it desirable to do so.

The meaning of the signals is that an atmospherical disturbance exists (which will be explained in the telegram), and will probably, but not *necessarily*, cause a gale at the place warned, *from the direction* indicated by the signal.

The Meteorological Office supplies the canvas shapes and lanterns to such places as require them, on loan, but in all cases the local authorities must undertake the charges incidental to the hoisting of the signal, such as flagstaff and gear, oil, &c., and also to the keeping of the apparatus in repair, painting, &c.

APPENDIX XI.

REPORT ON THE COMPARISON OF THE FORECASTS ISSUED AT 8.30 p.m. WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 Months, April 1886 to March 1887.

The letters used have the following signification :—

a = complete success.		c = partial failure.
b = partial (more than half) success.		d = total failure.

The checking has been conducted on the same system as that employed in previous years, *i. e.*, each forecast has been considered under the separate headings of "Wind" and "Weather," but the results of the 8 p.m. Forecasts only are here published.

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

The Summary for the whole year is given at page 10.

DISTRICTS.		APRIL 1886.				MAY 1886.				JUNE 1886.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.
SCOTLAND, N.	a	57	53	55	87	37	60	49	85	63	40	52	82
"	b	27	37	32		43	30	36		27	33	30	
"	c	10	7	9		17	0	9		7	17	12	
"	d	6	3	4		3	10	6		3	10	6	
SCOTLAND, E.	a	54	47	51	81	17	50	49	81	64	64	64	87
"	b	33	27	30		37	27	32		33	13	23	
"	c	10	26	18		13	7	10		0	10	5	
"	d	3	0	1		3	16	9		3	13	8	
ENGLAND, N.E.	a	60	47	54	75	57	43	50	80	70	50	60	87
"	b	23	20	21		36	24	30		27	27	27	
"	c	10	20	15		7	13	10		3	7	5	
"	d	7	13	19		0	20	10		0	16	8	
ENGLAND, E.	a	63	40	52	87	61	37	49	80	64	37	51	84
"	b	27	43	35		32	30	31		30	37	33	
"	c	7	10	8		7	13	10		3	13	8	
"	d	3	7	5		0	20	10		3	13	8	
MIDLAND COS.	a	60	40	50	82	68	43	56	87	77	47	62	91
"	b	24	40	32		32	30	31		20	37	29	
"	c	13	13	13		0	10	5		0	6	3	
"	d	3	7	5		0	17	8		3	10	6	
ENGLAND, S.	a	57	50	54	86	59	31	45	80	69	47	54	84
"	b	27	37	32		31	38	35		37	23	30	
"	c	13	10	11		7	11	10		0	13	6	
"	d	3	3	3		3	17	10		3	17	10	
SCOTLAND, W.	a	47	60	51	87	31	33	32	69	54	43	49	84
"	b	10	27	33		38	37	37		33	37	35	
"	c	7	10	9		17	10	14		10	3	6	
"	d	6	3	4		14	20	17		3	17	10	
ENGLAND, N.W.	a	57	50	54	87	45	30	38	77	73	43	58	87
"	b	27	40	33		38	40	39		27	30	29	
"	c	10	7	9		10	17	13		0	10	5	
"	d	6	3	4		7	13	10		0	17	8	
ENGLAND, S.W.	a	50	50	50	76	46	45	46	86	67	50	59	84
"	b	27	24	26		43	38	40		27	24	25	
"	c	23	23	23		4	10	7		3	3	3	
"	d	0	3	1		7	7	7		3	23	13	
IRELAND, N.	a	40	54	47	92	31	53	42	78	63	50	57	85
"	b	59	49	45		45	27	36		30	27	28	
"	c	7	3	5		17	13	15		7	7	7	
"	d	3	3	3		7	7	7		0	16	8	
IRELAND, S.	a	44	47	46	86	38	43	41	77	63	54	59	85
"	b	43	37	40		35	37	36		30	23	26	
"	c	10	10	10		10	7	8		7	13	10	
"	d	3	6	4		17	13	15		0	10	5	

SUMMARY.

BRITISH ISLES	a	54	49	52	84	47	43	45	80	65	48	57	85
"	b	31	34	32		37	32	35		20	28	28	
"	c	11	13	12		10	10	10		4	9	7	
"	d	4	4	4		6	15	10		2	15	8	

DISTRICTS.		APRIL 1886.				MAY 1886.				JUNE 1886.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.
SCOTLAND, N.	a	57	53	55	87	37	60	40	85	63	40	52	82
"	b	27	37	32		43	30	36		27	33	30	
"	c	10	7	9		17	0	9		7	17	12	
"	d	6	3	4		3	10	6		3	10	6	
SCOTLAND, E.	a	54	47	51	81	47	50	49	81	64	64	64	87
"	b	33	27	30		37	7	32		33	13	23	
"	c	10	25	18		13	27	10		0	10	5	
"	d	3	0	1		3	16	9		3	13	8	
ENGLAND, N.E.	a	60	47	54	75	57	43	50	80	70	50	60	87
"	b	23	20	21		36	24	30		27	27	27	
"	c	10	20	15		7	13	10		3	7	5	
"	d	7	13	19		0	20	10		0	16	8	
ENGLAND, E.	a	63	40	52	87	51	37	40	80	64	37	51	84
"	b	27	43	35		32	30	31		30	37	33	
"	c	7	10	8		7	13	10		3	13	8	
"	d	3	7	5		0	20	10		3	13	8	
MIDLAND COS.	a	60	40	50	82	68	43	56	87	77	47	62	91
"	b	24	40	32		32	30	31		20	37	29	
"	c	13	13	13		0	10	5		0	6	3	
"	d	3	7	5		0	17	8		3	10	6	
ENGLAND, S.	a	57	50	54	86	59	31	45	80	60	47	54	84
"	b	27	37	32		31	38	35		37	23	30	
"	c	13	10	11		7	14	10		0	13	6	
"	d	3	3	3		3	17	10		3	17	10	
SCOTLAND, W.	a	47	60	54	87	31	33	32	69	54	43	49	84
"	b	40	27	33		38	37	37		33	37	35	
"	c	7	10	9		17	10	14		10	3	6	
"	d	6	3	4		14	20	17		3	17	10	
ENGLAND, N.W.	a	57	50	54	87	45	30	38	77	73	43	58	87
"	b	27	40	33		38	40	39		27	30	29	
"	c	10	7	9		10	17	13		0	10	5	
"	d	6	3	4		7	13	10		0	17	8	
ENGLAND, S.W.	a	50	50	50	76	46	45	46	86	67	50	59	84
"	b	27	24	26		43	38	40		27	24	25	
"	c	23	23	23		4	10	7		3	3	3	
"	d	0	3	1		7	7	7		3	23	13	
IRELAND, N.	a	40	54	47	92	31	53	42	78	63	50	57	85
"	b	50	40	45		45	27	36		30	27	28	
"	c	7	3	5		17	13	15		7	7	7	
"	d	3	3	3		7	7	7		0	16	8	
IRELAND, S.	a	44	47	46	86	38	43	41	77	63	54	59	85
"	b	43	37	40		35	37	36		30	23	26	
"	c	10	10	10		10	7	8		7	13	10	
"	d	3	6	4		17	13	15		0	10	5	

SUMMARY.

BRITISH ISLES	a	54	49	52	84	47	43	45	80	65	48	57	85
"	b	31	34	32		37	32	35		29	28	28	
"	c	11	13	12		10	10	10		4	9	7	
"	d	4	4	4		6	15	10		2	15	8	

DISTRICTS.		JULY 1886.				AUGUST 1886.				SEPTEMBER 1886.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.
SCOTLAND, N.	a	58	48	53	84	49	58	51	79	35	48	42	78
"	b	32	29	31		35	16	25		31	38	36	
"	c	10	10	10		13	7	16		28	4	16	
"	d	0	13	6		3	19	11		3	10	6	
SCOTLAND, E.	a	71	52	62	89	65	52	59	88	48	52	50	76
"	b	19	35	27		26	32	29		31	21	26	
"	c	10	3	6		9	13	11		14	7	11	
"	d	0	10	5		0	3	1		7	20	13	
ENGLAND, N.E.	a	68	45	57	89	61	49	55	87	52	52	52	80
"	b	23	12	32		26	35	31		31	24	28	
"	c	6	7	7		13	3	8		7	7	7	
"	d	3	6	4		0	13	6		10	17	13	
ENGLAND, E.	a	77	61	69	85	58	58	58	84	66	38	52	83
"	b	13	29	17		29	23	26		24	38	31	
"	c	10	13	11		13	19	12		7	17	12	
"	d	0	6	3		0	9	1		3	7	5	
MIDLAND COS.	a	55	52	54	83	58	58	58	86	66	31	49	76
"	b	36	23	29		32	23	28		27	28	27	
"	c	6	19	13		10	10	10		7	24	16	
"	d	3	6	4		0	9	1		0	17	8	
ENGLAND, S.	a	71	55	63	83	55	68	62	86	59	55	57	80
"	b	23	16	20		39	13	26		31	14	23	
"	c	6	13	6		6	10	8		7	17	12	
"	d	0	16	11		0	9	1		3	14	8	
SCOTLAND, W.	a	61	45	53	84	55	27	41	78	45	55	50	74
"	b	39	23	31		26	47	37		31	17	24	
"	c	0	23	12		10	6	8		7	14	11	
"	d	0	9	4		9	20	11		17	14	15	
ENGLAND, N.W.	a	71	52	62	83	49	37	43	79	45	52	49	83
"	b	23	19	21		35	37	36		34	31	31	
"	c	6	16	11		6	6	6		14	7	10	
"	d	0	13	6		10	20	15		7	7	7	
ENGLAND, S.W.	a	52	55	51	81	42	39	41	70	54	43	49	82
"	b	35	19	27		32	26	29		35	32	33	
"	c	13	16	14		20	13	16		7	7	7	
"	d	0	10	5		6	22	11		4	18	11	
IRELAND, N.	a	42	42	42	71	58	49	51	81	41	46	44	86
"	b	29	29	29		23	32	27		48	36	42	
"	c	13	19	16		3	13	8		0	14	7	
"	d	16	10	13		16	6	11		11	4	7	
IRELAND, S.	a	48	42	45	71	52	55	54	84	45	57	51	81
"	b	10	42	26		26	35	39		44	36	40	
"	c	23	13	18		9	7	8		4	6	2	
"	d	19	3	11		13	3	8		7	7	7	

SUMMARY.

BRITISH ISLES	a	61	56	56	82	55	56	53	82	50	48	49	81
"	b	26	27	26		30	29	29		34	29	32	
"	c	9	14	12		10	9	10		9	11	10	
"	d	4	9	6		5	12	8		7	12	9	

DISTRICTS.		OCTOBER 1886.				NOVEMBER 1886.				DECEMBER 1886.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.
SCOTLAND, N.	a	42	36	30	75	37	53	45	82	45	78	62	83
"	b	39	32	36		47	27	37		23	19	21	
"	c	16	19	17		10	17	14		23	3	13	
"	d	3	13	8		6	3	4		9	0	4	
SCOTLAND, E.	a	42	42	42	70	30	30	30	69	48	55	52	76
"	b	32	23	28		47	30	39		16	32	24	
"	c	23	16	19		17	23	20		23	10	16	
"	d	3	19	11		6	17	11		13	3	8	
ENGLAND, N.E.	a	39	48	44	76	44	40	42	79	49	45	47	81
"	b	39	26	32		40	33	37		26	42	34	
"	c	22	13	18		13	17	15		19	3	11	
"	d	0	13	6		3	10	6		6	10	8	
ENGLAND, E.	a	49	32	41	68	37	33	35	79	36	35	36	79
"	b	26	29	27		47	40	44		15	42	43	
"	c	19	13	16		6	17	11		13	10	12	
"	d	6	26	16		10	10	10		6	13	9	
MIDLAND COS.	a	52	36	44	73	27	33	30	74	23	32	28	70
"	b	19	39	29		43	41	44		48	36	42	
"	c	26	6	16		20	13	16		19	19	19	
"	d	3	19	11		10	10	10		10	13	11	
ENGLAND, S.	a	55	29	42	76	31	33	33	78	36	32	34	68
"	b	26	42	34		43	47	45		35	32	34	
"	c	16	16	16		17	10	11		19	16	17	
"	d	3	13	8		7	10	8		10	20	15	
SCOTLAND, W.	a	29	30	30	69	27	33	30	63	36	36	36	73
"	b	35	13	39		33	33	33		29	45	37	
"	c	26	10	18		27	10	19		19	6	13	
"	d	10	17	13		13	24	18		16	13	14	
ENGLAND, N.W.	a	42	64	53	74	37	37	37	67	36	52	44	83
"	b	29	13	21		23	37	30		45	32	39	
"	c	10	13	16		27	6	17		19	19	14	
"	d	10	10	10		13	20	16		0	6	3	
ENGLAND, S.W.	a	39	37	38	68	50	43	47	85	58	52	55	79
"	b	26	33	30		30	47	38		19	29	21	
"	c	29	10	19		17	7	12		10	6	8	
"	d	6	20	13		3	3	3		19	13	13	
IRELAND, N.	a	29	58	44	76	35	67	51	84	52	55	54	84
"	b	39	26	32		15	20	33		32	29	30	
"	c	19	10	15		17	7	12		10	0	5	
"	d	13	6	9		3	6	4		6	16	11	
IRELAND, S.	a	39	58	49	75	42	64	53	84	39	35	37	83
"	b	26	26	26		38	23	31		39	52	46	
"	c	22	10	16		17	10	13		9	3	6	
"	d	13	6	9		3	3	3		13	10	11	

SUMMARY.

BRITISH ISLES	a	42	43	43	73	36	42	39	77	42	46	44	78
"	b	30	30	30		40	35	38		32	35	34	
"	c	22	12	17		17	12	14		17	8	12	
"	d	6	16	10		7	11	9		9	11	10	

DISTRICTS.		JANUARY 1887.				FEBRUARY 1887.				MARCH 1887.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.
SCOTLAND, N.	a	45	71	58	85	50	71	61	82	32	62	47	80
"	b	38	17	27		25	18	21		52	32	42	
"	c	13	6	9		14	0	7		10	3	7	
"	d	6	6	6		11	11	11		6	3	4	
SCOTLAND, E.	a	32	65	49	79	50	61	56	84	39	74	57	80
"	b	12	19	30		36	21	28		45	20	32	
"	c	23	6	15		11	7	9		13	3	8	
"	d	3	10	6		3	11	7		3	3	3	
ENGLAND, N.E.	a	45	39	42	81	54	50	52	91	55	74	65	97
"	b	39	39	39		46	32	39		39	26	32	
"	c	13	16	15		6	14	7		6	0	3	
"	d	3	6	4		0	4	2		0	0	0	
ENGLAND, E.	a	61	32	17	81	57	26	17	86	49	58	54	88
"	b	26	49	37		39	39	39		45	23	34	
"	c	13	19	16		4	14	9		3	16	9	
"	d	0	0	0		0	11	5		3	3	3	
MIDLAND COS.	a	52	36	44	85	45	16	45	89	49	55	52	94
"	b	39	42	41		53	26	44		42	42	42	
"	c	9	13	11		4	7	6		3	3	3	
"	d	0	3	1		0	11	5		6	0	3	
ENGLAND, S.	a	52	52	52	89	61	50	57	93	42	52	47	86
"	b	15	29	37		32	39	36		49	29	39	
"	c	3	19	11		4	7	5		6	19	13	
"	d	0	0	0		0	4	2		3	0	1	
SCOTLAND, W.	a	42	38	40	73	46	54	50	72	42	39	41	78
"	b	31	35	33		22	21	22		39	35	37	
"	c	24	10	17		25	18	21		13	10	11	
"	d	3	17	10		7	7	7		6	16	11	
ENGLAND, N.W.	a	33	40	37	72	57	51	56	81	36	52	44	85
"	b	37	33	35		22	29	25		45	36	41	
"	c	17	29	18		14	3	9		16	6	11	
"	d	13	7	10		7	14	10		3	6	4	
ENGLAND, S.W.	a	43	37	40	77	61	57	61	84	39	36	38	75
"	b	30	43	37		22	25	23		36	39	37	
"	c	29	13	16		7	6	4		19	19	19	
"	d	7	7	7		7	18	12		6	6	6	
IRELAND, N.	a	49	52	46	82	57	43	50	88	42	52	47	85
"	b	33	38	36		29	46	38		39	36	38	
"	c	20	3	11		11	4	7		16	6	11	
"	d	7	7	7		3	7	5		3	6	4	
IRELAND, S.	a	30	48	39	75	47	32	40	81	39	52	46	76
"	b	30	42	36		39	50	44		32	29	36	
"	c	23	3	13		7	7	7		10	3	7	
"	d	17	7	12		7	11	9		19	16	17	

SUMMARY.

BRITISH ISLES	a	43	47	45	80	54	51	53	85	42	55	49	86
"	b	35	35	35		33	32	32		42	32	37	
"	c	16	12	14		9	7	8		11	8	9	
"	d	6	6	6		4	10	7		5	5	5	

DISTRICTS.		JANUARY 1887.				FEBRUARY 1887.				MARCH 1887.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.
SCOTLAND, N.	a	45	71	58	85	50	71	61	82	32	62	47	89
"	b	36	17	27		25	18	21		52	32	42	
"	c	13	6	9		14	0	7		10	3	7	
"	d	6	6	6		11	11	11		6	3	4	
SCOTLAND, E.	a	32	65	49	79	50	61	56	84	39	74	57	89
"	b	42	19	30		36	21	28		45	20	32	
"	c	23	6	15		11	7	9		13	3	8	
"	d	3	10	6		3	11	7		3	3	3	
ENGLAND, N.E.	a	45	39	42	81	54	50	52	91	55	74	65	87
"	b	39	39	39		46	32	39		39	26	32	
"	c	13	16	15		0	14	7		6	0	3	
"	d	3	6	4		0	4	2		0	0	0	
ENGLAND, E.	a	61	32	47	84	57	36	47	86	49	53	54	88
"	b	26	49	37		39	39	39		45	23	34	
"	c	13	19	16		4	14	9		3	16	9	
"	d	0	0	0		0	11	5		3	3	3	
MIDLAND COS.	a	52	36	44	85	43	46	45	89	40	55	52	94
"	b	39	42	41		53	36	44		42	42	42	
"	c	9	19	14		4	7	6		3	3	3	
"	d	0	3	1		0	11	5		6	0	3	
ENGLAND, S.	a	52	52	52	89	64	50	57	93	42	52	47	86
"	b	45	29	37		32	39	36		49	29	39	
"	c	3	19	11		4	7	5		6	19	13	
"	d	0	0	0		0	4	2		3	0	1	
SCOTLAND, W.	a	42	38	40	73	46	54	50	72	42	39	41	78
"	b	31	35	33		22	21	22		39	35	37	
"	c	24	10	17		25	18	21		13	10	11	
"	d	3	17	10		7	7	7		6	16	11	
ENGLAND, N.W.	a	33	40	37	72	57	54	56	81	36	52	44	85
"	b	37	33	35		22	29	25		45	36	41	
"	c	17	20	18		14	3	9		16	6	11	
"	d	13	7	10		7	14	10		3	6	4	
ENGLAND, S.W.	a	43	37	40	77	64	57	61	84	39	36	38	75
"	b	30	43	37		22	25	23		36	39	37	
"	c	20	13	16		7	0	4		19	19	19	
"	d	7	7	7		7	18	12		6	6	6	
IRELAND, N.	a	40	52	46	82	57	43	50	88	42	52	47	85
"	b	33	38	36		29	46	38		39	36	38	
"	c	20	3	11		11	4	7		16	6	11	
"	d	7	7	7		3	7	5		3	6	4	
IRELAND, S.	a	30	48	39	75	47	32	40	84	39	52	46	76
"	b	30	42	36		39	50	44		32	29	30	
"	c	23	3	13		7	7	7		10	3	7	
"	d	17	7	12		7	11	9		19	16	17	

SUMMARY.

BRITISH ISLES	a	43	47	45	80	54	51	53	85	42	55	49	86
"	b	35	35	35		33	32	32		42	32	37	
"	c	16	12	14		9	7	8		11	8	9	
"	d	6	6	6		4	10	7		5	5	5	

APPENDIX XII.

LIST of STATIONS from which DAILY SIMULTANEOUS OBSERVATIONS
(at Oh. 8m. p.m. G. M. T.) have been received in 1886.

Stations.	Observers.	Remarks.
ENGLAND AND WALES.		
Bradford - -	J. McLandsborough, F.R.A.S., F.R. Met. Soc. and A. E. Preston, F.R. Met. Soc.	—
Chatham, School of Military Engineering.	W. Saunders, Bugler, R.E.	—
Falmouth Observatory -	The Staff.	—
Greenwich Observatory -	The Staff, for the Astronomer Royal.	—
Guernsey - -	A. Collenette, F.R. Met. Soc.	—
Kew Observatory -	The Staff.	—
Leicester (Museum) -	J. C. Smith.	—
Liverpool Observatory (Bidston).	J. Hartnup, F.R. Met. Soc.	—
Oxford, Radcliffe Obs. -	The Staff.	—
Plymouth - -	J. Merrifield, LL.D., F.R.A.S.	—
Stonyhurst Observatory -	The Staff.	—
SCOTLAND.		
Aberdeen Observatory -	The Staff.	—
Orkney, Swanbister -	W. I. Fortescue.	—
IRELAND.		
Galway, Queen's College	W. Ryan.	—
Valencia Observatory -	The Staff.	—
BRITISH COLONIES, POSSESSIONS, &c.		
Barbados, W. I. -	Surgeon-Maj. in charge.	—
Gibraltar - -	Surgeon-Gen. in charge.	—
Malta - -	Q. R. Willan.	—
Nassau (Bahamas) -	J. A. Kerr	—
Natal - -	Surgeon-Maj. in charge.	—
Scutari, British Cemetery	Serg. W. H. Lyne, R.E.	—
Sierra Leone - -	Surgeon-Maj. in charge.	—

SUMMARY.

—		—
England and Wales -	-	11
Scotland - -	-	2
Ireland - -	-	2
British Colonies and Possessions -	-	7
Total		22

APPENDIX XIII.

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

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

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.

The measurements are subjected to a careful examination in order to ensure as far as possible their accuracy, and the regulations which have been adopted to secure this end are in the main the same as those which will be found in the Report of the Office for 1868. 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 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 each month. The curves and tabulations are eventually bound and stored in the Office.

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.

The photographic curves are also used in the harmonic analyser; and for this purpose the barograms require a slight special preparation.

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.

The record having been made as complete as possible, the daily, five-daily, and monthly means of the barometer and of the dry-bulb and wet-bulb thermometers are deduced.

Returns from observatories.

Examination of returns.

Results of examination and report to Council.

General supervision of observatory work.

Harmonic analyser.

Interpolations.

Means.

APPENDIX XIII.

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The record having been made as complete as possible, the daily, five-daily, and monthly means of the barometer and of the dry-bulb and wet-bulb thermometers are deduced.

Returns from observatories.

Examination of returns.

Results of examination and report to Council.

General supervision of observatory work.

Harmonic analyser.

Interpolations.

Means.

The hourly vapour tension is then computed by an expansion of Glaisher's Hygrometrical Tables, prepared in the Office, and the work is independently checked. Vapour tension.

A copy is next prepared of the above-mentioned hourly measurements of the barometer, dry-bulb and wet-bulb thermometers, wind and rain curves, and of the computed values of vapour tension. To these are added the daily means of the three first-mentioned elements, the extremes and daily range of pressure and temperature, and the daily totals of rainfall, and the whole series is printed and published under the title of "Hourly Readings from the Self-recording Instruments at the Four Observatories under the Meteorological Council." Hourly Readings.

To ensure accuracy the sheets are read over in proof with the original measurements of the curves. The interpolated readings are printed in *italic* type, but no distinguishing mark is affixed to means which are partly based on them. When the gap in the record is too long to be dealt with by an interpolation of the missing hourly readings, the mean for the day is obtained either from the maximum and minimum readings for the day, or by an interpolation from the adjacent daily means, and the result thus obtained is printed as an approximation.

The five-daily, monthly, and annual means, together with the absolute extremes of pressure and temperature for each month, are printed as part of the "Hourly Readings." The tables are repeated in French measures. Tables for the Quarterly Weather Reports.

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

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

The anemograms received from the stations enumerated on page 92 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 the highest importance, the tabulations are always employed in the preparation of the summary of weather and gale tables for the Quarterly Weather Report. They are also regularly used in the checking of the Storm Warnings issued by the Office.

III.—*Method followed with regard to the Returns from Land Stations of the Second Order.*

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. Origin and progress of system.

At the end of the present year the total number of stations was 73, including 16 belonging to the Royal Meteorological Society and 5 belonging to the Scottish Meteorological Society.

This number is exclusive of the self-recording observatories, and of the anemographic stations, but it includes several from which only very scanty information is received.

The stations are distributed as follows: 43 in England, 3 in Wales, 11 in Scotland, and 16 in Ireland.

The returns are received at the Office monthly, and are duly entered and stored.

Publication on Form A.

The publication of the returns is carried out in the following way: For a certain number of stations the observations of pressure (to the second place of decimals), temperature, wind, cloud amount, and weather, at 9 a.m. and 9 p.m. each day, together with the computed vapour tension and relative humidity at those hours, and the daily maxima and minima of temperature, and daily rainfall, are published *in extenso* on the Form, A., proposed by the Permanent Committee of the First International Meteorological Congress at Vienna in 1874, and adopted for international use by the Second International Meteorological Congress at Rome in 1879.

The Permanent Committee assigned an inferior limit to the number of stations from which returns should be published *in extenso*, varying from two for Belgium to 100 for Russia in Asia, the number in the case of the United Kingdom being 15. In 1875, when the systematic publication of returns from Stations of the Second Order began, only nine British stations were available, but this number has steadily grown, until for 1880 returns from 33 stations were published on the A. Form. Though this list could be extended if desired, it has been thought better to curtail it somewhat on account of the size of the publication. The volume for 1883, now passing through the press, will therefore, like that for 1881 and 1882, contain returns, *in extenso*, from only 30 stations.

Additions to the list for publication.

Care is taken in adding to the list for publication to see, first, that the station is satisfactory as regards its instruments, their exposure, &c.; secondly, that the returns bear internal evidence of accuracy and care in their preparation; and thirdly, that the district represented by the station is one for which information is needed.

Examination.

Full particulars as to the methods adopted in the examination of the returns will be found in previous reports.

Publication on Form B.

Besides this publication in full, the monthly means of the various elements, together with summaries of the wind direction and of the weather, are published on the Form, B., also devised by the Permanent Committee of the Vienna Congress, and adopted by the Roman Congress.

Returns from six stations were published in this manner for the year 1873, and from nine stations for the year 1874. In 1875 the list included the names of 26 stations. This number has grown to 45 for the year 1883, and might be even further increased.

All the stations, returns from which are published *in extenso* on Form A., are included in the Form B. list. But this list also includes others, either not quite so good, not so representative, or not so long established. The method of preparation is in the main the same as in the case of the Form A. But the summaries of wind and weather are specially prepared for this publication. For wind, the summary shows the number of *observations* at 9 a.m. and 9 p.m. under each of the semi-quadrantal points N., N.E., E., &c., the observations under intermediate points being thrown alternately forward and backward. For weather, the summary gives the number of *days* of rain, snow, hail, thunderstorm, clear sky, overcast, and gale. The days of clear sky and overcast are those when the means of the cloud-amounts at 9 a.m. and 9 p.m. are less than 2, and more than 8 respectively. The days of gale are those when force 7 or upwards, by Beaufort scale, is recorded.

British rainfall.

The monthly rainfall values (total, number of rainy days, and maximum) for the observatories and all the Stations of the Second Order are supplied each year to Mr. Symons, F.R.S., for publication in his "British Rainfall."

Unpunctual observations.

The observations are taken at 9 a.m. and 9 p.m. local time each day. It sometimes happens, however, that strict punctuality cannot be observed.

The returns are received at the Office monthly, and are duly entered and stored.

Publication on
Form A.

The publication of the returns is carried out in the following way: For a certain number of stations the observations of pressure (to the second place of decimals), temperature, wind, cloud amount, and weather, at 9 a.m. and 9 p.m. each day, together with the computed vapour tension and relative humidity at those hours, and the daily maxima and minima of temperature, and daily rainfall, are published *in extenso* on the Form, A., proposed by the Permanent Committee of the First International Meteorological Congress at Vienna in 1874, and adopted for international use by the Second International Meteorological Congress at Rome in 1879.

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Additions to the
list for publi-
cation.

Care is taken in adding to the list for publication to see, first, that the station is satisfactory as regards its instruments, their exposure, &c.; secondly, that the returns bear internal evidence of accuracy and care in their preparation; and thirdly, that the district represented by the station is one for which information is needed.

Examination.

Full particulars as to the methods adopted in the examination of the returns will be found in previous reports.

Publication on
Form B.

Besides this publication in full, the monthly means of the various elements, together with summaries of the wind direction and of the weather, are published on the Form, B., also devised by the Permanent Committee of the Vienna Congress, and adopted by the Roman Congress.

Returns from six stations were published in this manner for the year 1873, and from nine stations for the year 1874. In 1875 the list included the names of 26 stations. This number has grown to 45 for the year 1883, and might be even further increased.

All the stations, returns from which are published *in extenso* on Form A., are included in the Form B. list. But this list also includes others, either not quite so good, not so representative, or not so long established. The method of preparation is in the main the same as in the case of the Form A. But the summaries of wind and weather are specially prepared for this publication. For wind, the summary shows the number of *observations* at 9 a.m. and 9 p.m. under each of the semi-quadrantal points N., N.E., E., &c., the observations under intermediate points being thrown alternately forward and backward. For weather, the summary gives the number of *days* of rain, snow, hail, thunderstorm, clear sky, overcast, and gale. The days of clear sky and overcast are those when the means of the cloud-amounts at 9 a.m. and 9 p.m. are less than 2, and more than 8 respectively. The days of gale are those when force 7 or upwards, by Beaufort scale, is recorded.

British rainfall.

The monthly rainfall values (total, number of rainy days, and maximum) for the observatories and all the Stations of the Second Order are supplied each year to Mr. Symons, F.R.S., for publication in his "British Rainfall."

Unpunctual
observations.

The observations are taken at 9 a.m. and 9 p.m. local time each day. It sometimes happens, however, that strict punctuality cannot be observed.

In such cases, if the difference in time does not exceed 30 minutes, the observations are, in most cases, printed without alteration. When the difference exceeds 15 minutes, a note is inserted in the remarks showing the exact time of observation. If the difference in time is more than half-an-hour, the readings are usually rejected and an interpolation made.

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

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

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

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

The daily records of sunshine which are now received from 35 Stations in the British Islands are examined generally to guard against accidental changes in the adjustment of the instrument. 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.

A tabulation of these curves is published as part of the Weekly Weather Report, mentioned in Appendix VII., and for those stations which are also Stations of the Second Order the monthly totals of bright sunshine in hours, together with the percentage of its possible duration, is published as Part IV. of "Returns from Stations of the Second Order." A table showing the daily amount of sunshine at Bunhill Row, one of the London stations, is also prepared quarterly for the Royal Meteorological Society.

INSPECTION.

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

IV.—*Telegraphic Reporting Stations.*

Full particulars relating to these stations, the information received from them, and the method of dealing with that information, will be found in Appendix VII. A paragraph in that Appendix (p. 70) explains the use that is made of the monthly schedules sent in by the observers.

V.—*Extra Stations.*

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

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

APPENDIX XIV.

LIST OF DOCUMENTS RELATING TO THE LAND METEOROLOGY OF THE BRITISH ISLANDS, RECEIVED DURING THE YEAR ENDING MARCH 31ST, 1887.

Stations.	Observers.	Nature of Information received.	Notes.
I. †Valencia	J. E. Cullum -	Continuous records of pressure, temperature, wind, sunshine, and rain, with notes on the weather.	From September 1886.
†Glasgow	Prof. R. Grant, M.A., LL.D., F.R.S. -		
†Aberdeen	Prof. C. Niven, M.A., F.R.S. -		
†Falmouth	E. Kitto, F.R. Met. Soc. -		
†Stonyhurst	Rev. S. J. Perry, S.J., F.R.S. -		
†Kew	G. M. Whipple, E.Sc., F.R.A.S., F.R. Met. Soc. -	Continuous record of wind, rainfall, and sunshine.	From September 1886.
II. †Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S. -		
Alawick Castle	Lt.-Col. F. Holland, for the Duke of Northumberland, K.G. -	Continuous record of wind (direction and velocity).	From September 1886.
†Fleetwood	M. S. Gaultier, C.E. -	"	
†Holyhead	Hugh W. Williams, C.E. -	"	From September 1886.
†North Shields	Capt. W. Harrison -	"	
†Swanbister (Orkney)	W. I. Fortescue, Esq. -	"	From September 1886.
†Scilly	W. Thomas -	"	
†Yarmouth	G. T. Watson -	"	From September 1886.
Kilenny Castle	The Marquis of Ormonde -	"	
Waterford	The Harbour Authorities -	Continuous record of pressure.	From September 1886.
III. †Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S. -	"	
Aysgarth	Rev. Fenwick W. Stow, M.A., F.R. Met. Soc. -	Regular observations at 9 a.m. and 9 p.m. of pressure, temperature (dry-bulb and wet-bulb), wind, cloud and weather, with the daily maxima and minima of temperature, the daily rainfall, and general remarks on the weather.	From September 1886.
†Babacombe, Devon	E. E. Glyde, F.R. Met. Soc. -		
†Bennington, Herts.	Rev. J. Dunne Parker, LL.D., F.R. Met. Soc. -		
†Braemar	James Aitken, J.P. -		
†Brookborough (Colebrook Park).	W. Ferguson, for Sir Victor Brooke, Bt., F.L.S. -		
†Buxton	E. J. Sykes, M.B., F.R.A.S., F.R. Met. Soc. -	Regular observations at 9 a.m. and 9 p.m. of pressure, temperature (dry-bulb and wet-bulb), wind, cloud and weather, with the daily maxima and minima of temperature, the daily rainfall, and general remarks on the weather.	From September 1886.
†Carmarthen	G. J. Hearler, M.D. -		
†Cheadle	J. C. Phillips, Esq. -		

LIST OF DOCUMENTS—continued.

Stations.	Observers.	Nature of Information received.	Notes.
† Newton Reigny (Pentrich).	T. G. Benn, F.R. Met. Soc.	-	Till December 1886.
† Parsonstown -	Benj. Budds, for the Earl of Rosse, F.R.S.	-	
† Pinmore -	Peter Donald -	-	
† Prestwich (Manchester)	T. R. H. Clunn, M.D., F.R. Met. Soc.	-	
† Rothesay -	James Kay, Esq.	-	
† Sealeby -	R. A. Allison, M.P., F.R. Met. Soc.	-	
† Scarborough -	Allan Rowntree, F.R. Met. Soc.	-	
† Seaham -	G. H. Aird -	-	
† Southampton	J. T. Cook, R.E., for Director General of the Ordnance Survey.	-	
† Southbourne -	T. A. Compton, B.A., M.D., F.R. Met. Soc.	-	
† Stokesay -	Miss M. A. Digges La Touche -	-	
† Stonyhurst -	Rev. S. J. Perry, S.J., F.R.S. -	-	
† St. David's, Pembroke	W. P. Probert, LL.D., F.G.S., F.R. Met. Soc.	-	
† St. Leonards	H. Colborne, M.R.C.S. -	-	
† Swanbister -	W. I. Fortescue, Esq. -	-	
† Uppingham -	Rev. G. H. Mullins, M.A., F.R. Met. Soc.	-	
† Wakefield -	H. Clarke, L.R.C.P., F.S.S., F.R. Met. Soc.	-	
† Whitby (Lighthouse) -	E. J. W. Powell -	-	
† York -	J. Wright, for H. M. Platnauer, F.G.S.	-	
IV. The Telegraphic Stations, see List on page 50	-	-	<p>Regular observations twice (and in some cases three times) daily of pressure, temperature, wind, weather, and sea disturbance.</p> <p>Pressure, temperature (dry-bulb, wet-bulb, max., min.), wind and rainfall, once daily.</p> <p>Pressure, temperature, wind, and weather, once daily.</p> <p>Pressure and temperature four times daily, and wind twice daily.</p>
V. † Arlington Court, Devon	J. Carter, for Lady Chichester	-	
Baltimore -	J. Halsey -	-	
Castletownsend -	Lieut. T. W. Cobb, R.N.	-	
Crookhaven -	" "	-	

LIST OF DOCUMENTS—continued.

Stations.	Observers.	Nature of Information received.	Notes.
† Chatham School of Military Engineering.	P. McHugo, for Inspector in Survey -	Full return for 9 a.m.	
Cooper's Hill (Egham)	Prof. H. McLeod, F.R.S. -	Full return for 9 a.m. and 3 p.m.	
Crosshaven -	J. W. Bridle -	Pressure, temperature, and wind, twice daily.	
Delph, Yorkshire -	W. K. Inglis -	Pressure, wind, and weather twice daily, with max. and min. temperatures, and rainfall.	
Ennis -	J. Hill, C.E., F.R. Met. Soc. -	Daily rainfall.	
Gouleston, Norfolk -	R. J. C. Day -	Pressure and wind twice daily.	
Harpندن -	T. Wilson, F.R. Met. Soc. -	Pressure, temperature, and wind, twice daily, with rainfall.	
Haslar -	G. Coppen -	Pressure and temperature four times daily.	
Killarney Asylum -	Oscar T. Woods, M.D. -	Daily rainfall.	
Rugby -	C. H. Hodges, M.A. -	Full set of 9 a.m. observations with 9 p.m. temperatures.	
Saffron Walden -	J. G. Bellingham -	Pressure and temperature twice daily, with 9 a.m. wind and rainfall.	
Schull -	Lieut. T. W. Cobb, R.N. -	Pressure, temperature, and wind twice daily.	
† Sheffield (Weston Park)	Elijah Howarth, F.R.A.S. -	Full returns for 9 a.m. and 6 p.m.	
Stamford (Ketton Hall)	Fred. Coventry, F.R. Met. Soc. -	Full monthly summary.	
Sudbury -	W. Bayley Ransom -	Pressure, temperature (dry-bulb, max., min.), wind, cloud, and rainfall, once daily, with general remarks.	
Symbister, Shetland -	J. S. Nicolson -	Pressure and temperature twice daily.	
Tarbert (Harris) -	Donald Bethune -	Pressure and wind twice daily.	
Union Hall -	Lieut. T. W. Cobb, R.N. -	Pressure, temperature, and wind, twice daily.	

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

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SUNSHINE have been received.

Station.	Observer.
Aberdeen - - - -	Prof. C. Niven, M.A., F.R.S.
Armagh - - - -	J. L. E. Dreyer, Ph.D., F.R.A.S.
Blackpool - - - -	Hy. Welch, M.B.
Cambridge - - - -	H. Todd.
Churchstoke - - - -	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester - - - -	Prof. Ohm, B.A., F.R. Met. Soc.
Cronkbourne, Isle of Man - - - -	A. W. Moore, M.A., J.P.
Cullompton - - - -	Thos. Turner, J.P., F.R. Met. Soc.
Dublin - - - -	A. B. Coddington, Lt. Col. R.E.
Durham - - - -	H. J. Carpenter.
Falmouth - - - -	E. Kitto, F.R. Met. Soc.
Geldeston, Beccles - - - -	E. T. Dowson, F.R. Met. Soc.
Glasgow - - - -	Prof. R. Grant, M.A., LL.D., F.R.S.
Hastings - - - -	H. Colborne, M.R.C.S.
Hillington - - - -	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Jersey (Noirmont) - - - -	J. Fisher.
Kew Observatory - - - -	G. M. Whipple, B.Sc., F.R.A.S.
Leicester - - - -	J. C. Smith.
Llandudno - - - -	J. Nicol, M.D., J.P., F.R. Met. Soc.
London, Bantlett Row - - - -	Messrs. de La Rue.
„ Westminster - - - -	The Staff, Meteorological Office
Markree Castle - - - -	A. Marth, F.R.A.S.; for Col. E. H. Cooper.
Newton Reigny (Penrith) - - - -	T. G. Benn, F.R. Met. Soc.
Oswald Kirk, Yorkshire - - - -	R. Thompson.
Oxford - - - -	E. J. Stone, F.R.S.
Parsonstown - - - -	O. Boeddicker, Ph.D.; for the Earl of Rosse, F.R.S.
Plymouth - - - -	J. Merrifield, LL.D., F.R.A.S.
St. Ann's Head - - - -	Messrs. Blake & Spicer.
Southampton - - - -	Sir C. Wilson, Col. R.E., K.C.B., F.R.S.
Stonyhurst - - - -	Rev. S. J. Perry, M.A., F.R.S.
Stornoway - - - -	D. Macdonald.
Swanbister (Orkney) - - - -	W. Irvine Fortescue.
Valencia - - - -	J. E. Cullum.
Worsop - - - -	H. Mellish, F.R. Met. Soc.
York - - - -	J. E. Clarke, B.A., B.Sc.

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Cambridge	-	-	-	-	H. Todd.
Churchstoke	-	-	-	-	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester	-	-	-	-	Prof. Ohm., B.A., F.R. Met. Soc.
Cronkbourne, Isle of Man	-	-	-	-	A. W. Moore, M.A., J.P.
Cullompton	-	-	-	-	Thos. Turner, J.P., F.R. Met. Soc.
Dublin	-	-	-	-	A. B. Coddington, Lt. Col. R.E.
Durham	-	-	-	-	H. J. Carpenter.
Falmouth	-	-	-	-	E. Kitto, F.R. Met. Soc.
Geldeston, Beccles	-	-	-	-	E. T. Dowson, F.R. Met. Soc.
Glasgow	-	-	-	-	Prof. R. Grant, M.A., LL.D., F.R.S.
Hastings	-	-	-	-	H. Colborne, M.R.C.S.
Hillington	-	-	-	-	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Jersey (Noirmont)	-	-	-	-	J. Fisher.
Kew Observatory	-	-	-	-	G. M. Whipple, B.Sc., F.R.A.S.
Leicester	-	-	-	-	J. C. Smith.
Llandudno	-	-	-	-	J. Nicol, M.D., J.P., F.R. Met. Soc.
London, Bunhill Row	-	-	-	-	Messrs. de La Rue.
„ Westminster	-	-	-	-	The Staff, Meteorological Office
Markree Castle	-	-	-	-	A. Marth, F.R.A.S.; for Col. E. H. Cooper.
Newton Reigny (Penrith)	-	-	-	-	T. G. Benn, F.R. Met. Soc.
Oswald Kirk, Yorkshire	-	-	-	-	R. Thompson.
Oxford	-	-	-	-	E. J. Stone, F.R.S.
Parsonstown	-	-	-	-	O. Boeddicker, Ph.D.; for the Earl of Rosse, F.R.S.
Plymouth	-	-	-	-	J. Merrifield, LL.D., F.R.A.S.
St. Ann's Head	-	-	-	-	Messrs. Blake & Spicer.
Southampton	-	-	-	-	Sir C. Wilson, Col. R.E., K.C.B., F.R.S.
Stonyhurst	-	-	-	-	Rev. S. J. Perry, M.A., F.R.S.
Stornoway	-	-	-	-	D. Macdonald.
Swanbister (Orkney)	-	-	-	-	W. Irvine Fortescue.
Valencia	-	-	-	-	J. E. Cullum.
Workshop	-	-	-	-	H. Mellish, F.R. Met. Soc.
York	-	-	-	-	J. E. Clarke, B.A., B.Sc.

APPENDIX XV.

ACCESSIONS TO THE LIBRARY DURING THE YEAR ENDING
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|| **Wollny, E.**—Untersuchungen über die Feuchtigkeits- und Temperaturverhältnisse des Bodens bei verschiedener Neigung des Terrains gegen den Horizont. 70 pp. 8°. (*Forschungen auf dem Geb. Agrik.-phys., Heidelberg, Bd. ix., Heft 1.*)

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|| **Stewart, B. and Carpenter, W. L.**—On a comparison between apparent inequalities of short period in sun-spot areas and in diurnal declination-ranges at Toronto and at Prague. 16 pp. 8°. (*Proc. R. Soc.*, 1886, *No.* 243.)

United States Naval Observatory.—Astronomical and meteorological observations made during the year 1882, at the United States Naval Observatory. Vice-Admiral **S. C. Rowan**, Superintendent. lxiii. + 198 + 21 + 82 + 34 + 28 pp., 3 plates, la. 4°. Washington, 1885.

C—ATMOSPHERIC PRESSURE.

|| **Hann, J.**—Bemerkungen zur täglichen Oscillation des Barometers. 14 pp. la. 8°. (*Sitzb. k. Akad. Wissensch., Wien, Bd. xciii., Abth. ii.*, 1886, p. 981.)

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— **The aurora borealis.**—32 pp. 8°. (*Edinb. Rev.*, 1886, Oct., No. 336.)

|| **Sundell, A. F.**—Om norrskenet den 1 April 1886. 2 pp. 8°. (Helsingfors, 1886.) (*Finska Vetensk. Soc. Förh.*, xxvii.)

F—CLIMATE AND HYGIENE.

* **Hooper, G. S.**—Observations on the topography, climate, and prevalent diseases of the Island of Jersey, the result of meteorological observations, and general practice, during thirteen years. 199 + 8 pp. la. 8°. London, 1837.

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|| **Lancaster, A.**—Le climat de la Belgique en 1886. 73 pp., 2 plates, sm. 8°. Bruxelles, 1887. (*Ann. Obs. R. Bruxelles*, 1887.)

|| **Liznar, J.**—Ueber das Klima von Brünn. 70 pp., 4 plates, la. 8°. Brünn, 1886. (*Verhandl. naturf. Ver. Brünn*, xxiv.)

* **Mackenna, B. V.**—Ensayo histórico sobre el clima de Chile. (Desde los tiempos prehistóricos hasta el gran temporal de Julio de 1877.) ix. + 490 pp. sm. 4°. Valparaíso, 1877.

|| **Marcet, W.**—On the distribution and object of carbonic acid in nature, and its sanitary relations. On the influence of altitude on the chemical phenomena of respiration. 16 pp. 8°. (*Trans. San. Inst. Gt. Brit.*, vii.)

|| **Physiographical Commission of the I. R. Academy of Science at Cracow.**—Materials for Galician climatology, collected by the Meteorological section . . . 1882, 1885. 2 vols. la. 8°. Cracow, 1883, 1886. (*Extract Rep. Physiogr. Comm.*)

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|| **Piche, A.**—Les méthodes d'investigation scientifique et leur application à la science des climats. Communication faite au congrès de Biarritz. 15 pp. 8°. Bruxelles, 1887. (*Ciel et Terre*, 2 série, t. II., 1887.)

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Registrar General of Births, Deaths and Marriages in Ireland.—Quarterly returns of the marriages, births, and deaths registered in . . . Ireland; . . . 1886. 1st—4th quarters, Nos. 89–92. la. 8°. Dublin, 1886–87.

— — — — — Weekly returns of births and deaths in Dublin (including its suburban districts), and in fifteen of the principal urban sanitary districts in Ireland, 1886. Vol. XXIII. la. 8°. Dublin, 1887.

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|| **Scott, R. H.**—Climatology of the sea. An address delivered at the Annual General Meeting of the R. Meteor. Soc., Jan. 20, 1886. 2 pp. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xii., 1886, p. 65.)

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* **Woeikoff, A.**—Die Klimate der Erde. Nach dem Russischen. Vom Verfasser besorgte, bedeutend veränderte deutsche Bearbeitung. Teil I.—II. 2 vols., with plates, la. 8°. Jena, 1887.

|| **Woeikoff, A.**—Examination of Dr. Croll's hypotheses of geological climates. 18 pp. 8°. (*Amer. Journ. Sc.*, 3rd ser., xxxi., 1886, p. 161.)

G—EARTHQUAKES.

* **(Darwin, G. H.)**—Earthquakes. 14 pp. la. 8°. (*Fortnightly Rev.* 1887, Feb., p. 262.)

|| **Russell, H. C.**—Local variations and vibrations of the earth's surface. Read . . . 1 July 1885. 31 pp., 5 diagrams, 8°. (Sydney, 1886.) [*Journ. Proc. R. Soc. N.S.W.*, 1885.]

H—ELECTRICITY AND MAGNETISM.

* **Admiralty, London.**—Curves of equal magnetic variation, 1880 By Staff Commr. E. W. Creak. Chart, la. f°. London, 1880.

Anderson, R.—Lightning conductors, their history, nature and mode of application. Third edition, revised, re-arranged, and enlarged. xv.+470 pp. 8°. London, 1885.

|| **Davis, W. M.**—Notes on studies of thunder-storms in Europe. 2 papers, 8°. Ann. Arbor, 1886. (*Amer. Meteor. Journ.*)

|| ———.—On the methods of study of thunder-storms. Communicated Feb. 10, 1886. 12 pp. la. 8°. (*Proc. Amer. Acad. Arts Sc.*, xxi., p. 336.)

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|| **Franz, R.**—Ueber die diamagnetische Polarität. 21 pp. la. 4°. Halle, 1878. (*Nova. Acta, k. leop.-carol.-deutsche. Akad. Naturf.*, xl., No. 6, p. 233.)

|| **Gasparis, A. de.**—Determinazioni assolute della inclinazione magnetica nel R. Osservatorio astronomico di Capodimonte disposte dall' astronomo Prof. F. Brioschi ed eseguite dagli assistenti Dott. F. Contarino et Dott. F. Angelitti nell' anno 1884. Quarta comunicazione. 7 pp. la. 4°. Napoli, 1886. (*Rend. R. Accad. Sc. Fis. Mat. Napoli*, 1886, Maggio, Fasc. 5.)

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|| **Giese, W.**—Kritisches über die auf arktischen Stationen für magnetische Messungen, insbesondere für Variationsbeobachtungen, zu benutzenden Apparate. 33 pp. la. 8°. (*Erner's Repert. Physik.*, xxii., p. 203.)

|| **Hann, J.**—Gewitterperioden in Wien. 13 pp. sm. f°. (*Meteor. Zeitschr.*, 1886, Juni, p. 237.)

|| **(Hann, J.)**—Zur Höhe der Gewitterwolken. 2 pp. sm. f°. (*Meteor. Zeitschr.*, 1886, Juli, p. 323.)

*|| **Hirn, G.-A.**—Sur l'efficacité des paratonnerres. Extrait d'une lettre de M. G.-A. Hirn à M. Faye. *Compt. rend. acad. sc. Paris*, xcv., séance du 30 Oct. 1882. 4 pp. la. 8°. [?]

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(———.)—Results of magnetic observations made 1841-1885, in Hong-Kong. (By W. Doberck.) sm. f°. Sheet. Dated, 13th January, 1886.

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Glassford, W. A.—Rainfall on the Pacific Coast. Table showing monthly rainfall averages in California, Oregon, and Washington Territory, with mean averages for season, number of years from which averages are determined, and total for season of 1885 and 1886. la. f°. Sheet.

|| **[Hall, M.]**—Jamaica rainfall for the year 1885. 6 pp. sm. f°. Kingston, 1886.

This forms No. 71 of the Jamaica Weather Report.

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|| **Lang, C.**—Beobachtung der Schneebedeckung. 5 pp. la. 8°. (*Meteor. Zeitschr.*, 1887, Jan., p. 15.)

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(Waterworks Office, Malta.)—Report on the rainfall of Malta, and the yield of various springs for the year commencing 1st September 1885 and ending 31st August 1886. 6 pp., 1 diagram, f°. Malta, 1887.

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W—TEMPERATURE.

|| **Ångström, K.**—Sur une nouvelle méthode de faire des mesures absolues de la chaleur rayonnante ainsi qu'un instrument pour enregistrer la radiation solaire. 17 pp., 1 plate, 4°. Upsal, 1886. (*Nova Acta Reg. Soc. Sc. Upsal*, Ser. iii.)

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|| **Doering, O.**—La variabilidad interdiurna de la temperatura en algunos puntos de la República Argentina y de América del Sur en general. III. Variabilidad de la temperatura de Ushuaiá. 44 pp. la. 8°. Buenos Aires, 1886. (*Bol. acad. nac. cienc. Córdoba*, viii., p. 399.)

* || **Duperray, J.-G.**—Note sur des relations simples entre la pression de la vapeur aqueuse et la température. 5 pp. 4°. (Paris, s.a.) [*Acad. sc.*, 1871, Juin 12.]

* **Forbes, [J. D.]**—On the effect of the mechanical texture of screens on the immediate transmission of radiant heat. 3 pp. 8°. Dated December 16, 1839.

Gordon, A. R.—Charts showing the mean monthly and annual temperatures of Hudson's Bay region and Eastern Canada, September 1884 to October 1885. 13 charts, oblong f°. s.l.e.a.

* || **Haughton, S.**—New researches on sun-heat and terrestrial radiation, and on geological climates. Parts i. and ii. 52 pp. la. 4°. Dublin, 1881. (*Trans. R. Irish Acad.*, xxviii., p. 47.)

|| **Hill, S. A.**—On solar thermometer observations at Allahabad. 7 pp. 8°. Calcutta, 1887. (*Journ. Asiat. Soc. Bengal*, LV., Part ii., 1886, p. 316.)

Hong-Kong Observatory.—On one year's observations of thermometers exposed in Stevenson's screen. (By **W. Doberck.**) 5 pp. sm. f°. Dated, 2nd August, 1886.

* || **Martins, C.**—Du froid thermométrique et de ses relations avec le froid physiologique dans les plaines et sur les montagnes. 52 pp., 1 plate, 4°. Montpellier, 1859. (*Mém. acad. sc. Montpellier*, iv., 1859.)

* || ———.—Sur l'accroissement nocturne de la température avec la hauteur dans les couches inférieures de l'atmosphère. 43 pp., 1 plate, 4°. Montpellier, 1861. (*Mém. Acad. Sc. Montpellier*, v., 1861, p. 47.)

Meteorological Office, India.—Abstract of the results of the thermometric observations taken at the Meteorological Office, Chowringhee, in the months of January to December, 1886. sm. f°. Sheets.

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|| **(Meteorological Office, London).**—Harmonic analysis of the diurnal range of air temperature at the seven observatories of the Meteorological Office, for the twelve years from 1871 to 1882; obtained from the continuous photographic records by means of Sir William Thomson's harmonic analyser. 58 pp. la. 4°. (*Hourly Readings*, 1883, Part iv., App.)

|| **Mill, H. R.**—On the temperature of the water in the Firth of Forth. 11 pp. 2 plates, 8°. (*Proc. R. Soc. Edinb.*, xiii., 1884-85, p. 157.)

|| **Prestwich, J.**—On underground temperatures; with observations on the conductivity of rocks; on the thermal effects of saturation and imbibition; and on a special source of heat in mountain ranges. Read Feb. 12, 1885. 82 pp. la. 4°. London, 1886. (*Proc. R. Soc.*, xxxviii., 1885, p. 161.)

Prince, C. L.—Some remarks upon the temperature of the winter of 1885-86. 3 pp. sm. f°. Dated, Crowborough, April 28th, 1886.

* || **Schlagintweit, H.**—Atmosphärische Feuchtigkeit. pp. 398-425, la. 8°. [? Where from.]

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|| **Wild, H.**—Weitere Versuche über die Bestimmung der wahren Lufttemperatur. Der Akad. vorgelegt am 21 Oct. 1886. 24 pp. sm. f°. (St. Petersburg), 1887. (*Repert. Meteor.*, x., No. 10.)

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Hong-Kong Observatory.—On the practical use of the meteorological signals. sm. f°. Sheet. Dated, 11th April 1886.

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* **Möller, M.**—Wetter-Berather. Anleitung zum Verständniss und zur Vorherbestimmung der Witterung. 30 pp., 2 plates, la. 8°. Hamburg, 1886.

|| **Rotch, A. L.**—An experiment in local weather prediction. 4 pp. la. 8°. (*Amer. Meteor. Journ.*, 1887, Feb.)

* **Saxby, S. M.**—Saxby's weather system or lunar influence on weather. Second edition. viii. + 119 pp., sm. 8°. London, 1864.

Teisserenc de Bort, L.—La prévision du temps. Conférence faite au Congrès de climatologie de Biarritz, le 4 Oct. 1886. 15 pp. 8°. (*Ciel et Terre*, 2^e série, 2^e année, No. 19, 1886, p. 433.)

* **Weather-Book, The.**—Three hundred plain rules for telling the weather; by the barometer, thermometer, hygrometer, clouds, winds, animals, plants, &c. 64 pp. 18°. London, 1841.

Zenger, K. W.—Die Meteorologie der Sonne und die Wetter-Prognose des Jahres 1886. xi. + 52 pp., 1 plate, la. 8°. Prag, 1887.

Y—WINDS, STORMS, AND CYCLONES.

|| **Augustin, F.**—Über die jährliche Periode der Richtung des Windes. 22 pp., 1 plate, 8°. Prag, 1886. (*Sitzungsb. königl. böhm. Gesellsch. Wissensch.*, 1886. März 12.)

* **Bassnett, T.**—Outlines of a mechanical theory of storms, containing the true law of lunar influence, with practical instructions to the navigator, to enable him approximately to calculate the coming changes of the wind and weather, for any given day, and for any part of the ocean. 246 pp. sm. 8°. New York, 1854.

|| **Cloué, G.**—L'ouragan de Juin 1885 dans le Golfe d'Aden. 67 pp., 1 plate, la. 8°. Paris, 1886. (*Rev. mar. col.*, 1886, Avril.)

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Dechevrens, M.—L'inclinaison des vents. Un anémomètre pour observer cette inclinaison, avec un appendice sur les courants verticaux dans les cyclones. Deuxième note. 48 pp., 3 plates, la. 4°. [Zi-ka-wei], 1886.

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|| **Doberck, W.**—The law of storms in the eastern seas. 24 pp., 1 plate, sm. 8°. Dated, Sept. 1886. ("Hong-Kong Telegraph.")

* || **Fournet, —**—Recherches sur la distribution des vents dominants en France. pp. 417–456, la. 8°. [?]

(**Gibson, H. B.**)—Water-spouts on the gulf stream in winter. 9 pp. la. 8°. (*Amer. Meteor. Journ.*, iii., 1886, p. 119.)

|| **Harding, C.**—The gale of October 15 and 16, 1886, over the British Islands. 12 pp. la. 8°. (*Quart. Journ., R. Meteor. Soc.*, xiii., 1887.)

|| **Hirn, G. A.**—Étude sur une classe particulière de tourbillons qui se manifestent, sous de certaines conditions spéciales, dans les liquides. Analogie existant entre le mécanisme de ces tourbillons et celui des trombes. 40 pp., 3 plates, 8°. Paris, 1878. (*Bull. Soc. hist. nat. Colmar.*)

* || ———.—Remarques sur les effets singuliers d'un coup de vent du Sud-Ouest. *Compt. rend. acad. sc.*, Paris, xciii., séance du 8 août, 1881. 2 pp. la. 8°. [?]

(**Hong-Kong Observatory.**)—Report on information issued daily, in 1885, concerning typhoons. 3 pp. sm. f°. (*Gov. Notification, No. 142.*)

* || **Hopkins, —**—On the origin and nature of the forces that produce storms. Read Dec. 16th, 1851. [*Mem. Lit. Phil. Soc. Manchester.*]

* || **Jouan, H.**—Quelques observations sur les typhons ressentis dans la mer de Chine pendant les mois d'Août, Septembre et Octobre, 1867. pp. 113–141, la. 8°. [?]

* **Julien, F.**—Courants et révolutions de l'atmosphère et de la mer, comprenant une théorie nouvelle sur les déluges périodiques. vi. + 240 pp. 8°. Paris, 1860.

Klossovsky, A.—Les orages au sud de la Russie. 41 pp., 1 plate, la. 8°. Odessa, 1886.

|| (**Lang, C.**)—Ueber mittlere Windgeschwindigkeit in Bayern mit besonderer Berücksichtigung der Verhältnisse Münchens. 4 pp. la. 4°. (*Beobacht. meteor. Stat. K. Bayern.* vii., 1885, p. 34.)

* || [**Lloyd, H.**]—Notes on the storm of the 18th of April [1850]. 6 pp. 8°. [*Proc. R. Irish Acad.*, iv., p. 515.]

Natal Harbour Board.—Diagram showing the direction and velocity of wind from 1st January to 31st December 1885. By **D. I. Nolan**. la. 4°. Sheet.

Osservatorio meteorologico di Riposto.—Sulla tromba terrestre del 7 ottobre 1884. Lettera del Prof. **G. D'Amico** ed osservazioni del Prof. **J. Cafiero**. 13 pp., 3 plates, la. 8°. Giarre, 1884.

|| **Prince, C. L.**—An analysis of forty years' consecutive observations of storms in the county of Sussex. 6 pp., 1 plate, la. 8°. (*Quart. Journ., R. Meteor. Soc.*, xiii., 1887, p. 79.)

|| **Ragona, D.**—Studi sulla frequenza dei venti, e sulle relazioni della medesima coi principali elementi meteorologici. 92 pp. sm. f°. Roma, 1886. (*Mem. Pontif. Acad. Nuovi. Lincei*, ii.)

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* **Alexandrow, A.**—Complete Russian-English dictionary. 2 + 1034 + 42 pp. 8°. (St. Petersburg), 1885.

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Baden-Powell, B. F. S.—How I learnt ballooning. 11 pp. 8°. (*Temple Bar*, 1887, *Mch.*, p. 424.)

* **Bert, P.**—First year of scientific knowledge. Translated by J. Clayton. Third edition. 344 pp. sm. 8°. London and Paris, 1886.

Board of Trade, Standards Office.—Equivalents of imperial and metric weights and measures. Imperial to metric. Metric to imperial. 2 cards, sm. 4°. London, 1886.

Boldva, A. B. v.—Jan Mayen, nach der Aufnahme der österreich. arct. Beobachtungsstation, 1882–83. 1 chart, la. f°. s.l.e.a.

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[**Cunningham, J. T.**—The Scottish marine station for scientific research. Granton, Edinburgh, its work and prospects. 54 pp., 6 plates, 8°. Edinburgh, 1885.

|| **Davison, C., and Love, E. F. J.**—On the need of combined action for the translation and publication of foreign scientific memoirs. Read before the Soc., May 13th, 1886. 4 pp. 8°. (*Proc. Birmingham Phil. Soc.*, v., part i.)

[**Editorial Committee of the Norwegian North Atlantic Expedition.**—Den Norske Nordhavs-Expedition, 1876–1878. xv. Zoologi. Crustacea, II. ved G. O. Sars. 96 pp., 1 plate, f°. Christiania, 1886.

In the English language also.

———.—Den Norske Nordhavs-Expedition, 1876–78. xvi. Zoologi. Mollusca, II., ved H. Friele. 44 pp., 6 plates, f°. Christiania, 1886.

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* || **Forbes, [J. D.]**—Researches on heat. Third series. 4 pp. 8°. (*Proc. R. Soc. Edinb.*, 1838, *Apr.* 16.)

|| **Frankland, P. F.**—The distribution of micro-organisms in air. 18 pp. 8°. (*Proc. R. Soc.* xl., 1886, p. 509.)

* **Greely, A. W.**—Three years of Arctic service. An account of the Lady Franklin Bay expedition of 1881–84, and the attainment of the farthest North. 2 vols., with maps plates, and portraits, la. 8°. London, 1886.

Hector, J.—Handbook of New Zealand. Fourth edition, revised. 120 pp., 7 plates, la. 8°. Wellington, 1886.

* || **Hopkins, —.**—On the causes of the great currents of the ocean. Read 4th Nov. 1851. 15 pp. 8°. (*Mem. Lit. Phil. Soc. Manchester.*)

Hydrographisches Amt der Admiralität, Berlin.—Die Ergebnisse der Untersuchungsfahrten S. M. Knbt. "Drache" (Kommandant Korvetten-Kapitän Holzhauser) in der Nordsee in den Sommern 1881, 1882 und 1884. iv. + 77 pp., 15 plates, 4°. Berlin, 1886.

Inspector General of Customs, Shanghai.—List of the Chinese lighthouses, light-vessels, buoys, and beacons for 1886. (Corrected to 1st December 1885.) 14th Issue. 44 pp., 5 plates, 4°. Shanghai, 1886.

International Inventions Exhibition, 1885.—Official catalogue. lxxv. + 398 pp., 4 plates, 8°. London, 1885.

Nederlandsche Pool-Expeditie 1882-83, De.—Beschreven door Dr. M. Snellen, uitgegeven door de zorg van den Luitnt. ter Zee 1^{ste} Klasse B. J. G. Volck.—xii. + 164 pp., 20 plates, 3 portraits, f°. Utrecht, 1886.

Porro, F.—Alessandro Dorna. 3 pp. la. 8°. Dated, Torino, 20 Agosto, 1886.

|| **Prestwich, J.**—On the agency of water in volcanic eruptions; with some observations on the thickness of the earth's crust from a geological point of view; and on the primary cause of volcanic action. Read, April 16, 1885. 57 pp., 1 plate, 8°. London, 1886. (*Proc. R. Soc.*, 1886, No. 246, p. 117.)

Preussische Schlagwetter-Commission.—(Commission on Colliery Explosions.) Haupt-Bericht. Erstattet im Namen der Commission durch A. Hasslacher. Erste Hälfte (Bogen 1-8), la. 8°. Berlin, 1886.

* **Richthofen, F. F. von.**—Führer für Forschungsreisende. Anleitung zu Beobachtungen über Gegenstände der physischen Geographie und Geologie. xii. + 745 pp. 8°. Berlin, 1886.

* **Shaw, G. A.**—Madagascar of to-day. An account of the Island, its people, resources and development. 190 pp., 1 plate, 18°. London, 1886.

* **"The Times"** register of events in 1886. clxxxviii. + 216 pp. 8°. London, 1887.

Vogel, J.—The official handbook of New Zealand. A collection of papers by experienced colonists on the colony as a whole, and on the several provinces. 272 pp., 31 plates, 8°. London, 1875.

Wall, H. B. de la P.—Manual of physical geography of Australia. viii. + 194 pp., 5 plates, sm. 8°. Melbourne, 1883.

Walsingham, Lord.—On some probable causes of a tendency to melanic variation in lepidoptera of high latitudes. Being the annual address of the President to the Members of the Yorkshire Naturalists' Union, at Doncaster, March 3rd, 1885. 28 pp. 8°. (Leeds, s.a.)

APPENDIX XVI.

METEOROLOGICAL OFFICE : ACCOUNT OF RECEIPTS and PAYMENTS for
the year ending 31st March 1887.

RECEIPTS.

	£	s.	d.	£	s.	d.
Balance from year 1885-86	-	2,265	0	8		
Parliamentary Vote	-	15,300	0	0		
Repayment of expenses charged under—						
(1.) Incidental expenses	-	25	4	9		
(2.) Special researches	-	23	15	8		
(3.) Observatories and stations	-	0	8	11		
				49	9	4

SUPPLY OF INFORMATION :

D.W. Charts and						
Forecasts	-	232	0	2		
6 p.m. Charts	-	22	18	4		
Information for						
Press Agencies, &c.	-	76	15	8		
Telegrams	-	322	13	4		
Miscellaneous data	-	12	1	6		
				666	9	0

SALE OF INSTRUMENTS, &c. :

Royal Navy (A)	-	4	0	0		
Mercantile Marine account						
(B)	-	39	2	5		
				43	2	5

Commissions executed for Colonial and Foreign Institutions, &c. (C)	-			221	3	3
Commission charged on work done for Colonies, &c.	-			23	13	11

£18,568 18 7

PAYMENTS.

	£	s.	d.	£	s.	d.
ADMINISTRATION:						
Payment of Council	-	1,000	0	0		
Secretary	-	800	0	0		
Salaries and wages	-	792	12	0		
Rent, fuel, and lighting	-	710	0	7		
Incidental and contingent expenses:—						
Attendance, cleaning, &c.	-	416	17	11		
Furniture and fittings	-	232	15	1		
Expenses incidental to International Meteorological Congress	-	11	0	0		
Pensions	-	42	16	4		
				4,006	1	11
SPECIAL RESEARCHES	-			493	8	3

LAND METEOROLOGY:

Observatories and stations	-	1,870	11	6		
Salaries:— Discussion and reduction of observations	-	1,291	1	4		
				3,161	12	10

WEATHER INFORMATION AND FORECASTS:

Telegraphic reports and storm warnings	-	3,083	5	11		
Salaries:— Preparation and issue of reports and forecasts	-	1,639	19	9		
				4,723	5	8

INSPECTIONS:

Salaries and travelling expenses	-	559	16	9		
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OCEAN METEOROLOGY:

Salaries:— Discussion and reduction of observations	-	1,858	11	0		
Expenses incidental to the supply of instruments:—						
Proportion for care and issue of instruments	-	200	0	0		
Royal Navy	-	429	14	10		
Mercantile Marine	-	437	7	6		
Distant island and coast stations	-	22	8	5		
				2,948	1	9

Commissions executed for Colonial and Foreign Institutions, &c.	-	294	2	8		
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BALANCE:

Cash at Bank	-	2,249	8	11		
„ at Office	-	82	19	11		
Advance to Valencia Observatory	-	50	0	0		
				2,382	8	9

£18,568 18 7

APPENDIX XVII.

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

OFFICIAL.

- No. 1. Report for 1867. Presented to Parliament. 1s.
2. Instructions for Meteorological Telegraphy. New Edition. (1875.) 6d.
3. Fishery Barometer Manual. 6d. (New edition, 1887.)
4. Charts of Surface Temperature, South Atlantic Ocean. 2s. 6d.
5. Report for 1868. Presented to Parliament. 5d.
6. Report for 1869. Presented to Parliament. 10d.
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5s. each.
8. Barometer Manual. (Out of print, see Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5s. each.
10. Report for 1870. Presented to Parliament. 10d.
- *11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2s. 6d.
- *12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2s. 6d.
13. A Discussion of the Meteorology of the Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February 1870. Price, with Book of Charts, 5s.
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5s. each.
15. Report for 1871. Presented to Parliament. 10d.
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5s. each.
17. Report for 1872. Presented to Parliament. 1s.
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2s.
19. Quarterly Weather Report, 1873.—Parts I. to IV. 5s. each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20°—30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20s.
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1s.
22. Report for 1873. Presented to Parliament. 4d.
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2s.
24. Instructions in the Use of Meteorological Instruments. [Reprinted 1885.] 6s.
25. Quarterly Weather Report for 1874.—Parts I., II., and IV. 5s. each. Part III., 5s. 9d.
26. Report for 1874. Presented to Parliament. 6d.

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

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