

R E P O R T
OF THE
METEOROLOGICAL COUNCIL

TO THE
ROYAL SOCIETY,

For the Year ending 31st of March 1884.

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



L O N D O N :
PRINTED BY EYRE AND SPOTTISWOODE.

To be purchased, either directly or through any Bookseller, from any of the following Agents, viz.,
Messrs. HANSARD and SON, 13, Great Queen Street, W.C., and 32, Abingdon Street, Westminster;
Messrs. EYRE and SPOTTISWOODE, East Harding Street, Fleet Street, and Sale Office, House of Lords;
Messrs. ADAM and CHARLES BLACK, of Edinburgh;
Messrs. ALEXANDER THOM & CO., LIMITED, or Messrs. HODGES, FIGGIS, & Co., of Dublin.

1885.

[C.—4294.] *Price 1s. 2d.*

CONTENTS.

	PAGE
LIST OF COUNCIL - - - - -	4

REPORT.

Introductory - - - - -	5
Part I.—Ocean Meteorology - - - - -	5
Part II.—Weather Telegraphy - - - - -	12
Part III.—Land Meteorology of the British Islands - - - - -	19
Library - - - - -	25
Expenditure - - - - -	25

APPENDIX.

I. Method followed in the Extraction of Data from Ships' Logs -	27
II. List of Observers who have returned "excellent" Logs during the year - - - - -	29
III. List of Documents received from Ships and Foreign Land Stations during the year ending 31st March 1884 - - - - -	32
IV. Disposal of Instruments (Admiralty) - - - - -	46
V. Disposal of Instruments (Mercantile Marine) - - - - -	47
VI. List of Telegraphic Reporting Stations - - - - -	48
VII. Inspectors' Reports - - - - -	49
VIII. Method of dealing with Telegraphic Weather Intelligence - - - - -	61
IX. Supply of Daily Weather Reports - - - - -	70
X. List of Fishery Barometer Stations - - - - -	73
XI. Supply of Telegraphic Weather Intelligence, with Board of Trade Circular, No. 717, 1874 - - - - -	74
XII. Comparison of the Forecasts with the Weather subsequently experienced in the different Districts, for the 12 months ending March 1884 - - - - -	76
XIII. List of Stations from which daily Simultaneous Observations were received in 1883 - - - - -	81
XIV. Methods followed in dealing with the Land Meteorology of the British Isles - - - - -	82
XV. List of Documents received from Climatological Stations in the British Isles during the year ending 31st March 1884 - - - - -	87
XVI. Minute explanatory of the reasons for which the Meteorological Council have resolved to close some of their self-recording observatories - - - - -	91
XVII. Accessions to Library - - - - -	98
XVIII. Statement of Receipts and Payments - - - - -	118
XIX. List of Office Publications - - - - -	119

THE METEOROLOGICAL COUNCIL,

1883-84.

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

MR. WARREN DE LA RUE, D.C.L., F.R.S.

Captain SIR FREDERICK J. O. EVANS, K.C.B., F.R.S., Hydro-
grapher of the Admiralty.

MR. FRANCIS GALTON, F.R.S.

Professor GEORGE GABRIEL STOKES, F.R.S.

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

REPORT

OF THE

METEOROLOGICAL COUNCIL

TO THE

ROYAL SOCIETY,

For the Year ending March 31, 1884.

THERE has been no change in the Council during the year, and the 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 period for which the Council had undertaken to collect special information on an extensive scale from the North Atlantic, as explained in the last Report, expired at the end of August 1883, and the Office has therefore returned to its normal practice as regards its dealing with observers at sea.

A concise account of the practice at present followed will be found in Appendix I. (p. 27).

Appendix II. (p. 29) 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 :—

Captain's Name.	Ship.
Adams, Sub.-Lieut. R. P., R.N.	- H.M.S. “Dart.”
Adamson, John - - -	- “Roman Empire.”
Alderton, T. - - -	- S.S. “Australia.”
Ballard, H. - - -	- S.S. “Durban.”
Barlow, Brabazon J. - -	- S.S. “Amarapoora.”

Collection of information.

Presentation of charts to observers

Presentation
of charts to
observers.

Captain's Name.	Ship.
Boothby, George C. - - -	S.S. "Circassia."
Bolton, S. H. - - -	S.S. "Tyne Queen."
Bristow, W. M. - - -	"Undine."
Christie, John D. - - -	S.S. "Erl King."
Clarke, James - - -	S.S. "Olbers."
Cooke, Charles F. - - -	"The Lord Warden."
Crotty, J. H. - - -	"Evesham Abbey."
Denham, George - - -	S.S. "Erl King."
Donaldson, James - - -	S.S. "Bolivia."
Dunbar, John Ivor - - -	S.S. "Martaban."
England, Thomas - - -	"Jane."
Grey, C., R.N.R. - - -	"MacMillan."
Jones, Edward, R.N.R. - - -	S.S. "Drummond Castle."
McBride, A. C. - - -	"Island Belle."
McDougall, A. - - -	"Auckland."
Milne, W. F. - - -	S.S. "Esquimaux."
Moore, Lieut. and Commr. W. U., R.N.	H.M.S. "Dart."
Neale, Mr. W. H., M.B. - - -	"Eira."
Oldham, Lieut. in Command, C.F., R.N.	H.M.S. "Lark."
Pagan, James - - -	S.S. "Tenasserim."
Pirie, Lieut. George, R.N. - - -	H.M.S. "Flying Fish."
Pomeroy, H. - - -	"Elissa."
Price, J. H. - - -	"Viola."
Richardson, Sub.-Lieut. Wyndham, R.N.	H.M.S. "Sylvia."
Rosseter, William Lawrence - - -	"St. Kilda."
Smith, Mr. B. Leigh - - -	"Eira."
Steven, David - - -	"Inch Keith."
Strang, Robert - - -	"Lyttleton."
Thorpe, J. - - -	"Thurland Castle."
Vereker, Hon. Foley C. P., R.N. - - -	H.M.S. "Magpie."
Wait, A. McLean - - -	S.S. "Spartan."
Walker, Henry - - -	S.S. "Parthia" and S.S. "Cephalonia."
Whall, William B. - - -	S.S. "Drummond Castle."
Williams, E. M. - - -	"Burdwan."

The Council regret deeply to have to record the death of Captain J. McDonald Gray, who had been an "excellent" observer for more than 13 years.

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

The following is the total number of logs received from April 1, 1883, to March 31, 1884, 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.
176	132	75

The average number of logs received annually during the five years, 1878-82, was 151, and the per-centage of excellent logs among these was 66.

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

On the 31st of March 1884 the ships carrying instruments supplied by the Office were pursuing the following voyages:—

To Baffin's Bay or Greenland	-	-	-	6
„ North America, East Coast	-	-	-	11
„ „ „ West „	-	-	-	3
Off East Coast of North America	-	-	-	4
To South America, East Coast	-	-	-	13
„ „ „ West „	-	-	-	3
„ Australia and New Zealand, viâ Cape of Good Hope	-	-	-	26
„ „ „ „ „ Suez	-	-	-	3
„ India, viâ Suez	-	-	-	2
„ India, viâ Cape of Good Hope	-	-	-	20
„ China Seas, viâ Cape of Good Hope	-	-	-	5
„ „ „ „ Suez	-	-	-	6
„ Mediterranean Ports	-	-	-	5
„ Cape of Good Hope	-	-	-	10
„ West Indies	-	-	-	2
Between British Ports	-	-	-	2
Unknown	-	-	-	18

Total number of ships - - - 139

Districts from which observations are obtained.

Appendix III. (p. 32) supplies a list of the logs and of all the documents from stations abroad received at the Office during the year.

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, has during the past year employed nearly the whole Marine Branch of the Office.

Synchronous weather charts.

It will be remembered that the above-named period is that during which the International System of Circumpolar Observations has been carried out.

Steady progress has been made in preparing the data and plotting them on daily charts. Already 10,502 monthly forms have been received from 2,563 ships, giving an average of 808 forms for each of the 13 months. The following statement shows the distribution of the data over the several months:—

TOTAL NUMBER of FORMS received for each MONTH, to March 25th 1884.

1882—August	-	-	-	823
September	-	-	-	878
October	-	-	-	927
November	-	-	-	856
December	-	-	-	843
1883—January	-	-	-	771
February	-	-	-	812
March	-	-	-	857
April	-	-	-	874
May	-	-	-	817
June	-	-	-	706
July	-	-	-	694
August	-	-	-	644

Total 10,502

Synchronous
weather
charts.

Observations, on an average, at more than 400 positions are obtained for each day's chart. This average, however, does not include observations for each day from about 100 land stations, which are recorded on the charts to establish a connexion between the land and sea.

Full details of the system adopted for carrying out this investigation will be found in the Report for 1883; but the principal features of the method may conveniently be here repeated:—

“The charts are drawn upon the conical projection, which affords the best means of indicating the true relative directions of the winds and lines of equal pressure and temperature to one another and to the meridian. The working charts are drawn on sheets of double-elephant paper, and extend from the Equator to Lat. 75° N., and from Long. 100° W., to Long. 20° E., the meridian of 40° W. being in the centre. The scale is about 180 nautical miles to the inch.

“As it was important that the demands made on the observers should be no more than was strictly essential, it was decided to ask only for observations at 8 a.m. and noon, local time, at which hours the required data of barometric pressure, temperature, and wind direction and force are usually recorded in a ship's log. From these the necessary corrections to reduce the data to Greenwich noon are readily made by interpolation with sufficient exactness for the objects in view.

“The question of the time to be followed in recording the observations on the chart, whether it should be Greenwich noon or local noon, the former implying that the observations would be truly synchronous, and the latter that they would correspond to the time of the sun's coming to the local meridian, received careful consideration. The conclusion arrived at after examining the methods employed by other authorities in dealing with such investigations (including the charts recently prepared by the Deutsche Seewarte, which were obligingly forwarded for their inspection by Dr. Neumayer) was to enter on the chart the barometer reading and wind for Greenwich noon, thus making the values truly synchronous, but to enter the thermometer reading for local noon, as well as the difference of temperature between local noon and 8 a.m. local time, from which the temperature at Greenwich noon may be estimated by interpolation if required.

“As the diurnal (periodic) variations of pressure in the area dealt with are comparatively small, it was considered that they would probably have but small influence in determining the directions of the wind, or the movements of aerial disturbances across the Atlantic. But local noon on the western side of the charts in Long. 75° W. is about six hours later (absolutely) than local noon on the extreme east of the charts in Long. 20° E., and the disturbances and wind-systems usually move from west to east, and often with considerable rapidity. The conclusion was therefore come to that the observations of pressure to be represented should be truly synchronous.

"In the case of temperature the conditions differ materially from those affecting pressure. The diurnal changes of temperature, though not great, would, if synchronous observations at Greenwich noon were used, introduce an appearance of permanent higher temperature to the east as compared with the west, as such observations in the extreme west would be made five or six hours before local noon, while those in the extreme east would be one or two hours after local noon; a difference of temperature which would not have any true physical significance so far as probable consequent changes of pressure or general weather were concerned. Consequently it was determined to adopt the temperature at noon, local time, for entry in the charts. Provision, however, is made for the consideration, if occasion should require, of the synchronous temperature, by the entry on the chart of the difference between the readings at 8 a.m. and noon, local time, as before stated."

Synchronous
weather
charts.

The process of dealing with the data, which has been arrived at after many preliminary trials, may be briefly stated as follows:—

The forms (of which a specimen is given in Appendix IA. of the Report of 1883) were distributed freely to ships of the Royal Navy, through the kind co-operation of the Lords of the Admiralty, and to the Merchant Service, through various local marine board and shipping offices under the Board of Trade, but chiefly through direct communication with owners, captains, and officers of ships.

The collection of data has been supplemented by sending an experienced clerk to visit ships and make extracts from their logs.

By these means, observations, probably at more than 400 positions, will be collected for each day's chart, as before stated.

After correcting the observations for instrumental errors, &c., they are reduced to Greenwich noon, where necessary, by interpolation, and the results entered on a large chart on double-elephant paper, upon the conical projection, extending from the equator to 8° N. and from 130° W. to 40° E.

Tracings are then made on four separate sheets from the charts of each day of the entries of pressure, air temperature, sea temperature, and important weather observations respectively, and upon these tracings isobaric lines, isotherms of air and sea, and the outlines of important weather-areas are drawn, and the isobars and isotherms are then transferred back to the original large charts.

After the isobars are drawn on the large charts, arrows are drawn representing the direction and force of the wind, as well as the occurrence of squalls, every care being taken to combine the actual directions observed, with the least possible modification, in relation to the barometrical pressure and the general direction of the winds in the several parts of the charts.

The charts thus prepared will constitute the permanent records of the original data, as well as of the isobars, isotherms, and generalized winds. They are, however, too complicated and too large for publication; the Council, therefore, contemplate the

Synchronous
weather
charts.

publication of the results in two reduced charts, of which Plates I. and II. are specimens, the reductions being produced by an eidograph.

These charts will show the isobaric lines, isotherms of air and sea, the direction and force of wind, together with graphic indications of areas of rain, fog, and mist.

It has, however, become manifest that much time must elapse before all the necessary data are collected and plotted on the charts, and this work must be completed before the discussion can commence.

The charts for August, September, and October 1882 are nearly ready for reduction, but they cannot be finally dealt with until observations from all the circumpolar stations included on the chart have been received.

The Council are most grateful to the owners, captains, and officers of ships for their willing and able help in the work. Not only have Englishmen given their willing aid, but a large amount of excellent data has been sent in by the heads of Foreign meteorological offices, especially from the several circumpolar observing stations on the shores of the Atlantic Ocean, and by the captains and officers of foreign ships. The visiting clerk employed by this Office has also obtained much valuable information from foreign ships, whose captains and officers have received the clerk most kindly, lent him their logs, and given him all the aid in their power.

Sea surface
temperature
charts.

Sea Surface Temperature Charts.—This work has now been completed and published.

The series of charts are for the four cardinal months of February, May, August, and November, which are taken to represent the four seasons of sea surface temperature. In addition four smaller index charts are given, representing for the entire ocean, the lines of equal temperature (isotherms) in the four months above mentioned.

Whenever the sea is frozen, as in the month of February in high northern latitudes, the temperatures given on the charts are those of the air.

The authorities from which the material used in preparation of the charts have been derived are (1) the logs, &c. in the Office (2) the remark books of the Royal Navy, (3) the records of the most famous Arctic and exploring voyages of both British and foreign navigators, (4) the various publications on maritime meteorology which have from time to time appeared in the United States and in Europe.

The number of M. O. logs which were used in the discussion were for the

Atlantic Ocean	3,859
Indian	„ 1,849
Pacific	„ 770

And an estimate of the amount of material actually employed may be formed from the fact that for the Atlantic Ocean alone and for the month of August (which has been taken as a specimen), 80,000 observations were discussed.

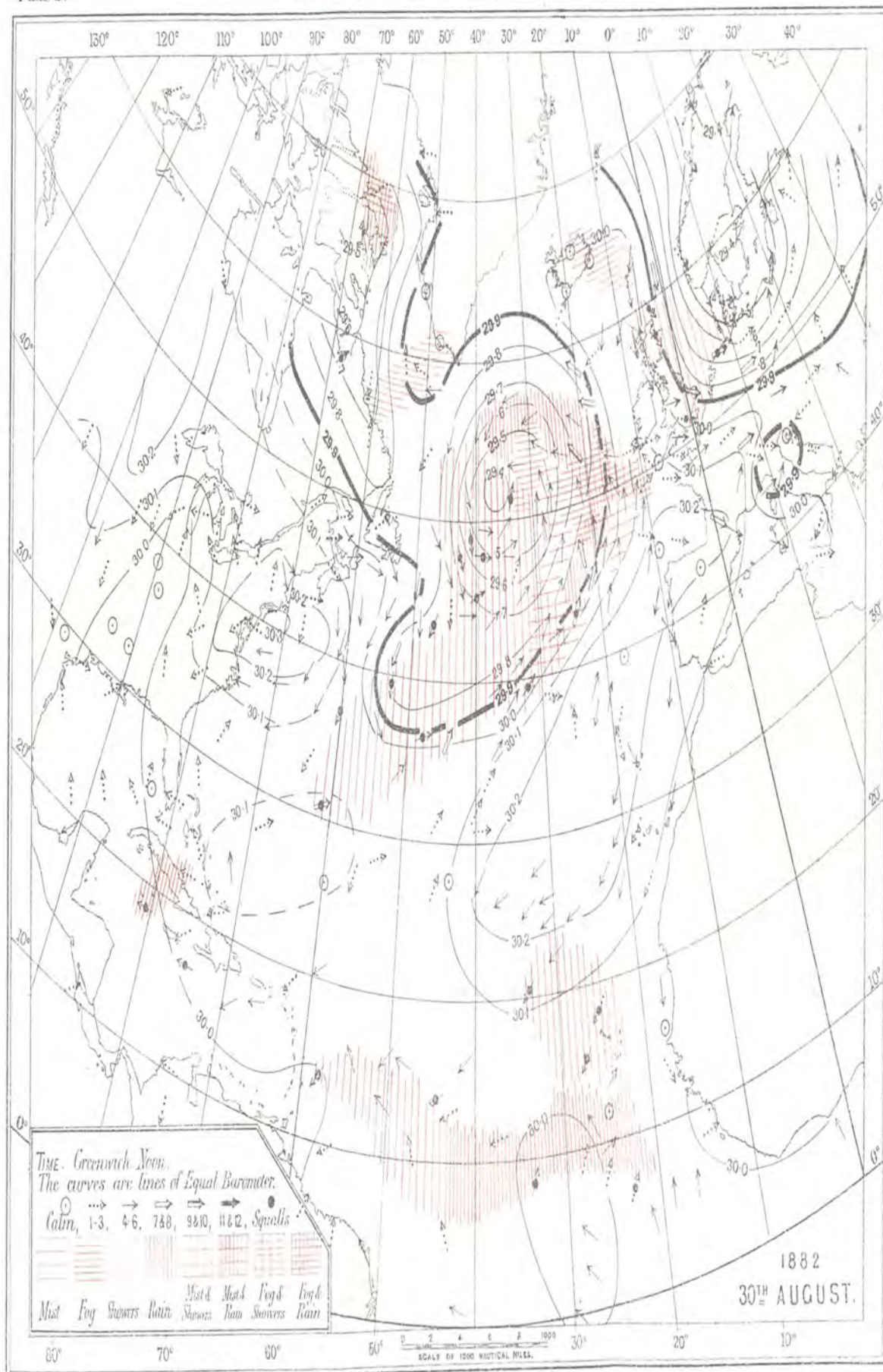
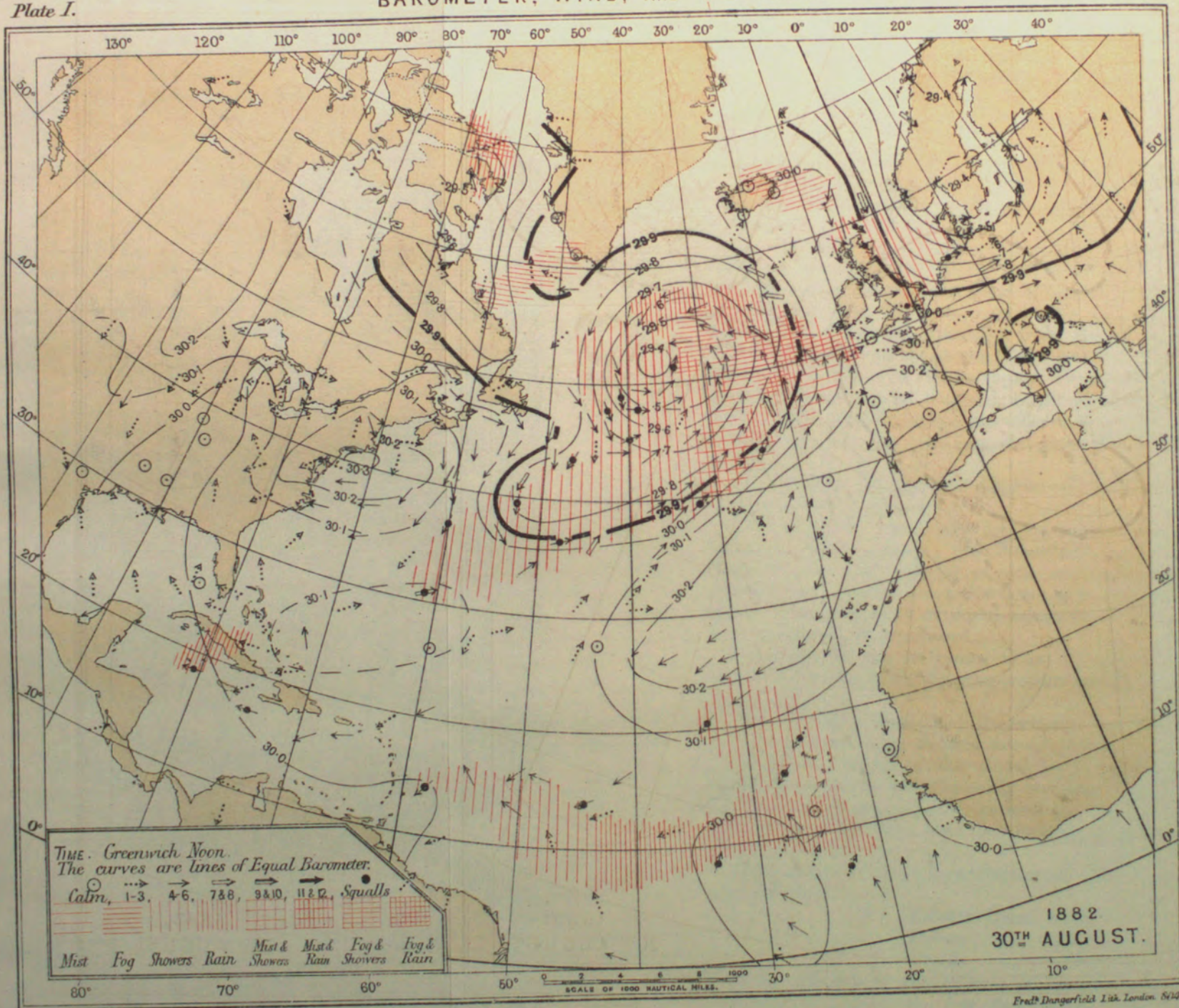


Plate I.

BAROMETER, WIND, AND WEATHER.



Charts of Barometrical Pressure over the Oceans.—These charts are in an advanced stage, three months of the series have been completed as regards the collection and entry of observations for all the oceans, and it is contemplated that the whole of this work will be finished by the end of the year 1884. The deficiency of material over certain unfrequented regions in the Pacific and Southern Ocean has rendered the drawing of isobars somewhat difficult, and the final preparation of the charts for the engraver has consequently been retarded.

Charts of
barometrical
pressure.

Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Three parts of this work have already appeared. The preparation of Part IV. has been found to occupy longer time than was anticipated, owing to the mass of materials from the last British Expedition, under Sir G. Nares, and from the "Polaris" expedition of the United States Government.

Arctic
meteorology.

The Circumpolar Observations.—The objects of the British expedition which was mentioned in the last Report, though it was not in any direct connexion with the Meteorological Council, were successfully carried out by the maintenance at Fort Rae, on the Great Slave Lake, of a complete series of observations in meteorology and magnetism for a full year. Captain Dawson, R.A., and his assistants left Fort Rae on the 1st September 1883, and reached England November 20th. The observations are in process of discussion and will be published by the Circumpolar Committee of the Royal Society.

Circumpolar
observations.

The Barometer Manual for the Use of Seamen.—This work, which, as explained in the last Report, has been prepared at the request of the Board of Trade, has now appeared. It is divided into the following sections: the Barometer and Method of using it; Barometric Pressure; Variations of Pressure; Winds, their Causes and Distribution; Winds and Storms of the Temperate Zones; Tropical Storms.

The Baromet
Manual for
the use of
Seamen.

The whole forms a book of 41 pages, and is illustrated by woodcuts and specially prepared charts of barometric pressure and wind.

Supply and Stock of Instruments.—In Appendix IV. (p. 46) 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 1884.

Instruments
belonging to
the Office.

Appendix V. (p. 47) 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.

Reporting
stations.

Telegraphic Reporting Stations.—The service has not been carried on without interruptions during the year now under review, any more than during its predecessors. The breaks in communication have not, however, been very serious or protracted.

Some important changes in the arrangements for the receipt of intelligence are now in progress. First may be noticed the recent extension of telegraphic communication to Belmullet, on the extreme north-west corner of the Co. Mayo, in Ireland. The Council have succeeded in finding an observer in this remote locality, and a station will soon be established there. It lies nearly 80 miles westward of Mullaghmore, the station now reporting on the coast of Donegal Bay.

It is in contemplation to organize another station on Malin Head, the extreme north point of Ireland. The Committee of Lloyd's have recently established a signal station, provided with telegraphic communication, on this headland, and have most liberally offered the Council permission to avail itself of the facilities thus afforded for the improvement of the telegraphic system. The Council have gladly acceded to the proposal, and the station will be organized in the coming summer.

The Council have it also in contemplation to substitute Dungeness for Dover as a reporting station. The former station lies on a low spit of land, well exposed to the wind from all points, and thereby offers a strong contrast to Dover, which lies immediately under high cliffs, and is therefore entirely sheltered from all land winds.

In the last Report it was stated that possibly hand anemometers might be supplied to some stations, and two specimen instruments of this character have been constructed, and are now in process of being tested, by the permission of the Elder Brethren, at two of the Trinity House Stations.

Changes in the
staff.

A list of the telegraphic reporters will be found in Appendix VI. (p. 48). The only change during the year has been at York, where Mr. H. M. Platnauer has succeeded Mr. Keeping as Curator of the Museum.

Inspection
of the stations.

Inspection of the Reporting Stations.—The 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 VII. (p. 49), show that the efficiency of the service has been fairly maintained.

Discussion of
the reports.

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 VIII. (p. 61). A list of the institutions and persons who received the Daily Weather Reports and Charts free of cost in 1883-4 forms Appendix IX. (p. 70).

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

Forecasts are issued twice a day, at 11 a.m. and at 8h. 30m. p.m. The Forecast prepared at 11 a.m., on the information derived from the 8 a.m. reports, refers to the probable weather between noon on the day of issue and noon on the day following, and is publicly posted up in several places in London,* and supplied to the afternoon editions of the newspapers.

Owing to the additional information afforded to the public by the appearance in so many of the daily papers of the Forecasts now prepared, the number of special inquiries has been small. The inquiries received through the Post Office during the year amounted to 76, and the personal applications to 34. The rules of the Office relating to such inquiries continue the same as in previous years, and are given in Appendix VIII. Inquiries at the Office.

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 XII., p. 76, 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., being an improvement of 2 per cent. on the figures for the previous year:— Testing of the forecasts.

SUMMARY OF RESULTS.

Districts.	Percentages.				Total percentage of Success.
	Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
SCOTLAND, N. - -	49	33	11	7	82
„ E. - -	50	31	10	9	81
ENGLAND, N.E. - -	50	31	11	8	81
„ E. - -	48	36	10	6	84
MIDLAND COUNTIES -	49	34	10	7	83
ENGLAND, S. - -	52	32	9	7	84
SCOTLAND, W. - -	42	35	13	10	77
ENGLAND, N.W. -	44	35	13	8	79
„ S.W. - -	47	35	11	7	82
IRELAND, N. - -	52	30	10	8	82
„ S. - -	47	32	10	11	79
Summary - -	48	33	11	8	81

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

Hay Harvest
Forecasts.

Hay Harvest Forecasts.—The Council renewed in 1883 the offer made in the three 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 as widely known as possible, and that a record should be kept of the value of each prediction and sent in weekly to the Office. The Societies again cordially accepted the proposal, and the following list of recipients was prepared:—

LIST of those who received HAY HARVEST FORECASTS
in 1883.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass - Major Smith -	Golspie. Munlochy, Inverness.
1. SCOTLAND, E.	G. Johnstone - W. S. Macdonald -	Glamis, by Forfar. Craigielaw, Longniddry.
2. ENGLAND, N.E.	J. Wilson - J. Turner -	Chillingham Barns, Belford, Northumberland. The Grange, Ulceby.
3. ENGLAND, E.	W. Birkbeck - Sir J. B. Laves, Bt., and J. H. Gilbert, Ph.D.	High House, Thorpe, Norwich. Rothamsted, Harpenden.
4. MIDLAND COUNTIES	Royal Agricultural College. The Duke of Somerset	Cirencester. Gerrard's Cross, Bucks.
5. ENGLAND, S.	C. Whitehead - E. P. Squarey -	Barming House, Maidstone. The Moot, Downton, Wilts.
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 -	Ewenny Priory, Bridgend, Glamorgan. Whitfield, Falsfield, R.S.O. Long Ashton, Clifton, Bristol. Batleigh Court, Glastonbury.
9. IRELAND, N.	Viscount Massereene and Ferrard. Rev. A. Brown - C. Cole Hamilton -	Antrim Castle, Antrim. The Manse, Hollymount, Co. Mayo. Cherrymount, Moynalty, Co. Meath.
10. IRELAND, S.	D. A. McCready - D. A. Milward - W. Talbot Crosbie, D.L.	Larchvale, Moneygall, King's Co. Lavistown, Kilkenny. Ardfert Abbey, Tralee, Co. Kerry.

The general result of this repetition of the experiment of 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:—

Hay Harvest
Forecasts.

SUMMARY of RESULTS.

Districts.	Names of Stations.	Percentages.				Total percentage of Success.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
SCOTLAND, N.	Golspie and Munlochy - - -	45	38	12	5	83
" E.	Glamis and Longniddry - -	63	32	3	2	95
ENGLAND, N.E.	Ulsby and Chatton, Northumberland -	70	23	7	—	93
" E.	Thorpe and Rothamsted - -	53	33	10	4	86
MIDLAND COUNTIES	Cirencester and Gerrard's Cross -	40	45	13	2	85
ENGLAND, S.	Maidstone and Downton - -	56	34	6	4	90
SCOTLAND, W.	Islay, Dumbarton, and Stranraer -	55	36	9	—	91
ENGLAND, N.W.	Leyburn, Prescott, and Knutsford -	64	29	7	—	93
" S.W.	Bridgend (Glamorgan), Falfield, Clifton, and Glastonbury.	41	39	15	5	80
IRELAND, N.	Antrim, Hollymount, and Moynalty -	47	38	14	1	85
" S.	Moneygall, Kilkenny, and Ardferd Abbey (Tralee).	51	37	9	3	88
Mean for all districts, 1883 - -		53	35	10	2	88
" " 1882 - -		50	37	11	2	87

*Remarks:—*The result of the checking shows that the general percentage of success (88) and also the proportion of completely successful forecasts is higher than even that of last year. The largest percentages were reached in Scotland, E., England, N.E., and England, N.W., the values being 95 and 93 respectively, while the smallest proportion of good forecasts (80) was in England, S.W.

Major Smith (Scotland, N.) says that the forecasts were very correct on the whole, particularly those from the 24–29 July, the forecasts on those days being “wonderfully correct.”

Mr. W. Downing (England, S.W.) in a letter to Mr. Neville, remarks “the weather reports have been in great request in this neighbourhood.”

Storm Warnings for the Coasts of the United Kingdom.—In Appendix XI. (p. 74) 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.

Results of storm warnings in 1883.

These stations were, at the end of March 1884, 139 in number, situated:—

68 in England, 13 in Wales, 37 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 1883 and the weather experienced on our coasts, the warnings being tested by the method explained in Appendix VIII. 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 1883.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent gales. Force 3 and upwards.	Warnings justified by subsequent strong Winds. Force 5 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.	Warnings in Error owing to Telegraphic mistakes.	Storms for which no Warning was issued.
Ireland, South	66	34	14	16	—	2	—	Mar. 6.
" East	75	40	16	19	—	—	—	Feb. 22, Mar. 6, Mar. 17,
Scotland, East	82	55	16	11	—	—	—	Oct. 25.*
" West	61	30	15	14	1	1	—	Mar. 7.
England, North-west	69	43	5	21	—	—	—	Mar. 7.
" West	61	30	13	18	—	—	—	Mar. 6, Aug. 10, Nov. 4.
" South	84	52	20	11	—	—	1	Mar. 6.
" South-east	44	22	13	7	—	2	—	
" East	68	37	20	10	—	1	—	
Totals -	610	343	132	127	1	6	1	
Per-centages -	—	56·2	21·6	20·8	0·2	1·0	0·2	

* Storms on the East Coast of Scotland marked thus were only felt North of Aberdeen.

Comparison of results for 1883 with previous years.

The following table contains a comparative statement of the storm warnings and their results in 1883 and in the ten preceding years. It will be seen that the percentage of warnings justified is somewhat less than in the previous 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.
1873	250	45·2	34·0	79·2	16·8
1874	317	45·4	32·8	78·2	16·4
1875	248	41·1	35·1	76·2	21·0
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

Results of storm
warnings in
1883.

These stations were, at the end of March 1884, 139 in number, situated:—

68 in England, 13 in Wales, 37 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 1883 and the weather experienced on our coasts, the warnings being tested by the method explained in Appendix VIII. 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 1883.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent Gales. Force 8 and upwards.	Warnings justified by subsequent strong Winds. Forces 6 and 7.	Warnings not justified by subsequent Weather.	Warnings late. Force 9 reached at two Stations before issue.	Warnings partially late. Force 9 reached at one Station before issue.	Warnings in Error owing to Telegraphic mistakes.	Storms for which no Warning was issued.
Ireland, South	66	34	14	16	—	2	—	
„ East	75	40	16	19	—	—	—	Mar. 6.
Scotland, East	82	55	16	11	—	—	—	Feb. 22, Mar. 6, Mar. 17, Oct. 25.*
„ West	61	30	15	14	1	1	—	
England, North-west	69	43	5	21	—	—	—	Mar. 7.
„ West	61	30	13	18	—	—	—	
„ South	84	52	20	11	—	—	1	Mar. 6, Aug. 10, Nov. 4.
„ South-east	44	22	13	7	—	2	—	Mar. 6.
„ East	68	37	20	10	—	1	—	
Totals -	610	343	132	127	1	6	1	
Per-centages -	—	56·2	21·6	20·8	0·2	1·0	0·2	

* Storms on the East Coast of Scotland marked thus were only felt North of Aberdeen.

Comparison of
results for
1883 with
previous years.

The following table contains a comparative statement of the storm warnings and their results in 1883 and in the ten preceding years. It will be seen that the percentage of warnings justified is somewhat less than in the previous 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.
1873	250	45·2	34·0	79·2	16·8
1874	317	45·4	32·8	78·2	16·4
1875	248	41·1	35·1	76·2	21·0
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

Remarks.—Of the storms for which no warning was issued only one was severe, that of March 6, which caused serious loss of life and property in the North Sea. The conditions under which it occurred were very unusual, and it came on very suddenly. Moreover, as most of the fishing boats which felt its effects had been absent from port two or three days, any warning sent to the ports could not have been conveyed to them. Storms for which no warnings were issued.

A return of all gales since 1873, of which no warnings were issued from the Office, has been called for by the House of Lords and will shortly be completed. This will supply full information on the circumstances under which these gales were left without notice.

Fishery Barometers.—In connexion with the subject of storm warnings, the supply of public so-called “fishery” barometers to the coast may be mentioned. The whole number of stations on our coasts supplied with these instruments by the Office is at present 168, being seven in excess of the previous year. Of these stations, 58 are in England, 5 in Wales, 47 in Ireland, 54 in Scotland, 3 in the Isle of Man, and 1 in Jersey. The list is given in Appendix X., p. 73. Fishery barometers.

Observations on Ben Nevis.—The observatory established under the auspices of the Scottish Meteorological Society at the summit of Ben Nevis, at the height of 4,000 feet, was completed in the course of the autumn of 1883, and the observing staff took up their residence there and commenced operations in the month of November. The Council have again contributed 100*l.* towards the cost of maintaining the observatory during the past year. They have not yet resolved that it will be desirable to obtain daily telegrams from the station, but they have received a few special telegrams from it; it has not, however, as yet been found that these have given earlier intimation of the approach of storms or changes of weather than has been obtained from the other telegraphic reporting stations. Observations on Ben Nevis.

Publications.—There has been some change made in the form of the Weather Reports issued by the Office, with a view to rendering them more uniform in size, and avoiding repetition in the statements they contain. In the last Report it was stated that a plan for supplying a progressive weekly record of various climatic factors was in contemplation. This scheme has now been partially carried out, and since the commencement of the year 1884, the records of Accumulated Temperature, Rainfall, and Bright Sunshine, since the 1st of January, have been inserted. The term “Accumulated Temperature” is employed to designate the amount and duration of the excess of the daily temperature above 42° F., measured in units of one degree continued for 24 hours. The mode of calculating the accumulated temperature is explained at length in a paper by the Chairman, General Strachey, which appeared in the Quarterly Weather Report for 1878, and the substance of which is briefly stated in Appendix VIII. Publications.

This information is given in the Weekly Weather Report, which has been enlarged to quarto size. The additional space thus given has been utilised to give a chart for the pressure and wind at 6 p.m., in addition to that for 8 a.m. before given.

The averages used for determining the variations of each week from the mean have been modified, and are those given in the following publications of the Office:—

Temperature, 20 years, 1861–80, from the Meteorological Atlas of the British Isles.

Rainfall, 15 years, 1866–80, from the Rainfall Tables of the British Isles.

The Daily Weather Report has also been altered from folio to quarto size, so as to be uniform with the foregoing publication. New averages of Pressure, Temperature, and Rainfall have been calculated for 22 stations.

Lastly, the publication of a Monthly Weather Report has been undertaken, in substitution for the Quarterly Report. It was stated in the last Report that the preparation of the engraved plates from the observatory records would be discontinued with the year 1880, and consequently the Quarterly Weather Report became more completely and exclusively a review of the information collected and discussed by the Telegraphic Department of the Office than was previously the case. The Weekly Weather Report in its new form will contain a complete series of Weather Charts, and their reproduction would be useless. The Council have decided to substitute a Monthly for the Quarterly Report, and to issue it as speedily as possible after the termination of the month to which it refers, and this publication has now commenced. With it will be published from time to time in the form of Appendices such special papers or reports as have hitherto formed part of the Quarterly Reports. These arrangements will lead to the publication of the reports from the Observatories and the Stations of the Second Order in a separate volume.

Simultaneous Observations.—The Office has continued its co-operation with the system of simultaneous observations, taken once in every 24 hours, which was organized ten years ago at the request of the Chief Signal Office of the United States.

The list of observers at land stations for 1883 is given in Appendix XIII., p. 81.

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 returns which have been received during the year from the Royal Navy has been 6,340, and from the Mercantile Marine, 5,300.

The Monthly
Weather
Report.

Simultaneous
observations.

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 stations with different degrees of fulness of organisation, which may be arranged in five classes.

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. Self-recording observatories.

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. Anemographic stations.

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

4. The Telegraphic Reporting Stations at which eye observations are taken, 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 detailed 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 XIV., p. 82.

Appendix XV., p. 87, contains a list of all documents relating to the land meteorology of the British Isles received at the Office during the year. Documents received.

As stated in the last Report, intimation was sent at the end of 1882 to the authorities at four of the observatories that the annual grant to the stations would cease after 1883. In the case of Falmouth, it was, however, subsequently arranged that if the Royal Cornwall Polytechnic Society would erect an observatory in a suitable locality, instead of the present building whose situation is very unsatisfactory, the annual grant should be continued. Changes in the observatories.

At Stonyhurst the authorities of the College are maintaining the observations. At Glasgow there is a prospect of the records being kept up by the supply of funds from local sources. At Armagh there is no possibility of any such arrangement, but that station will be maintained hereafter by the Office as one of the Second Order.

The minute of the Council on which these conclusions were adopted will be found at Appendix XVI., p. 91.

Inspection of
the stations.

Inspection of the Stations.—The self-recording observatories and the anemographic stations (Classes 1 and 2), as well as the Telegraphic Reporting Stations (Class 4), are regularly visited each year by the inspectors of the Office. The extra stations (Class 5) are inspected as opportunity offers. Of the Stations of the Second Order (Class 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 especially 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 of the Office and of Mr. Baker, who was charged with the duty of inspection during Mr. Whipple's illness in the summer of 1883, will be found in Appendix VII., p. 49.

Reports sup-
plied to
Registrar
General for
Ireland.

Information supplied to the General Register Office, Ireland.—Reports from nine 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.

Quarterly
Weather
Report.

Quarterly Weather Report.—The engraving of the plates showing the photographic curves of the seven observatories was completed in the course of the autumn, and, as already intimated, this work has been discontinued. Parts III. and IV., completing the volume for 1876, have now been issued.

The publication of the Hourly Readings from the seven observatories has been continued, and the volume for the year 1882 is in an advanced stage.

This volume differs from that for 1881 in that it contains the daily extremes of barometrical pressure, the daily range of the barometer and dry bulb thermometer, and the total daily rainfall.

The tables of monthly and five-day means from the observatories, which have hitherto appeared in the Quarterly Weather Report, will be issued with the Hourly Readings in future.

Stations of the
Second Order

Reports from Stations of the Second Order.—The volume for 1880 is in the press. Considerable delay has arisen in the production of the results for this year, inasmuch as it was thought desirable to include among the stations from which observations are published some of those under the direction of the Scottish Meteorological Society, returns from which the Council of that Society has consented to supply to the office for publication. These stations are *Dunrobin Castle, Braemar, Dundee, Rothersey, and Pinnore* (Ayrshire) the observations commencing with the year 1880. The schedules were not received until the autumn, so that the completion of their discussion could not be effected until the year was far advanced.

The arrangements under which this information is supplied are similar to those which have existed for the last ten years, with the Royal Meteorological Society, and which are fully detailed in the Report of the Meteorological Committee for 1874.

The Harmonic Analyser.—The work effected with this instrument during the year has been, in the first place, the completion of the reduction of the records of pressure for the year 1876. The following extract from a report by Professor Stokes on the results of this work, will show the degree of accuracy attained. The Harmonic Analyser.

“The height of the barometer for each month of the year 1876, and for each of the seven self-recording observatories, has been expressed as a function of the time of day in a harmonic series to three orders, by numerical calculation in the usual way, from the data furnished by the hourly means. The coefficients got in this manner show a very close agreement with those obtained by means of the machine. The coefficients of the variable terms, which have been calculated to four places of decimals, agree so well that the average difference is only about the thousandth of an inch. The comparison does not furnish the means of forming a judgment which of the two sets of numbers is the more accurate. The processes are, however, the same as those which had been tested with the thermometer (Report of the Meteorological Council for 1883, p. 27), in which case the calculated coefficients had been deduced from the odd and even hours separately; and the results rendered it probable that the coefficients obtained by calculation were rather the more accurate. But practically the agreement is so close that either set of numbers may be accepted.”

On the completion of these barometrical discussions the treatment of the thermograms was resumed, and the curves for the years 1875, 1877, and 1878 have been successively analysed, the constants in each case having been worked out from the indications of the machine.

Inquiry into the Causes and Prevalence of London Fog.—The year 1883 having been singularly free from fog, the committee who have kindly undertaken to investigate the subject have not had much opportunity to prosecute their inquiries, but Dr. Russell has carried out two inquiries into the proportion of carbonic acid in the atmosphere, and into the composition of London rain. London fog.

Carbonic Acid.—The amount of carbonic acid in London air has been determined at intervals during the last two and a half years. Carbonic acid in air.

These determinations are divided into two series, one gives the amount of carbonic acid taken at regular intervals irrespective of weather, and the other gives the amount when fog or mist is present. The average amount present in the air of the city is slightly below four parts in 10,000 of air, and this is shown to be rather less than that which has been found in the air of the few other towns which have been examined. Taking the most recent experiments on the composition of purely country air as indicating that the amount of carbonic acid is as low as three parts in 10,000 even then it seems that in the heart of London the average increase

Carbonic acid is not considerable. Further the individual analyses show that the amount of carbonic acid is often considerably below this average, usually during bright sunny days. The smallest amount of this gas found was 3·3 parts in 10,000 of air, and this was on the Bank Holiday in August 1883, and as far as experiments have yet been made, the amount present on a Bank Holiday is always considerably below the average.

The second series of determinations relate to the amount of carbonic acid present during a fog, and show how much this gas increases under such circumstances. The average of these experiments is 7·2. The largest amount found was 14·1, and this was during a long continued fog in December 1882. The gradual increase of the gas on this occasion up to this amount is traced; also other cases are given where there has been a very large increase of carbonic acid. Also the rapid disappearance of the carbonic acid with the disappearance of fog is shown.

The increase and diminution of this gas it is pointed out must indicate the coincident variation of the amount of many other impurities in the air. The variation of the amount with the time of year is also shown in the report.

London rain.

On London Rain.—The samples of rain were collected simultaneously at three stations: one in the city at St. Bartholomew's Hospital, one at Hamilton Terrace on the North-west, and one at Hackney on the North-east of London. The collecting of samples was commenced in the autumn of 1882, and has been carried on to the present time. The amount of sulphates and chlorides in the rain has been determined, and it appears that on taking the average of each set of experiments, the rain collected in the city contains twice as much impurity as that in the suburbs. This impurity is essentially of the same kind in all cases.

The samples collected at different times are shown to vary very considerably in composition, but as a rule the variations are not local but extend over the whole district examined. It is seen from the analyses given to what a great extent rain acts as a purifier of the atmosphere. The analyses made up to the present time indicate that a greater amount of sulphates are present in the summer rain than in winter rain. This apparently indicates that to a large extent the sulphates come from the decay of animal and vegetable matter, and not merely from combustion of coal. The composition of London rain is also compared with that of the country. The rain collected in the city appears to be never acid, but if rain be collected in open vessels which are left exposed for some length of time to the air, it will then be found to be acid. This arises from soot collecting in such rain water. It is further shown that the moisture in air condensed by application of cold contains impurities similar to those in rain, and that this method may be of service in examining the purity of air.

Motion of the upper currents.

Motion of the Upper Currents.—The experiments on this subject by means of shell firing, in order to ascertain the move-

ments of the upper currents, have recently been resumed on a small scale with satisfactory results, and Capt. A. Noble, C.B., F.R.S., who had kindly undertaken their organisation, has been requested to arrange, if it be possible, for a series of these experiments to be conducted under his superintendence for a limited period of, say, three months, in order to test the value of the proposal thoroughly. Motion of the upper currents.

Cloud Photography.—The photonephograph, devised by Capt. Abney, R.E., for the determination of the motion and altitude of clouds has been under trial at Kew. Several good specimens of dual pictures have been obtained, but it has been found that the extent of base available in the vicinity of the observatory is not sufficiently great to afford satisfactory determinations. This subject continues to receive attention, and it is hoped that before long the apparatus will be brought into satisfactory operation. Cloud photography.

Experiments on Hygrometry and Evaporation.—The experiments on Hygrometry which have been entrusted to Mr. W. N. Shaw, M.A. of Emmanuel College, Cambridge, are still in progress. A report on the subject of evaporation has been received from him and will be issued in the Quarterly Weather Report for 1877. Hygrometry and evaporation.

Krakatoa Wave.—On the receipt at the Office in the month of September of the photographic records for the latter part of August, it was noticed that at all the observatories, without exception, peculiar barometrical disturbances had been recorded during the last five days of the month, which were nearly simultaneous, and were unaccompanied by any change of weather. The fact that these disturbances could also be traced in the daily curves published by the Brussels Observatory, and had succeeded, after a short interval, the violent eruption of Krakatoa in the Straits of Sunda on the 26th and 27th of August, led to the suspicion that a connexion existed between these phenomena, and accordingly copies of barograms from St. Petersburg on the east and from Coimbra on the south-west were obtained. On examination, these were found to exhibit similar disturbances of pressure, so that the connexion between volcanic manifestations in the Eastern Archipelago and oscillations of barometrical pressure in Europe became demonstrable. The Krakatoa barometric wave.

The Chairman, General Strachey, suggested what has now been placed almost beyond doubt, that the true explanation of the phenomena, is that they were produced by the passage round the earth of a series of concentric aerial waves travelling at the rate of nearly 700 miles an hour from the place where the volcanic eruption occurred, and returning in the opposite direction after having met at the antipodes of Krakatoa; and that a succession of such waves was three or four times repeated. Records confirming this conclusion have been subsequently obtained from the most important foreign stations at which self-recording barometers were to be found, including St. Petersburg, Vienna, Rome, Berlin,

The Krakatoa
barometric
wave.

Paris, Coimbra, New York, Washington, Toronto, Cordoba, the South Georgian Islands, New Zealand, Sydney, Melbourne, Zikawei (Shanghai), Tokio, Calcutta, Bombay, Mauritius, and St. Paolo de Loanda.

A paper by Mr. Scott giving a reproduction of the several barograms, with a note by General Strachey giving the numerical calculations for the times of passage of the successive waves over the stations from which the observations were earliest reported, appeared in the Proceedings of the Royal Society, No. 229. A full investigation of all the data will take place as soon as they are in a complete state.

Meteorological
Atlas of the
British Isles.
Periodicity of
rainfall.

Meteorological Atlas of the British Isles.—This work has now appeared.

Diurnal Variation of Quantity and Frequency of Rainfall at the Self-recording Observatories.—Mr. Scott has completed a discussion of the diurnal range of rainfall, both as to frequency and as to quantity at the seven observatories for the ten years 1871–80. As regards the quantity much assistance was derived from Mr. Lovell Squire, formerly Superintendent of the observatory of Falmouth, who had carried out the calculations of the hourly totals for the entire period. The paper will be published as an appendix to the Quarterly Weather Report for 1877. The paper concludes as follows:—

“Summarizing the outcome of the entire investigation, it appears that as regards Quantity there is little regularity in the fall except at Valencia, where there is a decided minimum about 3h. p.m. At the other stations the regular march of the curve is disturbed by heavy showers, but we see that, for instance at Armagh, the hour of minimum at Valencia is characterized by a relative maximum, and this appears to a greater or less degree at several other stations. This would therefore seem to indicate that the phenomenon of the afternoon minimum is proper to the surface of the ocean, as Valencia is more exposed to sea influence than any of the other observatories.

“As regards Frequency, Valencia again is the only place that shows a definite range in all months. Here the greatest frequency of fall, the time that precipitation is most likely to occur, is the early morning, and the driest period of the day is about noon. At Kew, the most continental station, the conditions are reversed, the amount of variation is slight, but the frequency is decidedly greater in the afternoon than during the night hours and the early morning. The maximum in the early morning appears with more or less distinctness at all the observatories except Kew and Armagh.”

Electrical
anemometer.

Electrical Anemometer.—The difficulties which are met with in finding satisfactory exposure for anemometers at the coast stations has induced the Council to endeavour to establish on a high hill in the Island of Valencia an anemometer to be electrically connected with the observatory. They have received a most

courteous offer of assistance in the completion of the arrangements from Mr. W. H. Preece, F.R.S., of the Telegraphic Department of the General Post Office, and an anemometer is at present being fitted with electrical connections in the workshops of the Postal Telegraph Office, under the personal superintendence of Mr. Preece. Electrical anemometer

LIBRARY.

The library contains standard works on Meteorology and the allied sciences. It consists at present of nearly 8,000 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men.

Appendix XVI. contains a list of the accessions to the library during the year. A few volumes have been purchased.

In conformity with a practice now generally recommended by authorities on bibliography, all books and pamphlets received during the year have been catalogued upon cards, besides being entered in the existing reference catalogues.

EXPENDITURE.

Appendix XVII. shows the receipts and payments during the year ending 31st March 1884. The amount voted by Parliament was 15,300*l.*, as in the previous year. Financial.

The following abstract of expenditure shows the amount properly chargeable to the year in question, and its distribution under the various heads, together with the increase or decrease in 1883-84, as compared with the previous year :—

NET EXPENDITURE.	1882-83.	1883-84.	Increase.	Decrease.
	£ 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 salaries -	746 0 9	742 10 0	—	3 10 9
Rent, fuel, and lighting -	669 1 5	713 17 7	44 16 2	—
Alterations to premises, attendance, and contingencies -	617 16 3	466 16 2	—	151 0 1
Expenses incidental to International Meteorological Congress -	30 11 10	5 11 3	—	25 0 7
Pensions -	19 15 4	42 16 4	23 1 0	—
Special Researches -	756 10 3	660 8 8	—	96 1 7
Land Meteorology -	3,948 3 11	3,684 17 7	—	263 6 4
Weather Information -	4,058 14 11	4,026 0 1	—	32 14 10
Inspections -	509 6 7	525 8 5	16 1 10	—
Ocean Meteorology -	2,409 6 8	2,694 18 1	285 11 5	—
Total -	£ 15,565 7 11	15,363 4 2	369 10 5	571 14 2

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

APPENDIX.

APPENDIX I.

"COLLECTION of DATA from SHIPS."

THE method which has been followed by the Office, since its first establishment in 1854 up to the present date, in the collection of information on Ocean Meteorology, has been to supply officers of the Mercantile Marine with a complete outfit of verified instruments, on the condition of their returning the instruments, and the log of observations made with them, to the Office, or to one of the agents mentioned below, at the completion of the voyage.

Every instrument supplied has been originally verified at Kew Observatory, and on the completion of the voyage it is compared with a standard instrument either at the Office or by one of its agents. Under ordinary circumstances it is not requisite to send the instruments to Kew for re-verification after every voyage, as the changes in their errors are generally slight.

The regular outfit of a ship consists of :—

- 1 Barometer (Kew pattern).
- 6 Thermometers, with a thermometer screen.
- 4 Hygrometers.

The first record of observations is made in a Rough Book supplied for the purpose, which is retained by the captain, who copies the observations into a Meteorological Log kept for the Office.

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

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

Aberdeen	-	J. R. Jones	-	-	-	Navigation School.
Cardiff	-	Captain Fowler	-	-	-	Sailors' Home.
Dundee	-	Leonard Allen	-	-	-	Navigation School.
Glasgow	-	Messrs. D. M'Gregor & Co.	-	-	-	44, Clyde Place.
Greenock	-	Do.	do.	-	-	32, Cathcart St.
Hull	-	Z. Scaping	-	-	-	Trinity House.
Liverpool	-	J. Gill	-	-	-	Sailors' Home.
Southampton	-	C. H. Permain	-	-	-	13, Oriental Place.

A set of instruments is kept in working order at the Office in London and at each agency. When a captain expresses himself willing to observe, he is invited to inspect the instruments and learn what will be required of him. If this takes place at one of the agencies, and the captain decides to undertake the work, his name is submitted to the Marine Superintendent, who, if the owners of the ship are British subjects, and she is likely to return to some port in the United Kingdom, sanctions the supply, having due regard to the nature of the proposed voyage and giving preference to captains intending to visit the districts whence the information existing in the Office is scanty.

In a few exceptional cases captains are supplied at ports where there are no agencies, and in these cases the instruments are sent from the Office in London.

Agents receive a fee of 1*l.* 5*s.* for each case of supply and return of instruments, and an additional fee of 1*l.* for the first "excellent" log sent in by any observer whom they may have invited to begin keeping a log, but the Council reserve to themselves the right of deducting the fees for both supply and return of the instruments, if no log is returned, or one which is worthless.

Captains are requested to give notice of their return to any port in the United Kingdom to the agent at the port, if there be one, or else to the Office in London, and steps are then taken to send for the instruments and log. The latter is sent up to London, and the instruments are at once compared with a standard set, and if received at an agency, the results of such comparison are duly forwarded to London.

As regards the Royal Navy, Her Majesty's ships have been supplied by the Office, since its foundation in 1854, with the meteorological instruments used in the service, and for this provision is annually made in the Estimates furnished by the Office to the Treasury upon which the vote for the Meteorological Council is based. The records of observations made by naval officers are in due course deposited at the Admiralty, where they are available for use. It is optional with the observers to keep for the Office a Meteorological Log in addition to the regular record of observations required by the rules of the service. The Council are glad to say that they receive from time to time Meteorological Logs of high value from Her Majesty's ships.

Meteorological Logs received at the Office, whether from Her Majesty's ships or from the Mercantile Marine, are tested according to a definite form (the "test sheet," which has been published in the Report of the Maritime Conference of London, 1874, p. 35), and the observations are classified according to their quality.

As soon as this first testing has been effected, a letter is written to the captain, and if any questions arise to which he can probably give an answer, he is requested to do so while the incidents are fresh in his memory. The replies are noted in the log for future reference.

The method of discussion varies according to the object proposed and the amount of data to be dealt with.

If it is proposed to discuss all the meteorological observations in a given part of the sea, they are first transcribed into data books; an account of the way in which the data books are prepared and used has been given in previous Reports.

If only one element (such as the surface temperature of the sea) is to be discussed, it has been found best to plot the data directly from the logs in geographical position on a chart, and to deduce from the chart means for spaces as small as the number of the observations will allow.

DAILY SYNCHRONOUS METEOROLOGICAL OBSERVATIONS at 0*h.* 8*m.* p.m. GREENWICH MEAN TIME.

In addition to the meteorological logs received from the Navy, owing to the kindness of the Lords Commissioners of the Admiralty, a full set of observations is made at one time each day by all of Her Majesty's ships, in whatever part of the world they may be stationed. These are entered on monthly forms, and forwarded to the Office as soon as possible after the end of each month. Officers of the Mercantile Marine who are keeping meteorological logs, are also invited to co-operate in keeping the synchronous observations, and in numerous instances the observations are well and regularly made. By these means the Council are in early possession of valuable observations which cover, to some extent, the navigable seas of the whole Globe.

APPENDIX II.

LIST of CAPTAINS (and Officers) who have sent in Logs classed as "Excellent" during the year ending March 31, 1884. 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 "Ex- cellent" Logs.	Ship.
Adams, Sub.-Lieut. R. P., R.N.	2	H.M.S. "Dart."
Adamson, John - - -	1	"Roman Empire."
Alderton, T. - - -	2	S.S. "Australia."
Baker, Lieut. Henry, R.N. -	7	H.M.S. "Flying Fish."
Balderston, Richd. James -	4	"Belfast."
Balfour, Lieut. Andrew, R.N. -	11	H.M.S. "Magpie."
Ballard, H. - - -	1	S.S. "Durban."
Barlow, A. E. - - -	8	S.S. "Paramatta."
Barlow, Brabazon J. - - -	1	S.S. "Amarapooru."
Barron, William - - -	19	S.S. "Empress."
Bennett, Edwin Charles - -	10	"Thessalus."
Blake, Edwin John - - -	9	"Tilkhurst."
Bolton, S. H. - - -	3	S.S. "Tyne Queen."
Boothby, George C. - - -	1	S.S. "Circassia."
Bourke, Comr. Edmund, R.N., F.R. Met. Soc.	4	H.M.S. "Gannet."
Bristow, W. M. - - -	1	"Undine."
Brown, Alfred John - - -	10	"Chamois."
Buchan, James - - -	14	"Coppename."
Campbell, Archibald - - -	12	S.S. "Ethiopia" and S.S. "Circassia"
Campbell, James - - -	3	"Florence."
Carpenter, Lieut. Alfred, R.N., F.R. Met. Soc.	10	H.M.S. "Magpie."
Cato, W. R. - - -	6	S.S. "Scotia."
Christie, John D. - - -	1	S.S. "Erl King."
Clarke, James - - -	1	S.S. "Olbers."
Cooke, Charles F. - - -	1	"The Lord Warden."
Crotty, J. H. - - -	1	"Evesham Abbey."
Crutchley, William Caius, R.N.R.	6	S.S. "Nubian."
Dart, Leonard C. - - -	4	"Julia H."
Denham, George - - -	3	S.S. "Erl King."
Deuchars, William - - -	2	S.S. "Resolute."
Donaldson, James - - -	1	S.S. "Bolivia."
Dunbar, John Ivor - - -	2	S.S. "Martaban."
Ellery, William - - -	14	"Majestic."
England, Thomas - - -	1	"Jane."
Freeman, Thomas William -	17	S.S. "Bellerophon."
Gray, David - - -	10	S.S. "Eclipse."
Gray, John - - -	9	S.S. "Hope."
Grey, C., R.N.R. - - -	1	"MacMillan."
Grieve, William M. - - -	4	"City of York."

Captain's Name.	Number of "Ex- cellent" Logs.	Ship.
Hepworth, Campbell M. W., F.R. Met. Soc.	5	S.S. "Danube."
Holdich, John Peach, R.N.R.	8	"British Envoy."
Hoskyn, Lieut. and Comr. R.F., R.N.	8	H.M.S. "Flying Fish."
Hughes, W. P.	5	"Laomene."
Jeffery, Arthur W.	6	S.S. "Ptolemy" and S.S. "Teniers."
Jones, Edward, R.N.R.	1	S.S. "Drummond Castle."
Jones, S. Griff	4	"Hermine."
Kidley, W. H.	3	S.S. "Coptic."
Ladd, Mr. Richard, F.R. Met. Soc.	8	S.S. "Scotia."
Lalley, William Nicholson	4	S.S. "Derwent."
Lawson, James	4	S.S. "Minho" and S.S. "Humber."
Leeper, Lieut. A., R.N.	4	H.M.S. "Lark."
Legg, William	2	"Star of Greece."
Lehman, Charles	2	"Mikado."
McBride, A. C.	1	"Island Belle."
McDougall, A.	1	"Auckland."
Metcalf, John	7	S.S. "Oceanic."
Milne, W. F.	1	S.S. "Esquimaux."
Molony, E. J.	2	"British Merchant."
Moore, Lieut. and Comr. W. U., R.N.	2	H.M.S. "Dart."
Murray, Alexander	3	S.S. "Windward."
Neale, Mr. W. H., M.B.	1	"Eira."
Nicholson, M.	3	"Simla."
Norman, Francis	2	"Polestar."
Oldham, Lieut. in Command C. F., R.N.	4	H.M.S. "Lark."
Pagan, James	1	S.S. "Tenasserim."
Parry, Moses, F.R. Met. Soc.	6	"Queen of Cambria."
Parsell, Henry	6	S.S. "Baltic."
Parson, Geo. Fry	3	"Earnock."
Pearson, Charles William	22	S.S. "Strathleven."
Peebles, Robert	8	"Tweeddale."
Pirie, Lieut. George, R.N.	1	H.M.S. "Flying Fish."
Pomeroy, H.	1	"Elissa."
Price, J. H.	1	"Viola."
Prout, John Cawse	2	"Cape St. Vincent."
Raeburn, John, R.N.R.	8	"Lochee."
Renaut, Charles Henry	13	"Pleione."
Richardson, Sub-Lieut. Wynd- ham, R.N.	4	H.M.S. "Sylvia."
Robinson, Thomas	3	"Chinsura."
Rosseter, William Lawrence	2	"St. Kilda."
Russell, Charles James	3	"Candahar."
Scott, William	13	"Commewyne."
Shearer, George	6	"Corona."
Simpson, Alexander	14	"Traveller."
Smith, Mr. B. Leigh	1	"Eira."

Captain's Name.	Number of "Ex- cellent" Logs.	Ship.
Smith, William Charles -	8	"Her Majesty."
Smith, William Henry, R.N.R.	17	S.S. "Circassian."
Steven, David - - -	2	"Inchkeith."
Stiven, John H. - - -	4	"Arethusa."
Strang, Robert - - -	1	"Lyttleton."
Tannock, Robert Stewart -	4	"Glencairn."
<i>Thorne, J. W.</i> - - -	4	"Falstaff."
Thorpe, J. - - -	1	"Thurland Castle."
Tizard, Staff-Comr. T. H., R.N.	8	H.M.S. "Triton."
Tomlin, P. S. - - -	2	S.S. "Ballaarat."
Turner, E. Wrake - - -	11	"Mertola."
Vereker, Comr. Hon. Foley C. P., R.N.	2	H.M.S. "Magpie."
Wait, A. McLean - - -	1	S.S. "Spartan."
Walker, Henry - - -	2	S.S. "Parthia" and S.S. "Cephalonia"
Whall, William B. - - -	1	S.S. "Drummond Castle."
Wharton, W. J. L., R.N.	12	H.M.S. "Sylvia."
Wight, Henry Potts - - -	12	"Oamaru."
Williams, E. M. - - -	1	"Burdwan."
Youlden, H. - - -	3	"May Hulse."
Young, Thomas - - -	5	"City of Agra."

Names of observers deceased printed in italics.

APPENDIX III.—SHIPS supplied and DOCUMENTS returned during the year ending 31st March 1884.

The number of merchant ships supplied with standard instruments and meteorological logs during the above period was 123.
 The number of meteorological logs and documents from Foreign Stations received during the same period, and registered in the Office, amounted altogether to 310, of which 179 were returned from ships, and the remainder from land stations, outside the British Isles.

List of DOCUMENTS received from LAND STATIONS.

Place.	Observer.	No. of Documents.	Nature of Observations.
Abaco (Bahamas)	J. Thompson, Lightkeeper	2	" Lighthouse " Register, February to December 1883.
Barbacena (Brazil)	-	1	Resumo das observações meteorológicas, March to October 1881.
Barbados (Commercial Hall)	T. L. Ince	2	" Lighthouse " Register, January to December 1883.
" (Joe's River House)	R. B. Walcott, M.D., F.R. Met. Soc.	2	" " " " " "
Bermuda	Sergt. J. Green, A.H.C.	5	Anemograms, January 1883 to January 1884.
Beyrout (Lee Observatory)	E. Niur, B.A.	12	Two observations daily, March 1883 to February 1884.
Borneo	-	1	Observations at the following stations :—Papar, January 1882 to September 1883 ; Kudat, November 1882 to June 1883 ; Sandakan, April to September 1883 ; Silam, January to June 1883 ; Elopura, August 1878 to January 1883.
Breaksea Island (King George's Sound).	G. Turner, Lightkeeper	1	" Lighthouse " Register, January to June 1883.
Cape Juby (North West Africa)	S. Morris	8	Two observations daily, June 1883 to January 1884.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper	3	" Lighthouse " Register, July 1882 to December 1883.
Cay Lobos (Bahamas)	J. M. Avandia and G. L. Niur, Lightkeepers.	2	" " " " " " January 1882 to June 1883.
Cay Sul (Bahamas)	T. R. Thompson, Lightkeeper	1	" " " " " " January to June 1883.

List of Documents—continued.

Place.	Observer.	No. of Documents.	Nature of Observations.
Famagusta (Cyprus)	A. H. Moghabghab and S. Photinos.	4	Two observations daily, June, and August to October 1882.
Gibraltar	Sergt. F. Norris, A.H.C.	12	Two observations daily, March 1883 to February 1884.
Great Basses	Lightkeepers	5	Eight observations daily, December 1882, January and February 1883 and September 1883 to January 1884.
Gueluz (Brazil)	-	1	Resumo das observações meteorológicas, March 1881 to April 1883.
Heligoland	Lightkeepers	8	Eight observations daily, February 1883 to January 1884.
Inagua (Bahamas)	S. W. Hall and J. G. Maura	3	"Lighthouse" Register, July 1881 to May 1882, and July 1882 to December 1883.
Itabira de Campo (Brazil)	-	1	Resumo das observações meteorológicas, August 1882 to March 1883.
Kyrenia (Cyprus)	E. Joannides	4	Two observations daily, June, and August to October 1882.
Larnaca (Cyprus)	A. Tsepis and G. P. Vondiziano	4	" " " " " " " "
Levuka (Fiji)	J. D. W. Vaughan	5	One observation daily, October 1881 to August 1882.
Limassol (Cyprus)	Luigi Béraud	4	Two observations daily, June, and August to October 1882.
Little Basses	Lightkeepers	6	Eight observations daily, December 1882, January and February 1883, and September 1883 to January 1884.
Nicosia (Cyprus)	D. S. Maenair and A. Kyriakides.	4	Two observations daily, June, and August to October 1883.
Norfolk Island	T. Rossiter	4	" " " " " " " "
Papbo (Cyprus)	A. H. Moghabghab and E. Malliotis.	4	" " " " " " " "
Point King (King George's Sound)	S. Mitchell, Lightkeeper	1	"Lighthouse" Register, January to June 1883.
Santos	-	1	Monthly rainfall observations, 1871-78.
Sao Paulo (Brazil)	H. B. Joyner, F.R.G.S., F.R. Met. Soc.	10	Two observations daily, February to November 1883.
Sombrero	J. A. Richardson, Lightkeeper	2	"Lighthouse" Register, December 1882 to November 1883.
Suva (Fiji)	J. D. W. Vaughan	4	One observation daily, September 1882 to April 1883.

List of Documents received from SHIPS.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Adamson, John	Roman Empire	1,542	G. Duncan, London	To Cape Town, Akryab, Table Bay, and home, 1882-83	10
Alderton, T.	S.S. Australia	2,137	P. & O. Steam Navigation Co., London.	One voyage to and from Sydney, via Suez, and one to Lat. 11° S., Long. 93° E., 1883	4
"	"	"	"	To Sydney and home, via Suez; and one voyage to and from Calcutta, via Suez, 1883-84	4
Balderston, R. J.	Belfast	1,865	R. Brocklebank, Liverpool	To and from Calcutta, 1882-83	7
"	"	"	"	"	1
Ballard H.	S.S. Durban	2,875	Union S.S. Co., Lim., London	Two voyages to and from Cape Town, &c., 1882-83	3
"	"	"	"	To and from Cape Town, 1883	2
Barlow, A. E.	S.S. Paramatta	4,759	P. & O. Steam Navigation Co., London.	To Madras, Calcutta, Madras, and home, via Suez, 1883	3
"	"	"	"	To and from Sydney, via Suez, 1883-84	4
Barlow, B. J.	S.S. Amarapoora	2,464	British and Burmese Steam Nav. Co., Lim., Glasgow.	To and from Rangoon, via Suez, 1883	3
Barron, William	S.S. Empress	1,080	W. Bailey, Hull	Trading between Hull and Hamburg, 1883	4
"	"	"	"	"	3
Bennett, E. O.	Thessalus	1,782	T. Carmichael, Greenock	To Sydney, San Francisco, and home, 1882-83	8
"	"	"	"	To and from Calcutta, 1883-84	7
Blake, E. J.	Tilkhurst	1,527	W. R. Price, London	To Singapore, Chittagong, and home, 1882-83	8
Bolton, S. H.	S.S. Tyne Queen	1,264	J. W. Smith, Hull	Two voyages to and from Ports in Spain, 1883	2

List of Documents, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Bolton, S. H.	S.S. Tyne Queen	1,264	J. W. Smith, Hull	Three voyages to and from Almeria, Carthage, &c., 1883	3
"	"	"	"	Three voyages to and from Spanish Ports, 1883-84	4
Boothby, G. C.	S.S. Circassia	4,272	The Barrow S.S. Co., London	Five voyages to and from New York, 1883	4
Bouchette, F. B.	S.S. Montreal	3,308	Mississippi & Dominion S.S. Co., Lim., Liverpool.	Two voyages to and from Portland, via Halifax; two to and from Quebec, 1883	4
"	"	"	"	Two voyages to and from Quebec, three to and from Halifax, N.S., 1883-84	3
Bourke, Commr. E. G., R.N., F.R. Met. Soc.	Gannet	1,130	H.M.S.	Surveying off the coast of Chile, and in the Straits of Magellan, thence to Monte Video, Sierra Leone, and home, 1883	4
Bristow, W. M.	Barque Undine	796	J. R. Kelso, N. Shields	To Lat. 41° S., Long. 63° E., 1882	6
Brown, A. J.	S.S. Chamois	1,382	W. Jackson, London	To and from Jamaica, 1883	3
Brown, E.	Barque Moorhill	484	E. Brown, Liverpool	To San Nicolas (River Plate), Pernam- buco, and home, 1883-84	2
Brown, James	S.S. Assyria	2,023	T. Henderson, Glasgow	One voyage to New York, via Halifax, and home; four voyages from Gibraltar to New York, and three home from New York, 1882-83	4
Buchan, James	Barque Coppename	316	J. C. Pearson, Glasgow	To and from Surinam, 1882-83	4
"	"	"	"	1883	4
" Cameron, J. G.	S.S. Belgic	2,652	Oceanic Steam Nav. Co., Liver- pool.	From San Francisco to Yokohama, Hong-Kong, Nagasaki and home via Suez, 1883	3
" Campbell, A.	S.S. Circassia	4,272	The Barrow Steam Ship Co., London.	Five voyages to, and four from, New York, 1883-84	3

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Campbell, A.	S.S. Ethiopia	4,005	The Barrow S.S. Co., Barrow	Five voyages to and from New York, 1883	4
Campbell, James	Barque Florence	436	J. T. Cowley, London	To Santos, Philadelphia, and home, 1883	5
7 Carpenter, Lieut. A., R.N., F.R. Met. Soc.	Magpie	774	H.M.S.	Surveying in China and Japan Seas, 1883	4
8 Cato, W. R.	S.S. Scotia	4,667	Telegraphic Construction and Maintenance Co., Lim., London.	To and from China, via Suez, 1883	4
"	"	"	"	To Hong-Kong, Nagasaki, and home, via Suez, 1883	4
"	"	"	"	To and from St. Vincent, 1883	2
9 Christie, J. D.	S.S. Earl King	2,193	W. Ross, Glasgow	To and from Quebec, 1882	24 days
Clarke, James	S.S. Olbers	2,168	Liverpool, Brazil, and River Plate Steam Navigation Co., Liverpool.	One voyage to Lisbon, Rio Janeiro, New York, and home; one to Lisbon, Rio Janeiro, and New York, 1883-84	4
Clarkson, R. M.	S.S. Dios	2,020	R. T. Nicholson, Sunderland	To Bombay, via Suez, 1883	1
Cooke, C. F., F. Roy. Met. Soc.	The Lord Warden	1,237	H. Green, Blackwall	To and from Melbourne, 1883	6
Crotty, F. H.	Evesham Abbey	1,613	J. Poole, Liverpool	To Sydney, San Francisco, and home, 1883-84	10
Crowell, S. O.	S.S. Alpha	653	W. Cunard, London	Three voyages between Halifax and Jamaica, via Bermuda, 1883	2
"	"	"	"	Three voyages between Halifax and Jamaica, via Bermuda, 1883-84	2
10 Crutchley, W. C., R.N.R.	S.S. Mexique	4,668	Union S.S. Co., Lim., Southampton	Two voyages to and from Cape Town, 1883	3
"	S.S. Nubian	3,091	"	To and from Cape Town, 1883	2
11 Dart, L. C.	Barque Julia H.	585	R. C. Haws, St. John's, N.B.	To Jamaica, Apalachicola (U.S.A.), and home, 1883	4

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Denham, George	S.S. Erl King	2,193	W. Ross, Glasgow	One voyage to and from Baltimore, one to and from New York, one to Quebec, 1882-83	3
"	"	"	"	Four voyages from Quebec to London, three from London to Quebec, one from Havre to New York, and thence to Liverpool, 1883	4
Deuchars, William	S.S. Resolute	624	Dundee Seal and Whale Fishing Co., Dundee.	To St. John's (Newfoundland), Greenland, and home, 1883	5
Donaldson, James	S.S. Bolivia	2,626	The Barrow S.S. Co., Lim., London.	Three voyages to and from New York, 1883	3
Donaldson, R. A.	S.S. Glenavon	2,985	J. McGregor, London	To and from China, via Suez, 1883-84	3
Daubar, J. I.	S.S. Martaban	2,517	British and Burmese Steam Navigation Co., Lim., Glasgow.	One voyage to and from Rangoon, via Suez, one to Rangoon and back to Lat. 1° N., Long. 83° E., 1883	4
"	"	"	"	One voyage home from Rangoon, and one to and from Rangoon, via Suez, 1883-84	4
Ellery, William	Majestic	1,884	T. & R. Brocklebank, Liverpool	To and from San Francisco, 1882-83	7
England, Thomas	Barque Jane	636	P. Sutherland, Liverpool	To and from Apalachicola, 1883-84	3
Evans, Lieut. Hugh R., R.N.	Magpie	774	H.M.S.	At Hong-Kong, 1883	16 days
Flinton, Benjamin	Barque Dartmouth	915	Merchant Shipping Co., Lim., London.	To Lat. 0° S., Long. 30° W., and home from Lat. 0° S., Long. 21° W., 1882-83	3
Freeman, T. W.	S.S. Bellerophon	1,397	Oceanic Steam Navigation Co., Liverpool.	To and from China, via Suez, 1883	3
"	"	"	"	" " " 1883-84	3

LIST OF DOCUMENTS, &c.—*continued.*

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Fullarton, D.	Timaru	1,306	Shaw, Savill, and Albion Co., Lim., London.	To Wellington, and home from New- castle, N.S.W., 1883-84	7
Gordon, John	S.S. Glenelvon	1,178	J. P. Lindsay, Newcastle-on-Tyne	To and from New Orleans, 1883	2
Gray, David	S.S. Eclipse	435	D. Gray, Peterhead	To and from Greenland, 1883	5
Gray, John	S.S. Hope	307	R. Kidd, Peterhead	"	5
Greive, W. M.	City of York	1,195	G. Smith, Glasgow	To Adelaide, Newcastle (N.S.W.), San Francisco, and home, 1883-84	10
Grey, C., R.N.R.	Mae Millan	1,450	J. McMillan, Jun., Dumbarton	One voyage to San Francisco, via Cape Good Hope, and home, via Cape Horn; one voyage to Bombay, 1881-82	12
Griffin, E. W., R.N.R.	S.S. African	1,258	Union S.S. Co., Lim., London	To and from Cape Town, 1883	2
Hallert, E. O.	S.S. Gachie	2,652	Oceanic Steam Navigation Co., Liverpool.	Between Hong-Kong, Yokohama, and San Francisco, 1882	4
"	"	"	"	" 1882	2
Halley, E.	City of Madras	1,577	G. Smith, Glasgow	To and from Rangoon, 1883	8
Hanslip, W. C.	S.S. Derwent	2,471	Royal Mail Steam Packet Co., London.	To Bordeaux, Lisbon, Brazil, River Plate, St. Vincent, Lisbon, and home, 1883	3
Hay, —	S.S. Alnora	2,613	E. S. Dawes, London	To and from Brisbane, via Suez, 1882-83	4
Hepworth, C. M. W., F.R. Met. Soc.	S.S. Danube	1,462	Union S.S. Co., Lim., Southampton	To and from Natal, &c., 1883	2
"	"	"	"	To Algoa Bay, and trading between S. African Ports, 1883	7
Hird, William	Taranaki	1,130	J. Leslie, London	To and from Otago, 1882-83	6
Holdich, J. P., R.N.R.	British Envoy	1,265	J. Coupland, Leicester	To Melbourne, Newcastle (N.S.W.), San Francisco, and home, 1882-83	12

List of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
¹⁴ Hoskyn, Lieut. and Comr. R. F., R.N.	Flying Fish	940	H.M.S.	Surveying in China and Japan Seas, 1882-83	4
"	"	"	"	Surveying in China and Japan Seas, 1883	1
"	"	"	"	Surveying in China and Japan Seas, 1883	4
"	"	"	"	At Hong-Kong, and surveying in Japan Sea, 1883	4
Hughes, W. P.	Laomene	1,746	D. Fernie, Liverpool	To Calcutta, New York, and home, 1882-83	8
Jeffery, A. W., F.R. Met. Soc.	S.S. Ptolemy	1,401	Liverpool, Brazil, and River Plate S.N. Co., Lim., Liverpool.	From Antwerp to Rio Janeiro, &c., and home, 1883	2
"	"	"	"	To Rio Janeiro, New York, and home, 1883	2
"	S.S. Teniers	-	-	To Rio Janeiro, Maccio, New York, and home, 1883	3
¹⁶ Jones, Edward, R.N.R.	S.S. Castle.	3,705	Sir T. Brassey, K.C.B., Westminster	To and from Cape Town, 1883	1
Jones, S. G.	Barque Hermine	538	T. H. Jackson, Liverpool	To and from Talcahuano, 1882-83	8
Kidley, W. H.	S.S. Coptic	2,789	Oceanic Steam Navigation Co., Liverpool.	Trading between San Francisco and Hong-Kong, via Yokohama, and home from Hong-Kong, via Suez, 1882-84	10
Lailey, W. N.	S.S. Derwent	986	Mercantile S. S. Co., Lim., London.	One voyage to and from Patras; one to Venice, Alexandria, and home, 1883-84	3
Lawson, James	S.S. Humber	1,528	Royal Mail Steam Packet Co., London.	To Barbadoes and home, 1882-83	1
"	S.S. Minho	1,491	"	To and from Brazil and River Plate, 1882-	2

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
17 Legg, William	Star of Greece	1,227	J. Corry, Croydon	To and from Calcutta, 1882-83	9
Lehman, Charles	Barque Mikado	643	W. Lund, Liverpool	To Swan River (W. A.) and Shanghai, and home from Hoilo, 1882-83	7
Lindguster, Aug.	S.S. Elysia	1,745	T. Henderson, Glasgow	To Bombay, New York (via Suez), and home, 1883	3
Littler, W. T.	Barque Corinth	611	T. B. Walker, London	To and from Brisbane, 1882-83	7
18 Lofley, —	Schooner Eira	—	—	To Franz Josef Land, then by boat to Nova Zembla, 1881-82	13
Longley, H.	S.S. Mosser	1,323	J. H. Bushby, London	Two voyages to China and Japan, via Suez, back via Suez to New York, and home, 1882-83	9
McBride, A. C.	Barque Island Belle	313	J. McBryde, Stranraer	Hamburg to Monte Video, Buenos Ayres, Puntas Arenas, and Buenos Ayres, 1882	4
McDougall, A.	Auckland	1,245	The Albion Shipping Co., Ltd., Glasgow.	To and from Otago, 1882-83	6
McFee, J. B.	" Barque Childers	" 896	R. J. Swyay, Liverpool	" 1883 To Calcutta, New York, Melbourne, and home, 1881-83	6
Metcalf, John	S.S. Oceanic	2,440	Oceanic Steam Navigation Co., Ltd., Liverpool.	Trading between San Francisco, Yokohama, and Hong Kong, 1881-82	17
19 Miller, A. T.	Conway	—	Training Ship	In the River Mersey, 1883	8
Milne, W. F.	S.S. Esquimaux	466	Dundee Whale and Seal Fishing Co., Dundee.	To Newfoundland, Davis Straits, and home, 1883	4
Moloney, E. J.	British Merchant	1,696	British Shipowners' Co., Ltd., Liverpool.	To and from San Francisco, 1882-83	8
20 Moore, Lieut. and Comr. W. U., R.N.	Dart	470	H.M.S.	To Simon's Bay, Adelaide, and Sydney, 1882-83	7
" Mowatt, T. R., junr.	" Barque Scottish Prince	" 895	A. McIlwraith, London	At Australian station, 1883 To Bundaberg (Queensland), Newcastle (N.S.W.), and Manila, 1881-82	4
					8
					5

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Muir, John -	Invercargill -	1,246	Shaw, Savill, and Albion Co., Lim., London.	To and from Otago, 1882-83 -	6
Murray, Alexander -	S.S. Wiodward -	321	W. Baxter, Peterhead -	To and from Greenland, 1883 -	4
²¹ Murray, J. B. -	S.S. Ethiopia -	2,604	Barrow Steam Ship Co., Lim., Barrow.	To and from New York, 1883 -	23 days.
¹² " -	S.S. Hispania -	2,213	A. C. Henderson, Glasgow -	To and from Bombay, via Suez, 1883 -	2
²² Naird, James -	" -	"	T. L. Devitt, London -	" " " " 1883 -	2
²² Nicholson, M. -	Simla -	2,172	" -	To Melbourne, Newcastle (N.S.W.), Bombay, and home, 1882-83 -	8
Niejahr, Wilhelm -	Barque Mersey -	963	W. Moodie, London -	To Buenos Ayres, and home from Rosario, 1883 -	3
Norman, Francis -	Barque Polestar -	625	J. Lyne, Liverpool -	To Valparaiso, 1882-83 -	3
²³ Oldham, C. F., R.N., Lieut. in Command.	Lark -	—	H.M. Schooner -	From Auckland to Solomon Islands, Brisbane, &c., 1882-83 -	4
²³ " -	" -	—	" -	At Australian station and New Zealand, 1882-83 -	4
²³ " -	" -	—	" -	At Australian station, 1883 -	4
¹² Pagan, James -	S.S. Tenasserim -	1,755	British and Burmese Steam Navi- gation Co., Lim., Glasgow.	To and from Rangoon, via Suez, 1883 -	3
" Parry, Moses, F. R. Met. Soc.	Barque Queen of Cambria -	"	W. Thomas, Nevin, Carnarvonshire -	To Port Chalmers, Valparaiso, and home, 1882-83 -	3
²⁴ Parseil, H. -	S.S. Baltic -	2,209	Oceanic Steam Navigation Co., Liverpool.	Four voyages to, and three from, New York, 1883 -	8
²⁵ Parson, G. F. -	Earnock -	1,198	W. Fraser, London -	To Melbourne, Bombay, and home, 1882-83 -	3
Patterson, J. E. C. -	Ellen Stuart -	1,572	P. Douglas, Liverpool -	To Calcutta, 1881 -	10
Pearson, C. W. -	S.S. Strathleven -	2,438	W. Burrell, Glasgow -	To China and Japan, via Suez, thence to New York (via Suez), and Gibraltar, 1882-83 -	4
					5

List of Documents, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year	Months of Register.
Pearson, David	S.S. Borghese -	1,331	W. H. Raeburn, Glasgow	From Teneriffe to Buenos Ayres, St. Thomas, Charlestown, and home, 1883-84	3
Peebles, Robert	Barque Tweedsdale -	1,403	J. Roxburgh, Glasgow	To and from Calcutta, 1882-83	8
Penny, Hugh	" -	"	" -	" - 1883-84	7
Perrin, Thomas	Barque Madras -	668	R. Kerr, Greenock	To Rio Janeiro, Anjer, and home, 1883	8
	Ambrose -	862	J. F. Gibb, London	To Adelaide, Newcastle (N.S.W.), Callao, Vancouver's Island, and home from Callao, 1882-83	10
Peters, J.	S.S. Gloucester -	1,304	Great Western Steamship Co., Ltd., Bristol	Two voyages to and from New York, one to Malta, Palermo, Boston, Cape Breton, and home, 1882-83	4
Peterson, Walter	Barque Callew -	482	C. Wilson, Sunderland	To Mauritius, Singapore, and home, 1882-83	8
Plage, Robert	Barque Cottica -	319	J. Grierson, Glasgow	To and from Surinam, 1883	3
Pomeroy, Herbert	Barque Elissa -	409	H. F. Watt, Wavertree, Liverpool.	To Caravellas (Brazil), Cape Verdes, Bahia, Boston, and home, 1882-83	6
Price, J. H.	Barque Viola -	595	C. T. Browning, Liverpool	To and from Valparaiso, 1883-84	6
Prout, J. C.	Cape St. Vincent -	1,422	A. P. Lyle, Greenock	To Adelaide, Newcastle (N.S.W.), Java, and Cadiz, 1882-83	9
Quaile, D. W. A.	Orissa -	1,199	R. Kerr, Greenock	To Calcutta, Mauritius, back to Calcutta, and home, 1882-84	11
Raeburn, John, R.N.R.	Lochee -	1,728	D. Bruce, Dundee	To Sydney, Newcastle (N.S.W.), San Francisco, and home, 1883-84	9
Randall, W.	Dynomene -	1,900	D. Furnie, Liverpool	To and from Calcutta, 1882-83	9
Renant, C. H.	Pilone -	1,092	The Shaw, Savill, and Albion Co., Ltd., London.	To and from Wellington, New Zealand, 1882-83	7
Robinson, Thomas	Chinsura -	1,266	T. Brocklebank, Liverpool	To Anjer, Akyab, and home, 1882-83	8
Rosseter, W. L.	Barque St. Kilda -	865	A. T. Parker, Liverpool	To and from Demerara, 1883	3
"	" -	"	" -	" - 1883-84	3

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Russell, C. J.	Candahar	1,418	R. Brocklebank, Liverpool	To and from Calcutta, 1882-83	8
²⁶ Savage, Lieut. W. M., R.N.	L. H. Tender Richmond	183	Board of Trade, London	At the Babanas, 1883	4
Scott, William	Barque Commewyne	315	J. Grierson, Glasgow	To and from Nickerie, 1883	4
"	"	"	"	To and from Surinam, 1883-84	3
Shaw, Gilbert	S.S. Beta	1,087	W. Cunard, London	Four voyages between Halifax and Jamaica, via Bermuda, 1883	3
"	"	"	"	"	3
Shearer, George	Barque Corona	1,210	W. Stephen, Dundee	To Adelaide, Newcastle (N.S.W.), Colombo, Bombay, and home, 1882-83	10
Simpson, Alexander.	Schooner Traveller	196	A. Simpson, Peterhead	To Ivigtut, Philadelphia, Ivigtut, Philadelphia, and Exmouth, 1883	7
Sinclair, S.	Tamerlane	768	W. M. Dickie, London	From Sydney to Shanghai, Higo, Hong-Kong, Amoy, New York, and Glasgow, 1872-73	12
²⁷ Smith, J. H., R.N.R.	Worcester	—	Training Ship	Off Greenhithe, 1883	4
Smith, W. C., F. R. Met. Soc.	Her Majesty	1,104	R. Grant, London	To Algoa Bay, Madras, and home, 1882-83	9
²⁷ Smith, W. H., R.N.R.	S.S. Circassian	2,356	R. G. Allan, Liverpool	One voyage to and from Baltimore; one to and from Portland; three to and from Quebec, 1883	4
Steven, David	Barque Inch Keith	1,238	A. Russell, Glasgow	To and from Calcutta, 1882-83	8
Stiven, J. H.	Arethusa	1,272	J. Hamilton, Liverpool	To and from Adelaide, 1882-83	7
Strang, Robert	Lyttelton	1,111	Shaw, Savill & Albion Co., Lim., London.	To and from Otago, 1883	5
Tannock, R. S.	Glencairn	1,564	A. Allen, Glasgow	To and from Rangoon, 1882-83	8
Thompson, Henry	S.S. Basil	867	The Booth S.S. Co., Lim., Liverpool.	Two voyages from Havre to Lisbon, Brazil, and home, and one home from Brazil, 1882-83	4

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Thompson, R. D.	Cosmo	1,220	J. G. Ross, Quebec	To Monte Video, Point de Galle, Calcutta, New York, and home, 1881-83	10
Thorne, J. W.	Barque Falstaff	1,419	J. Beazley, Liverpool	To and from Calcutta, 1882-83	8
Thorpe, J.	Thurland Castle	1,244	Lancaster Shipowners Co., Lim., Liverpool.	To Cape Town, Akyab, and home, 1882-83	8
Tizard, Staff-Com. T. H., R.N.	Triton	410	H.M.S.	Surveying on east coast of United Kingdom, 1883	7
²⁸ Tomlin, P. S.	S.S. Ballarat	4,752	P. & O. Steam Navigation Co., London.	To Colombo, Melbourne, and back, via Suez, 1883	3
²⁹ Travers, H. de la Cour.	S.S. Tartar	2,755	Union S.S. Co., Lim., Southampton	To and from East London, 1883	2
Turner, E. W.	Barque Mertola	392	E. W. Turner, Garston, Liverpool	To and from River Guadiana, 1882	2
" "	" "	"	" "	Three voyages to and from River Guadiana, 1882	4
Turpin, W. A.	S.S. Gaelic	2,652	Oceanic Steam Navigation Co., Liverpool.	One voyage between San Francisco and Hong Kong, via Yokohama; one from San Francisco to Yokohama, Hong-Kong, and home, via Suez, 1882-83	6
⁷ Vereker, The Hon. F. C. P., R.N.	Magpie	774	H.M.S.	From Hong-Kong to Manila, Labuan, and surveying on N.E. Borneo, 1883	4
⁷ " "	" "	"	" "	Surveying on N.E. Borneo, and to Singapore and Penang, 1883-84	4
³⁰ Wait, A. McLean	S.S. Spartau	2,223	Union S.S. Co., Lim., Southampton	Two voyages to and from Algoa Bay, &c., 1883	4
³⁰ " "	" "	"	" "	Two voyages to and from Cape Town, &c., 1883	4
Walker, Henry	S.S. Cephalonia	3,490	Cunard S.S. Co., Lim., Liverpool	Four voyages to and from Boston; one to and from New York, 1883	4
" "	S.S. Parthia	2,035	" "	Three voyages to and from New York, one to and from Boston, 1883	4

List of DOCUMENTS, &c.—*continued*.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
30 Watson, Alexander -	Barque Elvira -	464	H. R. Watt, Wavertree, Liverpool	To Natal, Calcutta, Demerara, Barbadoes, New Orleans, Hamburg, and home, 1882-83 -	10
31 Wharton, W. J. L., R.N.	Sylvia -	1,050	H.M.S. -	Surveying off Monte Video and in Straits of Magellan, 1882-83 -	4
32 " "	" -	"	" -	Surveying in Straits of Magellan, and voyage to Monte Video, 1883 -	4
32 " "	" -	"	" -	On east coast of South America, 1883 -	4
32 " "	" -	"	" -	On east coast of South America, 1883-84 -	4
33 Whiteside, J.	Maggie E. Seal -	1,365	C. Whiting, Liverpool -	To Monte Video, Valparaiso, Talcahuano, and home, 1882-83 -	7
Wight, H. P.	Oanara -	1,306	Albion Shipping Co., Lim., Glasgow.	To and from Otago, 1882-83 -	6
34 Williams, E. M.	Barque Bardwan -	803	T. & R. Brocklebank, Liverpool -	To and from Batavia, 1882-83 -	7
Wilson, John	S.S. Ethiopia -	2,604	Barrow S.S. Co., Lim., Barrow -	Two voyages to and from New York, 1883-84 -	2
Youlden, H.	Barque May Hulse -	463	J. Ransom, Southampton -	To Buenos Ayres, Coronel, Talcahuano, and home, 1882-83 -	7
35 Young, Thomas	City of Agra -	1,074	W. B. McGavin, London -	Christiania to Melbourne and home, 1882-83 -	5

(6) *Engines distinguished by marginal numbers the Meteorological Registers were kept chiefly by Officers, as follows:—*

- 1 Assisted by Messrs. Fairbairn and Brooks.
 2 Kept by H. Carey Reynolds.
 3 Kept by Henry M. Lamberton, 2nd Officer.
 4 Kept by G. Douglas Saunders, 3rd Officer.
 5 Kept by C. H. Kempson.
 6 Kept by Thomas Rannum, 2nd Officer.
 7 Kept by Lieutenant Andrew Ballour, R.N.
 8 Kept by Richard Ladd, F.R.A.S., F.R. Met. Soc.
 9 Kept by George Dothan.
 10 Kept by W. F. Tibbs, 4th Officer.
 11 Kept by R. G. Kessler, 4th Officer.
 12 Assisted by Officers.
 13 Kept by T. Q. East, 2nd Officer.
 14 Kept by William F. Brownless, 3rd Officer.
 15 Assisted by 1st and 2nd Officers.
 16 Kept by Henry King Sturdee, Chief Officer.
 17 Kept by Messrs. Cairne & Griffith, 3rd & 4th Officers.
 18 Kept by S. de B. Lockyer, 3rd Officer.
 19 Kept by George C. Gordon, 2nd Officer.
 20 Kept by J. W. Beresford Turner, 4th Officer.
 21 Assisted by T. G. Partington.
 22 Kept by Sub-Lieut. Wyndham Richardson, R.N.
 23 Kept by David R. Rees, 2nd Officer.
 24 Assisted by H. Cheriton, 3rd Mate.
 25 Assisted by H. Pike, 2nd Officer.

C7

1-2

APPENDIX IV.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Baro- meters.	Ane- roids.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1883, afloat -	176	378	1,073	151	133	100	128
Issued since -	58	76	265	24	25	14	34
Returned since -	234	454	1,338	175	158	114	162
	61	88	270	33	31	14	43
April 1st, 1884, afloat -	173	366	1,068	142	127	100	119

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

April 1st, 1883, in use -	66	116	259	21	29	5	16
Issued since -	13	2	61	6	5	1	—
Returned since -	77	118	320	27	34	6	16
	3	4	70	8	8	1	—
April 1st, 1884, in use -	74	114	250	19	26	5	16

DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1884.

Afloat in Royal Navy -	173	366	1,068	142	127	100	119
In use at stations -	74	114	250	19	26	5	16
In store at M.O. -	115	106	130	48	69	16	74
" Chatham -	4	6	16	4	3	4	4
" Sheerness -	4	8	13	3	3	3	15
" Portsmouth -	3	5	19	5	3	8	23
" Devonport -	2	8	13	5	5	7	28
" Queenstown -	3	3	1	1	1	—	8
" Gibraltar -	1	4	2	—	—	—	4
" Malta -	13	10	38	5	3	4	22
" Halifax -	2	8	5	2	5	—	12
" Bermuda -	3	6	43	—	2	—	15
" Jamaica -	1	—	1	—	—	—	—
" Cape of Good Hope -	7	2	5	6	6	—	31
" Trincomalee -	2	4	27	4	4	—	—
" Hong Kong -	3	6	21	4	5	2	10
" Coquimbo -	—	7	8	1	2	—	23
" Sydney -	2	5	56	1	2	—	—
" Esquimaux -	6	6	10	3	3	—	—
Total, April 1st, 1884 -	418	674	1,726	253	269	149	404
Lost, &c. since April 1st, 1883.	—	3	196	14	11	5	17
Under repair -	3	—	—	—	—	—	—

APPENDIX V.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1883, afloat -	140	—	764	—	—	145	493
Issued since -	123	—	704	—	—	117	391
	263	—	1,468	—	—	262	884
Returned since -	115	—	678	—	—	107	398
April 1st, 1884, afloat -	148	—	790	—	—	155	486

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

April 1st, 1883, in use -	104	3	248	62	64	39	41
Issued since -	17	1	24	4	3	2	4
	121	4	272	66	67	41	45
Returned since -	10	—	21	4	8	6	4
April 1st, 1884, in use -	111	4	251	62	59	35	41

DISPOSITION of Board of Trade Instruments on April 1st, 1884.

In merchant ships -	148	—	790	—	—	155	486
In use at stations -	111	4	251	62	59	35	41
In store at M.O. -	36	1	200	1	40	40	96
At Liverpool Agency -	9	8	35	—	—	8	29
„ Aberdeen „ -	2	—	15	—	—	1	30
„ Glasgow „ -	8	—	47	—	—	8	31
„ Dundee „ -	4	—	38	—	—	10	25
„ Hull „ -	5	—	33	—	—	8	19
„ Southampton „ -	4	—	19	—	—	6	18
„ Cardiff „ -	1	—	8	—	—	2	5
Total, April 1st, 1884 -	328	13	1,436	63	99	273	780
Lost, &c. since April 1st, 1883	7	—	200	—	8	24	81

APPENDIX VI.

LIST of STATIONS reporting Meteorological Observations by Telegraph to the Office on 31st March 1881, with the Names of Observers.

*†Sumburgh Head -	Rev. W. Brand - - -	Minister of Dunroessness.
*†Sternoway - -	D. MacDonald - - -	Late Officer S.S. "Great Eastern."
Wick - - -	J. Sinclair - - -	Watchmaker.
Nairn - - -	W. D. Penny - - -	Schoolmaster.
*†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 - - -	Curator of Museum.
Loughboro' - -	W. Berridge, F.R. Met. Soc. -	
†Ardrossan - -	J. W. Mayes - - -	Telegraph Clerk.
*†Mullagbmure -	K. Kerr - - -	Coastguard Officer.
Donaghadee - -	T. MacGowan - - -	Telegraph Clerk.
Parsonstown - -	G. Phillips - - -	Assistant Observer at Lord Rosse's Observatory.
Barrow-in-Furness -	W. S. Whitworth - - -	Engineer, Barrow-in-Furness Railway.
*†Holyhead - -	Griffith Jones - - -	Keeper of Sailors' Home.
Liverpool - - -	J. Harrop, junr. - - -	Bidston Observatory.
*†Valencia - - -	J. E. Cullum - - -	Superintendent of the Observatory.
Roche's Point - -	W. Kennedy - - -	Telegraph Clerk.
Fembroke - - -	Messrs. Blake and Baker -	Lightkeepers.
*†Scilly - - -	W. Thomas - - -	Signalman.
Prawle Point - -	J. John - - -	Coastguard Officer.
†Hurst Castle - -	G. G. Appleton - - -	Lightkeeper.
†Jersey - - -	J. Fisher - - -	Signalman.
*†Dover - - -	J. Costello - - -	Telegraph Clerk.
*†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. Foster - - -	Station Master.

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

The Council are making arrangements to establish stations at Belmullet, Co. Mayo; Malin Head, Co. Donegal; and Dungeness, Kent.

APPENDIX VII.

REPORTS ON THE INSPECTION OF THE STATIONS IN
1883.A.—REPORT OF INSPECTION OF THE IRISH AND WELSH STATIONS
WITH SCILLY.

TELEGRAPHIC REPORTING STATIONS.

Holyhead.—The new observer, Mr. Griffith Jones, is very attentive, but is unfortunately not a seaman, and has not been much accustomed to outdoor work, so that he had not had experience in judging of weather prior to his appointment. The station was in a satisfactory condition. The anemometers are both in good order.

St. Ann's Head.—This station calls for no particular remark. The exposure of sunshine recorder, thermometer, and rain gauge is the best at any of our stations.

Donaghadee.—The observer continues to be very satisfactory, but the exposure of thermometers and rain-gauge is not very good, being in a rather confined garden, and, in particular, there is no site available for a satisfactory wind vane.

Mullaghmore.—The station is in very good order, and since the establishment of telephonic communication it has been one of our most useful points of observation. Mr. Kerr, the reporter, is, I regret to say, to be superannuated at about the end of next year. It will be very desirable, if possible, to retain him at Mullaghmore. It is not likely that his successor, as chief officer of the coastguard, will take as much interest in the work as Mr. Kerr has done.

Belmullet.—In accordance with your instructions, I visited Belmullet. The town lies about 80 miles to the westward of Mullaghmore. It is situated on the isthmus connecting the Mullet peninsula with the mainland. Blacksod Bay, to the south, is about 15 miles long, Broadhaven, to the north, about eight, so that no direct reports of sea disturbance are procurable at Belmullet. The nearest point from which the open sea can be observed, though at a distance of a mile, is the church at Binghamstown, distant about 250 yards from the village. But that village consists of some 20 cottages, and no competent observer resides there at present. It is distant about two miles from Belmullet, and a private wire would be requisite to cover that distance.

At Belmullet itself the wind exposure is very satisfactory. There is no higher elevation than 100 feet for a long distance except the hills about Ballyglass and Erris Head, which reach 400 feet and are distant, say, four miles to the northward. The whole central part of Erris, the western barony of Mayo, is a level bog, with little elevation except along the north coast, so that the winds would be certainly true.

I learn from gentlemen resident at Belmullet that a competent observer could probably be found. I think the station would be a useful one, but its adoption would involve the maintenance of Mullaghmore, inasmuch as that would supply reports of sea disturbances from a well-exposed headland.

I may say that the telegraphic wires will probably be laid to Belmullet before Christmas.

Parsonstown.—This station calls for no special remark, except that the actual observers for the telegraphic reports and the second order observations, respectively, are clerks in an office in the town, and cannot therefore keep such a constant watch on the clouds and weather generally as is desirable and is obtainable at coast stations.

The deficiency is to some extent supplied by the occasional observations of Dr. Bøddicker, the astronomical assistant to Lord Rosse. The instruments are in good order. The wind reports continue to be unsatisfactory, as the grounds are densely wooded and the timber fine.

Roche's Point.—This station continues to be satisfactory.

Valencia.—The station calls for no remark; the substitution of telephones for the A B C instrument on the private wire has been a great improvement, and as the telegraphic clerk at the post office has been changed, the cause of complaint as to delay in the messages has been removed.

I have examined the country between the observatory and the top of Jokaun Hill, the proposed site for an automatic electric anemometer, and I fear that the cost of erection and maintenance of a wire for about four miles in such an exposed position would be very great.

Foynes.—This is a station furnishing information for the Weekly Weather Reports. It is not very satisfactory, as the observer has not as yet found any assistant or substitute when he is unavoidably absent.

STATIONS OF THE SECOND ORDER.

Dublin (Mountjoy).—This station continues very satisfactory. The observers are both very intelligent, and the instruments in good order. The only change in prospect at the station is that a new scaffolding for the anemometer and sunshine recorder is being erected, the old one referred to in my report for 1878 being decayed.

Dublin (Fitzwilliam Square).—This station fully maintains its character as being as good as is possible for a town situation.

Dublin (Glasnevin).—This station is in very good order. On the whole it may be said that Dublin is as well represented climatologically as any city in the United Kingdom.

Colebrooke.—This station continues in the same condition as heretofore.

Markree.—I expect that this station will show a marked improvement in future. Mr. Marth, the present observer for Colonel Cooper, took up the work in May.

OBSERVATORIES.

Armagh.—The instruments were in good order.

Valencia.—I found this observatory in a very satisfactory condition. The anemograph, however, now requires renewal, at least in the most important parts. Mr. Whipple recommended such renewal last year. The fans and cups are much worn, and the wheel work has much backlash.

If the Council think of improving the observatory, it might be advisable to lower the thermograph bulbs. This could be done at comparatively little cost by completing the fourth side of, and roofing in, the space between the present thermograph screen and the ground.

(Signed) ROBERT H. SCOTT.

Meteorological Office, October 13, 1883.

B.—REPORT ON THE INSPECTION OF THE ENGLISH STATIONS.

TELEGRAPHIC REPORTING STATIONS.

London (Brixton).—I found everything in excellent order. Continuous barometric comparisons having been carried on between the instrument at this station and those at the Meteorological Office, it did not appear necessary to make any on this occasion.

Jersey (Noirmont).—I took with me to this station the "uncontracted" Adie's barometer 531, to be substituted for the check barometer

416. It was in good order, but read $\cdot 008$ higher than the reporting barometer (the Kew corrections being applied). I found the instruments at this station in admirable order, and the observer is most painstaking. He estimated the wind force as 4 on the 26th, when my estimate was 5.

Hurst Castle.—The instruments at this station were in good order. The observer seems fairly careful, but makes occasional mistakes.

Prawle Point.—The observations at this station are most carefully taken, and the instruments are in excellent order. The instruments read well together. The observer, Mr. J. Johns, will quickly learn cloud observing, and I think that cirrus reports from this station would have considerable value.

Scilly (St. Mary's).—Wooden stays have been attached to the anemometer turret, which now vibrates but little in a storm. A portion of the iron of the case has been filed away, so that the pendulum does not touch the side. The clock required cleaning, parts of the works being somewhat rusted. The anemograms are not very distinct, the fault being due not to the instrument, but to the effects of salt and damp upon the paper. The observer's estimate of wind force is in better accord than formerly with the anemograms, but is now a trifle lower than the average estimate of the English observers. Both the reporting and check barometers were in absolute accordance with the standard 590.

Fork.—The observations at this station show slight improvement as regards the accuracy of the observer's readings. The reporting barometer (No. 156), which, when last compared, appeared to have a minus error, read on this occasion as much as $\cdot 045$ above my standard. The instruments had been suspended together for four hours, but at the time of the comparison the mercury was oscillating considerably. A good vane is wanted here, and in its absence the observer's estimate of the direction of the wind is not always accurate, *e.g.*, on the day of my visit, trusting to the Minster vane, the observer noted the wind as South, when it was S.S.E. The minimum thermometer (M.O. 64) reads somewhat low.

Spurn Head.—Since my last visit the barometer, formerly employed as a check instrument, has been adopted as the reporting barometer. (The instruments, however, not having been shifted.) Though reading higher than the instrument previously employed, it gave low readings as compared with my standard. The outdoor instruments are in excellent condition. I gave orders that the screen should be moved so as to face due North, which has since been done. The thermometers read very well together, and agreed with the standard. The observer appears very accurate in his estimate of wind and sea disturbance. The latter is estimated by the motion of the lightship outside, whenever this is visible, the tide producing peculiar seas upon the point itself.

North Shields.—As was the case in 1882, the wet-bulb thermometer of this station was found in a very foul condition. The other instruments were in good order, excepting the spare thermometer. The old rain gauge continues in good order.

SECOND ORDER STATIONS and those furnishing WEEKLY WEATHER REPORTS.

Hastings, St. Leonards.—All the instruments were found to be in particularly good order, and the observations are well kept up.

Southampton.—The work at this station appears to be admirably conducted. The observer happened to be absent on leave on the occasion of my visit. I found that his assistant read the instru-

ments and made the reductions correctly. The undesirable alterations in the site of the outdoor instruments mentioned in my report of 1882 would in any case have become necessary now, as the ground on the north side of the Ordnance Survey Offices is now fully occupied by new computing rooms. The returns from the station are excellent, and it may be mentioned that the observer distinguishes cloud forms with unusually facility.

Jersey, St Aubin's.—I did not dismount the instruments, as the observer expressed a wish that this should not be done, if avoidable. They are all unchanged and have been frequently and satisfactorily tested. Everything was in good order at the station, and the returns continued to be very complete.

Totnes.—Everything at this station was found in good order. Since my last visit the screen had been, for the convenience of the observer, shifted 13 yards S.E. by S. of its former position, a change which can produce no effects on the readings. The situation of the station appears to me to be such as to favour rather high maxima of temperature for this part of England.

Helston.—All the instruments at this station were found to be very good and in excellent order. The barometer has never been verified at Kew, but its readings underwent more than 60 comparisons at Falmouth Observatory in September 1882. The two comparisons made by me were in agreement with those determined at Falmouth. The observer at this new station, Mr. J. Gill, appears to be painstaking and accurate.

Leicester.—The instruments were found to be in tolerably good order. The observer's reading of the barometer was as much as .02 below my reading of the same instrument, the error being due to misadjustment of the fiducial point. The curator of the museum expressed his readiness to have the instrument shifted at a future time to a position where the light will be somewhat less inconvenient.

Peel (Isle of Man).—The altitude of the ground above sea level, as determined by barometric comparisons, is 137 ft. The country around is hilly, but the station has a very fair exposure, with a good view seaward (West). In the earlier returns from this station there were a few errors, but at the time of my visit the observer, Mr. T. H. Davis, read the instruments with the greatest rapidity and accuracy. He has a resident assistant who is quite competent for the work. All the instruments were found to be in excellent order, excepting the rain gauge, which had received an injury to the rim, and was about to be replaced by another instrument. There are also self-recording vanes and rain gauges of the observer's own design.

Douglas (Isle of Man).—The instruments at this station were found, as on previous occasions, in excellent order. The former assistant having left, and the present assistant being not quite competent for hygrometric reductions in Mr. Moore's frequent absence, the reductions have been somewhat interrupted. The observer set the vernier of the barometer much too low, an error shared to some extent by the assistant. Instructions were given on this point.

York.—The observer has, I think, made some further progress since the date of the former inspection, but the observations are still somewhat rough, and those on the direction of the wind do not appear to be always trustworthy. There have been some interruptions in the sunshine records, which it may be hoped will not again occur.

Alnwick (Northumberland).—Major Holland, who conducts the observations for the Duke of Northumberland, was absent on the day of my visit, but I obtained permission from his Grace to examine

the instruments. I was unable to dismount the thermometers. They are good instruments and read correctly, as compared with my standard in air. They have a good window-exposure facing North, but their height above the level of the ground (21 ft. 9 in.) is objectionable. A correction for altitude is made in the reports. Their altitude above the sea level is 202 ft. 10 in. The barometer is a good Fortin. The anemometer has a good position, but the connexions are long and complex. The rain gauge which is fairly exposed, is 178 feet above mean sea level.

Hesley Hall (near Bawtry).—The observations are usually taken by Mr. Whitaker's gardener, who is a competent observer. The instruments were in good order. The Stevenson's screen has not a very perfect exposure, and is not over grass. The rain gauge is also considerably sheltered by a fruit tree on the North side. Mr. Whitaker promised to consider the question of removing the outdoor instruments to a site upon the lawn, where their exposure will be very good.

Where several comparisons have been made, the mean result has been recorded. The asterisk indicates that the Kew correction has been applied to the observer's instrument, previously to comparison; its absence that it has not been applied.

TELEGRAPHIC REPORTING STATIONS.

STATION.	Barometers.			Thermometers.				
	Difference of Observer's from Inspector's Readings.	Reporting.	Check.	Temp. of Water.	Dry Bulb.	Wet Bulb.	Max.	Min.
Hurst Castle	-.001	-.016	-.019	63	0.0	0.0	0.0	-0.7
Jersey	-.001	-.006	-.006	60	0.0	+0.2	+0.1	0.0
London	—	—	—	53	0.0	-0.1	-0.2	-0.1
Prawle Point	-.002	-.004	-.006	62	-0.1	0.0	+0.1	-0.3
Scilly	-.001	.000*	.000*	61	0.0	0.0	+0.1	+0.2
Shields	-.001	-.003	-.005	53	0.0	+0.1	0.0	-0.1
Spurn Head	0.0	-.010	-.015	53	-0.1	+0.1	+0.1	-0.1
York	0.0	+0.05	—	53	-0.1	+0.1	+0.2	-0.3

STATIONS furnishing MONTHLY and WEEKLY REPORTS.

STATION.	Barometers.		Thermometers.				
	Difference of Observer's from Inspector's Readings.	Error of Barometer as compared with Inspector's Standard.	Dry Bulb.	Wet Bulb.	Maximum.	Minimum.	Gross Minimum.
Alnwick	-.001	—	—	—	+0.1	+0.1	—
Bawtry	+0.001	-.004	—	—	0.0	-0.1	—
Douglas	-.008	-.002*	0.0*	0.0*	0.0*	-0.1*	—
Hastings	0.0	-.001*	0.0*	-0.1*	-0.1*	-0.1*	—
Helston	+0.004	-.001	-0.1*	-0.1*	-0.6*	-0.9*	—
Jersey	0.0	—	—	—	—	—	—
Leicester	-.020	—	0.0	+0.2	0.0	-0.5	-0.6
Peel	-.001	-.001*	0.0*	-0.3*	+0.1*	-0.3*	-2.1*
Southampton	+0.001	-.006	-0.1*	-0.1*	-0.1*	0.0*	-0.2*
Totnes	-.001	—	-0.1*	0.0*	0.0*	0.0*	—
York	0.0	+0.05	-0.2	0.0	-0.5	-0.5	—

(Signed) W. CLEMENT LEY.

the instruments. I was unable to dismount the thermometers. They are good instruments and read correctly, as compared with my standard in air. They have a good window-exposure facing North, but their height above the level of the ground (21 ft. 9 in.) is objectionable. A correction for altitude is made in the reports. Their altitude above the sea level is 202 ft. 10 in. The barometer is a good Fortin. The anemometer has a good position, but the connexions are long and complex. The rain gauge which is fairly exposed, is 178 feet above mean sea level.

Hesley Hall (near Bawtry).—The observations are usually taken by Mr. Whitaker's gardener, who is a competent observer. The instruments were in good order. The Stevenson's screen has not a very perfect exposure, and is not over grass. The rain gauge is also considerably sheltered by a fruit tree on the North side. Mr. Whitaker promised to consider the question of removing the outdoor instruments to a site upon the lawn, where their exposure will be very good.

Where several comparisons have been made, the mean result has been recorded. The asterisk indicates that the Kew correction has been applied to the observer's instrument, previously to comparison; its absence that it has not been applied.

TELEGRAPHIC REPORTING STATIONS.

STATION.	Barometers.			Thermometers.				
	Difference of Observer's from Inspector's Readings.	Reporting.	Check.	Temp. of Water.	Dry Bulb.	Wet Bulb.	Max.	Min.
Hurst Castle -	- '001	- '016	- '019	63	0°0	0°0	0°0	-0°7
Jersey -	- '001	- '006	+ '006	60	0°0	+0°2	+0°1	0°0
London -	—	—	—	58	0°0	-0°1	-0°2	-0°1
Prawle Point -	- '002	- '004	- '006	62	-0°1	0°0	+0°1	-0°3
Silly -	- '001	- '000*	- '000*	61	0°0	0°0	+0°1	+0°2
Shields -	- '001	- '003	- '005	53	0°0	+0°1	0°0	-0°4
Spurn Head -	0°0	- '010	- '015	53	-0°1	+0°1	+0°1	-0°4
York -	0°0	+ '045	—	53	-0°1	+0°1	+0°2	-0°6

STATIONS furnishing MONTHLY and WEEKLY REPORTS.

STATION.	Barometers.		Thermometers.				
	Difference of Observer's from Inspector's Readings.	Error of Barometer as compared with Inspector's Standard.	Dry Bulb.	Wet Bulb.	Maximum.	Minimum.	Gross Minimum.
Alnwick -	- '001	0	0	0	+0°1	+0°1	0
Bawtry -	+ '001	- '004	—	—	0°0	-0°1	—
Douglas -	- '008	- '002*	0°0*	0°0*	0°0*	-0°1*	—
Hastings -	0°0	- '004*	0°0*	-0°1*	-0°1*	-0°1*	—
Helston -	+ '004	- '001	-0°1*	-0°1*	-0°6*	-0°9*	—
Jersey -	0°0	—	—	—	—	—	—
Leicester -	- '020	—	0°0	+0°2	0°0	-0°5	-0°6
Peel -	- '001	- '004*	0°0*	-0°3*	+0°1*	-0°3*	-2°1*
Southampton -	+ '001	- '006	-0°1*	-0°1*	-0°1*	0°0*	-0°2*
Totnes -	- '001	—	-0°1*	0°0*	0°0*	0°0*	—
York -	0°0	+ '045	-0°2	0°0	-0°5	-0°5	—

(Signed) W. CLEMENT LEY.

REPORT OF INSPECTION OF THE SCOTTISH STATIONS.

C.—BAROMETERS.

The barometers at all the stations were compared with inspector's mercurial standard barometer No. 588, and the thermometers with inspector's standard No. 2,522. The small aneroid No. 11 was also read at each inspection, but as its readings are very irregular, it is not intended to include them in this report.

The following table gives the corrected readings of standard No. 588, and the uncorrected readings of the reporting and check barometers at each of the stations, from which it appears that all of these instruments continue to be in excellent order:—

STATIONS.	Inspector's Standard No. 588. Corrected.	Reporting Barometer. Uncorrected.	Check Barometer. Uncorrected.	REMARKS.
Dundee - -	29·689	29·690	—	In post office. In house.
Aberdeen - -	28·614	29·610	—	
Do. - -	28·879	—	28·880	
Braemar - -	28·191	28·190	—	
Nairn - -	29·331	29·331	29·327	
Inverness - -	29·529	29·529	—	Red. same temp.
Dunrobin - -	30·007	30·009	—	
Wick - -	29·713	—	29·713	In house.
Do. - -	29·773	29·772	—	In shop.
Dunrossness - -	29·962	29·963	29·960	
Sandwick - -	30·080	30·093	—	
Stornoway - -	29·983	29·984	29·982	
Laudale - -	29·513	29·537	29·551	Red. to same temp.* Check barometer is 8 feet higher.
Rothsay - -	29·667	29·670	—	
Ardrossan - -	30·068	30·067	Under repair.	
Leith - -	30·002	29·993	—	In house.
Do. - -	29·983	—	29·978	Red. to same temp.
Pinnore - -	29·371	29·372	—	This is observer's second reading.
<hr/>				
OBSERVATORIES.				
Aberdeen - -	29·663	29·665		
Glasgow - -	29·465	29·472		

* In these two instances, the difference between the attached thermometer of the Inspector's and of the station barometer has been allowed for.

Excepting at two stations referred to below, the difference between the observer's and inspector's readings in no case exceeded 0·002 inch. In setting the vernier and reading off, I use a magnifying glass, but the observation is made by each observer in his usual way. The observer at Leith set the vernier 0·004 too low. On a second reading being taken he did it correctly.

THERMOMETERS.

The following table gives the results of comparisons made with inspector's standard No. 2,522, and the thermometers at the different stations and observatories, the readings of the standard being corrected

for instrumental errors, none of the Kew corrections for the station thermometers, however, being allowed for :—

STATIONS.	Standard No. 2,520, Corrected.	Dry Bulb.	Wet Bulb.	Spare T.	Max.	Min.	Time in Water in Minutes.	Change of Temp.	Notes.
Dundee -	59.2	+0.5	+0.6	—	+1.3	-0.2	90	Uniform	Min. on grass -0°·3.
Aberdeen -	56.5	+0.4	+0.5	+0.4	+0.5	+0.1	80	-0.2	
Bracmar -	51.6	+0.5	+0.5	—	+0.5	-0.2	80	+0.1	
Nairn -	56.0	+0.2	+0.7	+0.7	0.0	+1.0	75	+0.1	
Inverness -	57.1	0.0	+0.1	—	-0.1	+0.1	40	Uniform	
Dunrobin -	62.0	-0.4	-0.5	—	+0.5	-0.7	90	+0.2	Max. Sun +0°·2. Min. on grass 0°·0.
Wick -	59.8	+0.4	+0.4	—	0.0	+0.1	60	Uniform	
Dunrossness -	57.1	+0.3	+0.4	+0.2	+0.4	-0.5	140	+0.1	
Sandwick -	58.0	+0.3	-0.1	—	+0.5	-0.5	180	+0.2	
Stornoway -	57.7	+0.7	+0.6	+0.5	-0.3	-0.4	70	+0.3	
Laudale -	61.9	+0.2	+0.1	—	+0.2	+0.2	120	Uniform	
Rothsay -	57.5	-0.1	0.0	—	0.0	-0.2	75	-0.2	
Ardrossan -	58.5	+0.4	+0.4	—	0.0	-0.4	70	+0.3	
Leith -	49.3	+0.2	+0.5	—	+0.1	-0.2	40	+0.4	
Pinmore -	46.7	+0.2	+0.3	—	-0.3	-0.1	80	-0.2	
OBSERVATORIES.									
Aberdeen -	58.7	-0.1	+0.5	—	+0.5	0.0	70	Uniform	
					No. 10579	No. 5433			
Glasgow -	54.6	+0.2	0.0	—	0.0	-0.1	110	Uniform	Min. No. 1,225 -0°·2. Min. on grass -0°·9.

Since last report a new minimum thermometer has been supplied to Laudale, and a new maximum to Leith. The thermometers at Stornoway are to be removed to a better position; and arrangements have been definitely made for clearing off a considerable part of the wood close to the station at Nairn, by which the whole of the observations will be improved.

HYGROMETERS.

The observations of the dry and wet bulbs are so well made generally as to call for no special remark.

RAIN GAUGES.

It will be seen from the "squeeze" sent in October, that the rain gauge at Leith was at the date of inspection considerably off the circular. It was then made circular.

At Aberdeen Observatory the pencil tracings examined were clear and distinct, and an examination showed that the pencil worked without any undue friction. The pencil tracings of the rain gauge at Glasgow Observatory were also carefully examined, particularly the first part of the tracing after each emptying of the gauge. The tracing from 7 to 8 p.m. of August 13th is very curious, and not easy to account for.

ANEMOMETERS.

The little wooden hut for the anemometer at Sandwick was thoroughly repaired and re-painted in spring. As regards the anemograph sheets, when the pin is pressed down at 10.30 a.m. it marks

10.15 a.m. on the sheet, there being thus a constant error of 15 minutes on the sheets, and this error has probably continued since last time the instrument was repaired. The irregularity in the velocity curve at Aberdeen noticed in last report was, in all cases I had an opportunity of examining, much reduced. At Braemar the anemometer is on a pole 18 feet high, which was a suitable position at the time it was first placed there, but as some trees have grown up round the plot of grass of the observatory, interfering somewhat with the readings, it is proposed to raise it a little higher.

NOTES ON THE STATIONS.

Aberdeen.—Stevenson's screen was ordered to be re-painted. Everything else at this station was found to be in very good order.

Nairn.—All the instruments were in good order, were correctly read and reduced by Miss Penny, who was in charge of the station at the time of inspection. Mr. Penny having been called away owing to the death of his brother. I am glad to report that definite arrangements have at last been made for clearing away a considerable portion of the wood close to this station, by which the observations will be much improved.

Wick.—Everything at this station was in good order, and no change was required.

Dunrossness.—At the time of inspection the Rev. W. Brand was on his annual ministerial visit to Fair Island, but Mrs. Brand made and reduced all the observations, prepared the daily report, and despatched it to London in a very satisfactory manner. Attention was directed to the careful recording of all changes of weather occurring between two telegraphic messages to the Meteorological Office; and in future care is to be given that these changes are to be incorporated into the first message sent thereafter to London.

Stornoway.—The observations are carefully and correctly made by Mr. McDonald and his daughter. By some mistake, the rain gauge and Stevenson's screen remained in the positions they occupied at last inspection. Mr. McDonald was directed to remove them to the position indicated in my report of last year, and to intimate the date of change to the Office. The instruments are well attended to.

Ardrossan.—During the recent repairs in the Post Office, the reporting barometer was broken, and since then the check barometer has been used instead. This instrument, as the comparison with the standard showed, had been safely conveyed from Saltcoats to its position at Ardrossan.

As requested, special inquiry was made regarding the wind observations made at this station. From a long conversation with Mr. Mayes it seemed to me that these observations are made by him with fair intelligence. He stated as a fact that considerably more damage was done to the slates and chimney-pots at Saltcoats than at Ardrossan, but did not think the gusts of wind were stronger at the latter place. It is, however, possible that at Ardrossan those gusts may be less strong which accompany the winds blowing straight upon the abrupt rising ground or cliff immediately to eastward of the village. This point I shall give some attention to next inspection.

Lith.—The observer read the barometer 0.004 inch too low, and all his readings hitherto have probably been too low to that amount. After being shown the proper way of setting the vernier, he took several readings and all of them were correctly made. The old maximum thermometer, which was not working quite satisfactorily,

10.15 a.m. on the sheet, there being thus a constant error of 15 minutes on the sheets, and this error has probably continued since last time the instrument was repaired. The irregularity in the velocity curve at Aberdeen noticed in last report was, in all cases I had an opportunity of examining, much reduced. At Braemar the anemometer is on a pole 18 feet high, which was a suitable position at the time it was first placed there, but as some trees have grown up round the plot of grass of the observatory, interfering somewhat with the readings, it is proposed to raise it a little higher.

NOTES on the STATIONS.

Aberdeen.—Stevenson's screen was ordered to be re-painted. Everything else at this station was found to be in very good order.

Nairn.—All the instruments were in good order, were correctly read and reduced by Miss Penny, who was in charge of the station at the time of inspection, Mr. Penny having been called away owing to the death of his brother. I am glad to report that definite arrangements have at last been made for clearing away a considerable portion of the wood close to this station, by which the observations will be much improved.

Wick.—Everything at this station was in good order, and no change was required.

Dunrossness.—At the time of inspection the Rev. W. Brand was on his annual ministerial visit to Fair Island, but Mrs. Brand made and reduced all the observations, prepared the daily report, and despatched it to London in a very satisfactory manner. Attention was directed to the careful recording of all changes of weather occurring between two telegraphic messages to the Meteorological Office; and in future care is to be given that these changes are to be incorporated into the first message sent thereafter to London.

Stornoway.—The observations are carefully and correctly made by Mr. McDonald and his daughter. By some mistake, the rain gauge and Stevenson's screen remained in the positions they occupied at last inspection. Mr. McDonald was directed to remove them to the position indicated in my report of last year, and to intimate the date of change to the Office. The instruments are well attended to.

Ardrossan.—During the recent repairs in the Post Office, the reporting barometer was broken, and since then the check barometer has been used instead. This instrument, as the comparison with the standard showed, had been safely conveyed from Saltcoats to its position at Ardrossan.

As requested, special inquiry was made regarding the wind observations made at this station. From a long conversation with Mr. Mayes it seemed to me that these observations are made by him with fair intelligence. He stated as a fact that considerably more damage was done to the slates and chimney-pots at Saltcoats than at Ardrossan, but did not think the gusts of wind were stronger at the latter place. It is, however, possible that at Ardrossan those gusts may be less strong which accompany the winds blowing straight upon the abrupt rising ground or cliff immediately to eastward of the village. This point I shall give some attention to next inspection.

Leith.—The observer read the barometer 0.004 inch too low, and all his readings hitherto have probably been too low to that amount. After being shown the proper way of setting the vernier, he took several readings and all of them were correctly made. The old maximum thermometer, which was not working quite satisfactorily,

was replaced by a new one from the Office in July last. The check barometer, which had been removed to its present position on the death of Mr. Hutchison, was compared and found in good order. Shortly after last inspection, the Stevenson's screen was thoroughly repaired, painted, and firmly fixed, and the rain gauge was also repaired and well fixed.

Dundee.—The observations are made within the grounds of the Dundee Cemeteries. The situation is open on a long ridge lying east and west, and sloping southwards to the Firth of Tay. The thermometer screen is of the pattern supplied to the stations of the Scottish Meteorological Society before Stevenson's came into use, which it closely resembles. The instruments were all in good order and carefully observed. The maximum thermometer was broken in the end of 1879 and replaced by the present one, it being omitted at the time to report the fact to the Office. From the date of inspection, the thermometric observations, which had previously been read only to whole degrees, were begun to be read to tenths of a degree. The rain gauge is placed in an open space in the grounds at some distance from the other instruments.

Braemar.—This station is in a small open grass field near the centre of the village which slopes slightly to westward. The instruments belong to the Queen. They are all in excellent order and are read with care and intelligence by Mr. Aitken. The barometer and thermometers in shade are placed in a large wooden screen designed by the late Prince Consort and Sir James Clark in 1855, in the form of an octagon, 8 feet in diameter, and louvered all round. A Stevenson's screen will be added to the observing instruments with the view of ascertaining what temperatures are obtained by the screen so long in use and the screen now in general use among meteorologists. There is a snow gauge at this station about 18 inches in diameter and 2 feet in height. There is a vane and an anemometer on a stout pole with ladder, 18 feet high, its position at the time of erection was very good, but some trees have since grown up in the vicinity which possibly may somewhat shelter the cups. For so hilly a situation the exposure is remarkably good. The degree to which the winds are diverted from their course will appear from the following 15 years' averages:—N. 16, N.E. 41, E. 22, S.E. 24, S. 41, S.W. 163, W. 26, N.W. 28, and calms two days. The above mean of 163 days of S.W. winds is greatly above the general average of Scotland.

Inverness.—In February 1883, the temperature observations ceased to be made, the thermometers being found to be too far from the observer. At the same time the rain gauge was removed to the present position, which is so unsuitable that the rain observations are worthless. Mr. Fraser removes to another house in May, where, he informed me, suitable arrangements can be made for all the instruments. In the meantime, the barometric wind and weather observations continue to be made.

Dunrobin.—The instruments are placed in good positions on a large grass plot forming part of a long narrow strip of ground lying between Dunrobin Castle and the sea. The hilly ground, which rises immediately to westward, must occasion deviations in the direction and force of the wind. The mean direction on an average of 12 years is N. 32, N.E. 34, E. 72, S.E. 27, S. 18, S.W. 46, W. 92, and N.W. 38 days, thus showing an undue local predominance of west and east winds. The thermometer box is one of the sort in use when the station was established in 1859, and may be regarded as fairly comparable with Stevenson's

screen. A Stevenson's screen is to be added as soon as possible. The instruments were in good order, and the observations carefully and correctly made.

Sandwich.—The anemometer hut was repaired in spring in a thoroughly satisfactorily and substantial manner. The sunshine recorder is placed on a stout square wooden pillar, box-shaped on the top. On examination, the slate pedestal of the instrument had been inadvertently placed out of its proper position when removed in spring from its former place, thus confirming the opinion formed in the Office that its orientation was not properly attended to. It was put right. Greenwich mean time is observed in making all the observations, and every opportunity of bringing correct time from Stromness and Kirkwall is taken advantage of.

All the other instruments were in good order and the observations, as heretofore, continue to be made with correctness and fidelity.

Landale.—A new minimum thermometer replaced the old one on January 4th. As the Stevenson's screen is now stayed with stout wire (No. 10), double and twisted, the thermometers may be regarded as secured against the violent winds which occasionally occur at this station. The instruments were all in good order.

Rothsay.—The station is at Barone Cottage on the rising ground about three-quarters of a mile to the west of Rothsay. The ground there slopes gently to the south. Barone Hill, 530 feet high and $1\frac{1}{2}$ miles distant, is the highest point of a ridge lying approximately from S.W. to N.N.E. of the station. The position is open and the winds observed are only subject to such deflection as may be occasioned by this ridge.

A portion of spirit equal to about a degree was found at the top of the tube of the minimum thermometer. Mr. Kay, under direction, put it right. The rain gauge was not quite circular: the circularity was restored. All the other instruments were in good order and the observations made with care and accuracy.

Pinnore.—The station is situated close to the Stinchar in a rather deep valley surrounded by heights and hills. The piece of level ground in the curve of the river near the garden extends to about 10 acres. It is probable that the winds are a good deal deflected owing to the configuration of the land.

The thermometer screen is of the pattern in use before Stevenson's, and closely resembles that screen. It is placed at the edge of a large grass plot, with the black soil of a rose and flower plot on the other side, which is to be turfed for some distance round the screen.

The height of the barometer has been hitherto entered at 187 feet instead of 190 feet, which is the correct height of the cistern. It was known that Mr. Donald set the vernier to the level of the clear surface of the mercury in contact with the glass tube, for which error of observation a provisional correction of +0.035 inch had been adopted. The inspection confirmed the above. The vernier is now set, and the instrument read correctly. As regards the other instruments they were well placed, in good order, and well observed.

Aberdeen Observatory.—The rain gauge is still, as shown by the squeeze, off the circular, but no attempt was made to alter it owing to its construction. The pencil tracings of the rain gauges, which there was an opportunity of examining, were clear and distinct, and showed that the pencil was working without undue friction. All the instruments were in very good order and well attended to.

Glasgow Observatory.—The pencil tracings of the rain gauge were carefully examined, particularly the first part of the tracing after each

emptying of the gauge. The examination showed an improved distinctness in the tracings. Everything at the observatory was in good order.
(Signed) ALEXANDER BUCHAN.

D.—REPORT ON THE INSTRUMENTS AT THE OBSERVATORIES.

In conformity with your instructions, I beg leave to report to the Meteorological Council that I inspected the self-recording observatories at Aberdeen and Valencia, and at the same time (at the request of the Rev. S. J. Perry) I also visited the Stonyhurst Observatory.

Stonyhurst.—The whole of the instruments here were in excellent order, and neither the clocks nor the lenses required cleaning. My attention, however, having been specially called to the backlash existing in the anemograph, I carefully examined the instrument in this respect, and am of opinion that the defect cannot be obviated in its present form.

The clutches connecting the shafting to the pencils were noticed to be somewhat loose in their fittings, and Mr. Carlisle thought if these were tinned over so as to make them fit a little tighter, it might have a tendency, at all events, to improve the direction trace, so that when a sudden shift in the vane takes place the pencil would mark at once instead of lagging behind or skipping.

With this I agreed, and Mr. Carlisle promised to get it done.

The velocity shaft was dismounted, and the cup-bearing oiled, after which the orientation was carefully tested.

My attention was next called to the extremely dirty condition of the cistern of the large standard barometer used for the control observations. I therefore decided to dismount it, but experienced considerable difficulty in so doing, as the screws had become rusted, the instrument never having been detached from its frame since its erection in 1868.

The cistern was cleaned and the contained mercury filtered, after which the barometer was replaced and levelled. A comparison of the standard thermometers was made with Kew standard No. 571, and found to give the following corrections at 60°:—

Dry bulb, No. 619, -0.15 . Wet bulb, No. 382, -0.35 .

The rain gauge was in good order, and “squeezes” of the self-recording as well as the spare gauge funnels were taken.

Aberdeen.—At this observatory all the instruments were in good order.

I deemed it advisable, however, to clean the barograph and thermograph clocks, as well as the lenses and other parts generally.

The exterior portion of the anemometer was dismounted, thoroughly overhauled and cleaned, but the clock and recording apparatus only required oiling.

Afterwards the orientation was examined, and the four cardinal points checked by means of an azimuth compass, the results being satisfactory.

The rain gauge was also examined, but the clock was in such excellent order that it only required oiling. “Squeezes” were taken of the funnels of both the Beckley and spare gauges.

The corrections to the standard thermometers at 50 degrees were found to be, as compared with Kew standard No. 571, for the dry, No. 458, 0.0 , and for the wet, No. 395, -0.55 .

After testing, the graduations of the thermometers were re-blackened.

Valencia.—The barograph and thermograph at this observatory were in a very satisfactory condition, but at the same time I considered it desirable to clean both clocks, as well as the lenses and other parts generally.

With regard to the slight blurring in the wet bulb trace of the thermograph, it seems only to occur when the temperature ranges between 35 to 45 degrees, and is probably due to some accidental roughening of the glass at that part of the tube, as already pointed out by Mr. Whipple; but in consequence of the great risk attendant on taking the thermometer out of its fittings I did not think it advisable to dismount the tube in order to make a closer examination.

The photography at the time of my visit was good.

The corrections to the standard thermometers at 58 degrees were determined to be, as compared with Kew standard No. 574, for the dry, No. 399, -0.6 , and for the wet, No. 398, -0.45 ; after testing, the graduations of the thermometers were re-blackened.

Anemometer.—The external parts of the anemometer were entirely dismounted and thoroughly cleaned and oiled.

The cups and stays supporting the arms are, however, in a very shaky and unsatisfactory condition. I would therefore most respectfully beg to draw the special attention of the Council to Mr. Whipple's report on this instrument last year.

The orientation was examined, and the result is appended to this report; also the four principal points were checked by means of an azimuth compass, and found to agree with the marks used by Mr. Cullum for the purpose of orienting.

The rain gauge was taken to pieces and cleaned, and a new line was attached to the clock; as regards the attachment of the papers to the drum, Mr. Cullum experiences considerable difficulty, as the sheets are cut much wider than the cylinder itself.

(Signed) T. W. BAKER.

REPORT ON THE INSTRUMENTS AT KEW OBSERVATORY.

The anemograph was entirely dismounted and thoroughly cleaned on August 23rd. During the year the cap on the oil cup of the velocity shaft has been observed on several occasions to work loose, and so cause a creaking noise for a short time. It is intended to fit a tightening screw to it as soon as a convenient opportunity of so doing presents itself.

The working parts of the instrument show very few signs of wear, although it has now been running more than 15 years.

After remounting, it was again oriented, and a slight displacement of the sheet upon the cylinder was found necessary.

Barograph.—This instrument was cleaned on August 7th. It is in perfect order and required no repairs beyond a new clock line. During the holidays of the photographic assistant, Morgan's gelatino-bromide paper was used for both first and second sheets, as the photographic operations it entails are so trivial as contrasted with those of the waxed paper process. The only objection to its continued employment lies in the fact that owing to its contractile coating it possesses a strong tendency to curl, which cannot be overcome. This sometimes causes bagging when two sheets are put on together, and the light diffusing in the space between them, the trace on the under sheet becomes blurred. Attempts are being made to overcome this defect.

Thermograph.—The Kew thermograph was dismounted, its clock and lenses cleaned, and a new cord attached to the former.

In accordance with a request contained in a letter from the Meteorological Office, dated July 30, an attempt was made to improve the definition of the wet bulb trace. The defect being due to an apparent

excessively wide slit, the tube was re-blackened and a new and narrower slit made. Using, however, the gelatinised paper, it became evident that a good deal of stray light found its ways through the blackening, and on the return of Mr. Baker, the thermometer was again taken out, cleaned, and re-blackened on October 8th. This operation was not successful, and on the 9th it was repeated, and found that owing to the narrowness of the bore it was extremely difficult to admit light to the air speck whilst excluding it from sides of the tube, the tube itself acting as a cylindrical lens. In these operations the shield was of necessity removed from the tube, and the zero values will probably experience a slight change.

The dry-bulb thermograph tube was not touched in the above experiment, and its zero values remain at 80·6 degrees for the upper and 22·1 for the lower.

The standards were tested as usual in ice at the beginning of the year, and the following corrections were then determined :—

Dry bulb, No. 378, — 0°·4. Wet bulb, 473, — 0°·4

The rain gauge was cleaned and clock line renewed on June 18, being found in perfect order.

The sunshine recorder is also in good order, the sphere being cleaned from time to time as required.

(Signed) G. M. WHIPPLE.

APPENDIX VIII.

METHOD OF DEALING with TELEGRAPHIC WEATHER INTELLIGENCE.

The operations connected with the preparation and issue of the Forecasts and Storm Warnings have not been materially changed during the year, but the form of the Daily Weather Report has been changed to a large quarto (instead of foolscap), and new values have been calculated for the means of pressure, temperature, and rainfall given in the margin, and the mean temperature of evaporation at 8 a.m. has been added to them.

The Office still receives, when the telegraphic communications are perfect, fifty-three reports every morning, thirteen every afternoon (except on Sundays), and nineteen each evening. The interruptions which have occurred at times in the communication with Sumburgh Head and Stornoway have again been serious, owing to the severity of the gales which occurred during the winter. The suspension of the afternoon reports on Sundays is due to the fact that almost all the telegraphic circuits are closed at the hours at which the messages would be transmitted. The instructions to the observers have not been altered during the year, and the system of observing cirrus cloud has not been materially extended.

The foreign reporting stations, 23 in number, extend along the entire western coast of the Continent, from Bodö in lat. 67° N. to Corunna in lat. 43° N., and include four stations on the coast of the Baltic, and one in the Mediterranean. The information is received in accordance with arrangements made with the various Meteorological organisations in France, Holland, Germany, Denmark, Norway, and Sweden.

At the British 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.

As fast as the reports come in, the information is entered on a chart, which shows 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 intelligence of storms or of atmospherical disturbance is 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 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 for despatch to the provinces. The last of these messages consists of a brief statement of the general condition of the weather in Western Europe, as shown by the reports for the morning.

It is, however, not only in the morning that storm warnings are issued to the coasts, for a constant watch is 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 1884, there were prepared each morning, afternoon, and evening, Forecasts of the weather, for one 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. 13. The districts for which the Forecasts were prepared were those into which the returns for the Weekly Weather Report are divided, with the addition of Scotland, N., viz. :—

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

The demand for these Forecasts is still considerable, and efforts are constantly being made to increase their accuracy.

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.

The Charts prepared daily for newspaper publication are as follows :—

For the "Times," -	-	two daily, viz.: for 8 a.m. and 6 p.m.
For the Patent Type-founding 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.

The draft of the Daily Weather Report (in its improved form), 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 in London are issued by the lithographer 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.

In addition to the charts referred to above, the Patent Type-founding Company are supplied with various diagrams showing the changes in pressure, temperature, rainfall, wind, and weather for the London district. These are engraved *daily* for the "Daily Chronicle," *weekly* for the "Observer," and "Graphic," and *monthly* for the "Miller." They are all accompanied by remarks on the phenomena exhibited.

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

From 7 to 7.30 p.m. the nineteen 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. 13. The forecast 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 frequently 9 p.m. before they are issued. The "Times" still publishes the daily map showing the distribution of pressure, the winds, temperature, and rainfall at 6 p.m., the importance of which can hardly be over-estimated.

The official charts for 2 p.m. and for 6 p.m. are still much less complete than that for 8 a.m. That for 2 p.m. is drawn on the information received from eleven 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 fifteen stations in the United Kingdom, supplemented by four from continental stations, but the latter frequently 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. They 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 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 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 prompt information of storms to our coasts; but a telegram is sent to Jersey in the same way as on week days, and there is the ordinary interchange of messages with foreign countries. At 6 p.m. the same clerks attend at the Meteorological Office to receive the evening reports and to prepare the 8.30 p.m. Forecasts, and another opportunity is thus offered for the correction or extension of any warnings which may have been issued in the morning.

Daily Weather Report.

A considerable change has been made in the form of the Daily Weather Report since 1st January 1884. The information now fills four large quarto pages, and is arranged as follows:—

Page 1 contains the whole of the reports from which the maps for the day (given on page 2) are prepared; and also the 6 p.m. reports of the previous day; 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 pressure of the atmosphere for the month at 22 stations; (2) a similar map showing the distribution of temperature, the weather at each station, and the distribution of rainfall during the past 24 hours; together with tables of mean temperature of the air and of evaporation at 8 a.m. and the mean rainfall for the month at a large number of stations over the United Kingdom.

Page 3 contains (1) remarks on the principal features exhibited by the reports for the day; 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 after that of publication.

Page 4 contains the reports and remarks for 2 p.m. on the previous day, and there is space for the insertion of a Weekly Summary on Mondays, and any other brief information which it is deemed necessary to print at once.

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

Weekly Summary.

On each Monday a brief Summary of the Weather which has been 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.

In this manner the main meteorological features of the week are presented as a connected story, and additional facility is afforded for future reference.

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; and 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 has appeared since the beginning of February 1878. It consisted originally of four pages octavo, but has now been enlarged to four pages quarto, and has been considerably improved. The Report now contains the average and extreme temperatures and the rainfall values and the total amount of bright sunshine in each week, for ten 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 values for Accumulated Temperature, Rainfall, and Bright Sunshine are given, both for the week and for the whole period since January 1st.

The Accumulated Temperature is 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. It shows for the week, and for the whole period from the 1st January of each 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 accumulated Temperature is expressed in Day-degrees; a Day-degree signifying 1° F. of excess or defect of temperature above or below 42° F. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours.

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 temperature. In other cases this difference gives a value which does not depart greatly from the truth, the deviation depending on the greater or less extent of the 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 will give directly a fair approximation to the accumulated temperature for the day.

The following rules will supply a close approximation to the true values sought, and they have been adopted in 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 mentioned in the last rule.

RULES for computing the ACCUMULATED TEMPERATURE above or below 42° F. from the observed MAXIMUM and MINIMUM.

1. Multiply the difference between the maximum and minimum by the proper coefficient for the month shown, and the result will be the difference between the mean temperature for the day and the minimum.

2. Then the accumulated temperature will be obtained as follows :

Conditions of Temperature	Accumulated Temperature.	
	Above 42° F.	Below 42° F.
If the minimum is <i>above</i> 42° F., or <i>equal</i> to 42° F.	Add to the difference between the mean for the day and the minimum the excess of the minimum over 42° F.; or subtract 42° F. from the mean for the day.	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.	Four-tenths of the excess of 42° F. over the minimum.
If the mean for the day is <i>below</i> 42° F., but the maximum is <i>above</i> 42° F.	Four-tenths of the excess of the maximum over 42° F.	From the difference between the mean for the day and the minimum deduct the accumulated temperature above 42° F.
If the maximum is <i>below</i> 42° F., or <i>equal</i> to 42° F.	None.	From the excess of 42° F. over the minimum deduct the difference between the mean for the day and the minimum: or subtract the mean for the day from 42° F.

3. The quantities thus obtained must be multiplied by the number of days in the period, that is by 7 for a weekly period.

4. The multiplier in Rule 2 for a weekly period, if the base temperature be 32° F. or 42° F., is 0·4; if 52° F. it is 0·33; if 62° F. 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 have been recomputed, those now in use being :—

For Temperature	-	-	20 years 1861-80
„ Rainfall	-	-	15 „ 1866-80

These statistics are given on page 1 of the publication, the temperature, rainfall, and sunshine values for *each station** being given on page 4. In addition to the telegraphic reports, and the returns from the self-recording observatories, weekly returns from 34 volunteer

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

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 - - -	Major F. Holland, for the Duke of Northumberland, K.G.
Arlington (N. Devon) - - -	J. Carter, for Lady Bruce-Chichester.
Bawtry (Hesley Hall) - - -	B. I. Whitaker, F.R. Met. Soc.
Birmingham (Oscott) - - -	Rev. J. W. Browne, St. Mary's College.
Blackpool - - - <i>RM</i>	C. T. Ward, F.R. Met. Soc.
Brookeborough - - -	Mr. Ferguson, for Sir Victor Brooke, Bt., F.L.S.
Cheadle - - - <i>RM</i>	J. C. Philips, F.R. Met. Soc.
Churchstoke - - - <i>RM</i>	P. Wright, F.C.S., F.R. Met. Soc.
Cirencester - - -	The Royal Agricultural College.
Cullompton - - - <i>RM</i>	T. Turner, J.P., F.R. Met. Soc.
Douglas (Isle of Man) - - -	A. W. Moore, F.R. Met. Soc., Cronkbourne
Dublin - - -	J. W. Moore, M.D., F.R. Met. Soc.
Durham - - -	G. A. Goldney, the Observatory.
Foynes - - -	T. J. Carey, for Lord Monteagle.
Geldeston - - -	E. T. Dowson, F.R. Met. Soc.
Hastings (St. Leonard's) - - -	H. Colborne, M.R.C.S.
Hereford - - - <i>RM</i>	T. A. Chapman, M.D., F.R. Met. Soc.
Hillington - - - <i>RM</i>	Rev. H. E. B. Ffolkes, M.A., F.R. Met. Soc.
Kilkenny - - -	H. Carlton, for the Marquis of Ormonde.
Laudale (Loch Sunart) - - -	A. Fletcher, for T. H. G. Newton, F.R. Met. Soc.
Leicester - - -	J. C. Smith, the Museum.
Llandudno - - - <i>RM</i>	J. Nicol, M.D., F.R. Met. Soc.
Londonderry - - -	J. Conroy, F.R. Met. Soc.
Manchester (Prestwich) - - -	T. R. H. Clunn, M.D.
Markree Castle (Sligo) - - -	A. Marth, F.R.A.S., for Colonel Cooper, F.R.A.S.
Marlborough - - - <i>RM</i>	Rev. T. A. Preston, M.A., F.R. Met. Soc.
Newton Reigny (Penrith) - - -	T. G. Benn, F.R. Met. Soc.
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 - - - <i>RM</i>	A. Rowntree, F.R. Met. Soc.
Silloth - - -	Rev. F. Redford, F.R.S.E.
Southampton - - -	J. T. Cook, R.E., Ordnance Survey Office.
Strathfield Turgiss - - - <i>RM</i>	Rev. C. H. Griffith, F.R. Met. Soc.
Waterford (Brook Lodge) - - -	C. Percival Bolton, F.R. Met. Soc.

The returns marked "*RM*" are supplied through the Royal Meteorological Society.

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 is also issued, giving for each of the 12 districts before referred to (1) the Mean Temperature for the Quarter in each year since the year 1878 inclusive, and the means for certain groups of years ; (2) the Total Rainfall for the Quarter in each of the same years ; and (3) the Accumulated Temperature, Rainfall, and Bright Sunshine for the Quarter.

ISSUE OF FORECASTS.

Descriptions of 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. 13.
- (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 general publication, 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 descriptions 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, *in addition to the cost of transmission* ; the charges will therefore be, by *letter* post, 9s. per quarter, by *book* post, 5s. 9d.

* Good Friday and Christmas Day are reckoned as Sundays.

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 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.

SUBSCRIBERS FOR THE LITHOGRAPHED COPY OF THE DAILY REPORT have the 11 a.m. Forecast incorporated with their Report on each week day. The subscription for the Report is—

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

N.B.—Subscriptions must be paid in advance, and end at the usual official quarter day. The subscription for any part of an official quarter is charged as a complete quarter.

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 6.30 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 two shillings in stamps if the reply (not exceeding twenty words) 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 3s. The telegram containing the inquiry must not exceed 20 words in length, and must be addressed to the

METEOROLOGICAL OFFICE,
 LONDON.

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 have been already given in the Report (p. 13).

In carrying out this comparison the portions of the forecasts which referred to wind have been carefully separated from those relating to weather. The final results of the comparison will be found in Appendix XII., p. 76.

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 the several gentlemen who have volunteered to observe for the Office, and whose names will be found in App. XV., p. 87.

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 Light-house 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 1883 will be found on p. 16.

The coasts are subdivided into nine districts, as will be seen in the table. Two large tracts of coast are entirely omitted: 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 tracts of 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 IX.

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

Newspapers :

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

For Exhibition at following Seaports :

Banff.	Dover.
Barrow-in-Furness.	Dundee Harbour-master.
Belfast.	Exeter (2 copies).
Blackpool.	Falmouth.
Bo'ness.	Glasson Dock.
Boscastle.	Great Grimsby (2 copies).
Brighton.	Groomsport.
Briton Ferry.	Hastings.
Broughty Ferry.	Hayle.
Buckie.	Holyhead.
Budehaven.	Kingstown.
Caernarvon (2 copies).	Lancaster.
Cork.	Leith.
Cowes.	Lowestoft.
Cromer.	Margate.
Cullercoats.	Morecambe.
Deptford Yard.	Nairn.

For Exhibition at following Seaports—cont.

Newquay.	Silloth.
Penarth.	Southport.
Plymouth.	Teignmouth.
„ G. W. Docks.	Ventnor (2 copies).
Port Dinorwic.	Weston-super-Mare.
Porthcawl.	Wick.
Queenstown.	Wisbech.
St. Sennen Cove.	Yarmouth.
Scarboro'.	

In exchange for Observations :

Aird, G. H., Seaham.
 Barnstaple Meteorological Committee.
 Bellingham, J. G., Saffron Walden.
 Benn, T. G., F.R. Met. Soc., Newton Reigny.
 Berridge, W., F.R. Met. Soc., Loughborough.
 Cambridge Observatory.
 Chatham, The Instructor in Surveying. (2 copies.)
 Clark, J. E., York.
 Clouston, Rev. C., LL.D., Sandwick, Orkney.
 Colborne, H., M.R.C.S., St. Leonards-on-Sea.
 Conroy, J., F.R. Met. Soc., Londonderry.
 Cooper, Col., F.R.A.S., Markree, nr. Sligo.
 Cooper, W. F., Sheffield.
 Davis, T. H., F.R. Met. Soc., Peel, Isle of Man.
 Dowson, E. T., F.R. Met. Soc., Geldeston, Beccles.
 Durham, University Observatory.
 Glenalmond, Trinity College.
 Greenwich Observatory.
 Leicester Museum.
 Liverpool Observatory.
 McCormack, J., Aberdeen.
 Mellish, H., F.R. Met. Soc., Worksop.
 Moore, A. W., F.R. Met. Soc., 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).
 Pearson, Rev. J., M.A., F.R.A.S., Fleetwood.
 Prestwich Asylum, near Manchester.
 Probert, W. P., LL.D., F.R. Met. Soc., St. David's.
 Radcliffe Observatory, Oxford.
 Richards, W. H., Penzance.
 Rosse, Earl of, F.R.S., Parsonstown.
 Royal Indian C.E. College, Cooper's Hill.
 Rugby Natural History Society.
 St. Mary's College, Oscott.
 Southport, Fernley Observatory.
 Stow, Rev. F. W., M.A., F.R. Met. Soc., Aysgarth
 Bedale.
 Vibert, J. E., M.A., St. Aubin's, Jersey.
 Ward, Rev. B., Ware.
 Yorkshire Philosophical Society.

Government Offices :

Admiralty : 12 copies.
 Aldershot, Garrison Library.
 Army Medical Department.
 Army Medical Department, Woolwich.
 Board of Trade : 3 copies.
 "Britannia," H.M.S., Dartmouth.
 Commons, House of.
 Devonport Dockyard : 2 copies.
 " Commander-in-Chief.
 " Captain of Steam Reserve.
 " Master Attendant.
 Farnborough Station, Staff Commandant's Clerk.
 Dublin, Registrar General.
 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.
 "Resistance," H.M.S., Rock Ferry.
 Royal Military Academy.
 Sandhurst Staff College.
 Science and Art Department : 2 copies.
 Sheerness, Commander-in-Chief.
 " Dockyard.
 War Office, Adjutant General, Horse Guards.
 " Commander-in-Chief.

Societies, &c. :

Association of Underwriters, Liverpool.
 Do. Lloyd's.
 British Museum.
 Buchan, A., F.R.S.E., Edinburgh.
 Crossley, Mrs., Halifax.
 Griffith, Rev. C. H., Strathfield Turgiss.
 Jackson, H. Kains, London.
 Ley, Rev. W. C., M.A., Lutterworth.
 Meteorological Council : 4 copies.
 Miller, S. H., F.R.A.S., Lowestoft.
 Observatories : 7 copies.
 Richards, Vice-Adm., Sir G. H., F.R.S., London.
 Royal Society.
 Royal Meteorological Society.
 Scottish Meteorological Society.

Foreign Places :

Algiers, Meteorological Service.
Bombay, Observatory.
Brussels, Royal Observatory.
Cairo, Laboratoire Khédivial.
Calcutta, Meteorological Department.
Chemnitz, Meteorological Service of Saxony.
Christiania, Meteorological Institute.
Constantinople, Imperial Meteorological Observatory.
Copenhagen, Meteorological Institute.
Cracow, Observatory.
Florence, Museum.
Freedon, W. H. v., Bonn.
Hamburg, Deutsche Seewarte.
Lisbon, Observatory.
Madrid, Royal Observatory.
Melbourne, Observatory.
Paris, Central Meteorological Bureau.
„ Meteorological Observatory, Montsouris.
„ Meteorological Society.
„ Ministry of Marine.
Rome, Meteorological Institute.
San Fernando, Observatory.
St. Petersburg, Central Physical Observatory.
Stockholm, Meteorological Institute.
Tifis, Physical 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 X.

FISHERY BAROMETERS.

LIST of PLACES supplied with FISHERY BAROMETERS.

Shetland Isles.—Balta Sound, Uya Sound, Lerwick, Sandsair, 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, Port Erroll, Findon, Portlethen, Muchals, 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, Portsea, 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.—Port Magee, Valencia, Dingle, Tralee, Tarbert, Kileredane, 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, Babyle, Obb, Ness.

SUMMARY of STATIONS supplied with INSTRUMENTS.

England and Wales -	-	-	-	-	67
Scotland -	-	-	-	-	54
Ireland -	-	-	-	-	47
					<hr/>
					168
					<hr/>

APPENDIX XI.

TELEGRAPHIC WEATHER INTELLIGENCE.

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

81 in England and Wales, 38 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.
Lerwick.	Ramsey.	Ilfracombe.	Eyemouth.
Sealloway.	Douglas.	Barnstaple.	Berwick-on-
Boddam.	Castletown.	Boscastle.	Tweed.
Kirkwall.	Silloth.	Port Isaac.	Tynemouth.
Holborn Head.	Maryport.	Newquay.	S. Shields.
Wick.	Workington.	Hayle.	Sunderland.
Inverness.	Whitehaven.	St. Sennen.	Middlesborough.
Nairn.	Barrow.	St. Just.	Redcar.
Burghhead.	Morecambe.	Scilly.	Whitby.
Lossiemouth.	Fleetwood.	Penzance.	Filey.
Buckie.	Blackpool.	Falmouth.	Bridlington Quay
Portsoy.	Lytham.	Pendennis.	Hull.
Banff.	Southport.	Mevagissey.	Goole.
Fraserburgh.	Runcorn.	Plymouth.	Grimsby.
Peterhead.	Liverpool.	Teignmouth.	Boston.
Aberdeen.		Exmouth.	Sutton Bridge.
Stonehaven.	ENGLAND, W.		Lynn.
Montrose.	Port Penrhyn.		Sheringham.
Broughty Ferry.	Holyhead.		Cromer.
St. Andrews.	Port Dinorwic.		
Dundee.	Carnarvon.		
Anstruther.	*Aberystwith.	ENGLAND, S.	ENGLAND, S.E.
Pittenweem.	Milford.	Guernsey.	Yarmouth.
Burntisland.	Pembrey.	St. Helier's, Jersey.	Southwold.
Grangemouth.	Swansea.	Gorey, Jersey.	Ipswich.
Bo'ness.	Llanelli.	Weymouth.	Harwich.
Granton.	Briton Ferry.	Poole.	Chatham.
Leith.	Portcawl.	Cowes.	Sheerness.
Newhaven.	Penarth.	Ryde.	Faversham.
Fisherrow.	Cardiff.	Portsmouth.	
Dunbar.	Newport.	Littlehampton.	
Cove.	Burnham.	Brighton.	
	*Bridgewater.	Newhaven.	
		Hastings.	
	IRELAND, E.	Rye.	
	Belfast.	Dover.	
	Dougnadee.	Margate.	
	Howth.		
	Kingstown.		
FIRTH OF CLYDE.			
Glasgow.	IRELAND, S. and W.		
Greenock.	New Ross.		
Rothesay.	Dunmore East.		
Campbelton.	Dungarvan.		
Girvan.	Youghal.		
Ballantrae.	Queenstown.		
	Passage.		
	Cork.		
	Kinsale.		
	Tralee.		
	Limerick.		
	Galway.		

* Telegrams (only) exhibited.

Circular No. 717.

TELEGRAPHIC WEATHER INTELLIGENCE.

Board of Trade, February 14th, 1874.

THE Board of Trade have been informed by the Meteorological Committee that they are now prepared to re-introduce the use of Admiral FitzRoy's signals (cones and drum) with slightly modified significations, and that the change will take effect on and after 15th March 1874.

The signals to be used will 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.
- 3°. Drum, *with cone*, to indicate the probable approach of a *very heavy gale* from the direction indicated by the cone.*

The drum will not be used without the cone.

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, as pointed out in the explanatory pamphlet† sent herewith, copies of which are supplied for gratuitous distribution.

It will be seen from the pamphlet in question that 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 will supply 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., as directed by the Circular No. 278, dated 30th November 1867.

THOMAS GRAY.

APPENDIX XII.

REPORT ON THE COMPARISON OF THE FORECASTS WITH THE WEATHER
SUBSEQUENTLY EXPERIENCED, for the 12 Months, April 1883 to
March 1884.

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 13.

* The "drum" is not in use at present.

† The "explanatory pamphlet" referred to is a circular entitled "Telegraphic Weather Intelligence" printed in large type on four pages, so as to be posted up on a board.

DISTRICTS.		APRIL 1883.				MAY 1883.				JUNE 1883.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.
SCOTLAND, N.	a	53	60	57	81	55	58	57	84	43	50	47	92
"	b	37	17	27		35	19	27		50	40	45	
"	c	7	7	7		10	13	11		7	7	7	
"	d	3	16	9		0	10	5		0	3	1	
SCOTLAND, E.	a	63	57	60	92	61	52	57	78	57	50	54	87
"	b	27	37	32		29	13	21		37	30	33	
"	c	0	3	2		7	16	11		3	3	3	
"	d	10	3	6		3	19	11		3	17	10	
ENGLAND, N.E.	a	47	50	49	77	68	52	60	85	48	57	53	87
"	b	33	23	28		23	28	25		46	23	34	
"	c	17	27	22		0	6	3		7	7	7	
"	d	3	0	1		9	16	12		0	13	6	
ENGLAND, E.	a	57	50	54	84	49	39	44	81	55	37	46	85
"	b	27	33	30		42	32	37		38	40	39	
"	c	3	7	5		3	26	15		7	10	9	
"	d	13	10	11		6	3	4		0	13	6	
MIDLAND Cos.	a	53	43	48	75	58	42	50	82	48	50	49	77
"	b	27	27	27		32	32	32		35	20	28	
"	c	7	27	17		3	16	10		17	17	17	
"	d	13	3	8		7	10	8		0	13	6	
ENGLAND, S.	a	43	50	47	80	58	45	52	80	52	44	48	82
"	b	27	40	33		36	39	37		34	33	34	
"	c	7	7	7		3	6	5		14	10	12	
"	d	23	3	13		3	10	6		0	13	6	
SCOTLAND, W.	a	27	44	36	76	52	45	49	83	40	57	49	87
"	b	17	33	25		42	26	34		40	37	38	
"	c	13	10	11		3	10	11		17	3	10	
"	d	13	13	13		3	10	6		3	3	3	
ENGLAND, N.W.	a	37	60	49	87	52	45	49	76	53	50	52	82
"	b	47	30	38		35	19	27		37	24	30	
"	c	3	3	3		10	23	16		10	13	12	
"	d	13	7	10		3	13	8		0	13	6	
ENGLAND, S.W.	a	30	54	42	82	58	42	50	82	45	47	46	78
"	b	40	40	40		32	33	36		41	23	32	
"	c	20	3	12		7	10	8		7	13	10	
"	d	10	3	6		3	9	6		7	17	12	
IRELAND, N.	a	30	60	45	76	55	40	52	82	48	60	54	82
"	b	44	17	31		26	15	36		38	24	31	
"	c	13	7	10		6	6	6		4	13	9	
"	d	13	16	14		13	0	6		10	3	6	
IRELAND, S.	a	44	57	51	79	58	45	52	86	62	37	50	86
"	b	33	23	28		26	42	34		21	40	30	
"	c	10	3	6		3	7	5		10	13	12	
"	d	13	17	15		13	6	5		7	10	8	

SUMMARY.

BRITISH ISLES	a	44	53	49	81	57	47	52	83	50	40	50	81
"	b	35	29	32		32	30	31		38	30	34	
"	c	9	10	9		5	13	9		9	10	9	
"	d	12	8	10		6	10	8		3	11	7	

DISTRICTS.		APRIL 1883.				MAY 1883.				JUNE 1883.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.	Wind.	Weather.	Average.	a + b.
SCOTLAND, N.	a	53	60	57		55	58	57		43	50	47	
"	b	37	17	27		35	19	27		50	40	45	
"	c	7	7	7	84	10	13	11	84	7	7	7	92
"	d	3	16	9		0	10	5		0	3	1	
SCOTLAND, E.	a	63	57	60		61	52	57		57	50	54	
"	b	27	17	32		29	13	21		37	30	33	
"	c	0	3	2	92	7	16	11	78	3	3	3	87
"	d	10	3	6		3	19	11		3	17	10	
ENGLAND, N.E.	a	47	50	49		68	52	60		48	57	53	
"	b	33	23	28		23	26	25		45	23	34	
"	c	17	27	23	77	0	6	3	85	7	7	7	87
"	d	3	0	1		9	16	12		0	13	6	
ENGLAND, E.	a	57	50	54		49	39	44		55	37	46	
"	b	27	33	30		42	32	37		38	40	39	
"	c	3	7	5	84	3	26	15	81	7	10	9	85
"	d	13	10	11		6	3	4		0	13	6	
MIDLAND COS.	a	53	43	48		58	42	50		48	50	49	
"	b	27	27	27		32	32	32		35	30	28	
"	c	7	27	17	75	3	16	10	82	17	17	17	77
"	d	13	3	8		7	10	8		0	13	6	
ENGLAND, S.	a	43	50	47		58	45	52		52	44	48	
"	b	27	40	33		36	39	37		34	33	34	
"	c	7	7	7	80	3	6	5	89	14	10	12	82
"	d	23	3	13		3	10	6		0	13	6	
SCOTLAND, W.	a	27	44	36		52	45	49		40	57	49	
"	b	47	33	40		42	26	34		40	37	38	
"	c	13	10	11	76	3	19	11	83	17	3	10	87
"	d	13	13	13		3	10	6		3	3	3	
ENGLAND, N.W.	a	37	60	49		52	45	49		53	50	52	
"	b	47	30	38		35	19	27		37	24	30	
"	c	3	3	3	87	10	23	16	76	10	13	12	82
"	d	13	7	10		3	13	8		0	13	6	
ENGLAND, S.W.	a	30	54	42		58	42	50		45	47	46	
"	b	40	40	40		32	39	36		41	23	32	
"	c	20	3	12	82	7	10	8	86	7	13	10	75
"	d	10	3	6		3	9	6		7	17	12	
IRELAND, N.	a	30	60	45		55	49	52		48	60	54	
"	b	44	17	31		26	45	36		38	24	31	
"	c	13	7	10	76	6	6	6	88	4	13	9	85
"	d	13	16	14		13	0	6		10	3	6	
IRELAND, S.	a	44	57	51		58	45	52		62	37	50	
"	b	33	23	28		26	42	34		21	40	30	
"	c	10	3	6	79	3	7	5	86	10	13	12	80
"	d	13	17	15		13	6	9		7	10	8	

SUMMARY.

BRITISH ISLES	a	44	53	49		57	47	52		50	49	50	
"	b	35	29	32		32	30	31		38	30	34	
"	c	9	10	9	81	5	13	9	83	9	10	9	84
"	d	12	8	10		6	10	8		3	11	7	

DISTRICTS.		JULY 1883.				AUGUST 1883.				SEPTEMBER 1883.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.
SCOTLAND, N.	a	58	42	50	86	26	42	34	80	63	40	52	75
"	b	26	45	36		52	39	46		13	34	23	
"	c	6	7	6		19	13	16		7	13	16	
"	d	10	6	8		3	6	4		17	13	15	
SCOTLAND, E.	a	19	61	55	83	32	53	42	79	57	37	47	80
"	b	42	13	28		45	29	37		23	43	33	
"	c	6	20	12		16	6	11		7	7	7	
"	d	3	6	4		7	13	10		13	13	13	
ENGLAND, N.E.	a	78	48	63	84	55	39	47	83	47	40	44	80
"	b	19	26	23		35	36	36		33	40	36	
"	c	3	16	9		7	6	6		7	10	9	
"	d	0	10	5		3	19	11		13	10	11	
ENGLAND, E.	a	90	39	65	92	52	42	47	86	43	37	40	80
"	b	10	45	27		39	39	39		49	40	40	
"	c	6	16	8		6	6	6		7	13	10	
"	d	0	0	0		3	13	8		10	10	10	
MIDLAND COS.	a	71	48	60	92	52	29	41	83	50	33	42	82
"	b	26	39	32		42	42	42		33	47	40	
"	c	0	16	5		6	19	9		10	16	10	
"	d	3	3	3		6	10	8		7	10	8	
ENGLAND, S.	a	87	55	71	91	62	45	54	86	47	33	40	82
"	b	13	26	29		32	32	32		30	54	42	
"	c	0	16	8		3	10	6		10	10	10	
"	d	0	3	1		3	13	8		13	8	8	
SCOTLAND, W.	a	58	35	47	77	45	45	45	81	33	47	40	74
"	b	32	29	30		35	26	36		30	37	34	
"	c	3	19	7		10	13	11		17	3	10	
"	d	7	26	16		10	6	8		20	30	16	
ENGLAND, N.W.	a	55	23	39	70	52	52	52	86	40	47	44	77
"	b	32	38	35		32	29	31		10	27	23	
"	c	10	16	13		13	13	13		7	10	9	
"	d	3	13	8		3	6	4		13	10	14	
ENGLAND, S.W.	a	78	52	65	96	55	48	52	79	35	35	35	75
"	b	16	15	31		29	20	24		34	43	40	
"	c	3	3	3		3	19	11		14	17	15	
"	d	3	0	1		13	13	13		17	3	10	
IRELAND, N.	a	42	42	42	76	55	55	55	81	57	59	58	82
"	b	39	29	34		23	29	26		27	21	24	
"	c	10	16	13		6	10	8		3	10	7	
"	d	9	13	11		16	6	11		13	10	11	
IRELAND, S.	a	58	35	47	84	26	39	33	78	52	39	46	69
"	b	23	52	37		52	39	45		21	25	23	
"	c	6	10	8		16	9	13		10	18	14	
"	d	13	3	3		6	13	9		17	18	17	

SUMMARY.

BRITISH ISLES	a	66	41	55	86	46	41	45	81	48	41	45	78
"	b	25	36	31		38	34	36		29	37	33	
"	c	4	13	8		9	11	10		9	11	10	
"	d	5	7	6		7	11	9		14	11	12	

DISTRICTS.		JULY 1883.				AUGUST 1883.				SEPTEMBER 1883.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.
SCOTLAND, N.	a	58	42	50	86	26	42	34	80	63	40	52	75
"	b	26	45	36		52	39	46		13	34	23	
"	c	6	7	6		19	13	16		7	13	10	
"	d	10	6	8		3	6	4		17	13	15	
SCOTLAND, E.	a	49	61	55	83	32	52	42	79	57	37	47	89
"	b	42	13	28		45	29	37		23	43	33	
"	c	6	20	13		16	6	11		7	7	7	
"	d	3	6	4		7	13	10		13	13	13	
ENGLAND, N.E.	a	78	48	63	86	55	39	47	83	47	40	44	80
"	b	19	26	23		35	36	36		33	40	36	
"	c	3	16	9		7	6	6		7	10	9	
"	d	0	10	5		3	19	11		13	10	11	
ENGLAND, E.	a	90	39	65	92	52	42	47	86	43	37	40	80
"	b	10	45	27		39	39	39		40	40	40	
"	c	0	16	8		6	6	6		7	13	10	
"	d	0	0	0		3	13	8		10	10	10	
MIDLAND COS.	a	71	48	60	92	52	29	41	83	50	33	42	82
"	b	26	39	32		42	42	42		33	47	40	
"	c	0	10	5		0	19	9		10	10	10	
"	d	3	3	3		6	10	8		7	10	8	
ENGLAND, S.	a	87	55	71	91	62	45	54	86	47	33	40	82
"	b	13	26	20		32	32	32		30	54	42	
"	c	0	16	8		3	10	6		10	10	10	
"	d	0	3	1		3	13	8		13	8	8	
SCOTLAND, W.	a	58	35	47	77	45	45	45	81	33	47	40	74
"	b	32	29	30		35	36	36		30	37	34	
"	c	3	10	7		10	13	11		17	3	10	
"	d	7	26	16		10	6	8		20	50	16	
ENGLAND, N.W.	a	55	23	39	79	52	52	52	83	40	47	44	77
"	b	32	48	40		32	29	31		40	27	33	
"	c	10	16	13		13	13	13		7	10	9	
"	d	3	13	8		3	6	4		13	16	14	
ENGLAND, S.W.	a	78	52	65	96	55	48	52	76	35	35	35	75
"	b	16	45	31		29	20	24		34	45	40	
"	c	3	3	3		3	19	11		14	17	15	
"	d	3	0	1		13	13	13		17	3	10	
IRELAND, N.	a	42	42	42	76	55	55	55	81	57	59	58	82
"	b	39	29	34		23	29	26		27	21	24	
"	c	10	16	13		6	10	8		3	10	7	
"	d	9	13	11		16	6	11		13	10	11	
IRELAND, S.	a	58	35	47	84	26	39	33	78	52	39	46	69
"	b	23	52	37		52	39	45		21	25	23	
"	c	6	10	8		16	9	13		10	18	14	
"	d	13	3	8		6	13	9		17	18	17	

SUMMARY.

BRITISH ISLES	a	66	44	55	86	46	44	45	81	48	41	45	78
"	b	25	36	31		38	34	36		29	37	33	
"	c	4	13	8		9	11	10		9	11	10	
"	d	5	7	6		7	11	9		14	11	12	

DISTRICTS.		OCTOBER 1883.				NOVEMBER 1883.				DECEMBER 1883.			
		Percentage.				Percentage.				Percentages.			
		Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.
SCOTLAND, N.	a	42	42	42	80	44	67	56	81	37	70	54	82
"	b	36	39	38		39	20	25		40	17	28	
"	c	16	6	11		13	13	13		13	3	8	
"	d	6	13	9		13	0	6		10	10	10	
SCOTLAND, E.	a	49	49	49	88	44	57	51	77	43	54	49	77
"	b	35	42	39		33	20	26		33	23	28	
"	c	16	6	11		10	13	12		17	7	12	
"	d	0	3	1		13	10	11		7	16	11	
ENGLAND, N.E.	a	49	45	47	78	60	40	50	82	54	37	46	77
"	b	29	32	31		24	10	32		23	40	31	
"	c	19	16	17		3	17	10		20	13	17	
"	d	3	7	5		13	3	8		3	10	6	
ENGLAND, E.	a	65	48	57	92	64	40	52	83	43	50	47	77
"	b	29	42	35		23	40	31		40	20	30	
"	c	6	3	5		10	13	12		10	23	16	
"	d	0	7	3		3	7	5		7	7	7	
MIDLAND COS.	a	58	58	58	89	50	50	50	82	50	60	55	82
"	b	36	26	31		37	27	32		33	20	27	
"	c	3	6	5		7	13	10		10	10	10	
"	d	3	10	6		6	10	8		7	10	8	
ENGLAND, S.	a	71	65	68	93	50	57	54	82	53	47	50	82
"	b	26	23	25		33	23	28		37	27	32	
"	c	3	9	6		10	10	10		7	13	10	
"	d	0	3	1		7	10	8		3	13	8	
SCOTLAND, W.	a	29	42	36	73	40	47	44	79	17	57	37	71
"	b	26	49	37		37	33	35		10	27	34	
"	c	29	3	16		17	7	12		27	10	18	
"	d	16	6	11		6	13	9		16	6	11	
ENGLAND, N.W.	a	29	36	33	3	23	54	39	84	34	53	44	70
"	b	35	45	40		57	33	45		33	20	26	
"	c	26	13	19		13	13	13		20	10	15	
"	d	10	6	8		7	9	3		13	17	15	
ENGLAND, S.W.	a	42	45	44	79	50	53	52	84	47	47	47	79
"	b	26	45	35		37	27	32		33	30	32	
"	c	26	7	17		10	13	11		17	10	12	
"	d	6	3	4		3	7	5		3	12	8	
IRELAND, N.	a	32	45	39	76	44	54	49	82	40	67	54	77
"	b	39	35	37		33	33	33		33	15	23	
"	c	19	10	14		13	13	13		10	17	13	
"	d	10	10	10		10	0	5		17	3	10	
IRELAND, S.	a	45	42	44	78	40	57	49	77	33	53	43	80
"	b	26	42	34		30	27	28		37	37	37	
"	c	10	13	11		17	10	14		13	7	10	
"	d	19	3	11		13	6	9		17	3	10	

SUMMARY.

BRITISH ISLES	a	46	47	47	81	46	53	50	81	41	54	48	78
"	b	31	38	34		34	29	31		35	25	30	
"	c	16	8	12		11	12	12		15	11	13	
"	d	7	7	7		9	6	7		9	10	9	

DISTRICTS		JANUARY 1884.				FEBRUARY 1884.				MARCH 1884.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.
SCOTLAND, N.	a	21	46	31	76	39	48	44	78	45	65	57	88
"	b	42	42	42		36	33	34		39	53	31	
"	c	13	1	11		21	15	18		13	3	8	
"	d	12	8	10		4	4	4		6	9	4	
SCOTLAND, E.	a	38	58	38	63	38	36	37	70	68	58	63	89
"	b	25	25	25		31	16	39		26	20	23	
"	c	16	16	16		25	7	17		6	13	10	
"	d	21	21	21		3	11	7		6	3	1	
ENGLAND, N.E.	a	43	47	45	77	48	42	45	77	55	43	49	84
"	b	42	32	37		21	31	26		32	37	35	
"	c	11	11	11		17	7	12		16	8	6	
"	d	41	7	9		11	17	11		3	17	10	
ENGLAND, E.	a	46	47	46	82	44	38	41	77	50	40	45	88
"	b	47	29	34		45	11	13		37	13	10	
"	c	7	14	11		24	11	18		3	10	7	
"	d	9	31	7		10	7	8		16	7	8	
MIDLAND, COS.	a	36	37	37	72	42	33	37	77	64	37	40	77
"	b	51	36	45		31	15	38		23	16	31	
"	c	7	4	5		24	3	15		7	17	12	
"	d	3	3	3		3	21	12		10	4	8	
ENGLAND, S.	a	61	54	58	70	38	38	38	78	58	46	49	79
"	b	32	32	32		38	41	40		23	37	30	
"	c	6	7	3		17	11	15		10	20	15	
"	d	7	7	7		7	7	7		9	3	6	
SCOTLAND, W.	a	21	50	36	71	25	36	31	67	12	54	48	81
"	b	42	39	35		32	36	34		12	23	33	
"	c	21	17	19		36	18	27		19	16	16	
"	d	16	4	10		7	10	8		4	13	9	
ENGLAND, N.W.	a	26	30	28	76	36	36	36	77	37	55	55	80
"	b	41	52	48		43	30	41		30	20	25	
"	c	15	11	13		18	11	15		16	17	14	
"	d	15	7	11		3	14	8		3	16	6	
ENGLAND, S.W.	a	32	36	34	84	48	48	48	78	54	52	53	85
"	b	50	59	50		31	28	30		10	27	34	
"	c	11	3	7		11	17	15		3	14	8	
"	d	7	11	9		7	7	7		3	7	5	
IRELAND, N.	a	64	54	59	81	55	68	62	85	50	57	54	85
"	b	14	36	25		35	11	23		32	32	32	
"	c	11	7	9		3	7	5		11	11	11	
"	d	11	3	7		7	14	10		7	0	3	
IRELAND, S.	a	43	50	47	79	45	61	53	79	50	57	54	85
"	b	28	36	32		31	21	26		25	32	28	
"	c	18	7	12		16	4	7		7	7	7	
"	d	11	7	9		11	14	11		18	4	11	

SUMMARY.

BRITISH ISLES	a	39	46	43	79	40	44	42	76	51	51	53	84
"	b	37	36	36		31	33	31		32	31	31	
"	c	13	10	12		19	11	15		8	11	10	
"	d	11	8	9		7	11	9		6	7	6	

DISTRICTS.		JANUARY 1884.				FEBRUARY 1884.				MARCH 1884.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.
SCOTLAND, N.	a	21	46	34	76	39	48	44	78	48	65	57	88
"	b	42	42	42		36	33	34		39	23	31	
"	c	25	4	14		21	15	18		13	3	8	
"	d	12	8	10		4	4	4		0	9	4	
SCOTLAND, E.	a	38	38	38	63	38	36	37	76	68	58	63	89
"	b	25	25	25		31	46	39		26	26	26	
"	c	16	16	16		23	7	17		6	13	10	
"	d	21	21	21		3	11	7		0	3	1	
ENGLAND, N.E.	a	43	47	45	77	48	42	45	74	55	43	49	84
"	b	32	32	32		24	34	29		32	37	35	
"	c	14	14	14		17	7	12		16	3	6	
"	d	11	7	9		11	17	14		3	17	10	
ENGLAND, E.	a	46	46	46	82	24	38	31	74	50	40	45	83
"	b	43	29	36		45	41	43		37	43	49	
"	c	7	14	11		21	14	18		3	10	7	
"	d	4	11	7		10	7	8		10	7	8	
MIDLAND COS.	a	36	57	47	92	42	31	37	75	60	37	49	77
"	b	54	36	45		31	45	38		23	40	31	
"	c	7	4	5		24	3	13		7	17	12	
"	d	3	3	3		3	21	12		10	6	8	
ENGLAND, S.	a	61	54	58	90	38	38	38	78	58	40	49	79
"	b	32	32	32		38	41	40		23	37	30	
"	c	0	7	3		17	14	15		10	20	15	
"	d	7	7	7		7	7	7		9	3	6	
SCOTLAND, W.	a	21	50	36	71	25	36	31	65	42	54	48	81
"	b	42	29	35		32	36	34		42	23	33	
"	c	21	17	19		36	18	27		10	10	10	
"	d	16	4	10		7	10	8		6	13	9	
ENGLAND, N.W.	a	26	39	28	76	36	36	36	77	57	53	55	80
"	b	44	62	48		43	30	41		30	20	25	
"	c	15	11	13		18	11	15		10	17	14	
"	d	15	7	11		3	14	8		3	10	6	
ENGLAND, S.W.	a	32	36	34	84	48	48	48	78	54	52	53	87
"	b	50	50	50		31	28	30		40	27	34	
"	c	11	3	7		14	17	15		3	14	8	
"	d	7	11	9		7	7	7		3	7	5	
IRELAND, N.	a	64	54	59	84	55	68	62	85	50	57	54	85
"	b	14	36	25		35	11	23		32	32	32	
"	c	11	7	9		3	7	5		11	11	11	
"	d	11	3	7		7	14	10		7	0	3	
IRELAND, S.	a	43	50	47	79	45	61	53	79	50	57	54	82
"	b	28	36	32		31	21	26		25	32	28	
"	c	18	7	12		10	4	7		7	7	7	
"	d	11	7	9		14	14	14		18	4	11	

SUMMARY.

BRITISH ISLES	a	39	46	43	79	40	44	42	76	54	51	53	84
"	b	37	36	36		34	34	34		32	31	31	
"	c	13	10	12		19	11	15		8	11	10	
"	d	11	8	9		7	11	9		6	7	6	

APPENDIX XIII.

LIST of STATIONS from which DAILY SYNCHRONOUS OBSERVATIONS
(at Oh. Sm. p.m. G. M. T.) have been received in 1883.

Stations.	Observers.	Remarks.
ENGLAND AND WALES.		
Bolton - - -	Rev. T. Mackereth, F.R.A.S.	--
Bradford - - -	J. McLandsborough, F.R.A.S., F.R. Met. Soc.	--
Cardington - - -	J. McLaren, F.R. Met. Soc.	--
Chatham, School of Military Engineering.	G. A. Pickles, L.-Corp., 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, Jan.	--
Oscott (St. Mary's Col.)	Rev. J. W. Browne.	--
Oxford, Radcliffe Obs. -	The Staff.	--
Plymouth - - -	J. Merrifield, LL.D., F.R.A.S.	--
Sheffield - - -	W. F. Cooper.	--
Silloth - - -	Rev. F. Redford, M.A., F.R.S.E.	--
Stonyhurst Observatory -	The Staff.	--
Strathfield Turgiss -	Rev. C. H. Griffith, M.A., F.R. Met. Soc.	--
Truro (Royal Institution)	W. Newcombe.	--
SCOTLAND.		
Aberdeen Observatory -	The Staff.	--
Glasgow Observatory -	The Staff.	--
Orkneys (Sandwick House).	Rev. C. Clouston, LL.D.	--
IRELAND.		
Armagh Observatory -	Dr. J. L. E. Dreyer.	--
Galway, Queen's College	M. J. O'Donoghue.	--
Valencia Observatory -	The Staff.	--
BRITISH COLONIES, POSSESSIONS, &c.		
Barbados, W. I. -	Surgeon-Maj. in charge.	--
Gibraltar - - -	Surgeon Gen. in charge.	--
Malta - - -	A. King.	--
Nassau (Bahamas) -	C. L. Duncombe.	--
Natal - - -	Surgeon-Maj. in charge.	--
Scutari, British Cemetery	Serg. W. H. Lyne, R.E.	--
Sierra Leone - - -	Surgeon-Maj. in charge.	--

SUMMARY.

England and Wales -	18
Scotland - - -	3
Ireland - - -	3
Colonies and British Possessions -	7
Total	31

APPENDIX XIV.

METHODS FOLLOWED IN DEALING WITH METEOROLOGICAL RETURNS FROM LAND STATIONS IN THE UNITED KINGDOM.

These stations are of five classes, as stated on page 19.

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

Returns from
observatories.

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 and wet-bulb thermograms, of the anemograms, and of Beckley's rain-gauge curves.

Examination of
returns.

The measurements are subjected to a careful examination in order to ensure as far as possible their accuracy, and the regulations which have been adopted to secure this end will be found fully detailed 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 measures 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 and printed in their minutes. The curves and tabulations are eventually bound and stored in the Office.

Results of
examination and
report to
Council.

Chart plates.

In the more recent numbers of the Quarterly Weather Report (for 1876) plates of charts are issued showing the conditions of barometrical pressure and wind for Western Europe for 8 a.m. and 6 p.m. each day, each plate containing 36 charts.

General super-
vision of
observatory
work.

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

Harmonic
analyser.

The photographic curves are also used in the harmonic analyser; they require little or no preparation for this purpose beyond that necessary for their reduction for the Quarterly Weather Report.

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

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

The 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 obtained by addition. Means.

The hourly vapour tension is then computed by an expansion of Glaisher's Hygrometrical Tables, prepared in the Office, and the work 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, and the extremes and daily range of pressure and temperature, and the whole series is printed and published under the title of "Hourly Readings from the Self-recording Instruments at the Seven Observatories under the Meteorological Office." Hourly Readings.

To ensure accuracy the sheets are read over in proof with the originals. The interpolated readings are printed in *italic* type, but no distinguishing mark is affixed to the 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 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, have hitherto been published as an appendix to the Quarterly Weather Report, but in future, beginning with the volume for 1881, these values will be printed at the end of the "Hourly Readings." As before the tables will be repeated in French measures. Tables for the Quarterly Weather Report.

The gale tables printed in the text of the Quarterly Weather Report and of its successor, the Monthly 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 six extra anemographic stations. Gale tables.

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

The anemograms received from the six stations enumerated on page 87 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 chronicle 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 Origin and progress of the system.

15, and five years later to 49, including 14 stations belonging to the Meteorological Society (London), copies of the returns from which were sent to the Office under a special arrangement with the Society.

At the end of the present year the total number of stations is 74, including 15 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: 42 in England, 4 in Wales, 12 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, 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 are actually published on the A. Form, and the list could be at once increased, if thought desirable.

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 of the returns.

All the returns selected for publication on Form A. are carefully examined and compared before being copied for the printer. The reduction of all the barometer readings to 32° Fahr. at mean sea level is checked, and the corrected readings are then compared with the isobars on the Daily Weather Charts and readings at neighbouring stations for the day, allowance being made for any difference in time and the corresponding change in barometric pressure.

The correction of the readings of the dry-bulb and damp-bulb thermometers is checked, and the maxima and minima temperatures are compared with the dry-bulb thermometer readings over the same periods to ensure that they are the extreme temperatures registered.

The computed values of the vapour tension and the relative humidity are examined from the tables. The cloud amount is compared with the weather at the time of observation, and finally, the sums and means are all re-calculated.

Doubtful readings.

If any readings are doubtful, reference is made through the observer to the original observation book. If no fresh light is thrown on the question by this means, and if on reconsideration the reading still appears to be wrong, it is rejected, and the probable reading is inserted in its place, but printed in different type as an interpolation. These probable readings are used in obtaining the monthly means. Similarly,

if from any cause a set of readings has been omitted, the gap is filled by an interpolation, and the probable values are printed in different type.

Apparent errors, or discrepancies, in the working on the sheet are also referred to the observer before alteration.

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.

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 43 for the year 1880, 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 bi-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 mean 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.

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 29 stations in the British Islands are examined generally to guard against accidental changes in the adjustment of the instrument. After their receipt has been acknowledged, the cards are duly stamped and dated and then stored in the Office.

if from any cause a set of readings has been omitted, the gap is filled by an interpolation, and the probable values are printed in different type.

Apparent errors, or discrepancies, in the working on the sheet are also referred to the observer before alteration.

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.

Unpunctual
observations.

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 43 for the year 1880, 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 bi-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 mean 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.

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.

New stations.

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 29 Stations in the British Islands are examined generally to guard against accidental changes in the adjustment of the instrument. After their receipt has been acknowledged, the cards are duly stamped and dated and then stored in the Office.

Sunshine
records.

A tabulation of these curves is published as part of the Weekly Weather Report, mentioned in Appendix VIII.

The curves for 1881 have themselves been engraved and published.

Inspection.

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

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 VIII. A paragraph in that Appendix (p. 64) explains the use that is made of the monthly schedules sent in by the observers.

V.—*Extra Stations.*

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

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

APPENDIX XV.

LIST OF DOCUMENTS RELATING TO THE LAND METEOROLOGY OF THE BRITISH ISLANDS, RECEIVED DURING THE YEAR ENDING
MARCH 31ST, 1884.

Stations.	Observers.	Nature of Information received.	Notes.
I. †Valencia	J. E. Callum -	-	Stopped at end of 1883.
†Armagh	S. Call, for J. L. E. Dreyer, Ph.D., F.R.A.S. -	-	" "
†Glasgow	Prof. R. Grant, LL.D., F.R.S. -	-	" "
†Aberdeen	Prof. C. Niven, M.A., F.R.S. -	Continuous records of pressure, temperature, wind, sunshine, and rain, with notes on the weather.	
†Palmouth	E. Kitto -	-	
†Stonyhurst	Rev. S. J. Perry, F.R.S. -	-	
†Kew	G. M. Whipple, F.R.S. -	-	
II. Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S. -	Continuous record of wind and rainfall	From January 1884.
†Alnwick Castle	Major F. Holland, for the Duke of Northumberland, K.G. -	Continuous record of wind (direction and velocity).	
†Holyhead	Hugh Williams, C.E. -	"	
†Sandwick	Rev. C. Clouston, LL.D. -	"	
Seaham	G. H. Aird -	"	
†Scilly	W. Thomas -	"	
†Yarmouth	G. T. Watson -	"	
Waterford	The Harbour Authorities -	Continuous record of pressure.	
III. †Armagh	J. L. E. Dreyer, Ph.D., F.R.A.S. -	-	From January 1884.
Aysgarth	Rev. Fenwick W. Stow, M.A., F.R. Met. Soc. -	-	
†Balaacomb	E. E. Glyde, F.R. Met. Soc. -	-	
†Braemar	James Aitken, Esq. -	-	
†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, wind, cloud and weather, with the daily maxima and minima of temperature, and rainfall, and remarks on the weather generally.	
†Carnarvon	G. J. Hearley, M.D. -	-	
Chatham	Col. Sir C. Warren, R.E., C.B., K.C.M.G. -	-	
†Cheale	J. C. Phillips, F.R. Met. Soc. -	-	
†Cheltenham	R. Tyrer, B.A., F.R. Met. Soc. -	-	
†Churchstoke	Philip Wright, F.C.S., F.R. Met. Soc. -	-	
†Cirencester	R. Gorton -	-	

LIST OF DOCUMENTS—continued.

Stations	Observers	Nature of Information received.	Notes.
† Colabaoda -	W. Beagum, for Sir Victor Brooke, Bt., F.R.S.		
† Douglas, Isle of Man -	A. W. Moore, F.R. Met. Soc.		
† Dublin & Botanic Gardens, Glasnevin &c.	F. W. Moore -		
† Dublin (City) -	J. W. Moore, M.D., F.R. Met. Soc.		
† Dublin (Phoenix Park) -	Col. R. H. Stothard, R.E.		
† Dundee -	W. Ross McKelvie -		
†† Dunrobin Castle -	D. Melville -		
Durham -	G. A. Goldney -		
Gedeston (Suffolk) -	E. T. Dowson, F.R. Met. Soc.		
Glenabronn -	W. Bezan Lowe, M.A.		
† Hillington -	Rev. H. Folkes, M.A., F.R. Met. Soc.		
† Inverness -	James Ferguson -		
† Jersey (St. Aubin's) -	J. E. Vibert, M.A. -		
† Killarney -	Rev. G. R. Wynne, F.R. Met. Soc.		
† Llandale (Argyleshire) -	A. Fletcher, for T. H. G. Newton, M.A., F.R. Met. Soc.		
† Llandudno -	J. Nicol, M.D., F.R. Met. Soc.		
Leicester -	J. C. Smith, for Museum Authorities -		
† Londonderry -	J. Conroy, F.R. Met. Soc.		
† Margate -	J. Stokes, F.R. Met. Soc.		
† Markree Castle, Sligo -	E. Salles, and A. Marth, F.R.A.S., for Col. Cooper, F.R.A.S.		
† Marlborough -	Rev. T. A. Preston, M.A., F.R. Met. Soc.		
Newton Regency (Pentwith).	T. G. Benn, F.R. Met. Soc.		
† Oscott -	Revs. J. W. Browne and J. O'Hendon -		
† Parsonstown -	George Phillips, for the Earl of Rosse, F.R.S.		
† Peel, Isle of Man -	T. H. Davis, F.R. Met. Soc.		
		Regular observations at 9 a.m. and 9 p.m. of pressure, temperature, wind, cloud and weather, with the daily maxima and minima of temperature, and rainfall, and remarks on the weather generally.	From January 1884.

LIST OF DOCUMENTS--continued.

Stations.	Observers.	Nature of information received.	Notes.
<p> [†] Pinmore - [†] Prestwich - [†] Rothsay - [†] Sandwick - [†] Sealby - [†] Scarborough - [†] Seaham - [†] Southampton - [†] Stokesay - [†] Stonyhurst - [†] Strathfield Turgiss - [†] St. David's, Pembroke - [†] St. Leonards - [†] Totnes - [†] Uppingham - [†] Wakefield - [†] York - </p>	<p> Peter Donald, Esq. - T. R. H. Chinn, M.D. - James Kay, Esq. - Rev. C. Clouston, LL.D. - R. A. Allison, F.R. Met. Soc. - F. Shaw, F.R. Met. Soc. - G. H. Aird - A. T. Cook, R.E., for Director General of Ordnance Survey. - Miss M. A. Digges La Touche - Rev. S. J. Perry, F.R.S. - Rev. C. H. Griffith, B.D., F.R. Met. Soc. - W. P. Probert, LL.D., F.G.S., F.R. Met. Soc. - H. Colborne, M.R.C.S. - T. H. Edmunds - Rev. G. H. Mallins, M.A., F.R. Met. Soc. - H. Clarke, L.R.C.P., F.S.S., F.R. Met. Soc. - W. Keeling, M.A., F.G.S., and H. Plathauer - </p>	<p> Regular observations at 9 a.m. and 9 p.m. of pressure, temperature, wind, cloud and weather, with the daily maxima and minima of temperature, and rainfall, and remarks on weather generally. - - - - - - - - - </p>	<p> From July 1883. - - - - - - - - - </p>
<p> IV. The Telegraphic Stations, see List on p. - V. Baltimore - Castletownsend - Croskiven - Crosshaven - Cooper's Hill (Egham) - Ennis - Gorleston, Norfolk - </p>	<p> J. Halsey - Lieut. T. W. Cobb, R.N. - - - - - J. W. Brille - Prof. H. McLeod, F.R.S. - J. Hill, C.E., F.R. Met. Soc. - R. C. J. Day - </p>	<p> Regular observations twice (and in some cases three times) daily of pressure, temperature wind, weather, and sea disturbance. Full return, except for temperatures of dry and wet bulbs. - } Pressure and temp. four times daily, and wind twice daily. } Pressure, temperature, and wind, twice daily. Full return for 9 a.m. and 3 p.m. Daily rainfall. } Pressure and wind twice daily. </p>	<p> From July 1883. - - - - - - - - - </p>

LIST OF DOCUMENTS—continued.

Stations.	Observers.	Nature of Information received.	Notes.
Harpenden	T. Wilson, E.R. Met. Soc.	Pressure, temperature, and wind, twice daily, with rainfall.	
Hastar	G. Coppen	Pressure and temperature four times daily.	
† Helston	J. Gill	Full return, except for barometer.	Register incomplete.
Limerick	Capt. C. M. Wilson	Pressure and temperature twice daily	
Marlowery	J. Watkins, E.R. Met. Soc.	Daily rainfall.	
Rugby	C. H. Hodges, M.A.	Full 9 a.m. obs. with 9 p.m. temperatures.	
Saffron Walden	J. G. Bellingham	Pressure and temperature twice daily, with a.m. wind and rainfall.	
Sandwich (Sandwich)	James McKay	Pressure, wind, and weather once daily.	
Schroft	Lieut. T. W. Colby, R.N.	Pressure, temperature, and wind twice daily.	
Shelfield	W. P. Cooper	Full returns for 8 a.m. and 11 p.m.	
Shifford (Weston Park)	Edgah Howarth	Pressure, temperature, and wind, twice daily.	
Symesbury, Shroton	J. Symes, Esq.	Pressure and temperature twice daily	Register incomplete.
Tarbert (Harris)	Douglas Buchanan, for Sir E. Scott, Bt.	Full returns for 9 a.m. and 6 p.m.	
Union Hall	Lieut. T. W. Colby, E.N.	Pressure, temperature, and wind, twice daily.	

† Stations marked "†" belong to the Royal Meteorological Society; those marked "§" belong to the Scottish Meteorological Society; those marked "§" have been inspected during the year.

APPENDIX XVI.

*Extract from the Minutes of the Meteorological Council,
November 14, 1883.*

MINUTE EXPLANATORY OF THE REASONS FOR WHICH THE METEOROLOGICAL COUNCIL HAVE RESOLVED TO CLOSE SOME OF THEIR SELF-RECORDING OBSERVATORIES.

The Meteorological Council, having given notice in February last of their resolution to discontinue four of the seven photographic self-recording observatories which had hitherto been maintained by them, namely, those at Falmouth, Armagh, Stonyhurst, and Glasgow, have received representations from the Royal Cornwall Polytechnic Society, which is interested in the Falmouth Observatory, and from several gentlemen who are interested in the Armagh Observatory, as well as from a Sub-Committee of Section A. of the British Association for the Advancement of Science, composed of persons eminent for their knowledge of physics or meteorology, stating their reasons for thinking it important that the observatories which it had been determined to close should be retained in operation, and requesting the Council to reconsider their resolution.

The Council, recognising the weight of the authority which has thus questioned their action on scientific grounds, have given to these representations the respectful consideration which is due to them, and having carefully reviewed their proceedings in this matter, they now purpose to record the reasons which led them to adopt the resolution the propriety of which has been questioned, and which, after a careful reconsideration of the subject, confirm them in maintaining the course they before resolved to follow.

The seven continuously self-recording observatories were established about 15 years ago, and have been in regular operation since the beginning of 1869. The Meteorological Council, which body succeeded the old Meteorological Committee in 1877, was constituted on the Report of a Treasury Committee, which must be regarded as defining generally the scope of the operations of the Council and the objects to which the public funds granted by Parliament and placed under their control should be applied.

It became one of the first duties of the Council to review the system under which the work of the Meteorological Office was carried on, and among the questions which thus came under consideration was that of the extent to which the funds at the disposal of the Council should continue to be applied to the maintenance of the self-recording observatories, the direct cost of which was very considerable, besides requiring a large share of the time of the Office in the preparation of the observations for publication, which in itself also was a serious cause of further expense.

The necessity for this reconsideration had indeed been indicated in the Report of the Treasury Committee, which, referring to the self-recording observatories, remarked as follows:—"It may deserve consideration by the Council whether some, at any rate, of the existing stations may not be discontinued, and others obtained in more eligible sites. Doubts have also been expressed whether, in the present state

“ of meteorological science, the minute exactness of the observations
 “ now taken at these stations is of sufficient comparative value to
 “ justify the whole of the costs which they involve, when there are
 “ so many other objects of meteorological inquiry which call for
 “ increased expenditure.”

To show the serious practical importance of this question in its financial aspect, it will suffice to state that the costs of these observatories since their opening in 1867 till April 1882, including the charges for the reduction of the observations, and their preparation for publication, so far as this has been carried out, had amounted to no less than 52,782*l.*, besides the cost of publication and printing. Moreover, as the instruments have now been in use for so long a time, some of them require renewal, which will entail a considerable outlay.

Under the continually increasing pressure to add to the efficiency of other branches of the work of the Office, the Council was led to discuss from time to time the question of how best to deal with these observatories, and the decision first come to was that no change should be made at all events until the full cycle of 11 years had been completed. Early in 1882 the Council considered that the time had arrived when a final decision could no longer be properly delayed, and, subject to the result of further inquiries which they desired to make of eminent foreign meteorologists, they came to the conclusion that the retention of the whole number of seven self-recording observatories need not be continued after the end of 1883, which somewhat distant date was named to admit of reasonable notice being given to the observatories which might be discontinued.

The opinions specially asked for were those of Dr. Hann, the director of the Vienna Meteorological Observatory, of Dr. Wild, the head of the Meteorological Service in Russia, and of Mr. H. S. Eaton, a past President of the Meteorological Society of London. The well-known eminence of the two former gentlemen and their long practical experience as directors of large meteorological systems of observation, as well as their obvious freedom from all possible local prejudice, induced the Council to select them and to attach great weight to their opinions, which are therefore annexed *in extenso*. The opinion of the other gentleman consulted was quite to the same effect.

The late Chairman of the Council, Professor H. Smith, on the 16th May 1882, addressed the following letter of inquiry to the persons thus consulted :—

“ As you are no doubt aware, a system of seven self-recording observatories has been now maintained by the Meteorological Office for more than 14 years; and the opinion has been expressed by some meteorologists of eminence that the time has arrived when this system should be revised, with a view to a considerable diminution in the number of the observatories.

“ I venture to ask you as a great favour, to communicate to me any opinion which you may be led to form as to the question thus raised.

“ The funds annually placed at the disposal of the Meteorological Council by Her Majesty’s Government are strictly limited in amount; on the other hand, the Council is allowed considerable latitude in the appropriation of their annual grant.

“ Under these circumstances the question of the continued maintenance of the observatories presents itself to the Council, as turning, not on the desirability in itself of the continuance of the present system, but on the importance of that object as compared with other branches of meteorological work.

"If any of the observatories were suppressed, the funds thus liberated would not be lost to meteorology, but would be applied to other purposes of recognised importance, such as—

- "(1.) The more complete discussion of the continuous records already obtained ;
- "(2.) Extensions of the existing arrangements for the synoptic study of weather ;
- "(3.) Experimental researches on the physical problems of meteorology ; or
- "(4.) The more complete equipment of such of the observatories as might be retained.

"And it is felt by the Council that the cost of the seven observatories encroaches perhaps unduly on the funds which would be available for these or similar purposes.

"It has been suggested that the number of observatories might be reduced to three ; one at Kew, one at Valencia, one at Aberdeen, or some place in the north of Scotland ; these three points forming a nearly equilateral triangle which covers a great part of the United Kingdom.

"I shall be greatly obliged to you if you could inform me whether, in your opinion, three self-recording observatories, supported of course by stations of the second order, would be sufficient to furnish an adequate continuous record of the climate of the British Isles ; and if you should think the number three insufficient, whether any smaller number than seven would, in your judgment, suffice."

Dr. Hann wrote in reply as follows :—

"I think that three observatories of the first order, Valencia, Kew, and a third in the north of Scotland, ought to suffice for permanent service. The materials which have already accumulated from the seven observatories should certainly suffice for the investigation of the daily march of the principal elements of meteorology.

"If I were in the place of the Meteorological Council and had to decide this point, I should certainly, in view of the great expense of seven observatories, preserve only three, one in each kingdom, and abolish four of them, as soon as they had yielded material enough to solve the problems of local climatology.

"I should, however, maintain these points as stations of the second order, for observations to be made two or three times daily, if there do not exist in their vicinity stations of that class in similar situations.

"Eventually, if funds were readily available, I should erect at each of the seven observatories simple mechanical barographs (Höttinger's or Kreil's, at a cost of about 20*l.*), in order to trace the progress of barometrical waves in special cases, and should also leave the anemometers in action. I should not, however, reduce the records fully, but simply use them to trace easily the history of storms and squalls, in short to facilitate the study of extraordinary atmospherical phenomena.

"The apparatus mentioned does not require further attention than the insertion of, and the dating of, the papers, so that the cost of maintenance could not be high.

"I should not continue the records of temperature or humidity, but should possibly keep up that of rain, if that is mechanical and does not involve much expense or trouble.

"I am at present gradually establishing at various points in the Austrian Empire the very simple barographs of Höttinger (Zürich) which are very convenient, and not only enable us to trace the progress

of barometrical minima, but lead to the easy detection of errors in reading the mercurial barometer at the regular hours of observation.

"I fully approve of the proposal that the funds set free by the suppression of four of the observatories should be primarily devoted to the complete discussion and reduction of the material already accumulated from the entire seven, and secondarily to meteorological investigations of the modern type (*zeitgemäss*) and with a different object, such as synoptic studies [with the help of mean values for long periods, on the basis of monthly means] embracing large areas of the earth's surface—problems of physical meteorology—the establishment of stations of the second order at points where they would be desirable for synoptic work or for the investigation of special local peculiarities of climate."

Dr. Wild said :—

"The question of the possible reduction of the number of the automatic observatories in the British Isles is in its nature of such importance to the science of meteorology in general, that I have felt much difficulty in answering it.

"It would of course be in itself desirable for the investigation of the climate of a country to maintain as many stations in it provided with self-recording instruments as is possible. Unfortunately, however, the funds available for meteorological inquiry are, in almost all cases, so limited that they will only suffice to meet a certain proportion of the demands made on them. Under these circumstances, therefore, we must from time to time devote our energies to such inquiries and discussions as appear the most urgent and important for the progress of the science at the time.

"If from this point of view we consider the number of automatic observatories whose maintenance in a country is necessary, we shall certainly be led to recommend that this number should be limited in comparison with what may be deemed desirable.

"Almost without exception, the only scientific use which has been made of these frequent or continuous observations has been to deduce the diurnal range of each element, and thence to determine the corrections applicable to the observations taken at regular intervals, in order to obtain true daily means. Nay more, in view of the very small number of such stations in most countries it would be impossible to utilize their observations in any other direction.

"The disproportionate expense which the maintenance of such stations involves appears to me, in consideration of the impossibility of discussing their results in all directions, to indicate the necessity of reducing their number to such an extent as to render it possible to carry out the speedy and complete discussion of their records in the way above indicated.

"As to the United Kingdom in particular, I am of opinion that, as the seven observatories have been at work for 14 years, they have yielded material sufficient to exhibit the diurnal range of the principal elements for all parts of the British Isles, and that the time has come for reducing them to about three, so as to set free funds for the discussion of the records collected, and for the treatment of other important subjects in our science. Three such observatories in your country ought to be enough to enable you to trace extraordinary phenomena in the same detail as is done elsewhere, and to complete the materials for the study of diurnal range."

After the receipt of these opinions the Council, before finally settling which of the stations, if any should be given up and which should be retained, had many administrative points to consider. The retention of Kew was essential in connexion with the necessary provision of the

means of verifying and testing new instruments and methods of observation. Valencia, though the most costly, is also obviously the most important of the stations, in respect of all questions relating to the study and forecasting of the weather. Aberdeen, occupying a position nearly at the apex of an equilateral triangle of which Kew and Valencia formed the base, appeared to be the best practicable locality for a station in the north of the British Isles, a preference which was sustained by its position on the east coast, well exposed to the north. Some hesitation was felt as to Falmouth on account of its undeniably good geographical position; but the confined site of the observatory was held to be so unfavourable for the correct record of the temperature, humidity, and wind of the adjacent district, as to lead the Council to think that it should not have a place among the observatories to be retained in their present complete and costly form. With reference to this last point, on which the Inspectors of the Office have always insisted, the evidence of Dr. Maun (then recently President of the Meteorological Society) before the Treasury Committee may further be cited. He said:—"At Falmouth the observatory stands upon an accidentally selected spot, where a small street occupies the uniting line between two high ridges in a *cul de sac*. The temperature observations taken there are not comparable, certainly with those of observatories that are more fairly placed."

" (Chairman.) Do I understand you that the observatory at Falmouth is so placed as to be under very peculiar meteorological conditions?—Yes, under local conditions which do not give good general results."*

The Meteorological Council never had any doubt of the general importance of maintaining continuous records of the meteorological elements at several stations in the British Isles, and on this point they are quite in accord with the Sub-Committee of the British Association. The difference of opinion which exists arises from a different estimate of the relative importance of the various branches of the duties which have to be discharged by the Council, and of what will be the most effective distribution of the grant placed at its disposal, which, though on a liberal scale, is yet limited in amount, and an increase to which they could not suggest with any prospect of success without far stronger reasons than, in their opinion, could be based on the scientific urgency of maintenance of the observatories in question.

The Council, being thus constrained to regard the matter at issue as one which must be looked at in its financial, no less than in its scientific bearing, cannot avoid the conclusion that those who have so strongly urged the continued maintenance of the seven self-recording observatories have no adequate knowledge of the very large area over which the operations of the Meteorological Office extend, of the many subjects to which attention has to be given in the study of the meteorology not only of the land but also of the sea, and of the multiplied and increasing demands made upon it in other directions than those that have been pressed upon it in the memorials now under consideration. The objections made to the decision of the Council are not accompanied by any reference to these other demands which cannot at present be met for want of funds, nor have these been weighed one with another, neither does it seem to have been considered whether much at least of what is

* Report of the Treasury Committee appointed to inquire into the conditions and mode of administration of the annual grant in aid of meteorological observations [C.—1638.], 1877, page 88.

desired might not be secured as well and more economically under a modified system.

It is the belief of the Council that all that is really required in the interests of science can be obtained under the arrangements they have in view, and which they propose to carry out when the funds set free by the reduction in the number of observatories are available.

So far as the ordinary meteorological constants for the seven observatories are concerned, the Council feel confident that these may be obtained with all the accuracy required for present scientific needs from the records already accumulated and published or in course of publication, extending over not less than 13 years. They also consider that the maintenance of the observatories which they have decided to retain, viewed in connexion with the records of other similar institutions in this and other countries, will give ample means of studying any periodical variation of long period, such as the 19 years cycle which has been specially alluded to; although it is certain, from discussions which have already been undertaken, that such variations must be extremely small, so that it is doubtful whether their existence can be established, and difficult to believe that they would be found to be of any practical importance either in respect to climate or changes of weather,—the two branches of meteorology with which the public is most concerned.

It remains for the Council to explain the arrangements which they design to carry out, as soon and as far as practicable, as funds become available, with a view to removing recognised deficiencies in their present arrangements. These will chiefly consist in an increase in the number of the telegraphic reporting stations with an improvement in their equipment, and additions to the staff of the Office, in the following manner:—

1. By supplying many of the stations with inexpensive continuously recording mechanical barographs, to be employed as differential instruments, controlled by frequent readings of the ordinary mercurial barometer. These would be fully adequate to show the passage of barometric fluctuations, and of ensuring that no sudden event should pass unnoticed, while the progressive changes of pressure they indicated could be communicated by telegraph by aid of a special code of signals. A similar system of recording temperature could be extended to some selected stations.

2. By establishing self-recording anemometers in properly exposed situations, possibly connected electrically with the telegraph stations, which being usually in towns and sheltered from winds, are generally ill-suited for observations of wind direction and force.

3. By making arrangements for more systematic observations at or near telegraphic stations, of the upper ærial currents, as indicated by the movements of clouds, and especially cirrus.

4. By establishing, when funds become available, a night service at the Office, by which forecasts of weather based on observations made as late as 11 p.m. might be issued in time for publication in the newspapers in London and principal towns in the country. The morning forecasts are now based on observations made at 6 p.m. of the previous evening, and 14 hours out of the 24 to which they relate have therefore elapsed before they can be read.

5. By providing additional scientific staff in the Office, the time of its present establishment being absorbed by routine duties. A more thorough and continuous watch over the system of forecasts and the actual weather ensuing is requisite, as well as increased attention to the

early discussion of the observations, and closer supervision of the experiments and trials of new instruments.

By these measures, which will greatly increase the number of self-recording stations, it is believed that most of the objects held to be important by meteorologists will be better met than by the necessarily limited operation of the self-recording observatories which would be given up, whose efficacy in assisting the preparation of forecasts of weather is extremely small. The superior accuracy of the observations made at the existing observatories hardly extends beyond those of the dry and wet bulb thermometers, and the proposed greatly increased number of the stations at which continuous observations of pressure and wind would be recorded would more than compensate for such advantages as might otherwise be lost by the change.

The Council have no hesitation, on this review of their position, in recording their opinion that the objects which they have thus enumerated will, to say the least of it, require all the funds that can be saved by a reduction in the number of the observatories, and that these objects are of a nature to claim precedence over the continued register of the barometer and wet and dry bulb thermometers on the refined and costly system of the photographic self-recording observatories.

In conclusion, the Council would express their hope that local efforts may, in some cases at least, be forthcoming to maintain the observatories which they cannot, consistently with other demands on them, continue to support, and they are prepared to make moderate grants for a limited time for these observatories, to continue them in operation until such arrangements could be matured, and to place the instruments at the disposal of the body which undertakes to make use of them. As regards Falmouth, it would be the wish of the Council to secure a first-class self-recording observatory there or in the neighbourhood, provided that a thoroughly satisfactory site could be obtained, and if the cost of maintenance was not too great. Failing this, they would, as already stated to the Royal Cornwall Polytechnic Society, co-operate in the maintenance of a second-class observatory at the Land's End in connexion with the telegraph station, and they will now be prepared to co-operate in maintaining the barograph alone at the present station at Falmouth.

APPENDIX XVII.

ACCESSIONS TO THE LIBRARY DURING THE YEAR ENDING
31ST MARCH 1884.

A—AGRICULTURE AND BOTANY.

* **Baker, T. H.**—Records of the seasons, prices of agricultural produce, and phenomena observed in the British Isles. vii. + 360 pp. sm. 8°. London, [1883].

Donop, L. B. [? S.] von.—Report on the agricultural prospects of British North Borneo. 34 pp., 1 plate, 4°. s.l.e.a.

Contains some rainfall and temperature observations.

|| **Gibb, C.**—Report on Russian fruits. 55 pp. 8°. Montreal, 1883. (*From Eighth Rep. Montreal Hortiv. Soc.*)

* **Hall, T. B.**—A flora of Liverpool, by T. B. Hall, with an engraved map; and an appendix, containing meteorological tables and observations for the year 1838, by **W. Armistead**. xvii. + 186 pp., 3 plates, 1 map, sm. 8°. London, s.a.

(Office of the Chief Signal Officer, Washington.)—Signal Service tables of rainfall and temperature compared with crop production. Prepared under the direction of **W. B. Hazen**, by **H. H. C. Dunwoody**. Professional Papers of the Signal Service. No. x. 15 pp. la. 4°. Washington, 1882.

Ufficio centrale di Meteorologia, Roma.—Rivista Meteorico-Agraria. Anno IV., 1883, Nos. 1–36. la. 8°. (Roma, 1883–84.)

This is a continuation of “Servizio Meteorico-Agrario.”

B—ASTRONOMY.

Committee on Solar Physics, London.—Report by the Committee on solar physics appointed by the Lords of the Committee of Council on Education. iii. + 241 pp., 2 plates, 8°. London, 1882.

K. K. Sternwarte zu Prag.—Astronomische, magnetische und meteorologische Beobachtungen an der k. k. Sternwarte zu Prag im Jahre 1882. Auf öffentliche Kosten herausgegeben von **G. Gruss**. 43 Jahrg. xviii. + 62 pp. la. 4°. Prag, s.a.

Langley, S. P.—The selective absorption of solar energy. 28 pp., 3 plates, 8°. (*Amer. Journ. Sc., 3rd series, xxv., 1883, p. 169.*)

Montigny, C.—Influence des perturbations magnétiques sur la scintillation des étoiles. 31 pp. 8°. Bruxelles, 1883. (*Bull. Acad. roy. de Belgique, 3^{me} série, tome vi., No. 11, 1883.*)

———, —Notice sur la scintillation des étoiles dans ses rapports avec la constitution de leur lumière, d’après l’analyse spectrale. 23 pp. 8°. Bruxelles, 1883. (*B. P. Acad. roy. de Belgique, 3^{me} série, tome vi., No. 12, 1883.*)

Observatorio meteorológico-magnético central, Mexico.—Datos pluviométricos y agrícolas, relativos a la estación de Aguas en el corriente año de 1883. 16 p. Sheet.

Oliver, J. A. W.—Sun-spottory: or, what do we owe to the sun? A popular explanation of the cycle theory of the weather, famines, pestilences, commercial panics, &c. 36 pp. sm. 8°. London, 1883.

Royal Astronomical Society, London.—Memoirs. Vol. xlvii., 1882–83. xv. + 463 pp., 5 plates, 4°. London, 1883.

———, —Monthly Notices . . . containing Papers, Abstracts of Papers, and Reports of the proceedings of the Society from November 1882 to November 1883. Vol. xlviii., with plates, 8°. London, 1883.

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

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

APPENDIX XVII.

ACCESSIONS TO THE LIBRARY DURING THE YEAR ENDING
31st MARCH 1884.

A—AGRICULTURE AND BOTANY.

* **Baker, T. H.**—Records of the seasons, prices of agricultural produce, and phenomena observed in the British Isles. vii. + 360 pp. sm. 8°. London, [1883].

Donop, L. B. [? S.] von.—Report on the agricultural prospects of British North Borneo. 34 pp., 1 plate, 4°. s.l.e.a.

Contains some rainfall and temperature observations.

|| **Gibb, C.**—Report on Russian fruits. 55 pp. 8°. Montreal, 1883. (*From Eighth Rep. Montreal Hortic. Soc.*)

* **Hall, T. B.**—A flora of Liverpool, by T. B. Hall, with an engraved map; and an appendix, containing meteorological tables and observations for the year 1838, by **W. Armistead**. xvii. + 186 pp., 3 plates, 1 map, sm. 8°. London, s.a.

(Office of the Chief Signal Officer, Washington.)—Signal Service tables of rainfall and temperature compared with crop production. Prepared under the direction of **W. B. Hazen**, by **H. H. C. Dunwoody**. Professional Papers of the Signal Service. No. x. 15 pp. la. 4°. Washington, 1882.

Ufficio centrale di Meteorologia, Roma.—Rivista Meteorico-Agraria. Anno IV., 1883, Nos. 1-36. la. 8°. (Roma, 1883-84.)

This is a continuation of "Servizio Meteorico-Agrario."

B—ASTRONOMY.

Committee on Solar Physics, London.—Report by the Committee on solar physics appointed by the Lords of the Committee of Council on Education. iii. + 241 pp., 2 plates, 8°. London, 1882.

K. K. Sternwarte zu Prag.—Astronomische, magnetische und meteorologische Beobachtungen an der k. k. Sternwarte zu Prag im Jahre 1882. Auf öffentliche Kosten herausgegeben von **G. Gruss**. 43 Jahrg. xviii. + 62 pp. la. 4°. Prag, s.a.

Langley, S. P.—The selective absorption of solar energy. 28 pp., 3 plates, 8°. (*Amer. Journ. Sc.*, 3rd series, xxv., 1883, p. 169.)

|| **Montigny, C.**—Influence des perturbations magnétiques sur la scintillation des étoiles. 31 pp. 8°. Bruxelles, 1883. (*Bull. Acad. roy. de Belgique*. 3^{me} série, tome vi., No. 11, 1883.)

|| ———.—Notice sur la scintillation des étoiles dans ses rapports avec la constitution de leur lumière, d'après l'analyse spectrale. 23 pp. 8°. Bruxelles, 1883. (*Bull. Acad. roy. de Belgique*, 3^{me} série, tome vi., No. 12, 1883.)

Observatorio meteorológico-magnético central, Mexico.—Datos pluviométricos y agrícolas, relativos a la estación de Aguas en el corriente año de 1883. la. fo. Sheet.

* **Oliver, J. A. W.**—Sunspottery: or, what do we owe to the sun? A popular examination of the cycle theory of the weather, famines, pestilencies, commercial panics, &c. 56 pp. sm. 8°. London, 1883.

Royal Astronomical Society, London.—Memoirs. Vol. xlvii., 1882-83. iv. + 463 pp., 5 plates, 4°. London, 1883.

———Monthly Notices . . . containing Papers, Abstracts of Papers, and Reports of the proceedings of the Society from November 1882 to November 1883. Vol. xliii., with plates, 8°. London, 1883.

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

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

Royal Observatory, Greenwich.—Report of the Astronomer Royal to the Board of Visitors of the Royal Observatory, Greenwich, read at the annual visitation of the Royal Observatory, 1883, June 2. (By **W. H. M. Christie.**) 19 pp. la. 4°. s.l.e.a.

* **Swinton, A. H.**—An almanack of the Christian Era. Containing a legitimate prediction of the weather, disasters by wind and rain, shipwrecks and river floods, prognostics of the harvest, havoc by vermin and infection, famines and panics, electrical disturbances, calamities by earthquakes and volcanic eruptions, with much that is important or curious. A record of the past and glimpse into the future based on solar physics. 103 pp. 4°. London, 1883.

Venturi, A.—Metodo di Hansen per calcolare le perturbazioni dei piccoli pianeti interamente rifiuto ed originalmente esposto. 120 pp. sm. f°. Milano, 1882. (*Pubbl. R. Osserv. di Brera*, N. xxii.)

C—ATMOSPHERIC PRESSURE.

|| **Busin, P.**—Misura delle altezze mediante il barometro. Letta nella seduta del 17 giugno 1883. 2 pp. 4°. (*R. Accad. dei Lincei*, vii^a, serie 3^a.)

|| ———.—Sui tipi isobarici italiani. Letta nella seduta del 17 giugno 1883. 4 pp. 4°. (*R. Accad. dei Lincei*, vii^a, serie 3^a.)

|| **Capello, J. C. De B.**—Barometrical depressions between the Azores and the Continent of Europe. 3 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, ix., 1883, p. 115.)

|| **Gilbert, G. K.**—A new method of measuring heights by means of the barometer. 166 + 4 pp., 1 plate, sm. f°. Washington, 1882. (*Ann. Rep. U. S. Geol. Survey*, 1880–81, p. 405.)

|| **Heath, D. D.**—On Mr. Ferrel's theory of atmospheric currents. 11 pp. 8°. (*Phil. Mag.*, July, 1883, p. 13.)

|| **Hildebrandsson, H. H.**—Sur la distribution des éléments météorologiques autour des minima et des maxima barométriques. (Présenté à la Soc. R. des Sciences d'Upsal le 10 Mars 1883.) 31 pp. 4°. Upsal, 1883. (*Nova Acta Reg. Soc. Sc. Ups.*, Ser. iii.)

Scott, R. H.—Die "Krakatoa" Luftwelle. Notiz über eine Reihe barometrischer Störungen, August 27–31, 1883. Im Auszuge aus den Proceedings der Royal Society. 8 pp., 1 plate, la. 8°. (*Zeitschr. oesterr. Gesellsch. Meteor.*, Wien, xix., 1884, p. 97.)

D—AURORA.

|| **Lemström, S.**—Expériences sur l'aurore boréale en Laponie. 20 pp. la. 8°. (St. Petersburg, 1883.) [*Mittheil. internat. Polar-Comm. Viertes Heft*, p. 125.]

E—BIBLIOGRAPHY.

New York State Library.—Sixty-fourth and sixty-fifth annual reports of the Trustees . . . for the years 1881, 1882. 2 vols. 8°. Albany, 1882–83.

* **Royal Society, London.**—Catalogue of the scientific books in the library of the Royal Society. General catalogue. 1199 pp. 8°. London, 1883.

F—CLIMATE AND HYGIENE.

* **Bryson, A.**—Report on the climate and principal diseases of the African station; compiled from documents in the Office of the Director-General of the Medical Department, and from other sources, in compliance with the directions of the Right Honorable the Lords Commissioners of the Admiralty, under the immediate direction of **Sir W. Burnett**. xv. + 266 pp. la. 8°. London, 1847.

* **Hann, J.**—Handbuch der Klimatologie. x. + 764 pp., 1 plate, 8°. Stuttgart, 1883.

This is one of the series of the "Bibliothek geographischer Handbücher herausgegeben von Prof. Dr. F. Ratzel."

|| ———.—Über die klimatischen Verhältnisse von Bosnien und der Herzegowina. 21 pp. la. 8°. (*Sitzb. h. Akad. Wissensch.*, Bd. lxxxviii., ii. Abth., Jahrg. 1883, p. 96.)

Haviland, A.—The essential requisites of a sea-side health resort, and the requirements of a health seeker; with the physical geography and climate of the Isle of Man. A lecture delivered . . . 13th June, 1883. 72 pp. 8°. Douglas, 1883.

|| **Hellmann, G.**—Klima des Brocken. 20 pp. la. 8°. (*Kettler's Zeitschr. Bd.*, iii., pp. 5 and 61.)

|| **Hoffmeyer, N.**—Klima og Vejrforhold. 70 pp., 1 plate, la. 8°. Kjøbenhavn, 1883. (*Særtryk af Danmarks Statistik*, 1. Bind, 4de Hefte, p. 226.)

Inspector General of Customs, Peking.—Medical reports for the half-years ended 30th September, 1882, and 31st March, 1883. 24th and 25th Issues. With plates, 4°. Shanghai, 1883.

M^rWilliam, J. O.—Medical history of the expedition to the Niger during the years 1841–2, comprising an account of the fever which led to its abrupt termination. viii. + 287 pp., 4 plates, 8°. London, 1843.

* **Marcet, W.**—The principal Southern and Swiss health resorts, their climate and medical aspect. viii. + 408 pp., 9 plates, sm. 8°. London, 1883.

Registrar General, London.—Weekly return of births and deaths in London and in twenty-seven other great towns. Vol. xlv., 1883. Nos. 1–52. la. 8°. London, 1883.

Registrar General of Births, Deaths, and Marriages in Ireland.—Quarterly returns of the marriages, births, and deaths registered in . . . Ireland; . . . 1883. 1st–4th quarters, Nos. 77–80. la. 8°. Dublin, 1883–84.

—.—Weekly returns of births and deaths in Dublin (including its suburban districts), and in fifteen of the principal urban sanitary districts in Ireland, 1883. Vol. xx., la. 8°. Dublin, 1884.

(**Rowell, T. I.**)—Annual medical report on the Civil Hospitals in the Straits Settlements for the year 1882. 43 pp. f°. s.l.e.a.

Contains some meteorological observations for 1882.

(**Sanitary Commissioner of the Punjab.**)—Report on the Sanitary Administration of the Punjab for the year 1882. With maps and plates, sm. f°. Lahore, 1883.

Société de Médecine et de Climatologie de Nice.—Nice-Médical. 7^e Année, 1882–83, Nos. 1–12. la. 8°. Nice, 1882–83.

G—EARTHQUAKES.

|| **Rockwood, C. G.**—Notes on American earthquakes. No. 12. 9 pp. 8°. (*Amer. Journ. Sc.*, xxvi., May 1883, p. 353.)

H—ELECTRICITY AND MAGNETISM.

Assmann, [R.]—Eine locale Gewittercyclone. 5 pp., 1 plate, la. 8°. (*Zeitschr. Oesterr. Gesellsch. Meteor.*, Wien, 1882, p. 337.)

|| **Brioschi, F., Contarino, F., e Angelitti, F.**—Determinazioni assolute della inclinazione magnetica nel R. Osservatorio Astronomico di Capodimonte. 7 pp. sm. f°. Napoli, 1883. (*Rend. R. Accad. Sc. Fis. e Mat. di Napoli. Fasc. 7. Luglio*, 1883.)

Dechevrens, M.—Variations de l'aiguille aimantée pendant les éclipses de Lune. Régime des vents à Zi-ka-wei, 1877–1882. 33 pp., 3 plates, sm. f°. Zi-ka-wei, 1883.

|| **De La Rue, W., and Müller, H. W.**—Experimental researches on the electric discharge with the chloride of silver battery. Parts i.–iv., 4 parts, with plates and portrait, la. 4°. (*Phil. Trans., Part i., vol. 169*, 1878, pp. 55 and 155; *Part i., vol. 171*, 1880, p. 65; *Part ii., vol. 174*, 1883, p. 477.)

|| **Hellmann, G.**—Zur Leistungsfähigkeit des compensirten Magnetometers Weber-Kohlrausch. 2 pp. la. 8°. (*Carl's Repert. Exper.-Physik*, xviii., 1881.)

* **Lardner, D., and Walker, C. V.**—A manual of electricity, magnetism, and meteorology. Vols. i. and ii. 2 vols., sm. 8°. London, s.a.

Lefroy, Sir J. H.—Diary of a magnetic survey of a portion of the Dominion of Canada, chiefly in the North-western territories, executed in the years 1842–1844. xxiv. + 194 pp., 6 plates, la. 8°. London, 1883.

Royal Observatory, Greenwich.—Results of the magnetical and meteorological observations made at the Royal Observatory, Greenwich, in the year 1881: under the direction of **Sir G. B. Airy** and **W. H. M. Christie**. v. + xlii. + lxxvii. pp. la. 4°. London, 1883.

Schiaparelli, G. V., Pini, E., e Frisiani, P.—Sui temporali osservati nell'Italia Superiore durante l'anno 1878. 99 pp., 8 plates, sm. f°. Milano, 1883. (*Pubbl. R. Osserv. di Brera in Milano*. N. xvii.)

Seeland, F.—Magnetische und meteorologische Beobachtungen zu Klagenfurt. Dec. 1882—Nov. 1883. With monthly diagrams. 8°. s.l.e.a.

|| **Stewart, B.**—Terrestrial magnetism. 36 pp., 2 plates, 4°. (*Reprinted from the Encycl. Brit.*)

Tifiser physikalisches Observatorium.—Magnetische Beobachtungen . . . in den Jahren 1881–1882. Herausgegeben von **J. Mielberg**. cxvii. + 80 + 80 pp. la. 8°. Tiflis, 1883.

In the Russian language also.

|| **Weihrauch, K.**—Ueber die gegenseitige Einwirkung permanenter Magnete. 72 pp., 1 plate, la. 4°. Dorpat, 1883. (*Nouv. Mém. Soc. Imp. Nat. Moscou*, xiv., livr. 4.)

|| **Wijkander, A.**—Observations magnétiques, faites pendant l'expédition de la Vêga, 1878–80. 74 pp. la. 8°. (*Vega-Expéditionens Vetenskapliga Iagttagelser*. Bd. ii., p. 431. Stockholm, 1883.)

|| **Wild, H.**—Bestimmung des Werthes der Siemens'schen Widerstand-Einheit in absolutem electromagnetischen Maasse. (Lu le 20 Décembre 1883.) 122 pp., 5 plates, sm. f°. St. Pétersbourg, 1884. (*Mém. Acad. Imp. Sc. St. Pétersb.*, viie série, Tome xxxii., No. 2.)

|| ————Die Beobachtung der electrischen Ströme der Erde in kürzern Linien. 24 pp., 1 plate, sm. f°. St. Pétersbourg, 1883. (*Mém. Acad. Imp. St. Pétersb.*, viie série, Tome xxxi., No. 12.)

|| ————Observations sur les courants électriques de la terre dans des lignes d'un kilomètre de longueur et leur comparaison avec les variations magnétiques. 8 pp. 8°. St. Petersbourg, 1884. (*Mél. Phys. et Chim.*, xii., p. 91.)

I—GEODESY.

[**Office of the Surveyor General of India.**]—Account of the operations of the great trigonometrical survey of India. Vols. vii. and viii. . . . Prepared under the directions of Lieut.-General **J. T. Walker**. 2 vols., with plates, la. 4°. Dehra Dun, 1882.

Office of the Surveyor General of India.—Account of the operations of the great trigonometrical survey of India. Vol. ix. Electro-telegraphic longitude operations executed during the years 1875–77 and 1880–81 by Lieut.-Col. **W. M. Campbell** and Major **W. J. Heaviside**. Prepared under the directions of Lieut.-Gen. **J. T. Walker**. With plates, la. 4°. Dehra Dun, 1883.

———General report on the operations of the survey of India, comprising the great trigonometrical, the topographical, and the revenue surveys under the Government of India, during 1881–82. Prepared under the superintendence of **J. T. Walker**. With plates, sm. f°. Calcutta, 1883.

K—HYDRAULICS, HYDROLOGY, AND TIDES.

Admiralty, London.—Tide Tables for the British and Irish Ports, for the year 1884; also the times and heights of high water at full and change for the principal places on the Globe. Computed by **H. R. Harris**. vi. + 234 pp. la. 8°. London, (1883).

|| **Coghlan, T. A.**—Discharge of streams in relation to rainfall, New South Wales. 21 pp., 1 plate, 8°. London, 1884. (*Minutes Proc. Inst. Civ. Eng.*, lxxv., Session 1883–84, Part i.)

|| **O'Meara, P.**—The introduction of irrigation into new countries, as illustrated in North-Eastern Colorado. With an abstract of the discussion upon the Paper. Edited by **J. Forrest**. 96 pp., 2 plates, 8°. London, 1883. (*Minutes Proc. Inst. Civ. Eng.*, lxxiii., Session 1882–83, Part iii.)

|| **Pearson, J.**—Computation of tides: results of theory and observation. 5 pp., 1 plate, 8°. Dublin, 1883. (*A paper read before the R. Irish Acad.*, Nov. 13, 1882; and reprinted from the *Proc.*, 2nd Ser., vol. iii., No. 10, April 1883, p. 656.)

Service hydrométrique du Bassin de la Seine.—Observations sur les cours d'eau et la pluie centralisées pendant l'année 1881, sous la direction de **Ch. Lefébure de Fourcy** par **G. Lemoine** et **A. de Préaudeau**. 7 plates, f°. Versailles, s.a.

—Résumé des observations centralisées . . . pendant l'année 1881, par **[A.] de Préaudeau**, sous la direction de **[Ch.] Lefébure de Fourcy** et de **G. Lemoine**. 29 pp. la. 8°. Versailles, 1883. (*Ann. Soc. météor. de France*, xxx., juillet, 1882.)

L—METEOROLOGY.—MISCELLANEOUS.

* **Attlmayr, F., Köttstorfer, J., Luksch, J., Mayer, E., Salcher, P., und Wolf, J.**—Handbuch der Oceanographie und maritimen Meteorologie. Im Auftrage des k.k. Reichs-Kriegs-Ministeriums (Marine-Section). 2 vols., with plates, la. 8°. Wien, 1883.

Bebber, J. van.—Typische Witterungs-Erscheinungen. 10 pp., 5 plates, la. 8°. (*Monatl. Uebers. Witterung, Hamburg*, vii., 1882, p. 29.)

* (**Buchan, A.**)—Meteorology. 46 pp. 4°. [*Encyclop. Brit.*, xvi., p. 114.]

Campbell, J. F.—Sun-spots and world's weather. 14 pp. sm. 8°. (London, 1884.)

* (**Campbell, J. F.**)—Thermography. 390 pp. sm. 8°. Kensington, 1883.

Colonial Secretary's Office, Hong-Kong.—(Report from the Government Astronomer, together with instructions for making meteorological observations.) (By **W. Doberck**.) 18 pp. sm. f°. Dated, Hong-Kong, 1883.

‡ **Corbett, V. W.**—On water-gauge, barometer, and other observations taken at Seaham Colliery during the time the Mandlin seam was sealed up. 86 pp., 2 plates, la. 8°. Newcastle-upon-Tyne, 1883. (*Min. of Proc. North Engl. Inst. Mining & Mech. Eng.*, xxxii., 1883, p. 225.)

Dreyer, J. L. E.—An historical account of the Armagh Observatory. Armagh, 1883. Printed for private circulation. 20 pp., 1 plate, 8°. Liverpool, s.a.

‡ **Hann, J.**—Bericht über die Fortschritte der geographischen Meteorologie. 72 pp. sm. 4°. (*Geogr. Jahrb. von Behm, Göttingen*, ix., p. 51.)

H(ann), J.—Scott: On the results of observations made at the Pagoda, Royal Gardens, Kew, and elsewhere to determine the influence of height on thermometric readings, on vapour tension and on humidity. Quarterly Weather Report, New series, Part i. [1876], appendix iii. London, 1881. 4 pp. la. 8°. [*Zeitschr. oesterr. Gesellsch. Meteor.*, Wien., xviii., 1883, p. 395.]

In the German language.

‡ **Hazen, H. A.**—The sun-glows. 12 pp. la. 8°. (*Amer. Journ. Sc.*, xxvii., 1884, ch., p. 201.)

‡ (**Hellmann, G.**)—Der südlichste Gletscher Europa's. 6 pp. 8°. (*Verh. Gesellsch. Erdk. Berlin*, 1881, No. 10.)

*‡ **Klein, H. J.**—Die Fortschritte der Meteorologie. Nos. 5–8, 1877–82, 4 vols. sm. 8°. Köln und Leipzig, 1879–1883. (*Revue der Naturwissensch. herausgegeben von Dr. H. J. Klein*.)

‡ **Laughton, J. K.**—An address delivered at the annual general meeting of the Meteorological Society, January 17th, 1883. 13 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, ix., 1883, p. 71.)

‡ **Loomis, E.**—Contributions to meteorology. 19th paper, with three plates. la. 8°. (*Amer. Journ. Sc.*, xxvi., 1883, Dec.)

* **Mackenzie, G.**—Manual of the weather for the year MDCCCXXX.: including a brief account of the cycles of the winds and weather, and of the circle of the prices of wheat. 4 + 103 pp., 2 tables, sm. 8°. Edinburgh, 1829.

* **Mackenzie, G.**—The system of the weather of the British Islands: discovered in 1816 and 1817 from a journal commencing November 1802. xl. + 224 pp., 2 plates, 4°. Edinburgh, 1818.

Meteorological Council, London.—Meteorological Atlas of the British Isles. 10 pp., 40 plates, la. 4°. London, 1883.

—Sunshine records of the United Kingdom for 1881. Reduced from the original traces from 31 stations. viii. + 61 pp., 1 plate, la. 8°. London, 1883.

Service hydrométrique du Bassin de la Seine.—Observations sur les cours d'eau et la pluie centralisées pendant l'année 1881, sous la direction de Ch. Lefébure de Fourcy par G. Lemoine et A. de Préaudeau. 7 plates, fo. Versailles, s.a.

—Résumé des observations centralisées . . . pendant l'année 1881, par [A.] de Préaudeau, sous la direction de [Ch.] Lefébure de Fourcy et de G. Lemoine. 29 pp. la. 8°. Versailles, 1883. (*Ann. Soc. météor. de France*, xxx., juillet, 1882.)

L—METEOROLOGY.—MISCELLANEOUS.

* Attlmayr, F., Kottstorfer, J., Luksch, J., Mayer, E., Salcher, P., und Wolf, J.—Handbuch der Oceanographie und maritimen Meteorologie. Im Auftrage des k.k. Reichs-Kriegs-Ministeriums (Marine-Section). 2 vols., with plates, la. 8°. Wien, 1883.

Bebber, J. van.—Typische Witterungs-Erscheinungen. 10 pp., 5 plates, la. 8°. (*Monat. Uebers. Witterung, Hamburg*, vii., 1882, p. 29.)

* (Buchan, A.)—Meteorology. 46 pp. 4°. [*Encyclop. Brit.*, xvi., p. 114.]

Campbell, J. F.—Sun-spots and world's weather. 14 pp. sm. 8°. (London, 1884.)

* (Campbell, J. F.)—Thermography. 390 pp. sm. 8°. Kensington, 1883.

Colonial Secretary's Office, Hong-Kong.—(Report from the Government Astronomer, together with instructions for making meteorological observations.) (By W. Doberck.) 18 pp. sm. fo. Dated, Hong-Kong, 1883.

|| Corbett, V. W.—On water-gauge, barometer, and other observations taken at Seaham Colliery during the time the Maudlin seam was sealed up. 86 pp., 2 plates, la. 8°. Newcastle-upon-Tyne, 1883. (*Min. of Proc. North Engl. Inst. Mining & Mech. Eng.*, xxxii., 1883, p. 225.)

Dreyer, J. L. E.—An historical account of the Armagh Observatory. Armagh, 1883. Printed for private circulation. 20 pp., 1 plate, 8°. Liverpool, s.a.

|| Hann, J.—Bericht über die Fortschritte der geographischen Meteorologie. 72 pp. sm. 4°. (*Geogr. Jahrb. von Behm, Gotha*, ix., p. 51.)

H(ann), J.—Scott: On the results of observations made at the Pagoda, Royal Gardens, Kew, and elsewhere to determine the influence of height on thermometric readings, on vapour tension and on humidity. Quarterly Weather Report, New series, Part i. [1876], appendix iii. London, 1881. 4 pp. la. 8°. [*Zeitschr. oesterr. Gesellsch. Meteor.*, Wien., xviii., 1883, p. 395.]

In the German language.

|| Hazen, H. A.—The sun-glows. 12 pp. la. 8°. (*Amer. Journ. Sc.*, xxvii, 1884, ch., p. 201.)

|| (Hellmann, G.)—Der südlichste Gletscher Europa's. 6 pp. 8°. (*Verh. Gesellsch. Erdk. Berlin*, 1881, No. 10.)

* || Klein, H. J.—Die Fortschritte der Meteorologie. Nos. 5-8, 1877-82, 4 vols. sm. 8°. Köln und Leipzig, 1879-1883. (*Revue der Naturwissensch. herausgegeben von Dr. H. J. Klein.*)

|| Loughton, J. K.—An address delivered at the annual general meeting of the Meteorological Society, January 17th, 1883. 13 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, ix., 1883, p. 71.)

|| Loomis, E.—Contributions to meteorology. 19th paper, with three plates, la. 8°. (*Amer. Journ. Sc.*, xxvi., 1883, Dec.)

* Mackenzie, G.—Manual of the weather for the year MDCCCXXX.: including a brief account of the cycles of the winds and weather, and of the circle of the prices of wheat. 4 + 103 pp., 2 tables, sm. 8°. Edinburgh, 1829.

* Mackenzie, G.—The system of the weather of the British Islands; discovered in 1816 and 1817 from a journal commencing November 1802. xl. + 224 pp., 2 plates, 4°. Edinburgh, 1818.

Meteorological Council, London.—Meteorological Atlas of the British Isles. 10 pp., 40 plates, la. 4°. London, 1883.

—Sunshine records of the United Kingdom for 1881. Reduced from the original traces from 31 stations. viii. + 61 pp., 1 plate, la. 8°. London, 1883.

(**Meteorological Office, Bombay.**)—Brief sketch of the meteorology of the Bombay Presidency in 1882–83. (By **A. N. Pearson.**) 7 pp., 1 plate, sm. 8°. s.l.e.a.

* **Mill, H. R.**—The rainband : how to observe it, and what to expect from it. 38 pp., 1 plate, sm. 8°. London, 1883.

Office of the Chief Signal Officer, Washington.—The use of the spectro-scope in meteorological observations. Signal Service notes No. iv. Prepared under the direction of **W. B. Hazen**, by **W. Upton**. 7 pp., 3 plates, la. 8°. Washington, 1883.

|| **Pernter, J. M.**—Psychrometerstudie. 18 pp. la. 8°. (*Sitzb. k. Akad. Wissensch.*, lxxxvii., ii. *Abth.*, 1883, p. 777.)

* **Radau, R.**—La lumière et les climats. 88 pp. sm. 8°. Paris, 1877.

* ————Les radiations chimiques du soleil. 90 pp. sm. 8°. Paris, 1877.

|| **Rundell, W. W.**—Records of bright sunshine. 5 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, ix., p. 166.)

(**Russell, H. C.**)—The Sydney Observatory. History and progress. 16 pp. la. 8°. (Sydney, 1882.)

* (**Scott, R. H.**)—Meteorology at home and abroad. 7 pp. 8°. [*Longman's Mag.*, II., 1883, p. 387.]

|| **Scott, R. H.**—Weather knowledge in 1883. 11 pp. 8°. (London, s.a.) (*Proc. R. Inst. Great Britain*, x., 1883, p. 323.)

|| **Solander, E.**—Om isförhållandena i Sveriges rinnande vatten. 10 pp., 1 plate, 8°. (*Öfversigt af K. Vetensk.-Akad. Förhändl.* 1882, No. 1. Stockholm.)

United States Signal Service, History of the, with catalogue of its exhibit at the international fisheries exhibition, London, 1883. 28 pp. 8°. Washington City, 1883.

|| **Waters, A. W.**—New method of reading a thermometer and hygrometer at a distance by means of electricity. 4 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, ix., 1883, p. 205.)

M—METEOROLOGY.—CONFERENCES.

Copenhagen.—Report of the second meeting of the international meteorological Committee. Held at Copenhagen, August, 1882. Published by authority of the **Meteorological Council**. 119 pp. la. 8°. London, 1883.

N—METEOROLOGY.—INSTRUCTIONS.

Doberck, W.—Instructions for making meteorological observations prepared for use in China. 34 pp. la. 8°. Hong-Kong, 1883.

|| **Hellmann, G.**—Kurze Anleitung zur Anstellung der einfachsten klimatologischen Beobachtungen. 13 pp. la. 8°. Berlin, 1881. (*Beilage zum "Export."*)

Meteorological Society, London.—Instructions for the observation of phenological phenomena. Second edition. 10 pp. la. 8°. London, 1883.

O—METEOROLOGY.—INSTRUMENTS.

Casella, L.—List, with notes, of standard meteorological and other instruments for observatories, travellers and explorers, and the Army and Navy. 72 + iv. pp. la. 8°. London, 1883.

Negretti and Zambra's patent hourly recording thermometrical apparatus. 4 pp. la. 8°. s.l.e.a.

|| **Wild, H.**—Über den Gebrauch meines Polaristrobometer (Saccharimeters) in weissem Lichte. 4 pp. la. 8°. (*Mel. Phys. Chim.*, xi., 1883, p. 751.)

|| ————Über die Umwandlung meines Photometers in ein Spectro-Photometer. 22 pp., 1 plate, la. 8°. (*Mel. Phys. Chim.*, xi., 1883, p. 729.)

P—METEOROLOGY.—OBSERVATIONS.

A. EUROPE. a. AUSTRIA.

Hydrographisches Amt der k. k. Kriegsmarine zu Pola.—Meteorologische und magnetische Beobachtungen. 1883, Jan.—Dec., and Results. Oblong la. 8°.

I. R. Accademia di Commercio e Nautica in Trieste.—Osservazioni meteorologiche. 1883, Jan.—Dec., and Results. sm. f°. Sheets.

K. K. Central-Anstalt für Meteorologie und Erdmagnetismus, Hohe Warte bei Wien.—Beobachtungen. 1883, Jan.—Dec., and Results. 8°.

K. K. Central-Anstalt für Meteorologie und Erdmagnetismus, Vienna.—Jahrbücher. Jahrg. 1879–81. Neue Folge, xvi.–xviii. Band. (Vorwort von J. Hann.) 3 vols., 1 plate, la. 4°. Wien, 1882–84.

K. K. Marine-Akademie, Fiume.—Meteorologische Beobachtungen. 1883, Jan.—Dec., and Results. la. 8°. Sheets.

K. K. meteorologisches Central-Observatorium zu Wien.—Internationaler telegraphischer Wetterbericht. Jahrg. vii., 1883, Jan. 1—Dec. 31. la. 4°. Sheets.

K. K. Sternwarte in Krakau.—Meteorologische Beobachtungen. 1883, Jan.—Dec., and Results. 8°. Sheets.

b. BELGIUM.

Observatoire royal de Bruxelles.—Bulletin météorologique. 1883, Jan. 1—Dec. 31. f°. Sheets.

———.—Diagrammes du météorographe Van Rysselberghe. 1880–82. la. f°. Bruxelles, 1883.

c. DENMARK.

Dansk meteorologisk Institut.—Bulletin météorologique du Nord, publié par les Instituts météorologiques de Norvège, de Danemark et de Suède. Année 1883. Oblong 8°. Copenhague, s.a.

———.—Maanedsoversigt over Vejrforholdene. 1883, Jan.—Dec. f°.

———.—Meteorologisk Aarbog for 1880, 1881. (Fortale af N. Hoffmeyer.) 2 vols., with plates, f°. Kjöbenhavn, 1881–82.
French text also in parallel columns.

d. FRANCE.

Bureau central météorologique de France.—Annales . . . publiées par E. Mascart. Année 1880. Bulletin des observations françaises. Saint-Martin-de-Hinx. 13 pp. la. 4°. Paris, 1882.

———.—Bulletin international. xxviii^e Année. 1883, Jan. 1—Dec. 31. 4°.

Carlier, H.—Observations météorologiques faites à Saint-Martin-de-Hinx, France (Landes). 1^{er} Décembre 1881—30 Novembre 1883. Dix-huitième et dix-neuvième années. 2 vols., with plates, la. 4°. Bayonne, 1883–84.

Commission météorologique départementale des Pyrénées-Orientales.—Bulletin météorologique du Département des Pyrénées-Orientales, publié par le Dr. Fines. ix^e–xi^e Années. 1880–82. 3 vols. 4°. Perpignan, 1881–83.

e. GERMANY.

Centralbureau für Meteorologie und Hydrographie im Grossherzogthum Baden.—Uebersicht der Ergebnisse der an den badischen meteorologischen Stationen angestellten Beobachtungen. 1883, Jan.—Dec. Nos. 171–182. f°. Sheets.

For previous years see "Grossh. badische meteorologische Centralstation, Karlsruhe."

Deutsche Seewarte.—Wetterbericht. Jahrg. viii., 1883, Jan. 1—Dec. 31. f°. Sheets.

Grossh. badische meteorologische Centralstation, Karlsruhe.—Jahresbericht . . . für das Jahr 1882. xiv. Bearbeitet von L. Württenberger. 134 pp. 8°. Karlsruhe, 1883.

[**Hauptstation des forstlichen Versuchswesen in Preussen.**]—Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreich Preussen, des Herzogthum Braunschweig, der thüringischen Staaten, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von **A. Müttrich**. Neunter Jahrg., 1883, Jan.—Dec. 8°. Berlin, s.a.

[———.]—Jahresbericht über die Beobachtungs-Ergebnisse der von den forstlichen Versuchsanstalten des Königreich Preussen, des Königreich Württemberg, des Herzogthum Braunschweig, der thüringischen Staaten, der Reichslande und dem Landesdirectorium der Provinz Hannover eingerichteten forstlich-meteorologischen Stationen. Herausgegeben von Dr. **A. Müttrich**. Achter Jahrg., 1882. 124 pp. 8°. Berlin, 1884 [1883].

|| **K. b. meteorologische Centralstation, Munich.**—Uebersicht über die Witterungsverhältnisse im Königreiche Bayern. 1883, Jan.—Dec. la. f°. Sheets. (*Separat-Abdruck aus der "Augsburger Abendzeitung."*)

K. meteorologische Central-Station, Munich.—Beobachtungen der meteorologischen Stationen im Königreich Bayern unter Berücksichtigung der Gewittererscheinungen im Königreich Württemberg. Herausgegeben . . . durch **W. von Bezold** und **C. Lang**. Vierter Jahrg., 1882. With plates, sm. f°. München, 1883.

Königliches meteorologisches Institut, Berlin.—Preussische Statistik. lxxi. Ergebnisse der meteorologischen Beobachtungen im Jahre 1882. vii. + 120 pp., 1 plate, sm. f°. Berlin, 1883.

Königliches statistisches Bureau in Berlin.—Witterung nach den Beobachtungen des Königlichen meteorologischen Instituts. 1883, Jan.—Dec. 4°. (*Statist. Correspondenz, Jahrg. ix.—x., 1883–84.*)

Meteorologische Centralstation Stuttgart.—Meteorologische Beobachtungen angestellt im Jahres 1881 und 1882. 2 parts, oblong sm. 8°. s.l.c.a.

[**Meteorologische Centralstation Stuttgart.**]—Uebersicht über die Witterungsverhältnisse des Monats Januar—Dezember, 1881 und 1882, nach den Beobachtungen der württ. Stationen. (Von Prof. Dr. **Schoder**.) 2 parts, oblong la. 8°. s.l.c.a.

Ministerial-Kommission zur Untersuchung der deutschen Meere in Kiel.—Ergebnisse der Beobachtungsstationen an den deutschen Küsten über die physikalischen Eigenschaften der Ostsee und Nordsee und die Fischerei. Jahrg. 1882. Heft i.—xii. Oblong 8°. Berlin, 1884.

Wetterwarte der Magdeburgischen Zeitung.—Jahrbuch der meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung, Station I. Ordnung. Herausgegeben von Dr. **R. Assmann**. Jahrg. I. 1881 und 1882. xvi. + 102 pp., 1 plate, la. 4°. Magdeburg, 1883.

F. GREAT BRITAIN AND IRELAND.

Army Medical Department, London.—Annual abstract of meteorological observations taken at Netley and foreign stations in the year 1881. 12 pp. la. 8°. (*Army Med. Dep. Rep.*, 1881, App. x., p. 356.)

(**Benn, T. G.**)—On the spring, summer, and autumn of 1883, in the vicinity of the lake district of Cumberland, from observations taken at Newton Reiguy, near Penrith. 11 pp., 1 table, 8°. Penrith, 1883.

|| **Fox, W. L.**—Tables of sea temperature, bright sunshine and climate at Falmouth, for the year 1882. And notes by W. L. Fox, with other meteorological tables for West Cornwall and the Scilly Islands. 15 pp., 1 diagram, 8°. (*Ann. Rep. R. Cornwall Polyt. Soc.*, 1882.)

* **Hartnup, J.**—Meteorological results deduced from observations taken at the Liverpool Observatory during the five years ending December 31st, 1850. 17 pp. 8°. [*Proc. Liverpool Lit. & Phil. Soc.*, 38th and 39th sessions, 1849 to 1851, p. 167.]

McLandsborough, J., and Preston A. E.—Meteorology of Bradford for 1883. Computed from daily observations made at the Exchange, Bradford. Oblong 8°. Sheet.

Marriott, W.—The meteorological record. Monthly results of observations made at the stations of the Meteorological Society, with remarks on the weather for the year 1882. Vol. ii. vii. + 67 pp., 1 plate, la. 8°. London, 1883.

Mawley, E.—The weather of 1883 as observed in the neighbourhood of London, and compared in all respects with that of an average year. With tables of daily observations and a diagram. viii. + 78 pp. 8°. London, [1884].

|| **Merrifield, J.**—Meteorological summary [of observations recorded at Plymouth] for the year 1883. Oblong la. 8°. Sheet. ("Western Daily Mercury," Jan. 2, 1884.)

Meteorological Council, London.—Hourly readings from the self-recording instruments at the seven observatories under the Meteorological Council. 1881, 2 + 507 pp. la. 4°. London, 1883.

Meteorological Office, London.—Daily weather report. 1883, Jan. 1—Dec. 31. 2 vols. f°. s.l.e.a.

—Weekly weather report. Vol. vi., 1883. la. 8°. London, s.a.

Stonyhurst College Observatory.—Results of meteorological and magnetical observations, by the Rev. S. J. Perry) 1882. 78 pp. sm. 8°. Roehampton, 1883.

g. HOLLAND.

Koninklijk nederlandsch meteorologisch Instituut.—Nederlandsch meteorologisch Jaarboek voor 1882. Vier en dertigste Jaargang. Oblong 8°. Utrecht, 1883.

h. ITALY.

Fornioni, C.—Osservazioni meteorologiche orarie ottenute da strumenti registratori durante l'anno 1881. Rilevate e calcolate da C. Fornioni. 55 pp., 6 plates, sm. f°. Milano, 1882. (*Pubbl. R. Osserv. di Brera in Milano*, N. xxiii.)

Osservatorio della Regia Università di Torino.—Bollettino. Anno xvii. (1882). Oblong la. 8°. Torino, 1883.

R. Osservatorio astronomico di Brera in Milano.—Osservazioni meteorologiche eseguite nell'anno 1883 col riassunto composto sulle medesime da E. Pini. 61 pp. la. 8°. s.l.e.a.

Ufficio centrale di Meteorologia, Roma.—Bollettino meteorico. Anno v., 1883, Jan. 1—Dec. 31. la. 4°. Sheets.

i. NORWAY.

Norwegisches meteorologisches Institut.—Jahrbuch . . . für 1882 Herausgegeben von H. Mohn. vi. + 99 + 8 pp. sm. f°. Christiania, 1883.

| **Oftedal, N.**—Oversigt over Veirforholdene i Norge i Aaret 1882. 23 pp. sm. 8°. Kristiania, [1883]. (*Tidsskr. for Landmand.*)

j. PORTUGAL.

Observatorio do Infante D. Luiz.—Boletim meteorologico. 1883, Jan. 1—Dec. 31. sm. f°. Sheets.

Observatorio meteorologico e magnetico da Universidade de Coimbra.—Observações meteorologicas feitas . . . no anno de 1882. (*Prefacio por A. S. Viégas.*) ix. + 136 pp. f°. Coimbra, 1883.

k. RUSSIA.

Physikalisches Central-Observatorium, St. Petersburg.—Meteorologisches Bulletin. 1883, Jan. 1—Dec. 31. f°. Sheets.
In the Russian language also.

Société des Sciences de Finlande.—Observations météorologiques. Vol. viii. Année 1880. 212 pp. 8°. Helsingfors, 1883.

Tifiser physikalisches Observatorium.—Meteorologische Beobachtungen . . . im Jahre 1882. Herausgegeben von J. Mielberg. vi. + 162 pp. la. 8°. Tiflis, 1883.

In the Russian language also.

l. SPAIN.

Instituto y Observatorio de Marina de San Fernando.—Anales. Publicados de Orden de la Superioridad, por el Director Don C. Pujazon. Sección 2ª. Observaciones meteorológicas. Año 1882. ix. + 134 pp. f°. San Fernando, 1883.

M. SWEDEN.

Kongl. Svenska Vetenskaps-Akademien, Stockholm.—Meteorologiska iakttagelser i Sverige utgifna af Kongl. Svenska Vetenskaps-Akademien, anställda och utarbetade under inseende af meteorologiska Central-Anstalten. Tjugondeförsta Bandet, 2: dra Serien: Bd. 7. 1879. (Förord af R. Rubenson.) vii. + 153 pp. la. 4°. Stockholm, 1883.

Meteorologiska Central-Anstalt, Stockholm.—Månadsöfversigt af Väderleken i Sverige till Landtbrukets tjenst utgifven under meteorologiska Central-Anstaltens inseende af Dr. H. E. Hamberg. Tredje. Årgången, 1883. f°. Stockholm, 1884.

Observatoire météorologique de l'Université d'Upsal.—Bulletin mensuel. Vol. xiv. Année 1882. Par Dr. H. H. Hildebrandsson. 74 pp. la. 4°. Upsal, 1882-83.

N. SWITZERLAND.

|| **Kammermann, A.** Résumé météorologique de l'année 1882 pour Genève et le Grand Saint-Bernard. 44 + 95 pp. 8°. Genève, 1883. (*Arch. sc. phys. nat.*, 1883, Dec.)

Schweizerische meteorologische Centralanstalt in Zürich.—Wetterbericht. 1883, Jan. 1—Dec. 31. 4°. Sheets.

In the French language also.

|| **Waters, A. W.**—Observations made in St. Moritz in the winter 1882-83. 19 pp. 8°. (*Proc. Lit. Phil. Soc. Manch.*, xxii.)

B. — ASIA. a. GENERAL.

Colonial Secretary's Office, Hong-Kong.—Meteorological observations taken at the Government Lock Hospital, Victoria, Hong-Kong. 1883, Jan.—Dec. Oblong 8°. Sheets.

(Imperial Meteorological Observatory, Tokei.)—[Daily meteorological observations at the] Imperial meteorological station, Ozaka, Japan. 1882, July—Dec., and Results. sm. f°. Sheets.

In the Japanese language also.

Imperial Meteorological Observatory, Tokei.—Weather map. 1883, Mch.—June, la. 4°; July—Nov., f°; Dec., la. 8°. 10 vols. s.l.c.a.

In the Japanese language also.

Observatoire magnétique et météorologique de Zi-ka-wei.—Bulletin mensuel. Tome viii.; année 1882. With plates, sm. f°. Zi-ka-wei, 1882.

Observatorio meteorológico del Ateneo Municipal de Manila, bajo la dirección de los PP. de la Compañía de Jesús. Observaciones verificadas durante los años de 1880-82. 3 vols., with plates, sm. f°. Binondo, 1883.

(Principal Civil Medical Officer, Straits Settlements.)—Meteorological returns. Singapore, Straits Settlements. 1880, 1882. sm. f°. Sheets.

Surveyor General's Office, Colombo.—Results of meteorological observations in Ceylon during the months of January to December 1882. f°. Sheets. (*Suppl. to the Ceylon Gov. Gazette*, 1882-83.)

|| **[Surveyor General's Office, Colombo.]**—The meteorology of Ceylon in 1881. (By C. H. Allen.) 24 pp. f°. (*Administration Reports*, 1881, p. 25 B.)

b. INDIA.

Meteorological Office, Bengal.—Abstract of observations as received in the Office of the Meteorological Reporter to the Government of Bengal during the months of January and February 1883. sm. f°. Sheets.

These abstracts were discontinued until June 1883, and from that date they are included in the "Table of rainfall recorded at Stations in Bengal."

[Meteorological Office, Calcutta.]—Report on the meteorology of India in 1881. By H. F. Blanford. Seventh year. ii. + 180 + 294 pp., 9 plates, f°. Calcutta, 1883.

Meteorological Office, India.—Abstract of the results of meteorological observations taken at the Alipore Observatory in the months of Jan.—Dec., 1883. sm. f°. Sheets.

[Meteorological Office, India.]—Meteorological observations recorded at six stations in India in the year 1882, corrected and reduced. Published . . . under the direction of H. F. Blanford. xi. + 191 pp. f°. Calcutta, 1883.

Meteorological Office, India.—Results of the meteorological observations taken at the Alipore Observatory. 1882, Dec. 31—1883, Dec. 29. sm. f°. Sheets.

[**Meteorological Office, India.**]—Weather report. 1883, Jan. 1—Dec. 31. Sheets.

☞.—AFRICA.

|| **Danckelman, A. von.**—Die Ergebnisse der meteorologischen Beobachtungen der Herren Herrn. Soyaux und Eapt. R. Mahnke in Ssibange-Farm am Awandu, Gabun, Westafrika, während der Jahre 1882 u. 1883, sowie Bemerkungen zu den meteorologischen Beobachtungen aus Omaruru im Damaralande. 15 pp., 2 tabular sheets, 8°. Leipzig, 1884. (*Mith. Ver. Erdk.*, 1883.)

Laboratoire Khédivial du Caire.—Observations météorologiques. 1883, Jan.—Dec. la. 4°. Le Caire, s.a.

[**Service météorologique du Gouvernement général de l'Algérie.**]—Bulletin météorologique du Gouvernement général de l'Algérie. Années viii^e–ix^e, 1883, Jan. 1—Dec. 31. sm. f°. Sheets.

|| **Service météorologique du Gouvernement général de l'Algérie.**—Observations météorologiques du Réseau Africain. Année 1880. 74 pp. la. 4°. Paris, 1882. (*Ann. Bureau central meteor. France*, 1880, II.)

☛.—AMERICA. a. CANADA.

Candall, H. J.—Abstract of meteorological register for the year 1882. Charlottetown, Prince Edward Island. Oblong la. 8°. Sheet.

(**Magnetical Observatory, Toronto.**)—General meteorological register for the year 1883. 6 pp. 8°. s.l.e.a.

b. UNITED STATES.

New York Meteorological Observatory.—Abstract of registers from self-recording instruments. 1881, Jan.—Dec., and annual tables. 4°.

Nipher, F. E.—[Bulletin of the] Missouri Weather Service. 1883, Jan.—Dec. la. 4° and la. 8°. Sheets.

Office of the Chief Signal Officer, Washington.—International simultaneous meteorological observations, including a monthly summary with daily bulletins and accompanying charts, for the months of January to December, 1881. la. 4°. Washington, 1882–83.

This bulletin contains observations recorded in various countries throughout the Globe.

———War Department weather map. 1883, Jan. 1—Dec. 31. la. f°. Sheets.

c. CENTRAL AMERICA.

Instituto nacional de Guatemala.—Observaciones meteorológicas. 1882, Jan.—Dec., and Resumen. f°. Sheets.

Ministerio de Fomento de la República Mexicana.—Boletín. Tomo vi., 1881, Nos. 1–100, 107–179, 185–198. vii., 1882, Nos. 1–75, 77–124. la. f°. Sheets.

e. WEST INDIES.

|| (**Hall, M.**)—Weather report for the months of Jan.—Dec. 1883. sm. f°. Jamaica, 1883–84. (*From the Jamaican Gazette.*)

Jefatura de Obras públicas de Puerto Rico.—Resumen de las observaciones meteorológicas verificadas . . . 1883, Jan.—Dec. 4°. Sheets.

W[alcott], R. B.—Meteorological observations . . . taken at Joes River House, St. Joseph's, Barbados. . . during the year 1882. sm. f°. Sheet.

———Meteorological observations taken at . . . Barbados. 1883, Jan. 1—Dec. 30. Slips.

☞.—AUSTRALASIA.

Gore, R. B.—Meteorological observations, Wellington. 1882, Jan.—Dec. Slips.

|| **Hector, J.**—Abstract of meteorological observations, New Zealand, for the quarters ending March, June, September, and December 1882. sm. f°. Sheets. (*Extracts from the New Zealand Gazette*, 1882-83.)

|| (**Hector, J.**)—[Meteorological observations in New Zealand, 1881, 1882.] 2 papers, sm. f°. (*Statistics of New Zealand*, 1881 and 1882, p. 57.)

Melbourne Observatory.—Monthly record of results of observations in meteorology, terrestrial magnetism, etc., etc., taken at the Melbourne observatory, together with abstracts from meteorological observations obtained at various localities in Victoria. Under the superintendence of **R. L. J. Ellery**. 1882, Jan.—Dec. la. 8°. Melbourne, s.a.

(**Surveyor General, Perth.**)—Meteorological report for the year 1882. 14 pp., 13 plates, sm. f°. Perth, 1883.

⚓.—SEA.

Dänisches meteorologisches Institut und deutsche Seewarte.—Tägliche synoptische Wetterkarten für den nordatlantischen Ozean und die anliegenden Theile der Kontinente. Erstes Quartal (Dezember 1880 bis Februar 1881). 2 pp., 93 charts, f°. Copenhagen et Hambourg, 1884.

Deutsche Seewarte.—Resultate meteorologischer Beobachtungen von deutschen und holländischen Schiffen für Eingradfelder des Nordatlantischen Ozeans. Quadrate 110 und 75. Herausgegeben von der Direktion (**G. Neumayer**). Nos. IV. und V. 2 vols., la. 4°. Hamburg, 1882-83.

Hamberg, H. E.—Resumé af meteorologiska observationer i Gyda-viken i vestra Sibirien, 72° 14'—72° 25' N.L., 76° 14'—77° 12' O. Gr., ombord på fartyget Oscar Dickson, oktober 1880—july 1881, utförda af Kapten M. E. Arnesen. 4 pp. 8°. (*Ymer*, 1883, p. 146.)

Norsk Nordhavs Expedition, 1876-78. X. Meteorologi af **H. Mohn**. Med 13 Træsnit, 3 Plancher og 1 Kart. 150 pp. f°. Christiania, 1883.

In the English language also.

(**Office of the Chief Signal Officer, Washington.**)—Meteorological and physical observations on the East Coast of British America, by **O. T. Sherman**. Prepared under the direction of **W. B. Hazen**. Professional Papers of the Signal Service. No. xi. 202 pp., 1 plate, la. 4°. Washington, 1883.

Physikalisches Central-Observatorium, St. Petersburg.—Meteorologische Beobachtungen angestellt auf Schiffen der Russischen Flotte. Publicirt von der Abtheilung für maritime Meteorologie des physikalischen Central-Observatoriums, mit Unterstützung des hydrographischen Departements und auf Kosten des Marine-Ministeriums. Band I. (Vorwort von **H. Wild**.) 4 + xv. + 215 pp., 1 chart, la. 4°. St. Petersburg, 1883.

In the Russian language also.

Q—METEOROLOGY.—TABLES.

Kobold, H.—Klinkerfues'sche Constanten zur Reduction auf den scheinbaren Ort für die mittleren Tage 1884, 12^{te} mittlere Zeit Berlin. Berechnet von H. Kobold. Veröffentlicht von der Königlichen Sternwarte zu Göttingen. 15 pp. 8°. (Göttingen, s.a.)

Reduction of barometrical observations to sea level. 2 pp. f°. (*Engineering*, 1884, Feb. 22, p. 160.)

S—OZONE.

Bineau, A.—Résumé des données ozonométriques recueillies à Lyon depuis les premiers jours de Juin 1855 jusqu'au mois de Mars 1857, et remarques à ce sujet. Lu . . . le 24 Nov. 1857. 12 pp. la. 8°. (*Acad. de Lyon, Cl. de Sc., T. vii. p. 225.*)

T—PERIODICALS, PROCEEDINGS, TRANSACTIONS, AND ANNUAL REPORTS.

Académie des Sciences, Paris.—Comptes Rendus hebdomadaires des séances. . . . Tomes xcvi., xcvi., 1883. 2 vols. 4°. Paris, 1883.

American Philosophical Society.—Proceedings of the American Philosophical Society held at Philadelphia for promoting useful knowledge. Vol. xx., Jan. 1882 to April 1883. With plates, la. 8°. Philadelphia, 1883.

Archives des sciences physiques et naturelles. Troisième période Tomes ix.-x. 2 vols., with plates, 8°. Genève, 1883.

Association scientifique de France.—Bulletin hebdomadaire. Deuxième série. Tomes vii., viii., 1883–84. 2 vols. 8°. Paris, 1883.

Associazione meteorologica italiana.—Bollettino mensile pubblicato per cura dell'Osservatorio centrale del Real Collegio Carlo Alberto in Moncalieri. Serie II., vol. II. (della intera Collezione, Vol. xvii.) Anno 1881–82. 1 vol. sm. f°. Torino, 1882.

British Association for the Advancement of Science.—Report of the fifty-second meeting . . . held at Southampton in August 1882. lxxviii. + 716 + 94 pp., 10 plates, 8°. London, 1883.

Bureau central météorologique de France.—Annales . . . publiées par **E. Mascart**:—

Année 1880. II. Bulletin des observations françaises et revue climatologique. 1 vol., with plates, la. 4°. Paris, 1882.

1881. I. Etude des orages en France et mémoires divers. 1 vol., with plates, la. 4°. Paris, 1883.

III. Pluies en France. 1 vol., with plates, la. 4°. Paris, 1883.

IV. Météorologie générale. 1 vol., with plates, la. 4°. Paris, 1883.

* **Ciel et Terre.**—Revue populaire d'astronomie de météorologie, et de physique du globe. Quatrième année. 1^{er} Mars 1883–15 Février 1884. 1 vol., with plates, 8°. Bruxelles, 1884.

Comité international des Poids et Mesures.—Procès-verbaux des séances de 1882. 158 pp. 8°. Paris, 1883.

Commission météorologique du Département de Vaucluse.—Compte-Rendu pour l'année 1882. 38 pp., 7 plates, sm. f°. (Avignon, s.a.)

Deutsche Seewarte.—Monatliche Uebersicht der Witterung für jeden Monat des Jahres 1882. Jahrg. vii., with plates, la. 8°. Hamburg, s.a.

Finska Vetenskaps-Societeten.—Öfversigt af Finska Vetenskaps-Societetens Förhandlingar. xxiv. 1881–1882. With plates, 8°. Helsingfors, 1882.

Franklin Institute, Philadelphia.—The journal of the Franklin Institute, devoted to science and the mechanic arts, published by the Institute, under the direction of the Committee on publication. Vols. cxvi., cxvii.; Third series, vols. lxxxv., lxxxvi., 1883. 2 vols., with plates, 8°. Philadelphia, 1883.

Geological and Natural History Survey of Canada.—Report of Progress for 1879–80. xix. + 9 + 55 + 4 + 177 + 4 + 113 + 4 + 47 + 4 + 125 + 4 + 15 + 4 + 21. 22 plates, 5 maps, la. 8°. Montreal, 1881.

Government Observatory, Bombay.—Report on the condition and proceedings of the Government Observatory, Colaba, for the year which ended with the 30th June, 1883. (By **F. Chambers**.) 8 pp. sm. f°. s.l.e.a.

Hansa.—Zeitschrift für Seewesen. (Redigirt und herausgegeben von **W. von Freeden**.) xx. Jahrg., 1883. With plates, sm. f°. Hamburg, s.a.

(Hydrographic Office, Washington.)—Annual report of the Hydrographer to the Bureau of Navigation for the fiscal year ending June 30, 1883. 15 pp. la. 8°. Washington, 1883.

Hydrographisches Amt der Admiralität, Berlin.—Annalen der Hydrographie und maritimen Meteorologie. Organ des hydrographischen Amtes und der deutschen Seewarte. xi. Jahrg., 1883. With plates, la. 8°. Berlin, s.a.

Kaiserliche Akademie der Wissenschaften, St. Petersburg.—Repertorium für Meteorologie . . . Redigirt von **H. Wild**. Band viii., with plates, sm. f°. (St. Petersburg), 1883.

Kais. und Kön. geographische Gesellschaft in Wien.—Mittheilungen. 1882. Redigirt von Dr. **J. Chavanne**. xxv. Band (der neuen Folge xv.). With plates, la. 8°. Wien, 1882.

* **Kettler, J. I.**—Zeitschrift für wissenschaftliche Geographie. iii. Jahrg. With plates, la. 8°. Lahr, 1882.

K. K. hydrographisches Amt, Pola.—Mittheilungen aus dem Gebiete des Seewesens. Jahrg. 1883. xi. Band. With plates, la. 8°. Pola, 1883.

Contains also some unnumbered pages of meteorological observations recorded at Pola during 1882–83.

Knowledge.—An illustrated magazine of science plainly worded, exactly described. Conducted by **R. A. Proctor**. Vols. iii. and iv., 1883. 2 vols., 4°. London, 1883.

Kongelige danske videnskabernes Selskab.—Oversigt over det . . . Forhandlinger og dets Medlemmers Arbejder i Aaret 1882. With plates, la. 8°. Kjøbenhavn, 1882-83.

* **Krebs, G.**—Die Physik im Dienste der Wissenschaft, der Kunst und des praktischen Lebens. Herausgegeben von Dr. G. Krebs. 582 + xvi. pp., 1 tabular form, 8°. Stuttgart, 1884.

Leicester Literary and Philosophical Society.—Report of the Council . . . presented to the annual general meeting, assembled June 25th, 1883. And the transactions of the Society, for the session 1882-83. 47 + 17 pp. 8°. Leicester, [1883].

—The Transactions . . . from June, 1835, to June, 1879, forty-four sessions. Edited by F. T. Mott and T. Carter. iv. + 396 pp. 8°. Leicester, 1884.

* **London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science.** Conducted by Sir R. Kane, Sir W. Thomson, and W. Francis. Fifth series. Vols. xv.-xvi., 1883. 2 vols., with plates, 8°. London, s.a.

(Melbourne Observatory.)—Eighteenth report of the Board of Visitors to the Observatory; together with the annual report of the Government Astronomer. 16 pp. sm. f°. Melbourne, s.a.

Meteorological Commission, Cape of Good Hope.—Report . . . for the year 1882. viii. + 93 pp. sm. f°. Cape Town, 1883.

Meteorological Council, London.—The quarterly weather report, 1877 and 1880. Appendices and plates. 2 vols., with plates, la. 4°. London, 1883.

(Meteorological Office, Bengal.)—Administration report of the meteorological reporter to the Government of Bengal, for the year 1882-83. (By J. Eliot.) 19 pp. sm. f°. s.l.e.a.

[Meteorological Office, India.]—Report on the administration of the meteorological department of the Government of India in 1882-83. 107 pp. f°. s.l.e.a.

(Meteorological Office, Madras.)—Administration report of the meteorological reporter to the Government of Madras, for the year 1882-83. 24 pp. la. 8°. Madras, 1883.

Meteorological Service, Dominion of Canada.—Monthly weather review. 1883, Jan.—Dec. With plates, la. 4°. s.l.e.a.

—Report . . . by C. Carpmæl. For the year ending December 31, 1881. xxii. + 221 pp. la. 8°. Ottawa, 1882.

Meteorological Society, London.—Quarterly journal. Vol. ix., la. 8°. London, 1883.

Ministère de la Marine et des Colonies, Paris.—Revue maritime et coloniale. Tomes lxxvii.—lxxx. 5 vols., with plates, la. 8°. Paris, 1883-84.

Ministerio de Fomento de la República mexicana.—Anales. Tomo vii 702 pp., 8 plates, la. 8°. México, 1882.

* **Nature.**—A weekly illustrated journal of science. Vols. xxvii.—xxviii. 1882-83. 2 vols., with portraits, la. 8°. London and New York, 1883.

* **Nature, La.**—Revue des sciences et de leurs applications aux arts et à l'industrie. Journal hebdomadaire illustré. Rédacteur en Chef G. Tissandier. Onzième année, 1883. 1^{re} et 2^e Semestres. 2 vols. sm. f°. Paris, s.a.

* **Nautical Magazine for 1883.** New series. A journal of papers on subjects connected with maritime affairs. Vol. lii. 8°. London, s.a.

Observatoire de Montsouris.—Annuaire de l'Observatoire de Montsouris pour l'an 1883. Météorologie. Agriculture. Hygiène. (Introduction par Marié-Davy.) 449 pp., 1 plate, 18mo. Paris, s.a.

Observatorio astronomico nacional de Tacubaya.—Anuario . . . para el año de 1884 formado bajo la direccion del Ingeniero A. Anguiano. Año iv. 358 pp., 2 plates, sm. 8°. México, 1883.

Oesterreichische Gesellschaft für Meteorologie.—Zeitschrift. Redigirt von J. Hann. xviii. Band. With plates, la. 8°. Wien, 1883.

Office of the Chief Signal Officer, Washington.—Annual report of the Chief Signal Officer to the Secretary of War for the year 1880. Parts I. and II. 2 vols., with plates, 8°. Washington, 1881.

—Monthly weather review. 1882, 1883, Jan.—Dec. With charts, 4°. Washington, 1882-84.

Petermann's (Dr. A.) Mittheilungen aus Justus Perthes' geographischer Anstalt. Herausgegeben von E. Behm. 29 Band, 1883. With plates, 4°. Gotha, s.a.

Physikalischer Verein zu Frankfurt am Main.—Jahresbericht . . . für das Rechnungsjahr 1881–82. 45 pp., 6 sheets of met. obsrs. for 1882, 2 diagrams, 8°. Frankfurt a/M., 1883.

|| **Physikalisches Central Observatorium, St. Petersburg.**—Jahresbericht . . . für 1881 und 1882. Der Akademie abgestattet von **H. Wild.** 2 + 102 pp. sm. 8°. St. Petersburg, 1883. (*Report. Meteor.* viii.)

Pontificia Università Gregoriana, continuazione del bullettino meteorologico dell' Osservatorio del Collegio romano, con corrispondenza e bibliografia per l'avanzamento della fisica terrestre, fondato dal P. A. Secchi. Vol. xxi., anno xxi., 1882. With plate, sm. 8°. Roma, 1882.

(Prestoe, H.)—Report on the Botanic Gardens [Trinidad] for 1882, together with returns for, and observations relating to, 1881. 43 + vii. pp. sm. 8°. s.l.e.a.

Royal Cornwall Polytechnic Society.—The fiftieth and jubilee report, 1882. With plates, 8°. Falmouth, [1883].

Royal Geographical Society, London.—Proceedings . . . and monthly record of geography. New monthly series. Vol. v., 1883. With plates, la. 8°. London, 1883.

Royal Society of London.—Proceedings. Feb. to June 1883. Vol. xxxv., with plates, 8°. London, 1883.

Royal Society of Tasmania.—Papers and Proceedings . . . for 1881 and 1882. 2 vols., with plates, 8°. Hobart, 1882–83.

Royal United Service Institution, London.—Journal. Vol. xxvii., with plates, 8°. London, 1883.

Rugby School Natural History Society.—Report . . . for the year 1882. (Preface by **F. D. Morice** and **G. C. Richards**, Editors.) xvi. + 38 pp., 4 plates, 8°. Rugby, 1883.

Schweizerische meteorologische Centralanstalt.—Annalen. 1881, 1882. Der "Schweizerischen meteorologischen Beobachtungen" xviii., xix., Jahrg. 2 vols., with plates, 4°. Zurich, s.a.

For previous years, see P. A. n.

Scientific Department of the Naval Technical Committee, St. Petersburg.—Naval Repertory. 1882, Nos. 3, 4, 6, 7–9, 12; 1883, Nos. 1, 3, 5–9, 11, 12. Vols. cxxxix.–cxlix., with plates, la. 8°. St. Petersburg, 1882–83.

In the Russian language.

Smithsonian Institution, Washington.—Annual report of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures, and condition of the Institution for the year 1881. xvi. + 839 pp. 8°. Washington, 1883.

———.—Smithsonian contributions to knowledge. Vols. vi.–xi., xiii.–xviii., xx.–xxii. 15 vols., with plates, la. 4°. Washington, 1854–1880.

———.—Smithsonian miscellaneous collections. Vols. i., ii., iv., v., vii., ix., x., xii.–xxi., 17 vols., with plates and portraits, la. 8°. Washington, 1802–81.

Societas scientiarum Fennicæ.—Acta. Tomus xii. 1 vol., with plates, la. 4°. Helsingfors, 1883.

Société de Géographie de Genève.—Le Globe. Journal géographique. Tomes xxi., xxii. Quatrième série, Tomes i.–ii., 2 vols., 8°. Genève, s.a.

Society of Arts, London.—Journal. Vol. xxxi. From Nov. 17, 1882, to Nov. 16, 1883. With plate, la. 8°. London, 1883.

Symons's monthly meteorological magazine. Vol. xviii., 1883. With plates, 8°. London, s.a.

Tasmania.—Report of the meteorological Observer (**J. Shortt**) for part of the year 1882. 11 pp. 8°. Tasmania, s.a.

Ufficio centrale di Meteorologia italiana.—Annali. Serie II. Vols. ii., 1880, iii., 1881, Parte i.–iii. (Introduzione del **P. Tacchini**.) 4 vols., with plates, sm. 8°. Roma, 1882–83.

Yorkshire Philosophical Society.—Annual report of the Council . . . for MDCCCLXXXII. Presented to the annual meeting, February 6th, 1883. 19 pp. la. 8°. York, 1883.

U—RAIN.

|| **Burder, G. F.**—Rainfall at Clifton in 1882. 2 pp. 8°. (*Proc. Bristol Nat. Soc.*)

———.—Thirty years' rainfall at Clifton. 6 pp., 2 plates, 8°. (*Proc. Bristol Nat. Soc.*)

|| **(Hall, M.)**—Jamaica rainfall from about 1870 to the end of 1879. Parts i. and ii., with additions and corrections. 2 papers, f°. Kingston, 1883. (*Suppl. to the Jamaica Gazette, October 4 and 18, 1883.*)

These form Nos. 31 and 33 of the "Jamaica Weather Report."

Meteorological Council, London.—Rainfall tables of the British Isles for 1866–1880. Compiled from the records of 366 stations by **G. J. Symons**. (Preface by **R. H. Scott**.) 199 pp., 3 plates, la. 8°. London, 1883.

Meteorological Office, Bengal.—Table of rainfall recorded at stations in Bengal. 1883, Jan.—Dec., and annual tables. sm. f°.

Moore, J. W.—Rainfall in 1883, at 40, Fitzwilliam Square, West, Dublin. 8°. Sheet.

* **North-West Provinces.**—Revenue meteorological statements of the North-Western Provinces, for the several official years from 1844–45 to 1849–50. 91 pp., la. 4°. Agra, 1853.

This contains rainfall observations only.

Observatorium te Batavia.—Regenwaarnemingen in Nederlandsch-Indië. Vierde Jaargang, 1882. Door Dr. **J. P. Van der Stok**. xiv. + 341 pp. 8°. Batavia, 1883.

Title page and Preface in the English language also.

(Office of the Chief Signal Officer, Washington.)—Charts and tables showing geographical distribution of rainfall in the United States. Prepared, under the direction of **W. B. Hazen**, by **H. H. C. Dunwoody**. Professional Papers of the Signal Service. No. ix. 51 pp., 13 charts, la. 4°. Washington, 1883.

Principal Civil Medical Officer, Straits Settlements.—Rainfall Returns. Singapore, 1880. sm. f°. Sheets.

Raulin, V.—Observations pluviométriques faites en France de 1871 à 1880. 48 pp. 8°. (*Bordeaux, 1883.*)

———Sur le régime pluvial de l'Algérie pendant la période décennale 1871–80. 3 pp. 4°. (*Gazette Médicale de l'Algérie, 15 Aout, 1883.*)

Roper, W.—Statistics of Lancaster rainfall and other local meteorological information, 1784 to 1883. 17 pp., 3 plates, la. 8°. (Lancaster, 1884.)

Russell, H. C.—Anniversary address. Delivered to the Royal Society of N.S.W., 3 May, 1882. 30 pp. 8°. (Sydney, 1883.)

Contains some remarks on the artificial production of rain.

———Results of rain and river observations made in New South Wales during 1882. 22 pp., 2 plates, la. 8°. Sydney, 1883.

|| **Surveyor General's Office, Colombo.**—The Hon. the Surveyor-General's Return of rainfall in Ceylon during the year 1882, and means during different periods. la. f°. Sheet. (*Suppl. to the "Ceylon Gov. Gazette," No. 4527, June 1, 1883.*)

Symons, G. J.—British rainfall, 1882. On the distribution of rain over the British Isles, during the year 1882, as observed at more than 2,000 stations in Great Britain and Ireland, with articles upon various branches of rainfall work. 56 + 207 pp., 5 plates, 1 table, 8°. London, 1883.

W—TEMPERATURE.

|| **Blanford, H. F.**—Some further results of sun-thermometer observations with reference to atmospheric absorption and the supposed variation of the solar heat. 13 pp. 8°. (*Journ. Asiat. Soc. Bengal, LI. Part ii., 1882, p. 72.*)

|| **Erk, F.**—Die Bestimmung wahrer Tagesmittel der Temperatur unter besonderer Berücksichtigung langjähriger Beobachtungen von München. Mit einleitenden Bemerkungen von **W. von Bezold**. 55 pp., 3 plates, 4°. (*Abhandl. k. bayer. Akad. Wiss., II. Cl., xiv. Bd., ii. Abth., p. 177.*)

(Hazen, H. A.)—The dry- and wet-bulb hygrometer. Read before the Phil. Soc. of Washington, D.C., May 5, 1883, at its 235th meeting. 5 pp. la. 8°. (*Science, Cambridge, Mass., I., 1883, p. 502.*)

Hellmann, G.—Die milden Winter Berlin's seit 1720. 2 pp. sm. f°. Dated, Berlin, Feb. 1884.

|| ———Ueber den jährlichen Gang der Temperatur in Norddeutschland. 11 pp., 2 plates, sm. f°. (*Zeitschr. k. preuss. statist. Bureau, Jahrg. 1883.*)

|| **Högbom, A. G.**—Marche des isothermes en Automne dans le Nord de l'Europe. Présenté à la Soc. R. des Sc. d'Upsal le 20 Sept. 1883. 8 pp., 5 plates, 4°. Upsal, 1883. (*Nova Acta Reg. Soc. Ups., Ser. iii.*)

Meteorological Office, India.—Abstract of the results of the thermometric observations taken at the meteorological Office, Chowringhee, in the months of January to December, 1883. sm. f°. Sheets.

———Results of the thermometrical observations taken at the meteorological Office, Chowringhee. 1882, Dec. 31—1883, Dec. 29. sm. f°. Sheets.

|| **Pouchet, G.**—Note sur les températures de la mer observées pendant la mission de Laponie. 3 pp. 4°. Dated, 2 Janv., 1882. [*Compt. rend. acad. sc., Paris.*]

|| **Stow, F. W.**—On solar radiation, 1869–1874. 12 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, II. n.s., 1874, p. 205.)

|| ———On temperature in sun and shade. An account of experiments made at Harpenden, Herts. 9 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, I. n.s., 1873, p. 146.)

|| ———On the absorption of the sun's heat-rays by the vapour of the atmosphere. 16 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, II. n.s., 1875, p. 241.)

|| ———Solar radiation. An account of some experiments made at Harpenden, Herts. 10 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, I. n.s., 1873, p. 137.)

|| **Strachey, R.**—On the computation of the quantity of heat in excess of any fixed base temperature, received at any place during the course of the year, to supply a standard for comparison with the progress of vegetation. 21 pp. la. 4°. (*Quart. Weather Rep.*, 1878. p. [13].)

|| (**Woeikoff, A.**)—On some conditions necessary for the determination of heat in oceans, and their relation to the thermostatics of the Globe. 17 pp. la. 8°. (*Proc. Imp. Russian Geogr. Soc.*, vol. xix.)

In the Russian language.

|| **Woeikoff, A.**—Ueber die Grösse der täglichen Wärmeschwankung in ihrer Abhängigkeit von den Localverhältnissen. 17 pp. la. 8°. (*Zeitschr. oesterr. Gesellsch. Meteor.*, Wien, xviii., 1883, pp. 211 u. 241.)

X—WEATHER TELEGRAPHY AND PREDICTION.

|| **Abercromby, R., and Marriott, W.**—Popular weather prognostics. 17 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, IX., 1883, p. 27.)

|| **Bebber, J. van.**—Die Ergebnisse der ausübenden Witterungskunde während des Jahres 1882. 28 pp. la. 8°. (*Monatl. Uebers. Witterung, Hamburg*, vi., 1882, p. 1.)

* (**Durand-Gréville, E.**)—La prévision du temps et la météorologie générale. 53 pp. 8°. [*Bibl. Univ. et Revue Suisse*, 3^{me} période, 1883, xviii., p. 506, xix., p. 87.]

|| **Hildebrandsson, H. H.**—Samling af bemärkelsedagar, tecken, märken, ordspråk och skrock rörande väderleken. 118 pp. 8°. (*Antiqvar. tidskr. för Scerige, Del. 7, Nr. 2.*)

|| **Office of the Chief Signal Officer, Washington.**—To foretell frost. Signal Service Notes No. iii. Prepared under the direction of **W. B. Hazen** by **J. Allen**. 11 pp. la. 8°. Washington, 1882.

|| **Scott, R. H.**—On storm warnings. 21 pp. 8°. London, 1883. (*Paper read at a Conference of the Internat. Fisheries Exhib., July 16, 1883.*)

|| **Tasmania.**—Australian and Tasmanian intercolonial weather telegram and forecast system. Correspondence. Ordered by the House of Assembly to be printed, July 12, 1882. 12 pp. sm. f°. s.l.e.a.

* **Williams, W. M.**—The weather forecasts of the Meteorological Office. 2 pp. 4°. (*Knowledge*, vol. iii., June 29, 1883, p. 386.)

Y—WINDS, STORMS, AND CYCLONES.

|| **Berg, Graf F.**—Bromow's neue Theorie der fortschreitenden Bewegung von Cyklonen und Anticyklonen. 12 pp. la. 8°. [*Gaea: Natur und Leben*, xix. Jahrg., 1883, p. 137.]

|| **Curtis, R. H.**—Notes of a second series of experiments on the distribution of pressure upon flat surfaces perpendicularly exposed to the wind. 5 pp. la. 8°. (*Quart. Journ. Meteor. Soc.*, Vol. ix., 1883, p. 221.)

|| **Fineman, C. G.**—Sur la trombe du 7 Juin 1882 dans la vallée de Sâby. Présenté à la Soc. R. des Sciences d'Upsal le 29 Sept. 1882. 37 pp., 7 plates, 4°. Upsal, 1883. (*Nova Acta Reg. Soc. Sc. Ups., Ser. iii.*)

|| **Hamberg, H.-E.**—Sur la variation diurne de la force du vent. Mém. communiqué à l'acad. royale des sc. de Suède le 14 Mars 1883. 48 pp., 1 plate, 8°. Stockholm, 1883. (*Bihang till K. Sv. Vet.-Akad. Handl., Band 7, No. 8.*)

|| **(Laughton, J. K.)**—The law of storms and the heaving-to tack. 11 pp. 8°. (*Naut. Mag.*, 1880, Sept.)

Mansuy, E.—Aperçus nouveaux sur les causes et les lois des trombes et des tempêtes, extraits des voyages de M. Senman et traduits de l'anglais, avec l'autorisation de l'Auteur par E. Mansuy. 39 pp., 2 plates, la. 8°. Paris, 1878.

(Office of the Chief Signal Officer, Washington.)—Popular essays on the movements of the atmosphere. Compiled under the direction of **W. B. Hazen** by **W. Ferrel**. Professional Papers of the Signal Service, No. xii. 59 pp. la. 4°. Washington, 1882.

(——).—The motions of fluids and solids on the earth's surface, by **W. Ferrel**. Reprinted, with notes by **Frank Waldo**. Prepared under the direction of **W. B. Hazen**. Recent mathematical papers concerning the motions of the atmosphere, Part i. Professional Papers of the Signal Service, No. vii. 51 pp. la. 4°. Washington, 1882.

|| **(Woeikoff, A.)**—Results of observations on the force (velocity) of wind in Russia and the daily period of this phenomenon. 12 pp. la. 8°. (*Proc. Imp. Russian Geogr. Soc., vol. xix.*)

In the Russian language.

Z—MISCELLANEOUS.

Anderson, C.—On deep sea lighthouses. 12 pp., 2 plates, 8°. (*Read before the Soc. of Eng., April 2, 1883.*)

Board of Trade, London.—Abstracts of the Returns made to the Board of Trade of sea casualties which occurred on and near the coasts of the United Kingdom, from the 1st July, 1881, to the 30th June, 1882; . . . viii. + 161 pp., 6 charts, sm. f°. London, 1883.

* **Boguslawski, G. von.**—Handbuch der Ozeanographie. Band I. Räumliche, physikalische und chemische Beschaffenheit der Ozeane. xviii. + 400 pp. 8°. Stuttgart, 1884.

This forms one of the series of the "Bibliothek geographischer Handbücher, herausgegeben von Prof. Dr. F. Ratzel."

Commission zur wissenschaftlichen Untersuchung der deutschen Meere, in Kiel.—Vierter Bericht . . . für die Jahre 1877 bis 1881. Im Auftrage des Kgl. Preuss. Ministeriums für Landwirthschaft, Domänen und Forsten herausgegeben von **H. A. Meyer, K. Möbius, G. Karsten, V. Hensen, A. Engler**. vii. bis xi. Jahrg., ii. Abtheilung, pp. 185-313, 2 plates, 1°. Berlin, 1883.

* "**Corwin.**"—Cruise of the revenue-steamer "Corwin" in Alaska and the N.W. Arctic Ocean in 1881. Notes and memoranda: medical and anthropological; botanical; ornithological. 120 pp., 12 plates, la. 4°. Washington, 1883.

* **Elder, W.**—Biography of Elisha Kent Kane. 416 pp., 4 plates, 1 portrait, la. 8°. Philadelphia, 1858.

|| **(Evans, Sir F. J.)**—Obituary notice of General Sir Edward Sabine, R.A., K.C.B. 3 pp. la. 8°. (*Proc. R. Geogr. Soc., v., 1883, p. 491.*)

Great International Fisheries Exhibition, 1883.—Official catalogue. Second edition. xcii. + 382 + xxviii. pp. 8°. London, 1883.

Hector, J.—Hand-book of New Zealand. Third edition, revised. viii. + 147 pp., 9 plates, la. 8°. Wellington, 1883.

Ignatius, K. E. F.—Le Grand-Duché de Finlande. Notice statistique. Traduit du Suédois par **G. Biaudet**. 142 pp. 8°. Helsingfors, 1878.

This is a second edition, revised and enlarged, of a pamphlet published in 1876.

|| **Irving, A.**—Solar radiation and glacier motion. 4 pp. 8°. (Wellington College, 1883.) (*Nature*, xxvii., 1883, p. 553.)

Koninklijk nederlandsch meteorologisch Instituut.—Route voor Stoomschepen van het Kanaal naar New-York en terug. (Voorrede by **B. Ballot**.) 2 + 8 + 37 pp., 7 plates, f°. Utrecht, 1883.

|| [**Lefroy, Sir J. H.**].—Memoir of General Sir Edward Sabine, F.R.S., K.C.B., 16 pp. la. 8°. Woolwich, 1883. (*Proc. R. Artillery Inst.*, xii., No. 6.)

* **Leslie, —, Jameson, —, and Murray, H.**—Narrative of discovery and adventure in the Polar Seas and regions: with illustrations of their climate, geology, and natural history; and an account of the whale-fishery. viii. + 424 pp., 1 chart, 5 plates, sm. 8°. Edinburgh, 1830.

* **McIlraith, Rev. J.**—Life of Sir John Richardson. xi. + 280 pp., 1 plate, 1 portrait, sm. 8°. London, 1868.

Mühry, A.—Kurze Bemerkung über das System der Meeresströmungen im Südatlantischen Ozean. 2 pp. 4°. (*Petermann's Geogr. Mitth.*, 1883, p. 384.)

|| **Nordenskiöld, A. E.**—Den blifvande expeditionen till Grönland. Promemoria, afgifven till dr Oscar Dickson, af A. E. Nordenskiöld. 12 pp. 8°. (*Ymer*, 1883, p. 101.)

Norwegian Statistics.—Statistics of the sea fisheries of Norway during the year 1881, with retrospective statistical tables relating to the sea fisheries in the years 1866–1881. Published by the Central Statistical Office. xxv. + 79 pp. la. 8°. Christiania, 1883.

The second part is in the Norwegian language.

Office of the Chief Signal Officer, Washington.—Memoir on the use of homing pigeons for military purposes. Signal Service notes, No. ii. Prepared under the direction of **W. B. Hazen** by **W. E. Birkhimer**. 27 pp. la. 8°. Washington, 1882.

———.—Report on the Michigan forest fires of 1881. Signal Service notes, No. i. Prepared under the direction of **W. B. Hazen** by **W. O. Bailey**. 16 pp., 6 plates, la. 8°. Washington, 1882.

* **Olsen, O. T.**—The piscatorial atlas of the North Sea, English and St. George's Channels. Illustrating the fishing ports, boats, gear, species of fish (how, where, and when caught), and other information concerning fish and fisheries. 4 pp., 50 plates, la. 8°. Grimsby and London, 1883.

* **Parry, Rev. E.**—Memoirs of Rear-Admiral Sir W. Edward Parry, Kt., F.R.S., &c. Fourth edition. xvi. + 365 pp., 1 map, 1 portrait, sm. 8°. London, 1858.

* **Payer, J.**—New lands within the Arctic Circle. Narrative of the discoveries of the Austrian ship "Tegetthoff" in the years 1872–1874. Translated from the German, with the Author's approbation. In two volumes. Vol. I. xxxi. + 335 pp., 12 plates, 1 map, la. 8°. London, 1876.

Peschel, O.—Neue Probleme der vergleichenden Erdkunde als Versuch einer Morphologie der Erdoberfläche. Zweite um eine Abhandlung vermehrte Auflage. 4 + 215 pp., 2 plates, 8°. Leipzig, 1876.

* **Philips'** handy atlas of the counties of England. By **J. Bartholomew**. New and enlarged addition, with consulting index. 47 pp., 43 maps, sm. 8°. London, 1882.

* ——— handy atlas of the counties of Ireland: constructed by **J. Bartholomew**, revised by **P. W. Joyce**. 41 pp., 33 maps, sm. 8°. London, 1882.

* ——— handy atlas of the counties of Scotland: constructed by **J. Bartholomew**. 34 pp., 32 maps, sm. 8°. London, 1882.

* ——— handy atlas of the counties of Wales: constructed by **J. Bartholomew**. 16 pp., 16 maps, sm. 8°. London, 1883.

Rosser, W. H.—Stellar navigation with new A, B, and C tables for finding by easy methods latitude, longitude, and azimuths; latitudes and declinations ranging to 68° N or S. 36 pp. la. 4°. London, 1883.

* **Royal Geographical Society, London.**—Hints to travellers, scientific and general. Edited for the Council of the Royal Geographical Society by Lieut.-Colonel **H. H. Godwin-Austen**, **J. K. Laughton**, and **D. W. Freshfield**. Fifth edition. Revised and enlarged. xvi. + 296 pp., 3 plates, sm. 8°. London, 1883.

Shields, J.—On the application of oil to break the force of the sea at the entrance to harbours, and for the protection of ships at sea. 56 pp., 1 plate, 8°. London, 1883.

[**Société de Géographie de Genève.**].—Travaux de l'Association des Sociétés Suisses de Géographie dans sa deuxième session à Genève les 29, 30 et 31 Août 1882. 1 + vii. + 206 pp., 2 plates, la. 8°. Genève, 1883.

|| **[Lefroy, Sir J. H.]**—Memoir of General Sir Edward Sabine, F.R.S., K.C.B., 16 pp. la. 8°. Woolwich, 1883. (*Proc. R. Artillery Inst.*, xii., No. 6.)

* **Leslie, —, Jameson, —, and Murray, H.**—Narrative of discovery and adventure in the Polar Seas and regions: with illustrations of their climate, geology, and natural history; and an account of the whale-fishery. viii. + 424 pp., 1 chart, 5 plates, sm. 8°. Edinburgh, 1830.

* **McIlraith, Rev. J.**—Life of Sir John Richardson. xi. + 280 pp., 1 plate, 1 portrait, sm. 8°. London, 1868.

Mühry, A.—Kurze Bemerkung über das System der Meeresströmungen im Südatlantischen Ozean. 2 pp. 4°. (*Petermann's Geogr. Mitth.*, 1883, p. 384.)

|| **Nordenskiöld, A. E.**—Den blifvande expeditionen till Grönland. Promemoriar, afgifven till dr Oscar Dickson, af A. E. Nordenskiöld. 12 pp. 8°. (*Ymer*, 1883, p. 101.)

Norwegian Statistics.—Statistics of the sea fisheries of Norway during the year 1881, with retrospective statistical tables relating to the sea fisheries in the years 1866-1881. Published by the Central Statistical Office. xxv. + 79 pp. la. 8°. Christiana, 1883.

The second part is in the Norwegian language.

Office of the Chief Signal Officer, Washington.—Memoir on the use of homing pigeons for military purposes. Signal Service notes, No. ii. Prepared under the direction of **W. B. Hazen** by **W. E. Birkhimer**. 27 pp. la. 8°. Washington, 1882.

———.—Report on the Michigan forest fires of 1881. Signal Service notes, No. i. Prepared under the direction of **W. B. Hazen** by **W. O. Bailey**. 16 pp., 6 plates, la. 8°. Washington, 1882.

* **Olsen, O. T.**—The piscatorial atlas of the North Sea, English and St. George's Channels. Illustrating the fishing ports, boats, gear, species of fish (how, where, and when caught), and other information concerning fish and fisheries. 4 pp., 50 plates, la. 8°. Grimshy and London, 1883.

* **Parry, Rev. E.**—Memoirs of Rear-Admiral Sir W. Edward Parry, Kt., F.R.S., &c. Fourth edition. xvi. + 365 pp., 1 map, 1 portrait, sm. 8°. London, 1858.

* **Payer, J.**—New lands within the Arctic Circle. Narrative of the discoveries of the Austrian ship "Tegetthoff" in the years 1872-1874. Translated from the German, with the Author's approbation. In two volumes. Vol. I. xxxi. + 335 pp., 12 plates, 1 map, la. 8°. London, 1876.

Peschel, O.—Neue Probleme der vergleichenden Erdkunde als Versuch einer Morphologie der Erdoberfläche. Zweite um eine Abhandlung vermehrte Auflage. 4 + 215 pp., 2 plates, 8°. Leipzig, 1876.

* **Philips'** handy atlas of the counties of England. By **J. Bartholomew**. New and enlarged addition, with consulting index. 47 pp., 43 maps, sm. 8°. London, 1882.

* ——— handy atlas of the counties of Ireland: constructed by **J. Bartholomew**, revised by **P. W. Joyce**. 41 pp., 33 maps, sm. 8°. London, 1882.

* ——— handy atlas of the counties of Scotland: constructed by **J. Bartholomew**. 34 pp., 32 maps, sm. 8°. London, 1882.

* ——— handy atlas of the counties of Wales: constructed by **J. Bartholomew**. 16 pp., 16 maps, sm. 8°. London, 1883.

Rosser, W. H.—Stellar navigation with new A, B, and C tables for finding by easy methods latitude, longitude, and azimuths; latitudes and declinations ranging to 68° N or S. 36 pp. la. 4°. London, 1883.

* **Royal Geographical Society, London.**—Hints to travellers, scientific and general. Edited for the Council of the Royal Geographical Society by Lieut.-Colonel **H. H. Godwin-Austen**, **J. K. Laughton**, and **D. W. Freshfield**. Fifth edition. Revised and enlarged. xv. + 296 pp., 3 plates, sm. 8°. London, 1883.

Shields, J.—On the application of oil to break the force of the sea at the entrance to harbours, and for the protection of ships at sea. 56 pp., 1 plate, 8°. London, 1883.

[Société de Géographie de Genève.]—Travaux de l'Association des Sociétés Suisses de Géographie dans sa deuxième session à Genève les 29, 30 et 31 Août 1882. 4 + vii. + 206 pp., 2 plates, la. 8°. Genève, 1883.

(Standards Office, Board of Trade.)—Calculations of densities and expansions. 31 pp. la. 8°. London, 1883.

|| **Steenstrup, J.**—Zeni'ernes Reiser i Norden. En kritisk Fremstilling af det sidste Tiaars vigtige Bidrag til Forstaaelsen af Venetianerne Zeni's Ophold i Norden fra 1391 til 1405. (Tvende Foredrag, holdte i det kgl. nord. Oldskrift-Selskab. d. 13 Decbr. 1881 og 16 Mai 1882.) 160 pp., 5 plates, la. 8°. Kjøbenhavn, 1883. (*Aarb. nord. Oldk. og Hist.*; 1883, p. 55.)

Sugden, S. S.—The navisphere, patented in England, France, Germany, America, &c., &c., by Commander M. H. De Magnac, French Navy. Instructions for its use, abbreviated. 20 pp. 8°. London, s.a.

* "The Times" register of events in 1883. xli. + 214 pp. 8°. London, 1884.

* **Tytler, P. F.**—Historical view of the progress of discovery on the more northern coasts of America, from the earliest period to the present time. With descriptive sketches of the natural history of the North American regions, by **J. Wilson**. To which is added an appendix, containing remarks on a late memoir of Sebastian Cabot, with a vindication of Richard Hakluyt. 444 pp., 1 map, sm. 8°. Edinburgh, 1832.

University of Tôkiô.—Measurement of the force of gravity at Sapporo (Yesso), being an appendix to Memoir No. 5 of the science department, Tôkiô Daigaku (University of Tôkiô). By **A. Tanakadate, R. Fujisawa, and S. Tanaka**. 21 pp. la. 8°. Tôkiô, 2542 (1882).

Weights and Measures.—Report by the Board of Trade on their proceedings and business under the Weights and Measures Act, 1878. (Ordered, by the House of Commons, to be printed, 11 August, 1883.) 25 pp. sm. 8°. (London, 1883.)

* **Wiebel, K. W. M.**—Die Insel Kephalouia und die Meermühlen von Argostoli. Versuch einer Lösung dieses geophysikalischen Räth-sels. 8 + ix. + 160 pp., 1 chart, 4°. Hamburg, 1874.

APPENDIX XIX.

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.
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. The Barometer Manual (out of print, see Nos. 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.

LIST OF PUBLICATIONS, &c.—continued.

- No. 23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2s.
24. Instructions in the Use of Meteorological Instruments. 2s. 6d. [Reprint in the Press.]
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.
27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the best routes across the Equator. 24s.
28. Contributions to our Knowledge of the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger*. 1s.
29. Report for 1875. Presented to Parliament. 4d.
30. Quarterly Weather Report for 1875.—Parts I.—IV. 5s. each.
31. Report for 1876-7. Presented to Parliament. 3s. 5d.
32. A Discussion of the Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. 15s.
33. Quarterly Weather Report for 1876. (New Series.) Part I., 6s.; Parts II.—IV., 5s. each.
34. Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Part I., 2s.; Part II., 10s.; Part III. 6s.
35. Report for 1877-8. Presented to Parliament. 1s.
36. Report of the Proceedings of the Meteorological Congress at Rome, 1879. 1s. 6d.
37. Report on the Meteorology of Kerguelen Island. By the Rev. S. J. Perry, S.J., F.R.S. 3s.
38. Report for 1878-9. Presented to Parliament. 5d.
39. Meteorological Observations at Stations of the Second Order for the year 1878. 20s.
40. Aids to the Study and Forecast of Weather, by the Rev. W. Clement Ley, M.A. 1s.
41. Report for 1879-80. Presented to Parliament. 1s.
42. Report for 1880-81. Presented to Parliament. 1s. 2d.
43. Charts of Meteorological Data for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Price of the Charts, 25s.; of the Remarks, 7s.
44. Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope, between Lat. 30° and 50° S., and Long. 10° and 40° E., by Capt. H. Toynbee, F.R.A.S. 7s. 6d.
45. Meteorological Observations at Stations of the Second Order for the year 1879. 20s.

LIST OF PUBLICATIONS, &c.—continued.

- No. 46. Report on the Storm of October 13–14, 1881. By Robert H. Scott, F.R.S. 1s. 6d.
47. Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. 7s. 6d.
48. Report for 1881–2. Presented to Parliament. 1s.
49. Quarterly Weather Report for 1879 (New Series). Appendices and Plates. 27s.
50. Quarterly Weather Report for 1880 (New Series). Appendices and Plates. 28s.
51. Hourly Readings, 1881. (New Series.) Part I., 10s. 6d. Parts II., III., and IV., 21s. each.
52. Quarterly Weather Report, for 1877. (New Series). Appendices and Plates. 27s. Part I., 10s. Parts II. and III. (In the Press.)
53. Meteorological Atlas of the British Isles. 5s. 6d.
54. Hourly Readings, 1882. (New Series.) Parts I. and II. 20s. each. Part III., 22s. 6d. Part IV. (In the Press.)
55. Quarterly Weather Report for 1878. (New Series.) Appendices and Plates. 28s.
56. Sunshine Records of the United Kingdom for 1881. 4s.
57. Meteorological Observations at Stations of the Second Order for the year 1880. (In the Press.)
58. Report for 188–3. Presented to Parliament. 10½d.
59. Sea Temperature Charts for the Atlantic, Indian, and Pacific Oceans. 21s.
60. Principles of Forecasting by Means of Weather Charts. By the Hon. Ralph Abercromby, F.R. Met. Soc. 1s. 9d.
61. The Barometer Manual for the Use of Seamen. 1s. 3d.
62. Monthly Weather Reports for 1884:—Jan.–March, May–Nov. 1s. 6d. each. April (with two Appendices). 2s. 6d. Dec. (in the Press.)
63. Hourly Readings, 1883. (New Series.) Part I. (In the Press.)

NON-OFFICIAL.

- No. 1. Report to the Committee on the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6d.
2. Report to the Committee on the Meteorology of the North Atlantic.—By Captain H. Toynbee, Marine Superintendent. 1s.
3. Report to the Committee on the Use of Isobaric Curves.—By Captain H. Toynbee, Marine Superintendent. 1s.
4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. 6d.

LIST OF PUBLICATIONS, &c.—continued.**NON-OFFICIAL—continued.**

5. On the Winds, &c. of the North Atlantic along the Track of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6*d*.
6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1*s*.
7. Notes on the Form of Cyclones in the Southern Indian Ocean.—By C. Meldrum, Esq., M.A., F.R.S. 6*d*.
8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 6*d*.
9. Report of the Permanent Committee of the Vienna Congress for 1874. 1*s*. 6*d*.
10. On the Physical Geography of the part of the Atlantic which lies between 20° N. and 10° S., and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875, by Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1*s*. 6*d*.
11. Report of the Permanent Committee of the Vienna Congress for 1876. 2*s*.
12. Reports to the Permanent Committee of the Vienna Congress on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2*s*.
13. Report of the Permanent Committee of the Vienna Congress for 1878. 6*d*.
14. Report of the International Meteorological Committee, meeting at Berne, 1880. 1*s*.
15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen, August 1882. 2*s*. 6*d*.

Published and sold by POTTER, 31 Poultry, and STANFORD, 55, Charing Cross.

The Annual Reports may be obtained at the appointed Sale Offices for Parliamentary Papers, or directly through any Booksellers.