



REPORT
OF THE
METEOROLOGICAL COUNCIL

TO THE
ROYAL SOCIETY,

For the Year ending 31st of March 1883.

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



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THE METEOROLOGICAL COUNCIL,

1882-83.

Professor HENRY J. S. SMITH, F.R.S., Chairman (to February 9, 1883).

Lieutenant-General RICHARD STRACHEY, C.S.I., F.R.S. (Chairman from February 10, 1883).

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

Captain SIR FREDERICK J. O. EVANS, K.C.B., F.R.S., Hydrographer to the Admiralty.

MR. FRANCIS GALTON, F.R.S.

Professor GEORGE GABRIEL STOKES, F.R.S.

MR. EDWARD J. STONE, F.R.S. (from March 1883).

R E P O R T
OF THE
M E T E O R O L O G I C A L C O U N C I L
TO THE
R O Y A L S O C I E T Y,
For the Year ending March 31, 1883.

IT is with great regret that the Council have to commence Introductory their Report for the past year by recording the death of their late Chairman, Professor Henry J. Smith, which occurred, after a very short illness, on the 9th February last.

In a Report such as the present it would not be appropriate to attempt any estimate of the heavy loss thus caused to science in general, but the Council desire to express their deep sense of the loss which is more particularly their own, and to record their testimony of the admirable manner in which he conducted the varied duties of his office, combining as he did the highest order of intelligence, remarkable assiduity in the discharge of business, and a union of sound judgment with urbanity, which commanded the confidence and affection of all those with whom he had intercourse.

The Council of the Royal Society have nominated Lieutenant-General R. Strachey for the office of Chairman, and Mr. E. J. Stone, F.R.S., Radcliffe Observer of the University of Oxford, and late H.M.'s Astronomer at the Cape of Good Hope, to fill the vacant seat on the Council.

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 Office Keeper, Mr. J. S. Harding, who had been in the employment of the Meteorological Department of the Board of Trade, and subsequently of the Meteorological Office, for more than 20 years, and was at an advanced age, was, after communication with the Treasury on the subject, allowed to retire on a pension nearly corresponding in amount to what he might have received if he had been in the Civil Service.

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.

Collection of Information.—The methods followed by the Office in treating observations relating to Marine Meteorology have been somewhat modified during the year, in consequence of the arrangements required for obtaining the information needed for the synchronous charts of the North Atlantic (to which further reference will be made) from a large number of ships, in addition to those supplied with instruments by the Office.

A concise account of the practice at present followed will be found in Appendix I. (p. 29).

Appendix II. (p. 34) 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:—

Presentation of charts to observers.

Captain's Name.	Ship.
Baker, Lieut. Henry, R.N.	H.M.S. "Flying Fish."
Bell, Adolphus E.	S.S. "Tamar."
Bone, H. T.	S.S. "Sunbeam."
Broadfoot, J. A.	S.S. "Cipero."
Deuchars, William	S.S. "Jan Mayen."
Grainger, T. L.	S.S. "Manora."
Hoskyn, Lieut. and Commr. Richard Frazer, R.N.	H.M.S. "Flying Fish."
Jeffery, Arthur W.	S.S. "Humboldt."
Lawson, James	S.S. "Minho."
Lehman, Charles	"Mikado."
Littler, W. T.	Barque "Corinth."
Norman, Francis	Barque "Polestar."
Potter, Thomas	S.S. "Salerno" and S.S. "Sunbeam."
Rooper, Lieut. Henry E., R.N.	H.M.S. "Alert."
Ross, Alexander	"Trochrague."
Shortland, Lieut. Frederick, R.N.	H.M.S. "Flying Fish."
Studdert, Robert	S.S. "Cotopaxi."
*Symons, F. J.	S.S. "Danube."
Tomlin, Percival Samuel	S.S. "Ballaarat."
Williamson, Lieut. Andrew Charles, R.N.	H.M.S. "Fawn."

The Council regret deeply to have to record the death of Captain W. Symington, who had been an "excellent" observer for more than 12 years.

The following is the total number of logs received from April 1, 1882, to March 31, 1883, 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.
154	103	67

* 2nd Officer.

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

The average number of logs received annually during the five years, 1877-81, was 143, and the per-centage of excellent logs among these was 67.

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 1883 the ships carrying instruments supplied by the Office were pursuing the following voyages:—

To Baffin's Bay or Greenland	-	-	-	-	7
„ North America, East Coast	-	-	-	-	8
„ „ „ West „	-	-	-	-	7
Off East Coast of North America	-	-	-	-	4
To South America, East Coast	-	-	-	-	12
„ „ „ West „	-	-	-	-	6
„ Australia and New Zealand, viâ Cape of Good Hope	-	-	-	-	24
„ India, viâ Suez	-	-	-	-	1
„ India, viâ Cape of Good Hope	-	-	-	-	16
„ China Seas, viâ Cape of Good Hope	-	-	-	-	5
„ „ „ Suez	-	-	-	-	8
„ Mediterranean Ports	-	-	-	-	2
„ Cape of Good Hope	-	-	-	-	10
„ West Indies	-	-	-	-	2
Between British Ports	-	-	-	-	3
Unknown	-	-	-	-	14
					<hr/>
Total number of ships	-	-	-	-	129
					<hr/> <hr/>

Districts from which observations are obtained.

Appendix III. (p. 36) supplies a list of the logs and of all the documents from stations abroad received at the Office during the year.

The Discussion of the Meteorology of the district lying near the Cape of Good Hope.—The Charts of Meteorological Data for the Ocean District adjacent to the Cape of Good Hope, together with a volume of Explanatory Remarks, were published in the month of August, and were followed in October by the Report on the Gales of the District by Captain Toynebee.

“The Cape Squares.”

Sea Surface Temperature Charts.—The engraving of the Sea Surface Temperature Charts for the three great oceans and for the four cardinal months of the year, viz., February, May, August, and November, which has been mentioned in previous Reports, is in an advanced state of progress, and the work may be expected to be published in the course of the ensuing year.

Sea temperature charts.

Copies of two of these charts on a large scale have been prepared for the International Fishery Exhibition about to open.

Synchronous Weather Charts for the Atlantic Ocean.—It was stated in the last Report that the Council had resolved to undertake an investigation of the weather of the North Atlantic Ocean for the thirteen months beginning August 1st, 1882, and ending August 31st, 1883, being the period agreed upon for the maintenance of an international system of circumpolar observations; and the arrangements for procuring the necessary materials were then explained.

Synchronous weather charts

Synchronous
weather charts.

The Lords Commissioners of the Admiralty have informed the Council that copies of the forms for recording observations have been issued to the Commanders-in-Chief at Portsmouth, at Devonport, and on the North American station, as also to the Admiral in command of the Channel Squadron, for use on board any of H.M.'s ships which may be in the North Atlantic during the interval for which the observations are to be maintained. The Board of Trade has also rendered valuable assistance by instructing its officers at the various outports to draw the attention of captains to the special observations which it is hoped they will take.

Besides the steps taken for inviting the co-operation of the owners and masters of ships either about to sail, or returning from voyages, it has been found expedient to employ an experienced clerk to visit the Docks in London and Liverpool, and to make extracts from the ships' logs, as well as to request the masters personally to fill up for the future forms supplied to them for that purpose. Extracts from the logs kept at the offices of the chief companies have also been obtained. Nearly one half of the forms received in the Office have been obtained by direct inquiry thus carried out, and ready help is given on all sides both from English and foreign vessels.

In this manner observations have been obtained, and are likely to be obtained in the future, from between 300 and 400 ships daily, so that when these are supplemented by the records from land stations there will not be less than 400 observations available for each day's chart.

Up to the 23rd February, 1,062 vessels had co-operated in the work, and 3,116 forms had been received, which were distributed as follows:—

August.	September.	October.	November.	December.	January.	February.
630	630	590	494	451	249	72

After revision in the manner described in Appendix I., the observations are entered in figures on the daily charts, and the isobars and isotherms are then drawn from them.

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 charts, 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. Synchronous
weather charts

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.

The system to be followed in the discussion of the materials entered on the charts is still under consideration, and it can only be finally settled when more progress has been made in laying down the isobars and isotherms for a considerable number of days in succession. Sufficient, however, has already been done to show that very interesting results are likely to be arrived at in the course of the investigation.

It may be of some interest to note that the duty of entering the observations on the charts has been entrusted to female clerks,

and that their work is regarded by the Superintendent of the Marine Department of the Office as being in every respect satisfactory.

Charts of
barometrical
pressure.

Charts of Barometrical Pressure.—It was stated in the last Report that the discussion of the distribution of mean atmospheric pressure over the oceans of the globe had been undertaken on a system analogous to that adopted for the charts of sea temperature. Captain Toynebee, with the larger part of the staff of the Marine Department, being fully occupied with the Atlantic work, the preparation of the pressure charts has been specially entrusted to Mr. Baillie.

The charts have made considerable progress during the year, according to the method described in the Report for 1882. The collation of the observations and their entry on the charts, for the Atlantic and Indian Oceans for the four cardinal months has been completed, the charts for the Pacific Ocean are in progress, and it is anticipated that the investigation will be well advanced towards completion for the engraver by the end of the present year.

Arctic
meteorology.

Contributions to our Knowledge of the Meteorology of the Arctic Regions.—This work, which has been entrusted to Mr. R. Strachan, and of which Parts I. and II. are already published and have been noticed in previous Annual Reports, has made steady progress during the year 1882. Part III., the contents of which were enumerated in the last Report, has been issued.

Part IV., now in course of preparation, deals with documents relating to the following winter stations :—

Wintering Stations.	Ships.	Commanders.	Year.	Information already published.
Prince of Wales's Strait.	H.M.S. "Investigator" -	Sir R. McClure -	1850-1	} Monthly means of Meteorological elements are given in Sir W. Armstrong's "Personal Narrative."
Mercy Bay -	Do. -	Do. -	1851-3	
Dealy Island -	H.M.S. "Resolute" and "Intrepid."	Sir H. Kellett -	1852-3	} Abstracts in Capt. McDougall's "Voyage of the 'Resolute.'"
Melville Sound -	Do. do. -	Do. -	1853-4	
Beechey Island -	H.M.S. "North Star" -	W. J. S. Pullen -	1852-4	} Nothing published.
Floeberg Beach -	H.M.S. "Alert" -	Sir G. S. Nares -	} 1875-6	
Lady Franklin Sound.	H.M.S. "Discovery" -	H. F. Stephenson		
Rensselaer Harbour.	"Advance" -	E. K. Kane, M.D., U.S.N.	1853-5	} Meteorological Abstracts in "Arctic Explorations," by E. K. Kane, M.D., and discussed in "Smithsonian Contributions to Knowledge, No. 101."
Port Foulke -	"United States" -	Isaac J. Hayes, M.D., U.S.N.	1860-1	
Thank God Bay	"Polaris" -	C. F. Hall -	1871-2	} "Scientific Results of the U.S. Arctic Expedition," by Emil Bessels, M.D.
Life Boat Cove -	" -	S. O. Buddington	1872-3	

All the stations dealt with in the work are shown in the accompanying chart (Plate I.).

The four parts already enumerated exhaust all the important series of observations extant for the area originally contemplated which was limited on the west by the meridian of 120° W. Inasmuch, however, as H.M.S. "Plover" spent four winters, and H.M.S. "Rattlesnake" one winter within the Arctic Circle in the vicinity of Behring's Straits, it appeared to the Council desirable

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Mercy Bay -	Do. -	Do. -	1851-3	
Dealy Island -	H.M.S. "Resolute" and "Intrepid."	Sir H. Kellett -	1852-3	
Melville Sound -	Do. do. -	Do. -	1853-4	} Abstracts in Capt. McDougal's "Voyage of the 'Resolute.'"
Beechey Island -	H.M.S. "North Star" -	W. J. S. Pullen -	1852-4	
Floeberg Beach -	H.M.S. "Alert" -	Sir G. S. Nares -	} 1875-6	} Published as a Parliamentary Paper, [C. 2176]. Session 1878.
Lady Franklin Sound.	H.M.S. "Discovery" -	H. F. Stephenson		
Rensselaer Harbour.	"Advance" -	E. K. Kane, M.D., U.S.N.	1853-5	} Meteorological Abstracts in "Arctic Explorations," by E. K. Kane, M.D., and discussed in "Smithsonian Contributions to Knowledge, No. 104."
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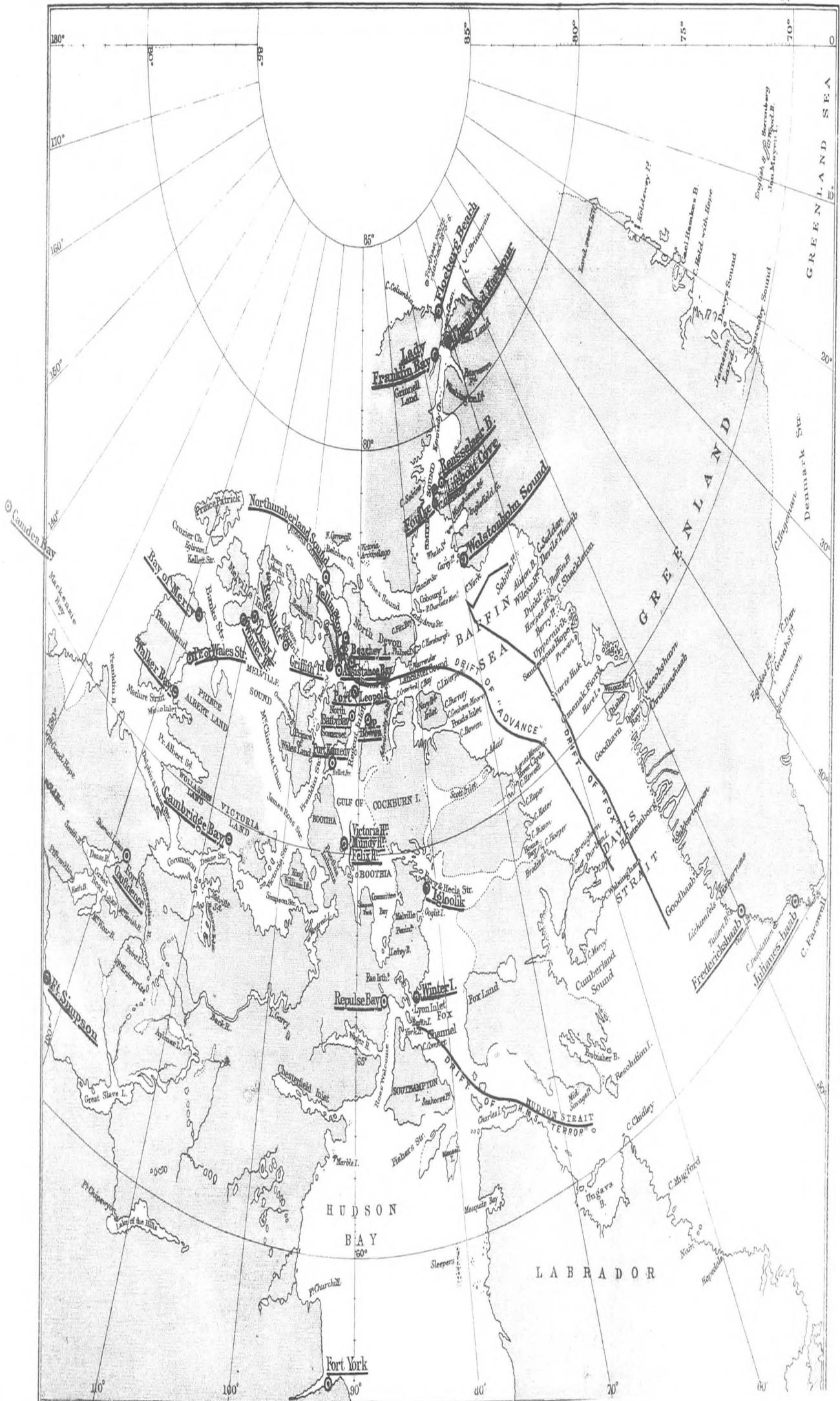
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CHART OF THE PART OF ARCTIC AMERICA

SHOWING THE STATIONS FOR WHICH DATA ARE GIVEN IN PARTS I, TO IV.

OF "CONTRIBUTIONS TO OUR KNOWLEDGE OF THE METEOROLOGY OF THE ARCTIC REGIONS."



that the scientific results of British Arctic wintering expeditions on the American coast should be completed by including observations from the western part of the Arctic shores of America, which will be published as Part V. of the series.

The Circumpolar Observations.—In the spring of 1881 the Council were requested by the Royal Society to give their opinion as to the advisability of the participation by England in the proposed scheme for international polar stations for meteorological and magnetical observations, during the year commencing with August 1882. The reply of the Council was favourable to the scheme, and the Royal Society were eventually requested by the Treasury to organise and send out an observing party to a station in British America. The station selected was Fort Rae, in 62° N., on the north shore of the Great Slave Lake, and early in May the observers, consisting of Capt. H. P. Dawson, R.A., with two non-commissioned officers R.A., and an artificer, started from this country. All possible facilities were offered by the officials of the Canadian Government, the Hudson's Bay Company, and the railway and steamboat authorities, but the difficulties of the journey were such that it was not until the 30th of August, 16 weeks after leaving Liverpool, that the station was reached. The observations were immediately commenced, and there is every reason to hope that they will result in a substantial advancement of our knowledge of the meteorology of North-west America.

The circum-
polar obser-
vations.

Sea Temperature Observations round the Coasts of the British Islands.—The results for the three years ending June 30, 1882, of these observations, which, as stated in previous Reports, have been carried on with the courteous assistance of the Admiral Superintendent of Naval Reserves, the Trinity House, and the Commissioners of Irish Lights, have been discussed, and have been combined with earlier information existing in the Office for portions of the coasts. The Council hope, with the consent of the above-named authorities, that this useful system of observations may be continued.

Sea tempera-
tures round
the British
Isles.

The figures have been laid down on monthly charts, which exhibit the manner in which an annual change in the sea temperature takes place along the coasts, the increase of warmth coming in from the west with the summer, and the converse occurring with the approach of winter. These charts will be included in the forthcoming Meteorological Atlas of the British Isles.

Charts on a large scale showing these results have been prepared for the International Fishery Exhibition about to open.

The Barometer Manual for Seamen.—The Barometer Manual (ed. 1869) has now been out of print for many years. The Board of Trade having recently determined to include the subject of the Law of Storms in the examination for masters' certificates, are desirous of reprinting the portion of the Manual which relates to the use of the barometer to seamen, and have requested the

The Barometer
Manual for
Seamen.

The Barometer
Manual for
Seamen.

Council to revise it for that purpose, with the view of bringing it up to the present state of knowledge on the subjects to which it relates. The Council have submitted the work to a careful examination, and they hope in the course of the summer to be able to prepare a revised Manual which will meet the requirements of the Board of Trade.

Instruments
belonging to
the Office.

Supply and Stock of Instruments.--In Appendix IV. (p. 48) will be found a list of the meteorological instruments supplied by the Office to ships in the Royal Navy during the year, with a statement of the entire stock and distribution of instruments standing on the books, to the account of the Admiralty, on the 31st March 1883.

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

PART II.

WEATHER TELEGRAPHY.

Reporting
stations.

Telegraphic Reporting Stations.--In the case of a few of the stations the telegraphic communication has as usual experienced some serious interruptions during the year. The four cables to the Shetlands, Hebrides, Scilly, and the Channel Islands all suffered damage to a greater or less extent; but the interruptions in the communication have been less protracted than they were in the year 1881. The only change in the arrangements calling for notice has been the erection of a private wire from Cliffony to Mullaghmore, on the west coast of Ireland, which will accelerate the communications with that important outpost, the messages having hitherto been carried by messenger over the distance of about three miles.

In the month of May the Council were requested by the Foreign Office to express an opinion on a proposal emanating from the Danish Government to lay a telegraphic cable, mainly for meteorological purposes, to Faroe, Iceland, and Greenland. The Council in reply pointed out that the scientific importance of the proposal was indisputable, but that the financial questions connected with its realization were not of a nature to fall within the province of a conference of meteorologists, to which it had been suggested that the question might be referred.

The Council have it in contemplation to improve the outfit of their Telegraphic Reporting Stations by supplying to some of the most important points mechanical self-recording apparatus of a simple character, possibly including anemometers on a principle somewhat similar to that devised by Mr. H. C. Russell for use in New South Wales, with the object of obtaining an instrumental measure of the velocity of wind, instead of trusting

entirely to the estimate of force on Beaufort's scale by the observer without instrumental aid.

In the correspondence which passed between the Council, the Royal Society, and the Treasury, at the commencement of the year 1882, as mentioned in the last Report, application had been made for a reduction of the rates for shorter telegrams, such as storm warnings, the cost of which pressed heavily on the resources of the Office, and for the restoration to the Office of the privilege, which it had up till recently enjoyed, of precedence for its weather telegrams. Rates for telegrams.

The Council had cause to regret that early in the month of April they received intimation to the effect that neither of these requests could be granted, but the proposed general reduction of the cost of all telegrams recently announced will probably go beyond the concession they had asked, and will doubtless prove a great boon to the Office.

A list of the telegraphic reporters will be found in Appendix VI. (p. 50). The only changes during the year have been the death of Mr. Hutchinson at Leith and the appointment of Mr. Hay in his place, and of Mr. MacDonald, senior, for his son, at Stornoway. Within the Office some changes have been made in the staff connected with this branch of the work, when Mr. W. L. Dallas was appointed Scientific Assistant to the Meteorological Reporter to the Government of India, and left the Office in May 1882. Changes in the staff.

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, Wales, and Scilly, by Mr. Scott. The reports submitted by the Inspectors to the Council, which are printed in Appendix VII. (p. 51), show that the efficiency of the service has been fairly maintained. Inspection of the stations.

Discussion and Publication of the Information received.—A description of the practice of the Office in the collection, discussion, and dissemination of the meteorological information received by telegraph is given in Appendix VIII. (p. 63). A list of the institutions and persons who received the Daily Weather Charts free of cost in 1882-3 forms Appendix IX. (p. 70). Discussion of the reports.

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

Forecasts are 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 posted up

in several public places in London,* and supplied to the afternoon editions of the newspapers.

Possibility of improving the forecast service.

The observations on which the 8h. 30m. p.m. forecast is based are taken at 6 p.m., one or two hours are then lost in the course of their telegraphic transmission to the Office, chiefly, it is believed, on the branch lines by which the outlying stations are connected with the main system; it requires about one hour to reduce the observations, to enter them in charts, and to draw the forecasts, and in the end these do not reach the London telegraph offices till about 9 p.m. The 8h. 30m. p.m. forecast is at present supplied to the public through the morning newspapers only, that is, it can hardly be read by them until 12 hours have elapsed since it was made, and 14 hours since the observations were taken on which it was based.

The Council, bearing in mind the importance of making arrangements for ensuring that the information which they receive shall be communicated to the public as speedily as possible, have made inquiry with a view of ascertaining whether any improvement on the present system could be introduced. They are informed that the latest hours at which the forecasts could be handed in to the telegraph offices in London for transmitting to the country are as follows:—

- (1.) 11 p.m. for the ordinary issue of the daily provincial press.
- (2.) 2 a.m. for the local town issues in the more important places and for the London morning newspapers.

Hence it will be seen that forecasts suitable to these requirements could be issued respectively two and five hours later than they are at present, so that for the rural districts it would not be practicable materially to accelerate the forecast service, though for the towns this might be done by the establishment of a supplementary night service, for which, however, no funds are at present disposable. The substitution of the hour of observation of 8 p.m. for 6 p.m., which would admit of two hours later forecast would, however, be attended with certain practical disadvantages, which would partly counterbalance the slight gain in time, and would render such a change unadvisable at present. Consequently the Council are not prepared to propose any immediate alteration in their system, though the subject will continue to receive their attention. They, however, feel assured that if the public interest in securing at an earlier hour such information of probable weather changes as is supplied by the forecasts, were to induce the local authorities of various towns to contribute their quota of the cost of procuring it, and to undertake its distribution in their respective

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neighbourhoods, the Meteorological Office would have no difficulty in supplying it.

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 137, and the personal applications 37, the total being the same as in the previous year. The rules of the Office relating to such inquiries continue the same as in previous years.

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 79 per cent., being an improvement of 1 per cent. on the previous year:—

SUMMARY OF RESULTS.

Districts.	Percentages.				Total percentage of Success.
	Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
SCOTLAND, N. - -	44	35	14	7	79
„ E. - -	44	36	13	7	80
ENGLAND, N.E. - -	48	32	14	6	80
„ E. - -	45	38	10	7	83
MIDLAND COUNTIES -	44	36	13	7	80
ENGLAND, S. - -	50	33	12	5	83
SCOTLAND, W. - -	41	34	15	10	75
ENGLAND, N.W. - -	41	37	14	8	78
„ S.W. - -	45	35	13	7	80
IRELAND, N. - -	40	37	13	10	77
„ S. - -	41	33	16	10	74
Summary - -	44	35	13	8	79

Hay Harvest Forecasts.—The Council renewed in 1882 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

by harvest
recasts.

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 1882.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass - J. R. Mitchell -	Golspie. Drynie, Inverness.
1. SCOTLAND, E.	G. Johnstone - W. S. Macdonald -	Glamis, by Forfar. Craigielaw, Longuiddry.
2. ENGLAND, N.E.	J. Wilson - J. Turner -	Woodhorn Manor, Morpeth. The Grange, Ulceby.
3. ENGLAND, E.	W. Birkbeck - Sir J. B. Lawes, Bt., and J. H. Gilbert, Ph.D.	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.	(The late) C. H. H. Wilsone, of Dalnair. J. S. R. Ballingal -	Endrick Bank, Drymen. Eallabus House, Islay.
7. ENGLAND, N.W.	G. W. Wray - The Earl of Derby - Hon. P. Egerton -	Leyburn, Yorkshire. Knowsley Hall, Prescott. Tatton Park, Knutsford.
8. ENGLAND, S.W.	Colonel J. B. Tubervill The Earl of Ducie - T. Dyke - R. Neville -	Ewenny Priory, Bridgend, Glamorgan. Whitfield, Falfield, R.S.O. Long Ashton, Clifton, Bristol. Butleigh Court, Glastonbury.
9. IRELAND, N.	W. M. Kirk - J. Simson - C. C. Hamilton -	The Bush, Antrim. Kilrush, Hollymount, Co. Mayo. Cherrymount, Moynalty, Co. Meath.
10. IRELAND, S.	D. A. M'Creedy D. A. Milward - W. Talbot Crosbie, D.L.	Loughton, Moneygall, King's Co. New Ross, Co. Wexford. 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 Drynie	48	35	15	2	83
" E.	Glamis and Longniddry	57	31	10	2	88
ENGLAND, N.E.	Morpeth and Uxoby	10	46	12	2	86
" E.	Thorpe and Rothamsted	56	24	18	2	80
MIDLAND COUNTIES	Cirencester and Gerrard's Cross	45	45	8	2	90
ENGLAND, S.	Maidstone and Downton	53	35	9	3	88
SCOTLAND, W.	Drymen and Islay	41	49	6	4	90
ENGLAND, N.W.	Leyburn, Prescott, and Knutsford	51	41	8	—	92
" S.W.	Bridgend (Glamorgan), Falfield, Clifton, and Glastonbury.	47	41	10	2	88
IRELAND, N.	Antrim, Hollymount, and Moyalty	17	33	14	6	80
" S.	Moneygall, New Ross, and Ardfert Abbey	63	29	8	0	92
Mean for all districts		50	37	11	2	87
- { 1882						
- { 1881		29	47	21	3	76

The issue of these forecasts commenced for England, N.E., E., the Midland Counties, S., and S.W. on the 12th of June. As the season advanced, those for the other districts were added, and the issue terminated generally on the 12th of August with Scotland N. Most of the districts received the telegrams daily, except on Sundays, for a space of about five weeks, but in the case of England S.W., they were continued for an additional fortnight, by a special request of the observers. In one district they were so fully appreciated that they were continued, at the expense of the recipient, for an additional period of four weeks. From that station, the correspondent says, "They are daily looked for by all our residents, and to the farmers they have been a great boon, having been so very correct, and as our harvest is nothing like complete, having had them now for some time we should feel the loss if you do not send them."

The result of the checking shows that the total percentage of success (87) is much larger than in either of the preceding years during which the Hay Harvest Forecasts have been issued, and also that the proportion of "completely successful" forecasts is decidedly greater than it has hitherto been.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix XI. (p. 74) will be found the names of the stations which

Storm warnings.

are furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade issued in February 1874.

These stations were, at the end of March 1883, 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.

Result of storm warnings in 1881.

The usual comparison has been instituted in the Office between the warnings issued in 1882 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 1882.

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	64	33	21	9	—	1	—	May 27.
„ East	59	36	12	11	—	—	—	Mar. 21.
Scotland, East	49	31	8	6	1	2	1	Jan. 10, Mar. 16, Mar. 21, Mar. 27, June 12, Nov. 4.
„ West	42	25	4	11	—	1	1	Mar. 21, Nov. 15.
England, North-west	58	42	5	10	—	1	—	Mar. 21.
„ West	66	32	22	11	—	1	—	Mar. 21, Aug. 15.
„ South	78	61	8	8	1	—	—	Mar. 21, Apr. 13,* Apr. 28, Nov. 26.*
„ South-east	38	25	10	3	—	—	—	—
„ East	49	24	16	6	—	2	1	Mar. 21.
Totals -	503	309	106	75	2	8	3	
Per-centages -	—	61·4	21·1	14·9	0·4	1·6	0·6	

* Storms on the South Coast marked thus were only felt in the Eastern part of the Channel.

Comparison of results for 1882 with previous years.

The following table contains a comparative statement of the storm warnings and their results in 1882 and in the ten preceding years. It will be seen that the percentage of warnings justified is about the same as 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.
1872	379	61	19·5	80·5	11·9
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

The last year formed no exception to its predecessors in the fact that more than once serious storms occurred of which no warning was issued. Continued experience leads to the conclusion that such occasional failures are unavoidable. Warnings can be sent to the coast only during such hours as the local telegraphic offices are open, that is, usually between 8 a.m. and 8 p.m., and the signals are visible only during daylight. If during the winter the indications of bad weather, which would in other circumstances lead to the issue of an immediate warning, are received after 6 p.m., when it would be dark, the signals will not be hoisted at the out stations until daylight next morning, for the local authorities are rarely willing to bear the expense of lamps, &c., for night signals, and meanwhile the storm may have come on.

Storm warnings.

Moreover, the warning of the coasts cannot be ensured simply by transmitting the messages by telegraph. In some cases the signal station is five or six miles distant from the nearest telegraph station, and the warnings are forwarded either by the daily coach or in one case by the afternoon coastguard patrol, as the cost of special portorage would be prohibitory.

International Exhibition of Storm Warning Apparatus.—In connexion with the Fishery Exhibition, already mentioned, it has been proposed to show models of the various systems for conveying weather intelligence to the coasts, the Council have contributed to this Exhibition and are glad to learn that the Governments of Denmark, Germany, Holland, Portugal, Russia, and the United States will also take part in it.

International Exhibition of storm warning systems.

Observations on Ben Nevis.—In the summer of 1882, as in the preceding year, the Scottish Meteorological Society were enabled, through the zeal and energy of Mr. Clement L. Wragge, to maintain daily observations on the top of Ben Nevis for the period of five months.

Observations on Ben Nevis.

The system was more completely organized in 1882 than in the previous year, and it included observations at points intermediate between the sea level at Fort William and the summit.

The reports from both Fort William and the summit were transmitted regularly to London, but as the telegraphic reports of the morning observations were never forwarded from Fort William before 3 p.m., they did not reach the Meteorological Office in London till eight or nine hours after they had been taken, so that they were of no practical utility in the preparation of the daily forecasts.

The Council have again contributed the sum of 100*l.* towards the expenses of the observations, and have intimated their hope that the Scottish Meteorological Society may be able materially to accelerate the communication to London of the information obtained at the expense of so much time and physical exertion, so as to render it available for aiding in forming the forecasts.

Cirrus Observations.—The observers who supply telegraphic reports of the movements of upper clouds continue to be very few in number; the phenomena to be recorded demand consider-

Cirrus cloud observations.

able care and skill for their observation, and are uncertain in the time of their occurrence, as well as transient in their manifestation, so that the observations cannot be taken at the fixed observing hours only.

The Rev. W. Clement Ley, the Inspector of the Meteorological Council's stations in England, has devoted special attention to the study of the clouds, and has in view improvements in the system of observing and reporting, by means of which he hopes that the movements of the upper strata of the atmosphere may be more completely and satisfactorily ascertained, an object believed to be of much importance as an element of weather forecasting.

Fishery
barometers.

Fishery Barometers.—The Office still continues to issue barometers on loan for public inspection at the smaller ports and fishing stations. The whole number of stations on our coasts supplied with these instruments by the Office is at present 161, being three in excess of the previous year. Of these stations, 58 are in England, 5 in Wales, 43 in Ireland, 51 in Scotland, 3 in the Isle of Man, and 1 in Jersey. The list is given in Appendix X., p. 73.

Simultaneous
observations.

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

The list of observers at land stations for 1882 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, and whenever a captain has filled up this form, a copy of his entries is supplied to the Chief Signal Office.

In the last Report it was 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 14,986, and from the Mercantile Marine, 4,511. Copies of them have been forwarded to Washington.

Weekly
Weather
Report.

Weekly Weather Report.—The publication of the Weekly Weather Report has been continued, and the Council have again to express their thanks to the Meteorological Society (of London) and to certain individual observers for supplying, to be embodied in that publication, returns from several stations.

As stated in the last Report, the Council have had under their consideration a plan for supplying a progressive record for the year, week by week, of the chief climatic factors, such as temperature, sunshine, rainfall, and the like, for the special information of persons engaged in agriculture. The methods proposed, which have been discussed in communication with Sir J. B. Lawes and Dr. Gilbert, are not yet settled, but the early realization of this proposal is anticipated.

Storm Warnings for the Coast of China.—Early in the year 1882 the Council received a request from Lloyds to urge upon the Colonial Office the desirability, in the interests of British commerce, that the Government of Hong Kong should give a cordial support to a proposal made by the Chinese Government to institute a weather telegraphic service on its own coasts. The Council had no hesitation in acceding to the request, and their representation to the Colonial Office met with a courteous response.

Storm warnings for the coasts of China.

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.

Documents received.

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.

As the automatic observatories have now been in full operation since the commencement of 1868, the Council, being disposed to think that a sufficiency of materials had been amassed to allow of

the determination of the principal meteorological elements for these stations, and that results commensurate with their cost would not accrue from their continued maintenance, applied to some of the most experienced meteorologists in Europe for their views on the subject. The gentlemen consulted expressed opinions practically identical, that the maintenance of three observatories near the three extremities of the United Kingdom, and disposed approximately in the form of an equilateral triangle, would meet all the reasonable requirements of meteorology. The Council have accordingly intimated to the authorities of the observatories of Armagh, Falmouth, Glasgow, and Stonyhurst that the annual grant to the stations would terminate with the year 1883. The observatories of Aberdeen, Kew, and Valencia will be maintained as heretofore.

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 Meteorological Society (of London); 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. Whipple will be found in Appendix VII., p. 51.

Reports supplied to Registrar General for Ireland.

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

The Registrar General for Scotland.

In the month of July an inquiry was received from Her Majesty's Government as to the possibility that the expense of preparing weekly, monthly, and quarterly returns for the General Register Office, which have hitherto been calculated by the Astronomer Royal for Scotland, could be borne by the Meteorological Office out of their vote.

The reply of the Council was to the effect that they were prepared to carry out the same arrangement as is in existence in Ireland, and to undertake the preparation of weekly, monthly, and quarterly tables for the Registrar General of Scotland without any charge to the Government, provided that the observations on which these tables have hitherto been founded be placed at their disposal.

Quarterly Weather Report.—The engraving of the plates showing the photographic curves produced at the seven self-recording observatories, has been carried on steadily, and the year 1878, the last of those remaining to complete the series of 12 years which it is proposed to engrave in detail, will, as intimated in the last report, be completed within the coming summer. The plates for 1879 and 1880 have been issued, those for 1877 are in the press. Part II. of the Report for 1876 is now ready.

Quarterly
Weather
Report.

Inasmuch as the detailed reproduction in copper-plate engraving of the curves representing the observations derived from the self-recording instruments at the seven observatories will cease with 1880, the Council have resolved to issue the tabulations of the hourly values from the commencement of 1881, printed in ordinary type, instead of having them lithographed, as has been hitherto the practice. The volume for 1881, has now been completed, with the addition of daily means of pressure and of temperature of the dry and wet bulb. The question of supplementing this publication by the addition of the hourly mean values of the principal elements has been under consideration, but a decision has been postponed until the results of the use of the Harmonic Analyser are more fully seen.

Reports from Stations of the Second Order.—The volume of records of these observations for the year 1879, has been published during the year, and the volume for 1880 is in progress.

Stations of the
Second Order.

The Harmonic Analyser.—The work effected with this instrument during the year has been the reduction of the records of air temperatures from the thermograms for all the observatories for the years 1873, 1874, and 1876. The records of pressure for 1876 are now being treated in a similar manner.

The Harmonic
Analyser

In order to test the accuracy of the results obtained by this instrument, the Council have had the constants of Bessel's formula calculated for the air temperature for 1876, and have issued them as an appendix to the Quarterly Weather Report for 1876. The accordance is most satisfactory, as will be seen from Note A.

Sunshine Records.—The returns for the year 1881 have been engraved in the Office in the same manner as the specimen given in the Report for 1881. The number of stations represented is 31, but the records of two of these are not complete. The plates have been published with a brief introduction, and with tabulations of the hourly amounts of sunshine.

Sunshine
records.

Inquiry into the Causes and Prevalence of London Fog.—The committee to whom this has been entrusted, as explained in the last two Reports, have continued their investigations as opportunity offered, but in the past winter few fogs of sufficient density to yield valuable results have been experienced. The result, however, stated in last Report as to the abnormal increase of the proportion of carbonic acid gas in the atmosphere has been fully confirmed, the

The Fog
Committee.

quantity having risen to 13 parts per 10,000 on one occasion, 4 parts being the usual proportion.

- Motion of the upper currents.** *Motion of the Upper Currents.*—The experiments on shell firing in order to ascertain the movement of the upper currents were continued during the spring of 1882, but the officers conducting them were called off to the Egyptian war early in July. The experiments will now shortly be resumed.
- Balloon experiments.** *Balloons.*—No further experiments have been made during the year, but the Council have it in contemplation to institute experiments with a captive balloon, provided with automatic electrical thermometers, like those of Siemens.
- Cloud photography.** *Cloud Photography.*—The apparatus described in the Reports for 1880–81 has been completed by Captain Abney, who has obtained some clearly defined dual cloud pictures from which the motion and altitude of the objects can be determined with some precision. It will shortly be brought into regular operation at Kew.
- Hygrometry and evaporation.** *Experiments on Hygrometry and Evaporation.*—The experiments undertaken on behalf of the Council by Mr. W. N. Shaw as to the comparison of different hygrometers have been continued during the past year.
- Atmospheric electricity.** *Atmospheric Electricity.*—A grant, as in the preceding year, has been made by the Council to Mr. Whipple, Superintendent of Kew Observatory, for the tabulation and reduction, on the plan proposed by him, of the electrograms taken at Kew Observatory.
- Rainfall of the United Kingdom.** *Rainfall of the United Kingdom.*—It was stated in the last Report that the tables with the monthly means for 356 stations and for the fifteen years, 1866–80, had been received from Mr. G. J. Symons, F.R.S., and printed. This work has now appeared. The tables are accompanied by maps showing the geographical situation of the stations and the river basins in which they respectively lie. It may confidently be expected that the work will be found practically useful by supplying the most accurate information obtainable of the average rainfall of the kingdom for the period of fifteen years to which it refers.
- Meteorological atlas of the British Isles.** *Meteorological Atlas of the British Isles.*—The maps for this Atlas, the mode of preparation of which was explained in the last Report, have now been engraved, and the entire work will consist of maps of monthly and annual mean pressure and air temperature, maps of monthly sea-surface temperature, and a map of annual rainfall, making in all 39 maps.

LIBRARY.

The library contains standard works on Meteorology and the allied sciences. It consists at present of nearly 7,500 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men.

quantity having risen to 13 parts per 10,000 on one occasion, 4 parts being the usual proportion.

Motion of the upper currents.

Motion of the Upper Currents.—The experiments on shell firing in order to ascertain the movement of the upper currents were continued during the spring of 1882, but the officers conducting them were called off to the Egyptian war early in July. The experiments will now shortly be resumed.

Balloon experiments.

Balloons.—No further experiments have been made during the year, but the Council have it in contemplation to institute experiments with a captive balloon, provided with automatic electrical thermometers, like those of Siemens.

Cloud photography.

Cloud Photography.—The apparatus described in the Reports for 1880–81 has been completed by Captain Abney, who has obtained some clearly defined dual cloud pictures from which the motion and altitude of the objects can be determined with some precision. It will shortly be brought into regular operation at Kew.

Hygrometry and evaporation.

Experiments on Hygrometry and Evaporation.—The experiments undertaken on behalf of the Council by Mr. W. N. Shaw as to the comparison of different hygrometers have been continued during the past year.

Atmospheric electricity.

Atmospheric Electricity.—A grant, as in the preceding year, has been made by the Council to Mr. Whipple, Superintendent of Kew Observatory, for the tabulation and reduction, on the plan proposed by him, of the electrograms taken at Kew Observatory.

Rainfall of the United Kingdom.

Rainfall of the United Kingdom.—It was stated in the last Report that the tables with the monthly means for 366 stations and for the fifteen years, 1866–80, had been received from Mr. G. J. Symons, F.R.S., and printed. This work has now appeared. The tables are accompanied by maps showing the geographical situation of the stations and the river basins in which they respectively lie. It may confidently be expected that the work will be found practically useful by supplying the most accurate information obtainable of the average rainfall of the kingdom for the period of fifteen years to which it refers.

Meteorological atlas of the British Isles.

Meteorological Atlas of the British Isles.—The maps for this Atlas, the mode of preparation of which was explained in the last Report, have now been engraved, and the entire work will consist of maps of monthly and annual mean pressure and air temperature, maps of monthly sea-surface temperature, and a map of annual rainfall, making in all 39 maps.

LIBRARY.

The library contains standard works on Meteorology and the allied sciences. It consists at present of nearly 7,500 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men.

Appendix XVI., p. 90, 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., p. 114, shows the receipts and payments during the year ending 31st March 1883. The amount voted by Parliament was 15,300*l.* as in the previous year.

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 1882-83, as compared with the previous year :—

NET EXPENDITURE.	1881-82.	1882-83.	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 -	705 10 11	746 0 9	40 9 10	—
Rent, fuel, and lighting -	654 18 2	669 1 5	14 3 3	—
Alterations to premises, attendance, and contingencies -	532 1 2	617 16 3	85 15 1	—
Expenses incidental to International Meteorological Congress -	—	30 11 10	30 11 10	—
Pensions -	—	19 15 4	19 15 4	—
Special Researches -	1,099 3 10	756 10 3	—	342 13 7
Land Meteorology -	4,027 19 11	3,948 3 11	—	79 16 0
Weather Information -	3,846 6 5	4,058 14 11	212 8 6	—
Inspections -	523 19 11	509 6 7	—	14 3 4
Ocean Meteorology -	2,156 19 4	2,409 6 8	252 7 4	—
Total -	£ 15,346 19 8	15,565 7 11	655 11 2	437 2 11

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

NOTE A.

On the RESULTS obtained by the USE of the HARMONIC ANALYSER.

The Harmonic Analyser of Sir William Thomson mentioned in a former report is now in regular employment in the Office. It was applied in the first instance to the photographs giving the records of the temperatures of the air at the seven self-recording observatories, and those for the years 1871-4, and 1876 have now been reduced by its means. The amount of detail in which the results shall be published has not yet been finally decided on, and naturally the publication would not take place till the results have been obtained for such of the other meteorological elements as the machine may be applied to.

It may be useful here to recall in few words the object of the instrument. Let us take for example the temperature of the air. Apart from irregular variations, which for the present purpose we must regard as casual, the temperature is subject to a well-marked diurnal fluctuation, which becomes very regular in the mean of a sufficient number of days. Further, the mean temperature of a day, and the amount of diurnal fluctuation, are subject to well-marked seasonal fluctuations. It is for the determination of such periodical variations, whether diurnal or annual, or annuo-diurnal, including as a special case the mean value of the element, that the machine is specially intended. Hitherto the reduction could only be made by the laborious process of measuring hourly lines on the photographs, tabulating the results, and then taking a vast number of means according to different groupings of the individual numbers. And even if this were done, the results would still be expressed in tables or exhibited to the eye in curves; and the throwing of the results into the usual form of a Bessel's or Harmonic series, whereby the leading features are exhibited by the values of a comparatively small number of constants, involves a very considerable amount of additional numerical calculation. Now the determination of these constants may be made directly from the photographs by means of the Harmonic Analyser.

There are two distinct objects, one or other of which may be kept in view in making such reductions. One is to express the law of a periodic phenomenon, eliminating such fluctuations as are non-periodic, and, for the purpose immediately in hand, are to be regarded as casual; the other to express in a succinct and comparable form the general character of the weather (or whatever element of it may be under consideration) over a time insufficient to obtain a mean nearly the same as would be got from observations extending over a time ever so long, but yet sufficient to eliminate pretty well casual fluctuations which occur a great many times in the interval. For instance, we might wish to determine the average temperature and diurnal fluctuation of

temperature in the first fortnight of the month of April, or we might wish to express succinctly the general character of the temperature in the first fortnight of April in a particular year, with a view of comparing it with the average for that season in a number of years. For either of these purposes the Harmonic reduction is available, and the use of the machine saves a great deal of labour. But it is not intended for tracing for instance the history of the progress of a particular storm, or generally for synoptic work.

The machine was long since tested by applying it to a series of zigzag lines or known curves, and comparing the constants got by it with those obtained by calculation. But some calculations made by Mr. H. S. Eaton, and kindly placed at the disposal of the Council, have enabled them during the past year to put the whole working of the machine, including the manipulation by the operator of the photographic sheets which are passed through it, as well as the mechanical construction of the machine by the engineer who made it, to a severe and eminently practical test.

The hourly readings of the instruments at the seven principal observatories have either been published or are in course of publication by the Office; but hitherto no means had been taken except the mean for the whole day, and the means of groups of these means. But Mr. Eaton calculated the hourly means for each month separately for the seven observatories for the year 1876, and kindly placed his results at the disposal of the Council. From these the coefficients in a Harmonic series, when the temperature is expressed as a function of the time of day, have been calculated at the office for each observatory and for each month separately; and these have been compared with the coefficients got by the machine. The detail of the comparison appears in the "Quarterly Weather Report" for 1876. It will be sufficient here to remark that the comparison shows that the constants may be got from the machine with an accuracy quite comparable with that obtained by the more laborious process of measurement and numerical calculation.

A commencement has been made of the application of the machine to barometer curves, but time has not yet permitted of a discussion of the results.

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 Oh. 8m. 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.

METEOROLOGICAL OBSERVATIONS in the NORTH ATLANTIC OCEAN.

A special collection is being made of weather observations in the North Atlantic for the 13 months beginning 1st August 1882 and ending 31st August 1883. A specimen of the form used for these observations is given in Appendix Ia.

The work in connexion with these observations is divided under the following heads:—

(a.) Examining shipping lists and sending forms, together with a circular letter to all captains going on important voyages; the letter asks for extracts from their former logs, which many of them have supplied.

(b.) Examining the forms received daily and getting out the necessary corrections for the barometer, wind direction, &c.

Acknowledging the forms by post-card, and asking any special questions respecting them. Also making suggestions respecting future observations.

(c.) Applying the corrections to the individual observations preparatory to entering them on the charts.

(d.) Visiting ships and making extracts from their logs; asking the captains to fill up forms for the office in future; leaving blank forms with them if they have not already received such by post. Also visiting the offices of the chief Companies and making extracts from their back logs.

(e.) Entering the observations in positions on separate charts for each day.

After the sea observations have been entered, it will be necessary to supplement them by the synchronous observations made at land stations, so that the conditions both over the sea and land can be studied.

The method of discussing these observations is not yet decided, but when sufficient data have been received for the earlier months, the Council hope to discuss and publish them as quickly as possible.

APPENDIX IA.

No. 38.

METEOROLOGICAL OBSERVATIONS IN THE NORTH ATLANTIC OCEAN.

SHIP'S NAME AND DESCRIPTION { CAPTAIN'S NAME {
 OWNER'S NAME { AND ADDRESS {
 AND ADDRESS { AND ADDRESS {

See back of this form for Instructions [on opposite page].

YEAR 188.....	MONTH	DAY. HOUR.	BAROMETER. Mercurial or Aneroid. (a)	AT- TACHED THER- MOME- TER.	TEMPERATURE.		COMPASS DEVIATION (due to the iron of the ship) ON THE COURSE STEERED. (b)	WIND.		WEATHER.	SHIP'S POSITION AT NOON.	TIME OF REMARK.	REMARKS. (1) Giving the times of important changes of wind, with the direction and force before and after the change. (2) Giving the reading of the lowest barometer during a gale and the time of its occurrence, with the direction and force of wind at that time.
					AIR ON DECK.	SEA SUR- FACE.		DIRECTION by Compass. (c)	FORCE.				
1		8 A.M. NOON.											
2		8 A.M. NOON.											
3		8 A.M. NOON.											
4		8 A.M. NOON.											

(a) Erase "or Aneroid" if it be a mercurial barometer, and "Mercurial or" if it be an aneroid; if both are on board always record the mercurial in preference to the aneroid.
 (b) The Compass Deviation on the course steered should be copied from the Deviation Card; the Variation is not asked for.
 (c) The corrections for Deviation and Variation will be applied in the Office.

METEOROLOGICAL OFFICE, LONDON.

The Meteorological Council propose to chart and discuss the weather of the North Atlantic Ocean for the thirteen months, beginning August 1st, 1882, and ending August 31st, 1883; and they request owners, captains, and officers of steam vessels, and sailing vessels traversing the North Atlantic Ocean to assist in the work, by furnishing observations transcribed on forms of which this sheet is a specimen, and which will be supplied by the Office. The Council propose to discuss the observations as early as possible. The use of the forms will save much time and labour in the Meteorological Office, and it is believed that a transcription from the log will cause but little trouble to the observers.

OBSERVATIONS TO BE TAKEN AT SEA AT 8 A.M. AND AT NOON OF SHIP'S TIME.

Barometer and (if a thermometer is attached to it) the **Attached Thermometer.** Give, if possible, a few readings in port before leaving, and in each port which you visit.

Temperature of Air in the Shade on Deck (if observations can be made).
Temperature of Sea Surface (if observations can be made).
Compass Deviation (that is, the error due to the iron of the ship) **on the Course** steered.

Wind—Direction (by compass) and Force.—The force may be expressed in words, or by the figures of Beaufort's scale, whichever the observer is in the habit of using.

Weather—In words or by the letters of Beaufort's notation whichever the observer is in the habit of using.

Position of the Ship—at Noon only.

In the column headed **Remarks** please to enter—

- (1) Whenever an important change of wind occurs—the time of its occurrence, and the direction and force of the wind before and after the change.
- (2) Whenever a gale occurs—the lowest reading of the barometer during the gale, the time of the lowest reading, and the direction and force of the wind at that time.

Officers willing to observe are requested to communicate with the

MARINE SUPERINTENDENT,

Meteorological Office,

416, Victoria Street,

LONDON. S.W.

stating how many monthly forms they want. They should give an address to which additional forms can be sent.

BEAUFORT'S SCALE OF WIND FORCE.

0 Calm.	Just sufficient to give steeage way.		
1 Light air	With which a well-conditioned Ship of War of Admiral Beaufort's time (1800—1850), with all sail set would go in smooth water and "clean full," from		
2 Light breeze	1 to 2 knots.		
3 Gentle breeze	3 to 4 knots.		
4 Moderate breeze	5 to 6 knots.		
5 Fresh breeze		Royals, &c.	FOR SHIPS RIGGED WITH DOUBLE TOPSAILS.*
6 Strong breeze		Single-reefed top-sails and topgallant sails.	6 Topgallant sails.
7 Moderate gale	To which she could just carry in chase, "full and by"	Double-reefed top-sails, jib, &c.	7 Topsails, jib, &c.
8 Fresh gale		Triple-reefed top-sails, &c.	8 Reefed upper topsails and courses.
9 Strong gale		Close-reefed top-sails and courses.	9 Lower topsails and courses.
10 Whole gale	With which she could scarcely bear close-reefed maintopsail and reefed foresail.		10 Lower main top-sail and reefed foresail.
11 Storm	Which would reduce her to storm-stay-sails.		
12 Hurricane	Which no canvas could withstand.		

* These modifications are made to meet the requirements of double topsails, introduced since Admiral Beaufort's time.

BEAUFORT'S NOTATION OF WEATHER.

b Blue Sky.	m Misty (hazy).	u Ugly (threatening) appearance of weather.
c Clouds (detached).	o Overcast.	v Visibility. Objects at a distance unusually visible.
d Drizzling Rain.	p Passing showers.	w Dew.
f Foggy.	q Squally.	
g Gloomy.	r Rain.	
h Hail.	s Snow.	
Lightning.	t Thunder.	

NOTE.—A bar (—) under any letter indicates increased intensity: thus **f** very foggy; **r** heavy rain; **t** very heavy rain.

APPENDIX II.

LIST of CAPTAINS (and Officers) who have sent in Logs classed as "Excellent" during the year ending March 31, 1883. The figures opposite to each show the total number of such Logs which they have returned to the Office during the period that they have been observing.

Captain's Name.	Number of "Excellent" Logs.	Ship.
Aldrich, Comr. Pelham, R.N. -	6	H.M.S. "Fawn."
Baker, Lt. Henry, R.N. -	4	H.M.S. "Flying Fish."
Balfour, Lieut. Andrew, R.N. -	8	H.M.S. "Magpie."
*Barker, D. W., F.M.S. -	4	"Superb."
Barlow, A. E. - - -	6	S.S. "Rosetta."
Barron, William - - -	17	S.S. "Sultan" and S.S. "Empress."
Beckett, Alexander - - -	5	"Amata."
Bell, Adolphus E. - - -	1	S.S. "Tamar."
Bennett, Edwin Charles - - -	9	"Thessalus."
Berridge, Henry - - -	4	"Superb."
Blake, E. J. - - -	8	"Tilkhurst."
Boue, H. T. - - -	1	S.S. "Sunbeam."
Bourke, Comr. Edmund, R.N., F.M.S.	3	H.M.S. "Gannet."
Broadfoot, J. A. - - -	2	S.S. "Cipero."
Brown, Alfred John - - -	10	"Arran."
Buchan, James - - -	13	"Coppename."
Campbell, Archibald - - -	10	S.S. "Ethiopia."
Campbell, James - - -	2	"Hope."
Carpenter, Lieut. Alfred, R.N., F.M.S.	9	H.M.S. "Magpie."
Crutchley, William Caius, R.N.R.	6	S.S. "African."
Dart, Leonard C. - - -	3	"Julia H."
Deuchars, William - - -	1	S.S. "Jan Mayen."
Dyke, Harry William - - -	4	"Markland."
Ellery, William - - -	13	"Majestic."
Freeman, Thomas William - - -	15	S.S. "Bellerophon."
Gordon, James - - -	7	S.S. "City of Agra."
Grainger, T. L. - - -	-	S.S. "Manora."
Gray, David - - -	9	S.S. "Eclipse."
Gray, Samuel B. - - -	5	"Letterwe."
Hepworth, Campbell M. W., F.M.S.	4	S.S. "Danube."
Holdich, John Peach, R.N.R. -	7	"British Envoy."
Hoskyn, Lieut. and Comr. R. F., R.N.	5	H.M.S. "Flying Fish."
Hughes, W. P. - - -	4	"Laomene."
Joffery, Arthur, W. - - -	3	S.S. "Humboldt" and S.S. "Ptolemy."
Jones, George Henry - - -	18	S.S. "Lamperts."
Jones, S. Griff - - -	3	"Hermine."

* Chief Officer.

Captain's Name.	Number of "Excellent" Logs.	Ship.
Lailey, William Nicholson -	3	S.S. "Cipero" and S.S. "Olympus."
Lawson, James -	4	S.S. "Minho."
Lenman, Charles -	1	"Mikado."
Littler, W. T. -	1	"Corinth."
Longley, Herbert -	9	S.S. "Yorkshire."
Macleary, John F. L. P., R.N., F.M.S.	8	H.M.S. "Alert."
Manning, Henry -	6	S.S. "Seine."
Molony, E. J. -	2	"British Merchant."
Murdoch, Peter -	4	"Sierra Estrella."
Norman, Francis -	1	"Polestar."
Parry, Moses, F.M.S. -	5	"Queen of Cambria."
Parsell, Henry -	5	S.S. "Baltic."
Parson, Geo. Fry -	2	"Earnock."
Pearson, Charles William -	20	S.S. "Strathleven."*
Potter, Thomas -	1	S.S. "Salerno" and S.S. "Sunbeam."
Raeburn, John, R.N.R. -	7	"Lochee."
Renaat, Charles Henry -	12	"Pleione."
Robinson, Thomas -	2	"Chinsura."
Rooper, Lieut. Henry E., R.N. -	1	H.M.S. "Alert."
Ross, Alexander -	1	"Trochrague."
Russell, Charles James -	2	"Baroda."
Scott, William -	11	"Commewyne."
Shearer, George -	5	"Corona."
*Symons, F. J. -	1	"S.S. "Danube."
Shortland, Lieut. Frederick, R.N.	1	H.M.S. "Flying Fish."
Simpson, Alexander -	13	"Traveller."
Slade, Lieut. E. J. W., R.N. -	2	H.M.S. "Fawn."
Smith, John -	4	"Naiad."
Smith, William Henry, R.N.R. -	16	"Circassian."
Spratly, W. -	4	S.S. "Rubens" and S.S. "Humboldt."
Stiven, John H. -	3	"Arethusa."
Stuart, Wm. Henry -	12	L.H. Tender "Richmond."
Studdert, Robert -	1	S.S. "Cotopaxi."
Swan, John -	3	"City of Madrid."
Synington, William (deceased)	21	S.S. "Hankow."
Tannock, Robert Stewart -	2	"Glencairn."
Thorne, J. W. -	3	"British Commodore."
Tizard, Staff-Comr. T. H., R.N. -	7	H.M.S. "Triton."
Tomlin, P.S. -	1	S.S. "Ballarat."
Waring, William -	10	S.S. "Gordon Castle."
Wharton, W. J. L., R.N. -	7	H.M.S. "Sylvia."
Wight, Henry Potts -	11	"Oamaru."
Williamson, Lieut. A. C. -	1	H.M.S. "Fawn."
Youlden, H. -	2	"May Hulsc."
Young, Sir Allen W., C.B. -	4	S.S. "Hope."

* 2nd Officer.

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Bjorklund, J. F.	Barque Beatrice	422	M. H. King, Bristol	To and from Manila, 1880-82 -	7
Blake, E. J.	" Tilkhurst	" 1,527	" W. R. Price, London	To and from Old Calabar, 1882 -	3
⁸ Bocquet, Harry	British Commerce	1,417	The British Shipowners Co., Lim., Liverpool.	To Sydney, San Francisco and home, 1881-82 -	10
⁹ Bone, H. T.	S.S. Sunbeam	1,784	W. E. Woolf, Hull	To and from San Francisco, 1882-83 -	9
Boothby, G. C.	S.S. Circassia	4,272	The Barrow S.S. Co., London	To Odessa, Antwerp, Sulina, Odessa, home, and Bombay, 1881-82 -	4
Bourke, Edmund, R.N., F.M.S.	Gannet	1,130	H.M.S.	Five voyages to New York; four home from New York, 1882-83 -	4
Broadfoot, J. A.	S.S. Ciperio	908	D. Caw, Glasgow	From Tabiti to Coquimbo, Callao, Val- paraiso, Coquimbo, Callao, Coquimbo, &c., 1882 -	12
"	"	"	"	To and from Trinidad, 1882 -	2
"	"	"	"	To West Indies, Belize, London, and Glasgow, 1882 -	3
Brown, A. J.	Barque Arran	1,064	J. Hendy, Greenock	To Jamaica, Belize, Newport (W.S.A.) and home, 1882-83 -	2
Brown, E.	Barque Moorhill	484	E. Brown, Liverpool	To Diego Garcia, 1882 -	5
"	"	"	"	From Antwerp to Rio Janeiro, Val- paraiso, Huanillos, and home, 1881-82 -	9
"	"	"	"	To Rio Janeiro, Pernambuco, Rio Grand do Norte, and home, 1882-83 -	10
Buchan, James	Barque Coppename	316	J. C. Pearson, Glasgow	To and from Demerara, 1881-82 -	2
Buchan, Robert	S.S. Alexandria	2,017	T. Henderson, Glasgow	To and from Sarinam, 1882 -	3
¹⁰ Campbell, Archibald	S.S. Ethiopia	4,005	The Barrow S.S. Co., Barrow	Glasgow to Genoa, New York, and Avonmouth, 1882 -	2
				Four voyages to and from New York, 1882 -	3

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
¹¹ Campbell, Archibald	S.S. Ethiopia	4,005	The Barrow S.S. Co., Barrow	Five voyages to and from New York, 1882-83	4
Campbell, James	Barque Hope	250	T. W. Katran, Castletown, Isle of Man.	To and from Aracayu, 1882	3
Candler, William	Barque Decapolis	632	T. B. Walker, London	To and from Brisbane, 1881-82	7
¹² Carpenter, Alfred, R.N., F.M.S.	Magpie	774	H.M.S.	Surveying in China and Japan Seas, 1882	4
"	"	"	"	Surveying in Japan Sea, 1882	4
"	"	"	"	Surveying in China and Japan Sea, 1882-83	4
¹³ Christie, J. D.	S.S. Earl King	2,193	W. Ross, Glasgow	To and from Quebec, 1882	1
Crotty, F. H.	Barque Kenyon	1,199	J. Poole, Liverpool	To Calcutta, Mauritius, Bombay, and home, 1881-82	11
Crowell, S. O.	S.S. Alpha	653	W. Cubard, Halifax, N.S.	Four voyages between Halifax and Jamaica, via Bermuda, 1881	3
"	"	"	"	One voyage between Halifax and Jamaica, via Bermuda, 1882	19 days
"	"	"	"	Between Halifax, Bermuda, and Jamaica, 1882-83.	4
¹⁴ Crutchley, W. C., R.N.R.	S.S. African	2,019	Union S.S. Co., Lim., Southampton	To and from Cape Town, 1882	2
"	"	"	"	"	2
"	"	"	"	To and from Table Bay, 1882	2
"	"	"	"	To and from Natal, 1882-83	2
Dart, L. C.	Barque Julia H.	585	E. C. Haws, St. John's, N.B.	To and from New York, 1882	2
"	"	"	"	To Baltimore, Havana, and home, 1882	4
¹⁵ Davison, H.	S.S. Belgie	2,652	The Oceanic Steam Navigation Co., Lim., Liverpool.	Between Hong Kong, Yokohama, and San Francisco, 1880-81	12

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Deuchars, William	S.S. Jan Mayen	469	The Dundee Polar Fishing Co., Dundee.	To and from Greenland, 1882	5
Dyke, H. W.	Barque Markland	920	W. H. De Veber, St. John's, N.B.	To Monte Video, Portland (Oregon), Valparaiso, and home, 1881-82	12
Ellery, William	Majestic	1,884	T. & R. Brocklebank, Liverpool	To and from Calcutta, 1882	6
Freeman, T. W.	S.S. Bellerophon	1,397	The Oceanic Steam Navigation Co., Liverpool.	To and from China, via Suez, 1881-82	4
8 "	"	"	"	To and from China, via Suez, 1882	3
8 "	"	"	"	" " " " 1882-83	4
8 Gardner, J. S.	Royal George	1,459	T. E. Greenshields, Liverpool	To and from San Francisco, 1881-82	10
16 Gordon, James	S.S. City of Agra	2,133	G. Smith, Glasgow	To and from Calcutta, via Suez, 1882	2
17 Grainger, T. L.	S.S. Almora	2,613	E. S. Dawes, London	To and from Brisbane, via Suez, 1882	4
18 "	S.S. Manora	3,242	"	" " " "	"
19 Gray, Alexander	S.S. Labrador	391	Hudson's Bay Co., London	To and from Labrador, 1882	5
Gray, David	S.S. Eclipse	435	D. Gray, Peterhead	To and from Greenland, 1882	4
Gray, S. B.	Barque Letterewe	798	D. Irwin, Liverpool	To and from Sydney, 1881-82	9
Halley, E.	City of Lucknow	1,195	G. Smith, Glasgow	To Otago, Portland (Oregon), and home, 1881-82	8
Hanslip, C. W.	S.S. Derwent	2,471	The Royal Mail Steam Packet Co., London.	To and from Brazil, 1882	2
Hay, Alexander	S.S. Almora	2,613	E. S. Dawes, London	To Batavia, Brisbane, Batavia, Colombo, and home, via Suez, 1882	4
20 Hepworth, C. M. W., F.M.S.	S.S. Danube	1,462	Union S.S. Co., Lim., Southampton	To and from Natal, 1882	5
Holdrich, J.P., R.N.R.	British Envoy	1,265	J. Coupland, Leicester	To and from San Francisco, 1881-82	8
Hoskyn, Lt.-Comr. R.F., R.N.	Flying Fish	940	H.M.S.	Surveying in Japan Sea, 1881-82	8
22 "	"	"	"	" " " " 1882	4
22 "	"	"	"	" " " " 1882	4

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Hughes, W. P.	Laomene	1,746	D. Fernie, Liverpool	To Melbourne, Newcastle (N.S.W.), San Francisco, and home, 1881-82	9
Jeffery, A. W.	S.S. Humboldt	1,644	Liverpool, Brazil, and River Plate S.N. Co., Lim., Liverpool.	To Monte Video, Rio Janeiro, New York, and home, 1881-82	2
"	"	"	"	To Brazil, New York, and home, 1882	2
"	S.S. Ptolemy	1,401	"	To Lisbon, Rio Janeiro, New York, and home, 1882	2
²³ Johnson, A. H.	S.S. Siam	3,041	P. & O. Steam Navigation Co., London.	To Calcutta, Venice, Bombay, and home, via Suez, 1881-82	4
Jones, G. H.	S.S. Lamperts	2,020	T. Bell, Newcastle-on-Tyne	Via Suez to Bombay, Marseilles, Gibraltar, Suva, and home, 1882	3
²⁴ Jones, S. G.	Barque Hermine	538	T. H. Jackson, Liverpool	To Valparaiso, Talca, and home, 1881-82	8
Lailey, W. N.	S.S. Cipro	908	D. Caw, Glasgow	From Belize to Lat. 45° N., Long. 34° W. To Trinidad, Demerara, and home. Towards Trinidad, Demerara, putting back to Plymouth and Glasgow, 1881-82	4
"	S.S. Olympus	2,415	A. Galbraith, Glasgow	To and from Ismailia, 1882	3
Lawson, James	S.S. Minho	1,491	Royal Mail Steam Packet Co., London.	To ports in Brazil and home, 1882	3
"	Barque Mikado	"	"	To and from Brazil, 1882	2
Lehman, Charles	Barque Mikado	643	W. Lamb, Liverpool	To Yokohama, Higo, Cuba, and New York, 1880-81	9
Littler, W. T.	Barque Corinth	611	T. B. Walker, London	To and from Brisbane, 1881-82	8
²⁵ Longley, Herbert	S.S. Yorkshire	2,273	W. H. Tindall, London	To China, Japan, New York, via Suez, and home, 1881-82	5

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Hughes, W. P.	Laomene	1,746	D. Fernie, Liverpool	To Melbourne, Newcastle (N.S.W.), San Francisco, and home, 1881-82	9
Jeffery, A. W.	S.S. Humboldt	1,644	Liverpool, Brazil, and River Plate S.N. Co., Lim., Liverpool.	To Monte Video, Rio Janeiro, New York, and home, 1881-82	2
"	S.S. Ptolemy	1,401	"	To Brazil, New York, and home, 1882	2
"	S.S. Siam	3,041	"	To Lisbon, Rio Janeiro, New York, and home, 1882	2
Johnson, A. H.	S.S. Siam	3,041	P. & O. Steam Navigation Co., London.	To Calcutta, Venice, Bombay, and home, via Suez, 1881-82	4
Jones, G. H.	S.S. Lamperts	2,020	T. Bell, Newcastle-on-Tyne	Via Suez to Bombay, Marseilles, Gibraltar, Sulina, and home, 1882	3
Jones, S. G.	Barque Hermine	538	T. H. Jackson, Liverpool	To Valparaiso, Taltal, and home, 1881-82	8
Lailey, W. N.	S.S. Cipero	908	D. Caw, Glasgow	From Belize to Lat. 45° N., Long. 34° W. To Trinidad, Demerara, and home. Towards Trinidad, Demerara, putting back to Plymouth and Glasgow, 1881-82	4
" Lawson, James	S.S. Olympus S.S. Minho	2,415 1,491	A. Galbraith, Glasgow Royal Mail Steam Packet Co., London.	To and from Ismailia, 1882 To ports in Brazil and home, 1882	3 3
" Lehman, Charles	Barque Mikado	643	W. Lund, Liverpool	To and from Brazil, 1882 To Yokohama, Hio-go, Cebu, and New York, 1880-81	2 9
Little, W. T.	Barque Corinth	614	T. B. Walker, London	To and from Brisbane, 1881-82	8
Longley, Herbert	S.S. Yorkshire	2,273	W. H. Tindall, London	To China, Japan, New York, via Suez, and home, 1881-82	5

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
²⁶ Lunham, R. D.	S.S. Ceylon	2,149	J. L. Clark, London	From Suez to Bombay, Calcutta, Manila, Hong-Kong, Yokohama, Honolulu, San Francisco, Acapulco, Callao, Valparaiso, Monte Video, Rio Janeiro, and home, 1881-82	6
"	"	"	"	To Madeira, Gibraltar, Lisbon, and home, 1882	1
Lyon, W. W.	S.S. Yorkshire	2,273	W. H. Tindall, London	To China, New York (via Suez), and home, 1882-83	6
McClure, William	Iron Cross	1,508	D. Fernie, Liverpool	To Calcutta, Mauritius, Clittagong, and home, 1881-83	9
McDougall, A.	Auckland	1,245	The Albion Shipping Co., Lim., Glasgow.	To and from New Zealand, 1881-82	6
McHugh, R. H.	Kingdom of Saxony	538	A. Gosman, London		
²⁷ Maclear, J. F. L. P., R.N., F.M.S.	Alert	1,240	H.M.S.	From Brazil to Lat. 42° S., Long. 36° E. From Cochin to Lat. 7° S., Long. 84° E., 1882	2
Malcolm, D.	Wemyss Castle	700	T. Skinner, London	From Singapore to Colombo, Seychelles, Mozambique, Simon's Bay, and home, 1882	11
²⁸ Manning, Henry	S.S. Seine	3,579	Telegraph Construction and Maintenance Co., Lim., London.	To Manila and Boston, 1882	9
"	"	"	"	To Singapore, Batavia, and home, via Suez, 1881-82	4
²⁹ Miller, A. T.	Conway	—	Training Ship	To Madeira, Lisbon, and home, 1882	2
Moloney, E. J.	British Merchant	1,696	British Shipowners' Co., Lim., Liverpool.	Off Birkenhead, 1882	4
Morton, Robert	Barque Glaramara	678	G. Nelson, Whitehaven	To and from Calcutta, 1881-82	7
Murdoch, Peter	Sierra Estrella	1,436	A. M. Anderson, Liverpool	From Cleveland Bay to Newcastle (N.S.W.), Portland (U.S.A.), and home, 1881-82	7
				To Bombay, Rangoon, and home, 1882	7

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Murray, Alexander	S.S. Windward	321	W. Baxter, Peterhead	To and from Greenland, 1882	5
Nicholson Malcolm	John Rennie	848	T. L. Devitt, London	To and from Adelaide, 1881-82	8
Norman, Francis	Barque Polestar	625	J. Lyne, Liverpool	To and from Valparaiso, 1881-82	7
³¹ Oldham, Lt. & Comr. C. F., R.N.	Lark	—	H.M. Schooner	From Simon's Bay to Sydney, Auckland, and Solomon Islands, 1881-82	4
³¹ Parry, Moses, F.M.S.	Barque Queen of Cambria	865	W. Thomas, Nevill, Carnarvonshire	At Australian Station, 1882	4
³² Parsell, Henry	S.S. Baltic	2,209	Oceanic Steam Navigation Co., Liverpool	To Monte Video, thence to Bassein, and Amsterdam, 1881-82	10
³³ " "	" "	"	" "	Five voyages to and from New York, 1882	4
Parson, G. F.	Earnock	1,198	W. Fraser, London	Five voyages to and from New York, 1882-83	4
³⁴ Pearson, C. W.	S.S. Strathleven	2,436	W. Burrell, Glasgow	To and from Shanghai, 1881-82	10
Peterson, Walter	Barque Caldew	482	C. Wilson, Sunderland	From Suez to Hong Kong, Yokohama, New York, and home, 1882	4
³⁵ Potter, Thomas	S.S. Salerno	2,059	C. H. Wilson, Hull	To Monte Video, Valparaiso, Pisagua, and home, 1881-82	7
" "	S.S. Sunbeam	1,784	W. F. Woolf, Hull	Hull to Falmouth and back to Hull, 1882	23 days.
Quaile, D. W. A.	Berbice	717	R. Kerr, Greenock	Hull to Cardiff, Odessa, Dartmouth, Rotterdam, Swansea, Odessa, London, Penarth, New Orleans, and Havre, 1882-83	6
Raeburn, John, R.N.R.	Lochee	3,728	D. Bruce, Dundee	To Lat. 18° N., Long. 26° W.	23 days.
" "	Barque Lochee	"	" "	To and from Calcutta, 1881-82	6
Renaat, C. H.	Pleione	1,092	W. Savill, London	" " 1882-83	7
Robinson, Thomas	Chinsura	1,266	T. Brocklebank, Liverpool	To and from Wellington, 1881-82	6
Ross, Alexander	Barque Trochrague	677	R. Kerr, Greenock	To Algon Bay, Madras, Vizagapatam, and home, 1881-82	7
Ross, Lieut. J. C., R.N.	Hecla	—	H.M.S.	To Spitzbergen, 1827.	8

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Rosseter, W. L.	Barque St. Kilda	865	A. T. Parker, Liverpool	To and from Demerara, 1882-83	3
Russell, C. J.	Baroda	1,364	R. Brocklebank, Liverpool	To and from Calcutta, 1882	7
Scott, William	Barque Commewyne	315	J. Grierson, Glasgow	To and from Surinam, 1881-82	3
"	"	"	"	To Demerara, Barbadoes, and home, 1882.	3
"	"	"	"	To and from Surinam, 1882-83	2
Shaw, Gilbert	S.S. Beta	1,087	W. Cunard, London	Two voyages between Halifax and Jamaica, via Bermuda, 1881-82	2
"	"	"	"	Between Halifax, Bermuda, and Jamaica, 1882	21 days.
"	"	"	"	Six voyages between Halifax and Jamaica, via Bermuda, 1882	4
Shearer, George	Barque Corona	1,210	W. Stephen, Dundee	To and from San Francisco, 1881-82	8
Simpson, Alexander	Schooner Traveller	196	A. Simpson, Peterhead	Voyage from Peterhead to Iviglut and one from Peterhead to Copenhagen, Iviglut, Hamburg, and North Shields, 1882	8
Skinner, C. L. T.	Barque Atacama	499	W. Nicol, Liverpool	To and from Valparaiso, 1881-82	7
Smith, J.	Naiad	1,039	J. B. Walmsley, London	To Valparaiso, Iquique, and Hamburg, 1882-83	8
³⁰ Smith, J. H., R.N.R.	Worcester	—	Training Ship	Off Greenhithe, 1881-82	4
³⁶ Smith, W. H., R.N.R.	S.S. Circassian	2,356	R. G. Allan, Liverpool	" 1882	4
³⁷ " " "	"	"	"	Two voyages to and from Quebec; three to and from Halifax, 1881-82	4
" " "	"	"	"	One voyage to and from Portland, via Halifax; five to and from Quebec, 1882	4
Spratly, W.	S.S. Humboldt	1,644	Liverpool, Brazil, and River Plate Steam Navigation Co., Ltd., Liverpool.	To Rio Janeiro, Monte Video, and Antwerp, 1882	2

LIST OF DOCUMENTS, &c.—*continued.*

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Rosseter, W. L.	Barque St. Kilda	865	A. T. Parker, Liverpool	To and from Demerara, 1882-83	3
Russell, C. J.	Barodia	1,364	R. Brocklebank, Liverpool	To and from Calcutta, 1882	7
Scott, William	Barque Commewyne	315	J. Grierson, Glasgow	To and from Surinam, 1881-82	3
"	"	"	"	To Demerara, Barbadoes, and home, 1882-	3
"	"	"	"	To and from Surinam, 1882-83	2
Shaw, Gilbert	S.S. Beta	1,087	W. Cunard, London	Two voyages between Halifax and Jamaica, via Bermuda, 1881-82	2
"	"	"	"	Between Halifax, Bermuda, and Jamaica, 1882	21 days.
"	"	"	"	Six voyages between Halifax and Jamaica, via Bermuda, 1882	4
"	"	"	"	To and from San Francisco, 1881-82	8
Shearer, George	Barque Corona	1,210	W. Stephen, Dundee	Voyage from Peterhead to Ivigut and one from Peterhead to Copenhagen, 1882-	8
Simpson, Alexander	Schooner Traveller	196	A. Simpson, Peterhead	Ivigut, Hamburg, and North Shields, 1882-	7
Skinner, C. L. T.	Barque Atacama	499	W. Nicol, Liverpool	To and from Valparaiso, 1881-82	8
Smith, J.	Naiad	1,039	J. B. Walmsley, London	To Valparaiso, Iquique, and Hamburg, 1882-83	4
³⁰ Smith, J. H., R.N.R.	Worcester	—	Training Ship	Off Greenhithe, 1881-82	4
³⁶ Smith, W. H., R.N.R.	S.S. Circassian	2,356	R. G. Allan, Liverpool	Two voyages to and from Quebec; three to and from Halifax, 1881-82	4
³⁷ " " "	"	"	"	One voyage to and from Portland, via Halifax; five to and from Quebec, 1882-	4
Spratly, W.	S.S. Humboldt	1,644	Liverpool, Brazil, and River Plate Steam Navigation Co., Lim., Liverpool.	To Rio Janeiro, Monte Video, and Antwerp, 1882	2

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Spratt, W.	S.S. Rubens	1,708	Liverpool, Brazil, and River Plate Steam Navigation Co., Lim., Liverpool.	To and from Monte Video 1882	2
Stiven, J. H.	Aretbusa	1,272	J. Hamilton, Liverpool	To and from Calcutta, 1881-82	8
Stuart, W. H.	L. H. Tender Richmond	183	Board of Trade, London	At Balamas, 1877-82	Four years & 5 months.
³³ Studdert, Robert	³¹ S.S. Cotopaxi	4,028	" The Pacific Steam Navigation Co., Liverpool.	At the Bahamas, 1882	4
³⁹ Swan, John	City of Madrid	1,191	G. Smith, Glasgow	To and from Australia (via Suez) 1882	3
Symington, William	S.S. Hankow	3,594	W. Milburn, Newcastle-on-Tyne	To Adelaide, San Francisco, and home, 1882	9
Tannoek, R. S.	Glencairn	1,564	A. Allen, Glasgow	To Hong Kong, via Suez, and back to Aden, 1882	3
Taunton, T. F.	S.S. Durham	1,831	W. Bailey, Hull	To and from Hangoon, 1881-82	7
Thorne, J. W.	British Commodore	1,390	British Shipowners Co., Lim., Liverpool.	To Odessa, Antwerp, Sulina and home, 1882-83	3
Tizard, Staff-Com. T. H., R.N.	Triton	410	H.M.S.	From New York to Calcutta, and home, 1881-82	9
⁴⁰ Tomlin, P. S.	S.S. Ballarat	4,752	P. & O. Steam Navigation Co., London.	Surveying off coast of United Kingdom, 1882.	6
"	S.S. Kbedive	3,860	"	To Colombo, Melbourne, and home, via Suez, 1882-83	3
⁴¹ Wait, A. McLean	S.S. Arab	2,044	Union S.S. Co., Lim., Southampton	To and from Bombay and China, via Suez, 1882	3
"	S.S. German	3,028	"	One voyage to and from Cape Town; three to and from Alexandra, 1882	4
⁴² Waring, William	S.S. Gordon Castle	2,031	T. Skinner, London	Two voyages to and from Cape Town, 1881-82	3
"	"	"	"	Via Suez, to China, Japan, China, New York, and home, 1882	5
⁴³ "	"	"	"	To and from China, via Suez, 1882-83	4

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Spraty, W. -	S.S. Rubens -	1,708	Liverpool, Brazil, and River Plate Steam Navigation Co., Lim., Liverpool.	To and from Monte Video 1882	2
Stiven, J. H.	Arethusa -	1,272	J. Hamilton, Liverpool -	To and from Calcutta, 1881-82	8
Stuart, W. H.	L. H. Tender Richmond	183	Board of Trade, London -	At Bahamas, 1877-82 -	Four years & 5 months.
³⁸ Studdert, Robert	S.S. Cotopaxi -	4,028	" " " " The Pacific Steam Navigation Co., Liverpool.	At the Bahamas, 1882 -	4
³⁹ Swan, John -	City of Madrid	1,191	G. Smith, Glasgow -	To and from Australia (via Suez) 1882	3
Symington, William	S.S. Hankow -	3,594	W. Milburn, Newcastle-on-Tyne	To Adelaide, San Francisco, and home, 1882 -	9
Tannock, R. S.	Glencairn -	1,564	A. Allen, Glasgow -	To Hong Kong, via Suez, and back to Aden, 1882	3
Taunton, T. F.	S.S. Durham -	1,831	W. Bailey, Hull -	To and from Rangoon, 1881-82	7
Thorne, J. W.	British Commodore	1,390	British Shipowners Co., Lim., Liverpool.	To Odessa, Antwerp, Sulina and home, 1882-83	3
Tizard, Staff-Com.	Triton -	410	H.M.S. -	From New York to Calcutta, and home, 1881-82	9
T. H., R.N.	S.S. Ballaarat -	4,752	P. & O. Steam Navigation Co., London.	Surveying off coast of United Kingdom, 1882.	6
⁴⁰ Tomlin, P. S.	S.S. Khedive	3,860	" " " "	To Colombo, Melbourne, and home, via Suez, 1882-83	3
⁴¹ Wait, A. McLean	S.S. Arab -	2,044	Union S.S. Co., Lim., Southampton	To and from Bombay and China, via Suez, 1882	3
" "	S.S. German -	3,028	" " " "	One voyage to and from Cape Town; three to and from Alexandria, 1882 -	4
⁴² Waring, William	S.S. Gordon Castle	2,031	T. Skinner, London	Two voyages to and from Cape Town, 1881-82	3
" "	" "	"	" " " "	Via Suez, to China, Japan, China, New York, and home, 1882	5
⁴³ " "	" "	"	" " " "	To and from China, via Suez, 1882-83 -	4

LIST OF DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage and Year.	Months of Register.
Wharton, W. J. L., R.N.	Sylvia -	1,050	H.M.S. -	To Rio Janeiro and Monte Video, and surveying off East Coast of South America, 1882	4
Wight, H. P.	Oamaru -	1,500	The Albion Shipping Co., Lim., Glasgow.	To and from Otago, 1881-82	8
Wilson, F. -	Mahana -	1,003	R. Brocklebank, Liverpool	To Auger, 1881	3
Youlden, H. -	Barque May Hulse -	463	J. Ransom, Southampton	To Valparaiso, and home from Mexillones (Peru), 1881-82	6
44 Young, Sir A. W., C.B., R.N.R.	S.S. Hope -	452	R. Kidd, Peterhead	To and from Matochkin Shar, 1882	2

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

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|--|---|---|
| 1 Kept by Lieutenants E. J. W. Slade, R.N., and Andrew C. Williamson, R.N. | 16 Assisted by A. Rindoch, 2nd Officer. | 31 Kept by Lieutenant Alexander Leeper, R.N. |
| 2 Kept by Lieutenant Andrew C. Williamson, R.N. | 17 Kept by Henry de Stoker, 4th Officer, and other officers. | 32 Kept by C. Unsworth, 3rd Officer. |
| 3 Kept by H. Casey Reynell, 2nd Officer. | 18 Kept by C. R. Dade, 4th Officer. | 33 Kept by W. P. Brownless. |
| 4 Kept by C. H. S. Tocque, 2nd Officer. | 19 Kept by J. K. Holmes. | 34 Assisted by E. F. Collard, 2nd Officer. |
| 5 Kept by C. H. S. Tocque and H. M. Lambert, 2nd Officers. | 20 Kept by F. J. Symonds, 2nd Officer. | 35 Assisted by G. H. Bernard, Chief Officer. |
| 6 Kept by Junior Officers. | 21 Kept by Lieutenants Frederick Shortland, R.N., and Henry Baker, R.N. | 36 Kept by Messrs. Caine and Cotterill, 3rd and 4th Officers. |
| 7 Kept by D. W. Barker, F.M.S., Chief Officer. | 22 Kept by Lieutenant Henry Baker, R.N. | 37 Kept by Messrs. Caine and Hewson, 3rd and 4th Officers. |
| 8 Assisted by Officers. | 23 Kept by W. S. Miller, 4th Officer. | 38 Kept by the Officers. |
| 9 Assisted by R. Griffiths, Mate. | 24 Assisted by C. A. Trevor, C. A. H. Slough, and A. S. Noble. | 39 Kept by H. G. Storey, 3rd Officer. |
| 10 Kept by Robert Morrison. | 25 Kept by William W. Lyon, Chief Officer. | 40 Kept by S. de B. Lockyer, 3rd Officer. |
| 11 Kept by Samuel Murray and Alexander Boyd, 2nd Officers. | 26 Kept by F. E. J. Locke, 5th Officer. | 41 Kept by A. W. Browne, and R. Woolward, 4th Officers. |
| 12 Kept by Lieutenant Andrew Ballour, R.N. | 27 Kept by Lieutenant Henry E. Rooper, R.N. | 42 Assisted by 2nd and 3rd Officers. |
| 13 Kept by G. Denham. | 28 Kept by Harold Woodcock, 2nd Officer. | 43 Assisted by G. Hensworth, 2nd Officer, and J. Sullivan, 3rd Officer. |
| 14 Kept by T. Q. East. | 29 Kept by H. Slowe and E. Collins. | 44 Kept by John Price, Surgeon, R.N. |
| 15 Kept by J. F. Nash, 3rd Officer. | 30 Kept by the Boys. | |

MISCELLANEOUS DOCUMENTS.

Height and temperature of the River Thames as observed at 9 a.m. each day at Surbiton, at the Works of the Chelsea Water Company, by G. Lott, Superintendent, from September 1, 1854, to September 30, 1880.

Extracts from ships' logs used in the discussion of the "City of Boston" storm of February 1870. Results published in Official 13.

Observations from various land stations used in the discussion of the "City of Boston" storm of February 1870. Results published in Official 13.

Deviation of standard compasses on board H.M. Ships specified, 1850-55.

Description of a cyclone to the eastward of Australia, from April 28 to May 4, 1874, as gathered from the logs of various ships by Lieut. G. R. Bethell, R.N., H.M.S. "Challenger."

APPENDIX IV.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Baro- meters.	Ane- roids.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screened.	
April 1st, 1882, afloat - -	173	378	1,004	148	131	92	130
Issued since - - - -	50	80	290	36	39	22	13
	223	458	1,294	184	170	114	143
Returned since - - - -	47	89	221	33	37	14	15
April 1st, 1883, afloat - -	176	378	1,073	151	133	100	128

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

April 1st, 1882, in use - -	66	114	237	20	30	6	16
Issued since - - - -	1	6	49	3	2	—	1
	67	120	286	23	32	6	17
Returned since - - - -	1	4	27	2	3	1	1
April 1st, 1883, in use - -	66	116	259	21	29	5	16

DISPOSITION OF ADMIRALTY INSTRUMENTS on April 1st, 1883.

Afloat in Royal Navy - -	176	378	1,073	151	133	100	128
In use at stations - - -	66	116	259	21	29	5	16
In store at M.O. - - -	105	88	135	40	75	20	84
" Chatham - - - -	1	8	10	2	1	4	4
" Sheerness - - - -	2	7	14	4	2	5	19
" Portsmouth - - - -	6	10	25	9	8	23	28
" Devonport - - - -	2	3	32	5	5	4	24
" Queenstown - - - -	3	3	1	1	1	—	8
" Gibraltar - - - -	1	4	2	—	—	4	—
" Malta - - - - -	2	13	51	6	4	4	20
" Halifax - - - - -	4	8	8	2	5	—	12
" Bermuda - - - - -	5	8	48	2	2	—	15
" Jamaica - - - - -	2	1	5	—	1	—	—
" Cape of Good Hope -	4	3	14	6	7	—	31
" Trincomalee - - - -	2	2	22	—	—	—	—
" Hong Kong - - - - -	2	8	32	6	8	1	10
" Coquimbo - - - - -	2	7	14	1	2	—	23
" Sydney - - - - -	3	5	56	1	2	—	—
" Esquimaux - - - - -	6	5	10	3	3	—	—
Under repair - - - - -	39	—	2	4	—	—	—
Total, April 1st, 1883 -	433	677	1,813	264	288	170	422
Lost, &c. since April 1st, 1882.	1	9	176	11	12	4	7

APPENDIX IV.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Baro- meters.	Ane- roids.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1882, afloat -	173	378	1,004	148	131	92	130
Issued since -	50	80	290	36	39	22	13
Returned since -	223	458	1,294	184	170	114	143
April 1st, 1883, afloat -	47	80	221	33	37	14	15
	176	378	1,073	151	133	100	128

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

April 1st, 1882, in use -	66	114	237	20	30	6	16
Issued since -	1	6	49	3	2	—	1
Returned since -	67	120	286	23	32	6	17
April 1st, 1883, in use -	1	4	27	2	3	1	1
	66	116	259	21	29	5	16

DISPOSITION OF ADMIRALTY INSTRUMENTS on April 1st, 1883.

Afloat in Royal Navy -	176	378	1,073	151	133	100	128
In use at stations -	66	116	259	21	29	5	16
In store at M.O. -	105	88	135	40	75	20	84
" Chatham -	1	8	10	2	1	4	4
" Sheerness -	2	7	14	4	2	5	19
" Portsmouth -	6	10	25	9	8	23	28
" Devonport -	2	3	32	5	5	4	24
" Queenstown -	3	3	1	1	1	—	8
" Gibraltar -	1	4	2	—	—	4	—
" Malta -	2	13	51	6	4	4	20
" Halifax -	4	8	8	2	5	—	12
" Bermuda -	5	8	48	2	2	—	15
" Jamaica -	2	1	5	—	1	—	—
" Cape of Good Hope -	4	3	14	6	7	—	31
" Trincomalee -	2	2	22	—	—	—	—
" Hong Kong -	2	8	32	6	8	1	10
" Coquimbo -	2	7	14	1	2	—	23
" Sydney -	3	5	56	1	2	—	—
" Esquimalt -	6	5	10	3	3	—	—
Under repair -	39	—	2	4	—	—	—
Total, April 1st, 1883 -	433	677	1,813	264	288	170	422
Lost, &c. since April 1st, 1882.	1	9	176	11	12	4	7

APPENDIX V.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screen.	
April 1st, 1882, afloat -	115	—	627	—	—	114	403
Issued since -	118	—	679	1	1	106	404
Returned since -	233	—	1,306	1	1	220	807
April 1st, 1883, afloat -	93	—	542	1	1	75	314
	140	—	764	—	—	145	493

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

April 1st, 1882, in use -	101	3	248	60	58	38	40
Issued since -	19	—	16	5	11	3	1
Returned since -	120	3	264	65	69	41	41
April 1st, 1883, in use -	16	—	16	3	5	2	—
	104	3	248	62	64	39	41

DISPOSITION of Board of Trade Instruments.

In merchant ships -	140	—	764	—	—	145	493
In use at stations -	104	3	248	62	64	39	41
In store at M.O. -	68	1	61	23	65	2	103
At Liverpool agency -	4	8	27	—	—	5	19
„ Aberdeen „ -	6	—	33	—	—	1	30
„ Glasgow „ -	6	—	35	—	—	4	17
„ Dundee „ -	6	—	33	—	1	7	16
„ Hull „ -	5	—	11	—	—	6	13
„ Southampton „ -	5	—	26	—	—	6	23
„ Cardiff „ -	1	—	13	—	—	1	11
Under repair -	9	—	3	—	—	5	3
Total, April 1st, 1883 -	354	12	1,254	85	130	221	769
Lost, &c. since April 1st, 1882 -	2	—	132	1	2	14	43

APPENDIX V.

INSTRUMENTS supplied, &c. to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1882, afloat -	115	—	627	—	—	114	403
Issued since -	118	—	679	1	1	106	404
	233	—	1,306	1	1	220	807
Returned since -	93	—	542	1	1	75	314
April 1st, 1883, afloat -	140	—	764	—	—	145	493

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

April 1st, 1882, in use -	101	3	248	60	58	38	40
Issued since -	19	—	16	5	11	3	1
	120	3	264	65	69	41	41
Returned since -	16	—	16	3	5	2	—
April 1st, 1883, in use -	104	3	248	62	64	39	41

DISPOSITION of Board of Trade Instruments.

In merchant ships -	140	—	764	—	—	145	493
In use at stations -	104	3	248	62	64	39	41
In store at M.O. -	68	1	61	23	65	2	103
At Liverpool agency -	4	8	27	—	—	5	19
„ Aberdeen -	6	—	33	—	—	1	30
„ Glasgow -	6	—	35	—	—	4	17
„ Dundee -	6	—	33	—	1	7	16
„ Hull -	5	—	11	—	—	6	13
„ Southampton -	5	—	26	—	—	6	23
„ Cardiff -	1	—	13	—	—	1	11
Under repair -	9	—	3	—	—	5	3
Total, April 1st, 1883 -	354	12	1,254	85	130	221	769
Lost, &c. since April 1st, 1882 -	2	—	132	1	2	14	43

APPENDIX VI.

LIST of STATIONS reporting Meteorological Observations by Telegraph to the Office on 31st March 1883, with the Names of Observers.

*†Sumburgh Head	-	Rev. W. Brand	-	-	-	Minister of Dunrossness.
*†Stornoway	-	D. MacDonald	-	-	-	Late Officer S.S. "Great Eastern."
Wick	-	J. Sinclair	-	-	-	Watchmaker.
Nairn	-	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	-	W. Keeping, M.A., F.G.S.	-	-	-	Museum.
Loughboro'	-	W. Berridge, F.M.S.	-	-	-	
†Ardrossan	-	J. W. Mayes	-	-	-	Telegraph Clerk.
*†Mullaghmore	-	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	-	? J. Tilston	-	-	-	Keeper of Sailors' Home.
Liverpool	-	J. Hartnup, junr.	-	-	-	Bidston Observatory.
*†Valencia	-	J. E. Cullum	-	-	-	Superintendent of the Observatory.
Roche's Point	-	W. Kennedy	-	-	-	Telegraph Clerk.
Pembroke	-	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.M.S.	-	-	-	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.

APPENDIX VII.

REPORTS ON THE INSPECTION OF THE STATIONS IN
1882.A.—REPORT OF INSPECTION OF THE IRISH AND WELSH STATIONS
WITH SCILLY.

I HAVE to report that I have completed the inspection of all the stations in Ireland and Wales except Street, Co. Longford, where the observer has found it impracticable to maintain his records.

OBSERVATORIES.

Valencia, October 4.—Observatory in good order. The repairs to the sea wall, authorised last year, have been executed in a satisfactory manner, and Mr. Cullum keeps the premises in a neat and tidy condition.

Armagh, October 10.—Instruments in good order. Dr. Dreyer has forwarded applications from himself and Mr. Call requesting a reconsideration of the terms of the allowance to the observatory.

TELEGRAPHIC REPORTING STATIONS.

Scilly, September 14.—The instruments were in a satisfactory condition. The pillar on which the small anemograph is placed rocks in gales, so that the pendulum strikes the wall of the anemograph case and stops the clock. I am in correspondence with Mr. Munro about this defect.

St. Ann's Head, September 28.—The station calls for no remark. The observations are well taken, and the exposure very good. The instruments are in good order.

Valencia.—October 4.—Instruments in good order. I regret to say that telegraphic communication with the station is in an unsatisfactory condition.

Roche's Point, October 6.—Station satisfactory; nothing to remark.

Parsonstown, October 7.—This station was satisfactory also.

Donaghadee, October 11.—The station is in very good order, and Mr. MacGowan, the observer, is most zealous.

Mullaghmore, October 13.—The station is in good order. I find that the difficulties about laying the private wire from Cliffony are now removed, and I propose to carry this out as soon as I can.

Holyhead, October 19.—This station calls for no special remark. The Stevenson's screen has been erected, and the thermometer readings are improved thereby.

STATIONS FOR THE WEEKLY WEATHER REPORT.

Waterford, September 29.—This station is not very satisfactory, but under the circumstances, I see no prospect of improvement, or of the substitution of another station for the present one.

Foynes, October 2.—Station in good order, and observer anxious to improve. I regret, however, that there is no present prospect of barometer readings being obtainable.

STATIONS OF THE SECOND ORDER.

Helston, September 18.—This station promises fairly well. The observer, Mr. Gill, is the schoolmaster. He has no barometer, but he attends to his thermometers and rain-gauge carefully.

St. David's, September 27.—As usual, in excellent order. The observer has begun to observe cirrus clouds.

Parsonstown.—See remarks above.

Londonderry, October 12.—Nothing to remark; observer very careful.

Colebrooke, October 14.—Station not very satisfactory. The observer, Mr. Ferguson, the gardener, has not had training enough taking such observations. The instruments are in good order.

Markree Castle, October 13.—Station in good order.

Dublin, Mountjoy Observatory, October 9.—Station calls for no remarks. The exposure is very good.

Dublin, Fitzwilliam Square, October 18.—This continues to be as good a station as it is possible to have in the confined locality afforded by a town garden.

Dublin, Glasnevin, October 18.—The station has gradually become thoroughly satisfactory in every respect. A vane has been erected on the large conservatory, which supplies a great defect previously existing.

I append the following table of errors of thermometers:—

—	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare.	2nd Spare.	Grass Min.	REMARKS.
Scilly - - -	+ '2	+ '7	+ '1	- '6	—	—	—	These were determined by comparison with the spare thermometer at the station, as standard had been broken.
St. Ann's Head	+ '4	+ '2	- '4	+ '1	—	—	—	
Valencia - -	+ '6	+ '7	+ '9	- '5	+ '9	—	—	The spare thermometers are respectively the 2nd maximum and minimum instruments.
Roche's Point -	+ '1	+ '0	+ '0	- '1	—	—	—	
Parsonstown -	+ '9	+ '5	+ '3	+ '2	- '5	+ '2	—	
Donaghadee -	+ '4	+ '6	+ '3	+ '2	+ '6	—	—	
Malla-lunore -	+ '2	+ '1	+ '5	+ '3	+ '3	+ '2	—	Spirit separated in minimum. Perhaps it had not fully joined when reading taken.
Holyhead - -	+ '3	+ '1	'0	- '7	+ '9	—	—	
Foynes - - -	+ '6	+ '7	+ '7	- '1	—	—	—	
Londonderry -	'0	'0	+ '9	- '3	+ '2	—	—	
Helston - - -	'0	+0'1	- '6	-1'2	—	—	—	
St. David's - -	+ '1	+ '2	- '1	+ '1	—	—	- '1	Dry bulb taken as standard. See above under Scilly.
Colebrooke - -	+ '6	+ '4	+ '1	+ '2	—	—	—	
Markree - - -	+ '4	+ '3	+ '3	+ '3	—	—	+ '1	
Mountjoy Observatory	+ '6	+ '5	+ '9	+ '2	—	—	- '2	
Fitzwilliam Square -	+ '3	+ '3	+1'0	+ '1	+ '4	—	—	
Glasnevin - - -	+ '5	+ '8	+1'2	- '7	—	—	- '2	

I did not test the solar radiation thermometers.

ROBERT H. SCOTT.

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

TELEGRAPHIC REPORTING STATIONS.

Prach Point (visited July 10).—The instruments were all in the best possible order, and the observations continue to be carefully conducted. Turf has been, at last, laid down around the Stevenson's screen. The observer (Mr. J. Johns), was absent, being on duty with the Channel Fleet, at the time of my visit, and the chief boatman was taking the observations. I found that he set the vernier too low, the error so produced being about -006 in., but after the instructions

St. David's, September 27.—As usual, in excellent order. The observer has begun to observe cirrus clouds.

Parsonstown.—See remarks above.

Londonderry, October 12.—Nothing to remark; observer very careful.

Colebrooke, October 14.—Station not very satisfactory. The observer, Mr. Ferguson, the gardener, has not had training enough taking such observations. The instruments are in good order.

Markree Castle, October 13.—Station in good order.

Dublin, Mountjoy Observatory, October 9.—Station calls for no remarks. The exposure is very good.

Dublin, Fitzwilliam Square, October 18.—This continues to be as good a station as it is possible to have in the confined locality afforded by a town garden.

Dublin, Glasnevin, October 18.—The station has gradually become thoroughly satisfactory in every respect. A vane has been erected on the large conservatory, which supplies a great defect previously existing.

I append the following table of errors of thermometers:—

—	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare.	2nd Spare.	Grass Min.	REMARKS.
Silly - - -	+ '2	+ '7	+ '1	- '6	—	—	—	? These were determined by comparison with the spare thermometer at the station, as standard had been broken.
St. Ann's Head	+ '4	+ '2	- '4	+ '1	—	—	—	The spare thermometers are respectively the 2nd maximum and minimum instruments.
Valencia - -	+ '6	+ '7	+ '9	- '5	+ '9	—	—	
Roche's Point -	+ '1'1	+ '1'0	+ '1'9	- '1	—	—	—	
Parsonstown -	+ '9	+ '5	+ '3	+ '2	- '5	+ '2	—	
Donaghadee -	+ '4	+ '6	+ '3	+ '2	+ '6	—	—	Spirit separated in minimum. Perhaps it had not fully joined when reading taken.
Mullaghmore -	+ '2	+ '1	+ '5	+ '3	+ '3	+ '2	—	
Holyhead - -	+ '3	+ '1	'0	- '7	+ '9	—	—	
Foynes - - -	+ '6	+ '7	+ '7	- '1	—	—	—	
Londonderry -	'0	'0	+ '9	- '9	+ '2	—	—	
Helston - - -	'0	+ '0'1	- '6	- '2	—	—	—	Dry bulb taken as standard. See above under Scilly.
St. David's	+ '1	+ '2	- '1	+ '1	—	—	- '1	
Colebrooke -	+ '6	+ '4	+ '4	+ '2	—	—	—	
Markree - - -	+ '4	+ '3	+ '5	+ '3	—	—	+ '1	
Mountjoy Observatory	+ '6	+ '5	+ '9	+ '2	—	—	+ '2	
Fitzwilliam Square	+ '3	+ '3	+ '0	+ '1	+ '4	—	—	
Glasnevin - -	+ '5	+ '8	+ '2	- '7	—	—	- '2	

I did not test the solar radiation thermometers.

ROBERT H. SCOTT.

B.—REPORT OF THE INSPECTION OF THE ENGLISH STATIONS. TELEGRAPHIC REPORTING STATIONS.

Prawle Point (visited July 4th).—The instruments were all in the best possible order, and the observations continue to be carefully conducted. Turf has been, at last, laid down around the Stevenson's screen. The observer (Mr. J. Johns), was absent, being on duty with the Channel Fleet, at the time of my visit, and the chief boatman was taking the observations. I found that he set the vernier too low, the error so produced being about -006 in., but after the instructions

given him, I think the mistake will not be repeated. I had endeavoured to make arrangements to visit this station in a gale, but did not arrive at the right time. There is no doubt that winds of forces above 7 are more rarely recorded here than one would, from the Scilly, Hurst, and Jersey reports, be led to anticipate. In my inspection notes for 1881 I expressed an opinion that this was due to a too low estimate on the part of the observer. During the past winter and spring I had an opportunity of continuously testing the reports from Prawle by observations taken on the coast about 22 miles to the west of this station. I now think that it is the Scilly, Hurst, and Jersey reports which are rather at fault, the observer at the first of those stations having considerably, and those at the two last slightly, over-estimated the forces of high winds. The directions of the wind at this station (in marked contrast to those at Hurst, where the south-westerly winds are greatly deflected) are thoroughly representative of those over the neighbouring parts of the Channel.

Loughborough (visited August 18th).—The instruments were all found to be in good order, and the observer carries on the work with the greatest carefulness. As has been previously reported, when the station was inspected as one of the Second Order, the position of the outdoor instruments, though not quite unexceptionable, is as good as can ordinarily be obtained in a private garden in a town. The new rain-gauge is close to the old five-inch gauge, and has a fair exposure. The observer's estimate of the force and direction of the wind, which I have checked for a long period, appears to me to be accurate, though gales are reported with more frequency than one would expect. The observer's clerk is able to read the instruments correctly, should occasion require; but Mr. Berridge himself is never absent from home.

Barrow-in-Furness (inspected August 26th).—The observations seem to be carefully made and reported, and the instruments were in fairly good order. In my last year's report I mentioned that the reporting barometer read apparently too high. The discrepancy which I then found between its reading and those of the check barometer, a good Fortin (as well as those of my own standard), has been further established by 13 comparisons taken in June last between the reporting barometer and the Fortin, the mean result of the comparisons being that the reporting barometer reads $\cdot 048$ in. above the Fortin. From my own comparisons made this year similar results appear, as shown in Table I. The observer, however, does not set the ivory point of the Fortin with facility, the instrument not being in a very convenient light; so that it will be better that the marine barometer, No. 312, should either continue to be used, or be exchanged for another instrument of the same pattern, or for one of the less contracted tubes. I continue to consider that the observer estimates the wind correctly, but that it is rarely possible for him to form a precise judgment of the amount of sea disturbance.

From observation and inquiry I conclude that the remarkable smallness of the angle of deviation of the winds, as observed at this station, is characteristic of this part of the English coast, and is not due to influences specially affecting the spot at which the observations are taken.

York (inspected August 30th).—The observations show a slight improvement, as the gardener of the museum grounds reads the instruments more accurately than formerly. The vane had been blown down and had not been again erected. This renders the task of estimating the direction of the wind a rather difficult one, the gardens being in a somewhat sheltered locality where there is little opportunity of observing the motion of smoke from chimneys.

North Shields (inspected August 29th).—The barometers were found in good order and agreed perfectly with my standard. The Stevenson's screen much required repainting both on the inside and the outside. This has since been done in accordance with directions. The wet-bulb thermometer was found to be not sufficiently clean. (The muslin at this place requires very frequent changing, the atmosphere being extremely charged with carbon.) The thermometers required reblacking and varnishing, which I did. The old rain-gauge has been well repaired and may last for some years. It has been furnished, in accordance with my instructions, with strong metal wings resting on the ground for the observer to stand upon when lifting the funnel; these keep the instrument level. The observer, Mr. Irvine, seems to be attentive to his work, and the reports are, as a rule, good.

London (Brixton) (visited October 2nd).—I found everything in admirable order, as usual, at this station.

Jersey (Noirmont) (October 4th and 5th).—I took to this station two new barometers having the less contracted tubes. Although these instruments (which were lashed together) were very carefully transported with the cistern ends uppermost throughout the journey, one of them on suspension at the station was found to contain a very large quantity of air, which, on the tube being taken out, and recourse being had to such measures as were available, I failed to expel. This instrument I accordingly brought back to the Meteorological Office, together with the old check barometer previously suspended at the station. The other new barometer, which was in perfect order, I left for use at the station, leaving the instrument, whose readings had been hitherto reported, in its place as a spare barometer. The outdoor instruments in the new site mentioned in last year's report have a perfect exposure, and they are well attended to. The thermometer screen is over short turf. The rain-gauge is fixed in a very firm solid block. Finding the dry-bulb thermometer, after numerous comparisons in water, at several temperatures, to read too high, I exchanged it for another instrument, the readings of which are correct. The observer continued to be very painstaking and accurate.

Dover (inspected October 9th).—The outdoor instruments were not in a very satisfactory state, the wet-bulb being foul, and the rain-gauge having lost its supports and being much inclined. The observer set the verniers too low, and his readings were not quite correct, but he was suffering at the time of my visit from ophthalmia. The position of the instruments at the station is eminently objectionable.

STATIONS of the SECOND ORDER, &c.

Plymouth (inspected June 30th).—The observer, Dr. Merrifield, was absent at the date of my visit. I found his assistant to take the observations carefully. No improvement could be suggested as to the position of the instruments, with the exception of the sunshine recorder, from which the sun's rays were intercepted in the summer time by a stack of chimneys. This will be now remedied by raising the instrument to the level of the summit of one of the chimneys of the observer's house. The observations at this station are recorded with much care.

Arlington Court (inspected July 5th).—The altitude is 613 feet above mean sea level. The country around is extremely broken and hilly and clothed with large timber. Extraordinarily heavy falls of rain are occasionally reported from this station. After a study of the climatic aspects of the place, examination of the rainfall entries, and inquiries made both of the observer and others, I am convinced that these reports

North Shields (inspected August 29th).—The barometers were found in good order and agreed perfectly with my standard. The Stevenson's screen much required repainting both on the inside and the outside. This has since been done in accordance with directions. The wet-bulb thermometer was found to be not sufficiently clean. (The muslin at this place requires very frequent changing, the atmosphere being extremely charged with carbon.) The thermometers required reblacking and varnishing, which I did. The old rain-gauge has been well repaired and may last for some years. It has been furnished, in accordance with my instructions, with strong metal wings resting on the ground for the observer to stand upon when lifting the funnel; these keep the instrument level. The observer, Mr. Irvine, seems to be attentive to his work, and the reports are, as a rule, good.

London (Brixton) (visited October 2nd).—I found everything in admirable order, as usual, at this station.

Jersey (Noirmont) (October 4th and 5th).—I took to this station two new barometers having the less contracted tubes. Although these instruments (which were lashed together) were very carefully transported with the cistern ends uppermost throughout the journey, one of them on suspension at the station was found to contain a very large quantity of air, which, on the tube being taken out, and recourse being had to such measures as were available, I failed to expel. This instrument I accordingly brought back to the Meteorological Office, together with the old check barometer previously suspended at the station. The other new barometer, which was in perfect order, I left for use at the station, leaving the instrument, whose readings had been hitherto reported, in its place as a spare barometer. The outdoor instruments in the new site mentioned in last year's report have a perfect exposure, and they are well attended to. The thermometer screen is over short turf. The rain-gauge is fixed in a very firm solid block. Finding the dry-bulb thermometer, after numerous comparisons in water, at several temperatures, to read too high, I exchanged it for another instrument, the readings of which are correct. The observer continued to be very painstaking and accurate.

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are perfectly reliable. The position of the instruments is admirable, and therefore incomparably better than that of those at Barnstable, and this circumstance, together with the assiduity of the observer, more than compensate for the fact that the climate of Arlington is, in respect of cloudiness and moisture, somewhat exceptional. The thermometer screen was slightly too high, and did not face in the right direction. I gave directions that this should be altered. The muslin and thread for the wet-bulb were almost quite clean, although they had been unchanged for a year-and-a-half, owing to the immunity of the atmosphere here from smoke. Instructions were, however, given that they should be changed every few months. The rain-gauges are in a meadow at some distance from the old gauge. They collect rather more water than the latter, which was to some extent sheltered by trees on the south-west.

Totnes.—The observer was in the act of leaving for the seaside at the date of my visit (July 3rd), and I was consequently unable to inspect the instruments.

Leicester (inspected August 16th).—The sub-curator of the museum, Mr. Smith, is in charge of the observations. He did not, at the time of my visit, read the instruments with perfect accuracy, and (as was the case with the previous observer) he adjusted the fiducial point wrongly, the result being an error of $\cdot 009$. I gave instructions and arranged a shade, which may enable the adjustment to be more easily made, the instrument being in a rather inconvenient light. The wet bulb was not in a very clean condition, and the wick employed was of a wrong texture. The necessary directions were given. A fortnight before my visit, the grass thermometer, a Casella forked spirit minimum, had been broken, and a new instrument of the same pattern had been substituted. The alcohol in this instrument I found to be divided, the error arising from this cause amounting to several degrees. I reunited the spirit, and gave the usual directions that the chamber should be frequently examined.

Durham (inspected August 28th).—The outdoor instruments were found to be in good order, except that the grass minimum contained a considerable quantity of spirit in the chamber. The evaporation had, however, very recently occurred, as the observer examines the instrument regularly. The readings of the barometer at this station, when corrected for temperature, again showed a rather considerable error. On removing the attached thermometer, I found that this instrument, which had no scale on the glass, had been pegged into its brass case with pieces of cork; these latter had become loose, so that the tube had shifted its position, the case being much too large for it. An error arising from this cause may have extended over many years. I rectified this so far as was in my power, so that the thermometer reads correctly, according to its brass scale, in air. The trees on the west of the observatory having been well polled, the sunshine recorder has now a complete exposure.

Stonyhurst Observatory (inspected August 25th).—The barograph and thermograph were in good order. The slight penumbra noticed in the wet-bulb trace is due, as I think to a defect in the glass of the thermometer. It is most noticeable in the photographic trace at low temperatures, but even at the high temperature at which I examined the instruments, the specks on the sheet had a red tint as compared with those from the dry bulb. The thermometers for eye observations when compared in water agreed closely with my standard. In the absence of Father Perry I could not obtain the corrections of the standard barometer, which read considerably lower than the inspector's standard. The Beckley self-registering rain-gauge possesses the same fault as that at Falmouth, but otherwise works well.

York (inspected August 30th).—The position of the outdoor instruments (with the exception of the sunshine recorder, the exposure of which is very good) is, as I have before complained, rather unsatisfactory, but I see no hope of effecting any improvement. The rain-gauges are now advantageously fixed in a strong block of wood; their rims are thus two feet above the ground; except that this would be a still further deviation from the regulation, they might with advantage be still higher, if shelter from the trees is to be avoided.

Jersey, St. Aubin's (visited October 5th).—No change had been made at this station since the inspection in the previous year. The instruments as usual were found to be in perfect order, and the work to be carried on with most admirable precision and care.

Southampton, Northam (October 7th).—Since my last visit a total change of position had been made of all the instruments at this station; this change being of an advantageous character as regards the sunshine recorder and the barometer, and disadvantageous with respect to the other instruments. The thermometer screen was, in the first place, shifted from the vegetable garden to the site which I had recommended, as being further from the garden wall; that site being a lawn on the north-west of the buildings. Shortly afterwards this site had to be occupied by new computing rooms, and at the same time the vegetable garden was converted into a lawn-tennis ground. The instruments were then moved into their present position, which is a narrow strip of lawn on the east of the buildings. Here the screen is only 15 feet from the railings which divide the lawn from the street; there is, however, a laurel hedge four feet in height between the screen and these railings. More serious than the neighbourhood of the road, is the nearness of the buildings on the west and south-west, which subtend about 50° at the rim of the rain gauge, and 40° at the level of the thermometer bulbs. I failed to obtain permission from the Director, General A. C. Cooke, to remove the instruments to the centre of the old tennis lawn near to the place in which the observatory used to stand, which would be a much more satisfactory position for them. The solar radiation thermometer at present occupies a position on the north-east of the new lawn. Here it is slightly sheltered by the trees in the morning. The sunshine recorder, occupying a position on the roof of the south range of buildings, has now a perfect exposure. The barometer, a very old but accurate instrument, is now in a glass case in one of the porches, and in a far more convenient light than in its former position at the observatory. The observations continue to be admirably conducted.

Beeches, Geldeston (inspected October 11th).—The work at this station is conducted in a perfect manner, the observer devoting to it a great deal of time and attention. The instruments were in excellent order. The old minimum thermometer to which I had previously taken exception because its scale was of insufficient extent, and because the chamber passed so far into the frame that it was never possible to see whether spirit had been condensed in it or not, had been recently discarded, and a better instrument substituted. The Redier barograph at this station works most admirably, requiring a very small amount of attention, and registering with perfect precision the smallest oscillations of pressure in squalls, thunderstorms, &c.

The inspection of the English stations this year has been somewhat meagre. I was detained on the south coast by ill-health until after midsummer, and in the autumn I have for the same reason been able to travel but little, though slowly recovering strength. I have every hope of being able to perform the work of inspection thoroughly in 1883.

Table I. refers to Telegraphic Reporting Stations, and shows the difference between the readings of the barometers and thermometers at those stations, and the readings of the inspector's standards, the former being uncorrected, and the latter corrected for index errors. The asterisk against the reading of any instrument indicates that this instrument, in use at the station at the date of inspection, has been changed for another, which is now employed.

Table II. shows the results of the comparisons of thermometers at stations furnishing monthly and weekly reports.

I.

STATION.	Barometers.			Thermometers.				
	Height of Mercury.	Reporting.	Check.	Temp. of Water.	Dry Bulb.	Wet Bulb.	Max.	Min.
Barrow	29.59	+0.034	-0.011	61	+0.1	+0.2	-0.1	-0.2
Dover	30.22	-0.009	-0.007	57	-0.1	-0.1	0.0	+0.3
Jersey	30.31	+0.001*	-0.001*	55	+0.6*	+0.4	+0.1	0.0
London	30.08	-0.004	—	58	+0.2	+0.1	0.0	-0.1
Loughborough	29.88	-0.021	—	59	+0.3	+0.4	-0.2	-0.1
Prawle	29.48	+0.002	+0.001	60	+0.1	+0.2	+0.1	-0.4
Scilly	29.68	—	—	55	+0.2	+0.7*	+0.1	-0.6
Shields	29.34	+0.001	+0.007	58	0.0	0.0	-0.1	-0.6
York	29.90	—	—	56	0.0	0.0	+0.6	-0.4

II.

—	Dry Bulb.	Wet Bulb.	Maximum.	Minimum.	Solar Radiation.	Gross Minimum.
Arlington	-0.2	0.0	0.0	-0.5	—	—
Beccles	0.0	+0.1	0.0	0.0	0.0	+0.1
Durham	0.0	0.0	0.0	-0.5	-0.4	-0.3
Leicester	+0.1	+0.2	-0.3	-0.5	+1.6	-0.5
Plymouth	+0.1	+0.2	+0.4	-0.4	—	—
St. Aubins	-0.2	-0.1	+0.1	-0.3	—	-0.1
Southampton	+0.3	+0.3	+0.7	-0.1	—	-0.2
Stonyhurst	-0.1	-0.2	0.0	-0.2	—	—
York	0.0	0.0	+0.1	0.0	—	—

(Signed) W. CLEMENT LEY.

C.—REPORT ON THE INSPECTION OF THE SCOTTISH STATIONS DURING 1882.

The barometers at the stations at Inverness, Nairn, Laudale, Ardrossan, Leith, and Glasgow were compared with inspector's standard barometer No. 588, these being the stations inspected after my arrival at Nairn. I did not think it necessary, after the complete inspection of 1881, to take the mercurial barometer with me to the more distant stations. Aneroid No. 11 was used, as heretofore, throughout the inspection with the same result, that this aneroid is not a satisfactory instrument for any tolerably accurate comparison of barometers during an inspection of stations. It is, however, of some use in such cases as Aberdeen, Wick, Ardrossan, and Leith, where the reporting and check barometers are kept in houses at some distance from each other.

The results of the comparison are given in Table I., which show that the barometers continue to be in good order. During the year the barometers at Stornoway were removed from Nicholson's Institution to the house of the new observer, whither they have been conveyed in safety, and have been placed in a good position. The check barometer

for Ardrossan has also been removed to a new position in Saltcoats, and this has been done satisfactorily.

A column is added to Table I., showing the differences between the observer's and the inspector's reading. The results show a most satisfactory approximation to absolute uniformity in the reading of this instrument among the observers, and it will be seen that almost every error shows a reading slightly too low.

The making of additional observations, when the barometer is markedly rising or falling, is slowly but steadily on the increase.

I have now had opportunities of seeing all the assistant observers read the various instruments, and have to report that their readings were in every case at least fairly good, and that in all cases the telegraphic message was made up in my presence correctly and without waste of time.

TIHERMOMETERS.

Table II. gives the results of the comparisons made at each station of their thermometers with inspector's standard No. 2420, the readings of which have been corrected for index errors. The readings of the station thermometers have not been corrected. In every instance the comparison was made as described in last report (Report for 1881, p. 60). The results show no greater difference as regards particular thermometers than one-tenth of a degree between the comparisons made during 1881 and 1882.

The minimum thermometer at Nairn with an error of $+1^{\circ}0$, and the maximum thermometers at Leith with an error of $+1^{\circ}6$, have been for some years in use at these stations. I believe these errors are correctly and continuously allowed for in making the observations; but it might be considered whether new instruments might not be sent to replace these, so as to obviate the possible occurrence of errors of observation with these thermometers, especially as regards new assistant observers.

HYGROMETERS.

The cloth of the wet-bulb at Ardrossan was somewhat soiled, but directions were given that it be more frequently changed in future. At Leith, the cloth of the wet-bulb was not sufficiently trimmed. At the other stations this instrument was found in good order. In future, the observer at Inverness is to read his hygrometers to tenths of a degree.

BOX FOR THERMOMETERS.

Since the former inspection the thermometers had been raised as indicated in previous report at Nairn and Laudale.

The boxes at Aberdeen and Laudale were painted immediately after the inspection of 1881; and the box at Wick was being painted at the time of this year's inspection. The box at Inverness and stand were ordered to be painted, and the ground turfed round for some little distance. As the lower part of the framework on which the box stands at Leith was found to be in a rotting state orders were given to have it properly repaired and firmly fixed.

RAIN GAUGES.

A new rain-gauge had been got for Dunrossness, which is placed in the same spot as the old one, and is well and firmly fixed. The rain-gauge at Wick was again found to be deformed, as if by weathering, and was again made circular.

The gauge at Inverness was half an inch off the horizontal and only 9 inches above ground. Directions were given to raise it 12 inches, and that its horizontality be secured. The gauge at Laudale had been brought to the height of 12 inches immediately after the inspection of

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1881. All the rain-gauges of the telegraph reporting stations are now placed at the uniform height of 12 inches above the ground.

ANEMOMETERS.

At Sandwick this instrument appears, from the examination I made, to be attended to with due punctuality. The anemometer has this peculiarity, viz., to mark the beginning of the curve at 10.15 a.m., the point must be put down at 10.30 a.m. The change is supposed to have been made at the last repairing of the instrument. It is perhaps better to treat this as an instrumental error than attempt any alteration on the instrument, which is in good working order, and has needed no repairs during the past year.

Owing to the serious and protracted illness of Dr. Clouston, the work of observing has devolved wholly on his servant Margaret Wishart. She has been carefully trained by Dr. Clouston, and her quiet demeanour, intelligence, and neat-handedness in manipulating the various instruments render her an excellent observer.

SUNSHINE RECORDER.

At Sandwick this instrument is placed near the anemometer in summer, when it has the sun all day. In this position in winter, a part of the manse would throw a shadow on it for a short time; at this time of the year, therefore, it is removed to the south of the manse where it has the sun all day. Since, however, it would be shaded in this position in summer by some low trees in the afternoon, it is then taken to the position near the anemometer.

(Signed) ALEXANDER BUCHAN,
Inspector of Scottish Stations.

Table I.—COMPARISON OF BAROMETERS, 1882.

TELEGRAPH REPORTING STATIONS.	Inspector's Barometer, No. 588.	Attached Thermometer.	Aneroid No. 11.	Reporting Barometer.	Attached Thermometer.	Check Barometer.	Attached Thermometer.	Obs. Errors.	REMARKS.
	corrected.			uncorrected.		uncorrected.			
Aberdeen	—	—	29.350	29.370	65.0	—	—	—	Assistant's error —.001
Do.	—	—	29.140	—	—	29.140	61.2	.000	
Wick	—	—	29.520	29.528	58.8	—	—	—	Do. —.002
Do.	—	—	29.485	—	—	29.472	59.5	—	.002
Dunrossness	—	—	29.485	29.472	57.5	29.472	57.5	.000	
Sandwick	—	—	29.560	29.580	65.3	—	—	.000	
Stornoway	—	—	30.060	30.044	55.1	30.043	55.5	.000	
Inverness	30.016	54.5	30.160	30.104	54.7	—	—	.000	
Nairn	29.795	54.5	29.820	29.789	55.2	29.793	54.5	—	Do. —.001
Laudale	29.695	58.2	29.705	—	—	29.694	59.9	—	.000
Do.	—	—	29.715	29.700	55.9	—	—	.000	
Ardrossan	29.640	56.2	29.640	29.634	57.3	—	—	.000	Do. —.002
Do.	—	—	29.600	—	—	29.598	56.7	—	.000
Leith	29.781	63.0	29.780	29.779	63.8	—	—	—	Do. —.001
Do.	—	—	29.730	—	—	29.721	59.4	—	.001

	Self.	
ABERDEEN:		
Observer's Standard, No. 1,140	29.300	63.4
Aneroid, No. 11	29.280	—
		Boswell, 29.300 63.4
GLASGOW:		
Inspector's Standard, No. 588 (corrected)	29.109	54.1
Observer's Standard, No. 1,722 (corrected)	29.109	51.2
Aneroid, No. 11	29.115	—
Old Observer's Standard (uncorrected)	29.095	54.8
		McLean, 29.109 51.2
		29.095 54.8

1881. All the rain-gauges of the telegraph reporting stations are now placed at the uniform height of 12 inches above the ground.

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	corrected.			uncorrected.		uncorrected.			
Aberdeen	—	—	29'350	29'370	65'0	—	—	—	Assistant's error — '001
Do.	—	—	29'140	—	—	29'146	61'2	'000	
Wick	—	—	29'520	29'528	58'8	—	—	—	Do. — '002
Do.	—	—	29'485	—	—	29'472	59'5	— '002	
Dunrossness	—	—	29'485	29'472	57'5	29'472	57'5	'000	
Sandwick	—	—	29'560	29'580	65'3	—	—	'000	
Stornoway	—	—	30'060	30'044	55'1	30'043	55'5	'000	
Inverness	30'016	54'5	30'160	30'104	54'7	—	—	'000	
Nairn	29'795	54'5	29'820	29'789	55'2	29'793	54'5	— '001	Do. — '001
Laudale	29'695	58'2	29'705	—	—	29'694	59'9	—	
Do.	—	—	29'715	29'760	55'9	—	—	'000	
Ardrossan	29'640	56'2	29'640	29'634	57'3	—	—	'000	Do. — '002
Do.	—	—	29'600	—	—	29'598	56'7	—	
Leith	29'781	63'0	29'780	29'779	63'8	—	—	+ '001	Do. — '001
Do.	—	—	29'730	—	—	29'721	59'4	—	
									Self.
									—
ABERDEEN:									
Observer's Standard, No. 1,149	—	—	—	—	—	29'300	63'4	Boswell.	63'4
Aneroid, No. 11	—	—	—	—	—	29'280	—	—	—
GLASGOW:									
Inspector's Standard, No. 588 (corrected)	—	—	—	—	—	29'109	54'1	—	—
Observer's Standard, No. 1,722 (corrected)	—	—	—	—	—	29'109	54'2	McLean.	54'2
Aneroid, No. 11	—	—	—	—	—	29'115	—	—	—
Old Observer's Standard (uncorrected)	—	—	—	—	—	29'095	54'8	29'095	54'8

Table II.—COMPARISON of THERMOMETERS with ERRORS, 1882.

STATIONS.	Inspector's Standard No. 2420. Corrected.	Dry Bulb.	Wet Bulb.	Spare.	Max.	Min.	Time in Water in Minutes.	Change of Temp.	Notes.
Aberdeen -	58.8	+0.4	+0.6	+0.6	+0.5	+0.1	190	0.0	Max. B.B. +0.1, Min. B.B. +0.2.
Wick -	58.7	+0.4	+0.5	—	+0.1	+0.2	60	+0.1	
Dumrossness	56.2	+0.4	+0.4	+0.3	+0.5	+0.4	180	0.0	
Sandwick -	56.4	+0.1	0.0	—	+0.6	-0.5	190	+0.3	
Stornoway -	54.1	+0.7	+0.6	+0.6	-0.3	-0.4	80	+0.1	
Inverness -	52.6	0.0	+0.1	—	+0.1	+0.1	100	+0.3	
Nairn -	56.8	+0.2	+0.8	+0.7	+0.1	+1.0	150	+0.2	
Laudale -	54.5	+0.2	+0.1	—	+0.2	0.0	110	+0.2	
Ardrossan -	53.6	+0.4	+0.4	—	0.0	-0.3	200	-0.1	
Leith -	56.5	+0.3	+0.5	—	+1.6	-0.2	85	+0.3	
OBSERVATORIES.					Max. T.	Min. T.			
Aberdeen -	61.3	0.0	+0.6	+0.5	—	-0.1	70	0.0	
Glasgow -	54.1	+0.3	+0.1	+0.1	No. 10579 +0.2	No. 10 +0.0	170	0.0	

(Signed) A. BUCHAN.

D.—REPORT ON THE INSTRUMENTS AT THE OBSERVATORIES, 1882.

Falmouth, visited September 7-9.—The instruments were in good order. I had the clocks of barograph and thermograph cleaned, as well as the lenses, and compared standard thermometers with the following results :

Kew Standard.	Falmouth Dry Bulb, No. 383.
Mean of 3 readings 59°·1	59°·5
	Correction to 383 = -0°·4
	Falmouth, Wet Bulb, No. 388.
" " 55°·8	56°·0
	Correction to 388 = -0°·2

The corrections in use were No. 383 -0.3; No. 388 = -0.2.

I re-blackened the stem of the wet-bulb thermometer, as a considerable quantity of stray light was falling on the cylinder.

The anemometer has been re-fitted throughout since last inspection, and facilities for oiling and adjustment have been provided on the new stand.

I found that owing to the warping of the wood the shafts were out of the vertical, and therefore shifted the stand supporting the recording apparatus about 2 inches northward.

A new time pricker was fitted to replace the old one, which was much bent.

The cups were in good order, but one fan of the direction apparatus was very loose on its spindle; this I packed with sheet lead and screwed tight.

The sunshine recorder was properly fixed, the rain gauge was also in good order, the clock having been recently cleaned.

The spare "Glaisher" gauge was not well placed. I gave instructions for fixing it in a more satisfactory manner.

Armagh Observatory, visited September 15-16.—Barograph and thermograph were both in good order, the clocks having been recently cleaned. I fitted new weights and counterpoises to the light-shutter gearing, so as to avoid the failures that were recently so numerous. Wiped lenses, mirrors, &c., and fitted new screws to the scales of the standard thermometers, the others being corroded away.

Compared the thermometers with following results:—

Kew Standard.	Dry Bulb.		Wet Bulb.		
58°·3	-	-	58°·8	-	- Correction -0°·5
57°·7	-	-	58°·2	-	- Correction -0°·5

The anemograph was thoroughly examined and found in good order throughout, the cut bearing not having deteriorated since it was rectified in 1879.

The rain-gauge was in good order, save that the mercury was dirty; this was remedied by filtration.

The sunshine recorder was found to be correctly placed.

Valencia Observatory, visited September 20-22.—The anemograph at this observatory may be considered as almost worn out.

Constructed by Messrs. Beck, it was originally less substantially made than the instruments at the other observatories, and it has experienced severe usage.

The cups and fans are greatly corroded, but as it would be difficult to re-fit new ones I would recommend, if possible, the complete substitution of another instrument, if one is available.

I had all parts of the instrument cleaned and re-adjusted.

The barograph and thermograph clocks and lenses were cleaned, new lines fitted, and counterpoise weights screwed on to light-shutter levers.

The minimum thermometer had some spirit in its chamber; this was put right.

I was unable to test the standard thermometers at this or any observatories subsequently visited, my standard thermometer having been unfortunately broken in transmission to Dublin from Armagh, where I had accidentally left it behind.

The rain-gauge and sunshine recorder appeared in good order.

Aberdeen Observatory, visited September 27-29.—Here I found the photographic instruments in good order, but had clocks cleaned and counterpoises fitted; the cases slightly interfered with shutter action; this was set right.

The lubrication of the external parts of the anemograph was not satisfactory, the oil being almost solidified, and the friction rollers firmly imbedded in it, so that all had to be taken to pieces and the oil removed. This was done and the instrument re-mounted in a proper condition.

The recording apparatus was dismounted and the cylinder carefully examined for the irregularities reported by Mr. Buchan; it was found, however, to be perfectly true in every part, and not fixed excentrically on its axis.

The pencils and their fittings were examined, cleaned, and the instrument replaced and freshly oriented.

The other instruments were in excellent condition.

Glasgow, visited October 2-4.—Finding all the instruments in good order, only the usual clock and lens cleaning was done. When the anemograph was dismantled I rectified, according to the blank forms at that date in use in the observatory, the direction pencil which slightly overlapped the ruling on one side.

Stonyhurst, visited October 6.—In the absence of the Rev. S. J. Perry, at Madagascar, I was received by the Rev. J. New, who has taken charge temporarily. All the instruments were in good order, but received the usual cleaning during my visit.

The anemograph not being provided with a pricker for time setting, difficulty is being constantly found in the correct timing of the curves.

I pointed out a way in which this might be rectified by an engineer at present engaged on the college works.

Radcliffe Observatory, visited October 19.—The photography at this observatory is unusually good, the curves far surpassing those at any other of the observatories in the kingdom. I was unable to find any special cause, the paper and the formulæ being the same as those used at other observatories.

The barograph and thermograph were both in good order. The wet-bulb thermometer is not altogether satisfactorily set up, and its definition might be better. Attempts to improve it, however, failed, and if pushed further a risk of breakage of the instrument would have been run.

The anemograph has been recently repaired and was in good order. The maker has not quite completed its renewal; new stays and some screws have yet to be fitted.

The rain-gauge was in good order, as was also the sunshine recorder, this instrument, however, standing loosely on a stone table, appeared to be subject to a risk of being thrown out of adjustment in the operation of changing the cards.

I called Mr. Stone's attention to this fact and he promised to have the slate cemented down to the stone.

G. M. WHIPPLE.

APPENDIX VIII.

METHOD OF DEALING WITH TELEGRAPHIC WEATHER INTELLIGENCE.

The operations connected with the preparation and issue of the Daily Weather Report, Forecasts, and Storm Warnings have not been materially changed during the year, and remain as follow :—

The Office 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 not been of so serious a description as in recent years. 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, however, been revised during the year, and the system of observing cirrus cloud has been gradually 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 then 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 and also to the Marine Ministry in Paris, by which department it is afterwards transmitted to Florence for the benefit of the Italian Naval Service. 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 at 11 a.m. 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 1882, 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-found- ing Company, on behalf of the “Shipping Gazette,” and for distribution to the provincial press - - -	}	one „ for 8 a.m.

The 8 a.m. charts are sent out at about 10.15 a.m. and the 6 p.m. chart at about 8.30 p.m.

The draft of the Daily Weather Report (in its enlarged and improved form), with two charts attached, is drawn on transfer paper, which 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,” “Graphic,” “Lloyd’s Weekly London Newspaper,” and the “Agricultural Gazette,” and *monthly* for the “Miller.” They are all accompanied by remarks on the phenomena exhibited.

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- | | | |
|-----------------------------------|---|--------------------------------------|
| 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. | | |

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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.

At 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 overestimated.

It will be seen that 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 Paris and 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.

No change has been made in the form of the Daily Weather Report since 1st January 1881. The information fills four foolscap pages, and is arranged as follows:—

Page 1 contains the title and date of the report; p. 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; (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 and rainfall 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 whole of the reports from which the above charts, remarks, and forecasts have been drawn, together with the 2 p.m. and 6 p.m. reports of the previous day.

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

Weekly Summary.

Soon after the end of each week a copy of the Weekly Weather Report (*see Appendix XV. to Report for 1881*), printed on large paper, is issued as a supplement to the Daily Weather Report, giving an account of the changes which have been observed in the weather from day to day, together with a brief general statement showing what have been the more prominent features in the weather conditions during the whole period.

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 is a publication which has appeared since the beginning of February 1878. A specimen will be found as Appendix XV., (*Report for 1881*). The Report now consists of 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. These statistics are now given on page 1 of the publication, the corresponding values for *each station** being given on page 4. In addition to the telegraphic

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

reports, and the returns from the self-recording observatories, weekly returns from 35 volunteer observers are used in preparing this report, the names of the observers at each station being as under—

Names of Stations.				Names of Authorities.
Alnwick Castle	-	-	-	Major F. Holland, for the Duke of Northumberland, K.G.
Arlington (N. Devon)	-	-	-	J. Carter, for Lady Bruce-Chichester.
Bawtry (Hesley Hall)	-	-	-	B. J. Whitaker.
Birmingham (Oscott)	-	-	-	Rev. J. W. Browne, St. Mary's College.
Blackpool	-	-	Ⓕ	C. T. Ward, F.M.S.
Brookeborough	-	-	-	Mr. Ferguson, for Sir Victor Brooke, Bt., F.L.S.
Chendle	-	-	Ⓕ	J. C. Philips, F.M.S.
Churchstoke	-	-	Ⓕ	P. Wright, F.C.S., F.M.S.
Cirencester	-	-	-	The Royal Agricultural College.
Douglas (Isle of Man)	-	-	-	A. W. Moore, F.M.S., Cronkbourne.
Dublin	-	-	-	J. W. Moore, M.D., F.M.S.
Durham	-	-	-	G. A. Goldney, the Observatory.
Foynes	-	-	-	T. J. Carey, for Lord Monteagle.
Geldeston	-	-	-	E. T. Dowson, F.M.S.
Hastings (St. Leonard's)	-	-	-	H. Colborne, F.M.S.
Hereford	-	-	Ⓕ	T. A. Chapman, M.D., F.M.S.
Hillington	-	-	Ⓕ	Rev. H. E. B. Ffolkes, M.A., F.M.S.
Laudale (Loch Sunart)	-	-	-	A. Fletcher, for T. H. G. Newton, F.M.S.
Leicester	-	-	-	J. C. Smith, the Museum.
Llandudno	-	-	Ⓕ	J. Nicol, M.D., F.M.S.
Londonderry	-	-	-	J. Conroy, F.M.S.
Manchester (Prestwich)	-	-	-	T. R. H. Clunn, M.D.
Markree Castle (Sligo)	-	-	-	E. Salles, for Colonel Cooper, F.R.A.S.
Marlborough	-	-	Ⓕ	Rev. T. A. Preston, M.A., F.M.S.
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.M.S.
Shrewsbury	-	-	Ⓕ	Rev. E. V. Pigott, F.M.S.
Silloth	-	-	-	Rev. F. Redford, F.R.S.E.
Southampton	-	-	-	J. T. Cook, R.E., Ordnance Survey Office.
Strathfield Turgiss	-	-	Ⓕ	Rev. C. H. Griffith, F.M.S.
Waterford	-	-	-	J. Neale.

The returns marked "Ⓕ" are supplied through the Meteorological Society (London).

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

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.

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.

* Good Friday and Christmas Day are reckoned as Sundays.

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.

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. 15).

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.

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 1882 will be found on p. 18.

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 Shammon 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 :

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

For Exhibition at following Seaports :

Banff.	Cowes.
Barrow-in-Furness.	Cromer.
Belfast.	Callerecoats.
Blackpool.	Deptford Yard.
Bo'ness.	Dover.
Boscastle.	Exeter (2 copies).
Bournemouth.	Falmouth.
Brighton.	Glasson Dock.
Briton Ferry.	Great Grimsby (2 copies).
Broughty Ferry.	Groomsport.
Buckie.	Hastings.
Budehaven.	Hayle.
Caernarvon.	Holyhead.
Cork.	Kingstown.

* "Remarks" only.

† Saturdays only.

For Exhibition at following Seaports—cont.

Morecambe.	Queenstown.
Lancaster.	Scarboro'.
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APPENDIX X.

FISHERY BAROMETERS.

LIST of PLACES supplied with FISHERY BAROMETERS.

Shetland Isles.—Sandsair, Lerwick, 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, Wells,

Gorleston, Harwich, Brightlingsea, Wivenhoe, Margate, Deal, 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, Strauraer.

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

Ireland, south coast.—Dunmore, Dungarvan, Kinsale, Castle-townsend, Crookhaven.

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

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

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

Hebrides, Stornoway, Cromore, Babyle, Obb, Ness.

SUMMARY OF INSTRUMENTS ON SERVICE.

England and Wales -	-	-	-	-	67
Scotland -	-	-	-	-	51
Ireland -	-	-	-	-	43
					<hr/>
					161
					<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,

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

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND. EAST COAST.	ENGLAND, N.W.	ENGLAND, S.W.	ENGLAND, E.
Lerwick.	Ramsey.	Ilfracombe.	Berwick-on-
Scalloway.	Douglas.	Barnstaple.	Tweed.
Boddam.	Castletown.	Boscastle.	Tynemouth.
Kirkwall.	Silloth.	Port Isaac.	S. Shields.
Holborn Head.	Maryport.	Newquay.	Sunderland.
Wick.	Workington.	Hayle.	Middlesborough.
Inverness.	Whitehaven.	St. Sennen.	Redcar.
Nairn.	Barrow.	Scilly.	Whitby.
Burghead.	Morecambe.	Penzance.	Filey.
Lossiemouth.	Fleetwood.	Falmouth.	Hull.
Buckie.	Blackpool.	Pendennis.	Goole.
Portsoy.	Lytham.	Mevagissey.	Grimsby.
Banff.	Southport.	Plymouth.	Boston.
Fraserburgh.	Runcorn.	Teignmouth.	Sutton Bridge.
Peterhead.	Liverpool.	Exmouth.	Lynn.
Aberdeen.	*Hawarden.		Sheringham.
Stonehaven.	Mostyn.		Cromer.
Montrose.	ENGLAND, W.		
Broughty Ferry.	Port Penrhyn.		
St. Andrews.	Holyhead.		
Dundee.	Port Dinorwic.		
Anstruther.	Carnarvon.	ENGLAND, S.	ENGLAND, S.E.
Pittenweem.	*Aberystwith.	Guernsey.	Yarmouth.
Burntisland.	Milford.	St. Helier's, Jersey.	Southwold.
Grangemouth.	Pembrey.	Gorey, Jersey.	Ipswich.
Bo'ness.	Lianella.	Weymouth.	Harwich.
Granton.	Briton Ferry.	Poole.	Chatham.
Leith.	Porthcawl.	Cowes.	Sheerness.
Newhaven.	Penarth.	Portsmouth.	Faversham.
Fisherrow.	Cardiff.	Littlehampton.	
Dunbar.	Newport.	Brighton.	
Cove.	Weston-super-	Newhaven.	
Eyemouth.	Mare.	Hastings.	
	Burnham.	Rye.	
	IRELAND, E.	Dover.	
	Belfast.	Margate.	
	Donaghadee.		
FIRTH OF CLYDE.	Howth.		
Glasgow.	Kingstown.		
Greenock.	IRELAND, S. and W.		
Rothesay.	New Ross.		
Campbelton.	Dunmore East.		
Girvan.	Dungarvan.		
Ballantrae.	Youghal.		
	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 1881 to March 1882.

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 during 1881 and 1882, *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 15.

* 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 1882.				MAY 1882.				JUNE 1882.			
	Percentages.				Percentages.				Percentages.			
	Wind.	Weather.	Average.	a + b	Wind.	Weather.	Average.	a + b	Wind.	Weather.	Average.	a + b
SCOTLAND, N.	a	28	38	33	42	61	52		47	43	45	
"	b	48	38	43	26	13	23	76	33	33	33	78
"	c	21	14	18	26	13	19		7	17	12	
"	d	3	10	6	6	3	4		13	7	10	
SCOTLAND, E.	a	17	31	24	48	58	53		57	50	54	
"	b	59	31	45	36	36	36	69	20	33	27	81
"	c	17	28	23	13	6	10		17	14	15	
"	d	7	10	8	3	—	1		6	3	4	
ENGLAND, N.E.	a	24	35	30	39	55	47		64	57	61	
"	b	48	34	41	39	29	34	71	23	33	28	89
"	c	28	17	22	19	13	16		10	7	8	
"	d	0	14	7	3	3	3		3	3	3	
ENGLAND, E.	a	31	52	42	55	36	46		64	27	46	
"	b	62	27	44	32	48	40	86	30	60	45	91
"	c	4	14	9	13	10	11		3	10	6	
"	d	3	7	5	—	6	3		3	3	3	
MIDLAND COS.	a	14	38	26	55	49	52		63	54	59	
"	b	76	38	57	39	29	34	86	27	23	25	84
"	c	7	17	12	6	19	13		7	26	13	
"	d	3	7	5	—	3	1		3	3	3	
ENGLAND, S.	a	27	45	36	48	32	40		77	47	62	
"	b	59	45	52	29	42	36	76	17	33	25	87
"	c	14	7	11	23	23	23		6	13	10	
"	d	0	3	1	—	3	1		0	7	3	
SCOTLAND, W.	a	17	35	26	55	65	60		54	40	47	
"	b	28	48	38	10	26	18	78	30	37	35	82
"	c	34	10	22	22	9	16		10	7	9	
"	d	21	7	14	13	—	6		3	16	9	
ENGLAND, N.W.	a	24	34	29	39	45	42		53	43	48	
"	b	42	45	44	45	42	44	86	27	40	34	82
"	c	17	14	15	10	10	10		13	16	11	
"	d	17	7	12	6	3	4		7	7	7	
ENGLAND, S.W.	a	24	28	26	48	61	55		60	30	45	
"	b	38	48	48	39	32	35	90	34	47	41	86
"	c	21	21	21	10	—	5		3	20	11	
"	d	7	3	5	3	7	5		3	3	3	
IRELAND, N.	a	17	35	26	29	52	41		30	67	49	
"	b	45	48	47	52	42	47	88	50	27	39	88
"	c	21	10	15	10	—	5		10	3	6	
"	d	17	7	12	9	6	7		19	3	6	
IRELAND, S.	a	14	35	25	29	68	19		47	60	54	
"	b	41	41	41	45	19	32	81	40	27	34	88
"	c	31	17	24	13	10	11		10	7	8	
"	d	14	7	10	13	3	8		3	6	4	

SUMMARY.

BRITISH ISLES	a	22	37	30	44	53	49		56	47	52	
"	b	59	40	45	36	34	35	84	39	36	33	85
"	c	26	15	17	15	10	12		9	12	10	
"	d	8	8	8	5	3	4		5	5	5	

DISTRICTS.	APRIL 1882.				MAY 1882.				JUNE 1882.			
	Percentages.				Percentages.				Percentages.			
	Wind.	Weather.	Average.	a + b	Wind.	Weather.	Average.	a + b	Wind.	Weather.	Average.	a + b
SCOTLAND, N.	a	28	38	33	42	61	52		47	43	45	
"	b	48	38	43	26	23	25	76	33	33	33	78
"	c	21	14	18	26	13	19		7	17	12	
"	d	3	10	6	6	3	4		13	7	10	
SCOTLAND, E.	a	17	31	24	48	58	53		57	50	54	
"	b	59	31	45	36	36	36	69	29	33	27	81
"	c	17	28	23	13	6	10		17	14	15	
"	d	7	10	8	3	—	1		6	3	4	
ENGLAND, N.E.	a	24	35	30	39	55	47		64	57	61	
"	b	48	34	41	39	29	34	81	23	33	28	89
"	c	28	17	22	19	13	16		10	7	8	
"	d	0	14	7	3	3	3		3	3	3	
ENGLAND, E.	a	31	52	42	55	36	46		64	27	46	
"	b	62	27	44	32	48	40	86	30	60	45	91
"	c	4	14	9	13	10	11		3	10	6	
"	d	3	7	5	—	6	3		3	3	3	
MIDLAND COS.	a	14	38	26	55	49	52		63	54	59	
"	b	76	38	57	39	29	34	86	27	23	25	84
"	c	7	17	12	6	19	13		7	20	13	
"	d	3	7	5	—	3	1		3	3	3	
ENGLAND, S.	a	27	45	36	48	32	40		77	47	62	
"	b	59	45	52	29	42	36	76	17	33	25	87
"	c	14	7	11	23	23	23		6	13	10	
"	d	0	3	1	—	3	1		0	7	3	
SCOTLAND, W.	a	17	35	26	55	65	60		54	40	47	
"	b	28	48	38	10	26	13	78	33	37	35	82
"	c	34	10	22	22	9	16		10	7	9	
"	d	21	7	14	13	—	6		3	16	9	
ENGLAND, N.W.	a	24	34	29	39	45	42		53	43	48	
"	b	42	45	44	45	42	44	86	27	40	34	82
"	c	17	14	15	10	10	10		13	10	11	
"	d	17	7	12	6	3	4		7	7	7	
ENGLAND, S.W.	a	24	28	26	48	61	55		60	30	45	
"	b	48	48	48	39	32	35	90	34	47	41	86
"	c	21	21	21	10	—	5		3	20	11	
"	d	7	3	5	3	7	5		3	3	3	
IRELAND, N.	a	17	35	26	29	52	41		30	67	49	
"	b	45	48	47	52	42	47	88	50	27	39	88
"	c	21	10	15	10	—	5		10	3	6	
"	d	17	7	12	9	6	7		10	3	6	
IRELAND, S.	a	14	35	25	29	68	49		47	60	54	
"	b	41	41	41	45	19	32	81	40	27	34	88
"	c	31	17	24	13	10	11		10	7	8	
"	d	14	7	10	13	3	8		3	6	4	

SUMMARY.

BRITISH ISLES	a	22	37	30	44	53	49		56	47	52	
"	b	50	40	45	36	34	35	84	30	36	33	85
"	c	20	15	17	15	10	12		9	12	10	
"	d	8	8	8	5	3	4		5	5	5	

DISTRICTS.	JULY 1882.				AUGUST 1882.				SEPTEMBER 1882.			
	Percentages.				Percentages.				Percentages.			
	Wind.	Weather.	Average.	a + b	Wind.	Weather.	Average.	a + b	Wind.	Weather.	Average.	a + b
SCOTLAND, N.	a	49	42	46	55	39	47		24	33	29	
"	b	32	42	37	32	39	36		50	37	43	
"	c	13	16	14	7	16	11	83	13	17	15	72
"	d	6	—	3	6	6	6		13	13	13	
SCOTLAND, E.	a	58	39	49	55	39	47		37	40	39	
"	b	36	49	42	29	42	35		49	37	38	
"	c	—	6	5	10	10	10	91	6	17	12	77
"	d	3	6	4	6	9	8		17	6	11	
ENGLAND, N.E.	a	65	12	54	61	49	55		44	43	44	
"	b	26	39	32	29	35	32		30	33	31	
"	c	9	13	11	10	10	10	86	13	17	15	75
"	d	—	6	3	—	6	3		13	7	19	
ENGLAND, E.	a	65	61	63	58	42	50		50	47	49	
"	b	16	29	23	29	52	41		37	33	35	
"	c	13	3	8	7	3	5	91	10	7	8	84
"	d	6	7	6	6	3	4		3	13	8	
MIDLAND COS.	a	68	52	60	58	52	55		44	40	42	
"	b	9	26	23	29	35	32		33	33	33	
"	c	10	22	16	7	7	7	83	17	17	17	75
"	d	3	—	1	6	6	6		6	10	8	
ENGLAND, S.	a	81	58	70	65	58	62		50	43	47	
"	b	10	29	19	29	36	32		27	30	28	
"	c	6	3	6	6	6	6	94	20	19	15	77
"	d	3	10	6	—	—	—		3	17	19	
SCOTLAND, W.	a	45	32	39	39	39	39		23	30	27	
"	b	39	45	42	35	42	39		37	53	45	
"	c	10	16	13	19	10	10	78	23	7	15	72
"	d	6	7	6	16	9	12		17	19	13	
ENGLAND, N.W.	a	65	49	57	52	46	49		40	53	47	
"	b	19	45	32	32	26	29		20	23	21	
"	c	10	3	7	13	19	16	78	30	7	19	68
"	d	6	3	4	3	10	6		10	17	13	
ENGLAND, S.W.	a	58	55	57	45	42	44		57	57	57	
"	b	20	32	26	39	35	37		13	27	20	
"	c	16	10	13	13	10	11	81	20	6	13	77
"	d	6	3	4	3	13	8		10	10	10	
IRELAND, N.	a	52	39	46	35	26	31		24	30	27	
"	b	26	49	37	42	48	45		30	44	37	
"	c	16	6	11	10	10	10	76	23	13	18	64
"	d	6	6	6	13	16	14		23	13	18	
IRELAND, S.	a	45	29	37	19	32	26		40	23	31	
"	b	23	45	34	39	42	40		20	50	35	
"	c	29	20	25	32	16	24	66	17	7	12	66
"	d	3	6	4	10	10	10		23	20	21	

SUMMARY.

BRITISH ISLES	a	59	45	52	49	42	46		39	40	40	
"	b	24	11	32	33	39	36		31	36	33	
"	c	12	39	11	12	11	11	82	17	11	14	73
"	d	6	5	5	6	8	7		13	12	12	

DISTRICTS.		JULY 1882.				AUGUST 1882.				SEPTEMBER 1882.			
		Percentages.				Percentages.				Percentages.			
		Wind.	Weather.	Average.	a+b	Wind.	Weather.	Average.	a+b	Wind.	Weather.	Average.	a+b
SCOTLAND, N.	a	40	42	46	55	39	47		24	33	29		
"	b	32	42	37	32	39	36		50	37	43		
"	c	13	16	14	7	16	11	83	13	17	15	72	
"	d	6	—	3	6	6	6		13	13	13		
SCOTLAND, E.	a	58	39	49	55	39	47		37	40	39		
"	b	36	49	42	29	42	35		40	37	38		
"	c	—	6	5	10	10	10	82	6	17	12	77	
"	d	3	6	4	6	9	8		17	6	11		
ENGLAND, N.E.	a	65	42	54	61	49	55		44	43	44		
"	b	26	39	32	29	35	32		30	33	31		
"	c	9	13	11	10	10	10	87	13	17	15	75	
"	d	—	6	3	—	6	3		13	7	10		
ENGLAND, E.	a	65	61	63	58	42	50		50	47	49		
"	b	16	29	23	29	52	41		37	33	35		
"	c	13	3	8	7	3	5	91	10	7	8	84	
"	d	6	7	6	6	3	4		3	13	8		
MIDLAND COS.	a	68	52	60	58	52	55		44	40	42		
"	b	9	26	23	29	35	32		33	33	33		
"	c	10	22	16	7	7	7	87	17	17	17	75	
"	d	3	—	1	6	6	6		6	10	8		
ENGLAND, S.	a	81	58	70	65	58	62		50	43	47		
"	b	10	29	19	29	36	32		27	30	28		
"	c	6	3	5	6	6	6	94	20	10	15	75	
"	d	3	10	6	—	—	—		3	17	10		
SCOTLAND, W.	a	45	32	39	59	39	39		23	30	27		
"	b	39	45	42	35	42	39		37	53	45		
"	c	10	16	13	10	10	10	78	23	7	15	72	
"	d	6	7	6	16	9	12		17	10	13		
ENGLAND, N.W.	a	65	49	57	52	45	49		40	53	47		
"	b	19	45	32	32	26	29		20	23	21		
"	c	10	3	7	13	19	16	78	30	7	19	68	
"	d	6	3	4	3	10	6		10	17	13		
ENGLAND, S.W.	a	58	55	57	45	42	44		57	57	57		
"	b	20	32	26	39	35	37		13	27	20		
"	c	16	10	13	13	10	11	81	20	6	13	77	
"	d	6	3	4	3	13	8		10	10	10		
IRELAND, N.	a	52	39	46	45	26	31		24	30	27		
"	b	26	49	37	42	48	45		30	44	37		
"	c	16	6	11	10	10	10	76	23	13	18	64	
"	d	6	6	6	13	16	14		23	13	18		
IRELAND, S.	a	45	29	37	19	32	26		40	23	31		
"	b	23	45	34	39	42	40		20	50	35		
"	c	29	20	25	32	16	24	66	17	7	12	66	
"	d	3	6	4	10	10	10		23	20	21		

SUMMARY.

BRITISH ISLES	a	59	45	52	49	42	46		39	40	40	
"	b	24	11	32	33	39	36		31	36	33	
"	c	12	39	11	12	11	11	84	17	11	14	73
"	d	5	5	5	6	8	7		13	12	12	

DISTRICTS.	OCTOBER, 1882.				NOVEMBER, 1882.				DECEMBER, 1882.			
	Percentage.				Percentage.				Percentage.			
	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.
SCOTLAND, N.	a	55	52	54	33	37	35		37	57	47	
"	b	26	23	24	40	43	42		33	23	28	
"	c	10	19	15	20	10	15	78	13	10	12	75
"	d	9	6	7	7	10	8		17	10	13	
SCOTLAND, E.	a	42	45	44	47	37	42		50	47	49	
"	b	39	29	34	53	43	38		33	33	33	
"	c	10	20	15	10	17	14	78	7	13	10	82
"	d	9	6	7	10	3	6		10	7	8	
ENGLAND, N.E.	a	61	12	52	43	34	39		54	43	49	
"	b	13	39	26	30	40	35		30	30	30	
"	c	16	13	14	20	13	16	78	13	20	16	79
"	d	10	6	8	7	13	10		3	7	5	
ENGLAND, E.	a	45	19	32	30	27	29		37	57	47	
"	b	26	52	39	50	43	46		60	23	42	
"	c	19	23	21	10	20	15	71	3	7	5	80
"	d	10	6	8	10	10	10		—	13	6	
MIDLAND COS.	a	35	32	34	37	34	36		47	60	54	
"	b	39	32	35	40	40	40		40	17	28	
"	c	13	20	17	17	13	15	69	10	20	15	82
"	d	13	16	14	6	13	9		3	3	3	
ENGLAND, S.	a	39	45	42	57	40	49		64	54	59	
"	b	32	26	29	33	33	33		23	30	27	
"	c	19	19	19	3	17	10	71	13	13	13	86
"	d	10	10	10	7	10	8		—	3	1	
SCOTLAND, W.	a	35	42	39	47	60	54		37	40	39	
"	b	39	42	40	33	20	26		37	37	37	
"	c	10	13	12	17	17	17	79	10	17	13	76
"	d	16	3	9	3	3	3		16	6	11	
ENGLAND, N.W.	a	23	29	26	50	37	44		27	33	30	
"	b	42	42	42	37	43	40		43	47	45	
"	c	16	19	18	7	10	8	68	20	17	19	75
"	d	19	10	14	6	10	8		10	3	6	
ENGLAND, S.W.	a	45	26	36	60	37	49		33	64	40	
"	b	36	55	45	23	47	35		44	20	32	
"	c	6	13	10	17	10	13	81	13	13	13	81
"	d	13	6	9	—	6	3		10	3	6	
IRELAND, N.	a	32	19	26	57	43	50		33	60	47	
"	b	39	52	45	33	40	37		33	17	25	
"	c	23	23	23	7	10	8	71	17	3	10	72
"	d	6	6	6	3	7	6		17	20	18	
IRELAND, S.	a	35	29	32	54	43	49		43	60	52	
"	b	26	39	33	23	30	26		27	24	25	
"	c	16	26	21	13	20	17	65	23	3	13	77
"	d	23	6	14	10	7	8		7	13	10	

SUMMARY.

BRITISH ISLES	a	41	35	38	47	39	43		42	52	47	
"	b	32	39	36	34	39	37		37	28	33	
"	c	14	19	16	13	14	13	74	13	12	12	80
"	d	13	7	10	6	8	7		8	8	8	

DISTRICTS.	JANUARY, 1883.				FEBRUARY, 1883.				MARCH 1883.				
	Percentages.				Percentages.				Percentages.				
	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	
SCOTLAND, N.	a	33	50	42		39	61	50		36	60	48	
"	b	47	37	42	84	50	25	38		45	23	34	82
"	c	10	10	10		4	11	7	88	19	10	15	
"	d	16	3	6		7	3	5		0	7	3	
SCOTLAND, E.	a	27	33	30		54	54	54		32	60	46	
"	b	50	43	47	77	21	32	27	81	42	17	30	76
"	c	10	17	13		11	11	11		10	17	13	
"	d	13	7	10		14	3	8		16	6	11	
ENGLAND, N.E.	a	40	47	44		57	43	50		42	65	54	
"	b	10	13	26	70	32	46	39	89	32	16	24	76
"	c	20	30	25		4	4	4		13	16	11	
"	d	0	10	5		7	7	7		13	3	8	
ENGLAND, E.	a	40	27	34		46	46	46		49	52	51	
"	b	23	49	31	65	43	36	40	86	29	42	35	86
"	c	17	17	17		7	11	9		16	0	8	
"	d	20	16	18		4	7	5		6	6	6	
MIDLAND Cos.	a	33	33	33		39	47	43		32	45	30	
"	b	40	44	42	75	46	39	43	86	35	42	38	77
"	c	10	10	10		11	7	9		23	7	15	
"	d	17	13	15		4	7	5		10	6	8	
ENGLAND, S.	a	33	30	32		39	46	43		45	58	52	
"	b	37	47	42	74	43	43	43	86	36	36	36	88
"	c	17	13	15		18	7	12		13	0	6	
"	d	13	10	11		0	4	2		6	6	6	
SCOTLAND, W.	a	30	33	32		36	50	43		39	57	48	
"	b	23	30	26	58	39	32	36	79	26	23	25	72
"	c	27	17	22		18	11	14		22	7	14	
"	d	20	20	20		7	7	7		13	13	13	
ENGLAND, N.W.	a	20	40	30		36	46	41		32	55	44	
"	b	57	31	46	76	43	23	34	75	42	26	34	78
"	c	10	13	11		11	25	18		16	10	13	
"	d	13	13	13		10	4	7		10	0	9	
ENGLAND, S.W.	a	27	23	25		43	36	40		58	55	57	
"	b	37	37	37	62	29	16	37	77	26	36	31	88
"	c	20	30	25		21	11	16		6	3	4	
"	d	16	10	13		7	7	7		10	6	8	
IRELAND, N.	a	37	54	43		46	64	55		29	45	37	
"	b	27	20	23	69	29	21	25	80	36	45	41	78
"	c	16	16	16		21	11	16		19	3	11	
"	d	20	10	15		4	4	4		16	7	11	
IRELAND, S.	a	27	50	39		43	50	47		48	58	53	
"	b	37	24	30	69	32	32	32	79	23	29	26	79
"	c	20	13	17		14	11	12		19	3	11	
"	d	16	13	14		11	7	9		10	10	10	

SUMMARY.

BRITISH ISLES	a	33	38	35		43	49	46		40	56	48	
"	b	38	34	36	71	37	34	36	82	34	30	32	80
"	c	16	17	17		13	11	12		16	7	12	
"	d	14	11	12		7	6	6		10	7	8	

DISTRICTS.	JANUARY, 1883.				FEBRUARY, 1883.				MARCH 1883.			
	Percentages.				Percentages.				Percentages.			
	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.	Wind.	Weather.	Average.	a+b.
SCOTLAND, N.	a	33	50	42	39	61	50		36	60	48	
"	b	47	37	42	50	25	38	88	45	23	34	
"	c	10	10	10	4	11	7		19	10	15	83
"	d	10	3	6	7	3	5		0	7	3	
SCOTLAND, E.	a	27	33	30	54	54	54		32	60	46	
"	b	50	43	47	21	32	27	81	42	17	30	
"	c	10	17	13	11	11	11		10	17	13	76
"	d	13	7	10	14	3	8		16	6	11	
ENGLAND, N.E.	a	40	47	44	57	43	50		42	65	54	
"	b	40	13	26	32	46	39	89	32	16	24	
"	c	20	30	25	4	4	4		13	16	14	76
"	d	0	10	5	7	7	7		13	3	8	
ENGLAND, E.	a	40	27	34	46	46	46		49	52	51	
"	b	23	40	31	43	36	40	86	29	42	35	
"	c	17	17	17	7	11	9		16	0	8	86
"	d	20	16	18	4	7	5		6	6	6	
MIDLAND COS.	a	33	33	33	39	47	43		32	45	39	
"	b	40	44	42	46	39	43	86	35	42	38	
"	c	10	10	10	11	7	9		23	7	15	77
"	d	17	13	15	4	7	5		10	6	8	
ENGLAND, S.	a	33	30	32	39	46	43		45	58	52	
"	b	37	47	42	43	43	43	86	36	36	36	
"	c	17	13	15	18	7	12		13	0	6	88
"	d	13	10	11	0	4	2		6	6	6	
SCOTLAND, W.	a	36	33	32	36	50	43		39	57	48	
"	b	23	30	26	39	32	36	79	26	23	25	
"	c	27	17	22	18	11	14		22	7	14	73
"	d	20	20	20	7	7	7		13	13	13	
ENGLAND, N.W.	a	20	40	30	36	46	41		32	55	44	
"	b	57	34	46	43	25	34	75	42	26	34	
"	c	10	13	11	11	25	18		16	10	13	78
"	d	13	13	13	10	4	7		10	9	9	
ENGLAND, S.W.	a	27	23	25	43	36	40		58	55	57	
"	b	37	37	37	29	46	37	77	26	36	31	
"	c	20	30	25	21	11	16		6	3	4	88
"	d	16	10	13	7	7	7		10	6	8	
IRELAND, N.	a	37	54	46	46	64	55		29	45	37	
"	b	27	20	23	29	21	25	80	36	45	41	
"	c	16	16	16	21	11	16		19	3	11	78
"	d	20	10	15	4	4	4		16	7	11	
IRELAND, S.	a	27	50	39	43	50	47		48	58	53	
"	b	37	24	30	32	32	32	79	23	29	26	
"	c	20	13	17	14	11	12		19	3	11	79
"	d	16	13	14	11	7	9		10	10	10	

SUMMARY.

BRITISH ISLES	a	32	38	35		43	49	46		40	56	48	
"	b	38	34	36	71	37	34	36	82	34	30	32	
"	c	16	17	17		13	11	12		16	7	12	80
"	d	14	11	12		7	6	6		10	7	8	

APPENDIX XIII.

LIST of STATIONS from which DAILY SYNCHRONOUS OBSERVATIONS
(at Oh. 8m. p.m. G. M. T.) have been received in 1882.

Stations.	Observers.	Remarks.
ENGLAND AND WALES.		
Bolton - - -	Rev. T. Mackereth, F.R.A.S.	—
Bradford - - -	J. McLandsborough, F.R.A.S., F.M.S.	—
Cardington - - -	J. McLaren, F.M.S.	—
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. Collette, F.M.S.	—
Kew Observatory - - -	The Staff.	—
Leicester (Museum) - - -	J. C. Smith.	—
Liverpool Observatory (Bidston).	J. Hartnup, Jun.	—
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.M.S.	—
Truro (Royal Institution)	W. Newcombe.	—
SCOTLAND.		
Aberdeen Observatory -	The Staff.	—
Glasgow Observatory - - -	The Staff.	—
Orkneys (Sandwick Manse).	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. Dunscombe.	—
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 21.

I.—Observatories continuously observing all the Meteorological Elements

Hourly measurements of the curves obtained from the self-recording instruments at the seven 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.

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 10, 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.

In addition to the publication of the "Hourly Readings" and mean results, tracings of the curves themselves upon a reduced scale are engraved on copper plates and published in the "Quarterly Weather Report." The instruments by which this reduction is effected are described in the Report of the Office for 1870; but since that time many improvements have been effected in the methods of dealing with the curves; sources of error unavoidable in the original traces have been detected and are now allowed for, or met by special contrivances, and as the result, greater faithfulness in the reproductions is secured. The *average* degree of accuracy now attained is within 0.2 for the thermograms, and 0.001 inch for the barograms (see note accompanying Quarterly Weather Report, Part IV., 1871).

In addition to the curves obtained from the self-recording instruments, a continuous curve of vapour tension is got from the reduced thermogram traces by means of the instrument invented for the purpose, and described in the Report of the Office for 1871, and is engraved on the copper plates with the automatic records.

Returns from observatories.

Examination of returns.

Results of examination and report to Council.

Plates of Quarterly Weather Report.

Accuracy of the plates.

Curve of vapour tension.

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Returns from observatories.

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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.

Plates of Quarterly Weather Report.

In addition to the publication of the "Hourly Readings" and mean results, tracings of the curves themselves upon a reduced scale are engraved on copper plates and published in the "Quarterly Weather Report." The instruments by which this reduction is effected are described in the Report of the Office for 1870; but since that time many improvements have been effected in the methods of dealing with the curves; sources of error unavoidable in the original traces have been detected and are now allowed for, or met by special contrivances, and as the result, greater faithfulness in the reproductions is secured. The average degree of accuracy now attained is within 0·2 for the thermograms, and 0·004 inch for the barograms (see note accompanying Quarterly Weather Report, Part IV., 1874).

Accuracy of the plates.

Curve of vapour tension.

In addition to the curves obtained from the self-recording instruments, a continuous curve of vapour tension is got from the reduced thermogram traces by means of the instrument invented for the purpose, and described in the Report of the Office for 1871, and is engraved on the copper plates with the automatic records.

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. The whole of this work is done in the Office, the copper plates being sent to the printer ready for press. Chart plates.

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

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. Harmonic analyser.

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 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 are published in the Quarterly Weather Report, together with the absolute extremes of pressure and temperature for each month, the tables being repeated in French measures. Tables for the Quarterly Weather Report.

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

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. The whole of this work is done in the Office, the copper plates being sent to the printer ready for press. Chart plates.

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

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. Harmonic analyser.

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 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 are published in the Quarterly Weather Report, together with the absolute extremes of pressure and temperature for each month, the tables being repeated in French measures. Tables for the Quarterly Weather Report.

The gale tables printed in the text of the Quarterly Weather Report, which show the extent, duration and degree of severity of all the stronger gales, are prepared from the tabulations of the anemograms received from the seven 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 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 62, including 15 belonging to the Meteorological Society.

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

The stations are distributed as follows: 39 in England, 4 in Wales, 5 in Scotland, and 14 in Ireland.

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

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 1879 returns from 27 stations are published on the A. Form, and the list could be at once increased, if thought desirable.

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.

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° Faht. at mean sea level is checked, and the corrected readings are then compared with the isobars

Origin and progress of the system.

Publication on Form A.

Additions to the list for publication.

Examination the returns.

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.

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.

Doubtful readings.

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.

Publication on Form B.

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 36 for the year 1879, 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 Forms 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

New stations.

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 39 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.

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

The curves for 1851 have themselves been engraved and published.

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. 66) 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."

Sunshine records.

Inspection.

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.

Sunshine records.

The daily records of sunshine which are now received from 30 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.

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. 66) 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, 1883.

Stations.	Observers.	Nature of Information received.	Notes.	
I. Valencia	J. E. Culham	Continuous records of pressure, temperature, wind, sunshine, and rain, with notes on the weather.		
Armagh	S. Call, for J. 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.			
Falmouth	Lovell Squire and E. Kitto			
Stonyhurst	Rev. S. J. Perry, F.R.S.			
Kew	G. M. Whipple, B.Sc., F.R.A.S.			
II. Alarwick 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. Aysgarth	Rev. Fenwick W. Stow, M.A., F.M.S.	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.	Register not complete.	
‡ Balaconibe	E. E. Glyde, F.M.S.			
‡ Buxton	E. J. Sykes, M.B., F.R.A.S., F.M.S.			
‡ Carnarben	G. J. Hearder, M.D.			
‡ Chatham	Lieut.-Col. C. Warren, R.E., C.B., C.M.G.			
‡ Chacele	J. C. Philips, F.M.S.			
‡ Cheltenham	R. Tyer, B.A., F.M.S.			
‡ Churehstoke	Philip Wright, F.C.S., F.M.S.			
‡ Colebrooke	W. Ferguson, for Sir Victor Brooke, Bt., F.L.S.			
‡ Dartmoor	W. H. Tooker			
Douglas, Isle of Man	A. W. Moore, F.M.S.			
‡ Dublin (City)	J. W. Moore, M.D., F.M.S.			

LIST OF DOCUMENTS—continued.

Stations.	Observers.	Nature of Information received.	Notes.
† Dublin (Phoenix Park)	Col. R. H. Stotherd, R.E.		
† Dublin (Botanic Gardens, Glasnevin)	F. W. Moore		
† Durham	G. A. Goldney		
† Galdston (Suffolk)	E. T. Dowson, F.M.S.		
‡ Hillington	Rev. H. Folkes, M.A., F.M.S.		
‡ Inverness	James Ferguson		
† Jersey (St Aubin's)	J. E. Vibert, M.A.		
‡ Killarney	Rev. G. R. Wynne, F.M.S.		
† Landale (Argyleshire)	A. Fletcher, for F. H. G. Newton, M.A., F.M.S.		
‡ Llandulho	J. Nicol, M.D., F.M.S.		
† Leicester	J. C. Smith, for Museum Authorities		
Londonberry	J. Conroy, F.M.S.		
† Markree Castle, Sligo	E. Salles, for Col. Cooper, F.R.A.S.		
‡ Marlborough	Rev. T. A. Preston, M.A., F.M.S.		
Newton Regny (Perrith).	T. G. Benn		
Oscott	Rev. J. W. Browne		
† Parsonstown	George Phillips, for the Earl of Rosse, F.R.S.		
Prestwich	T. R. H. Chinn, M.D.		
† Sandwick	Rev. C. Clouston, LL.D.		
‡ Sealeby	R. A. Allison, F.M.S.		
‡ Scarborough	F. Shaw, F.M.S.		
Seaham	G. H. Aird		
† Southampton	J. T. Cook, R.E., for Director General of Ordnance Survey.		
Stokesay	Miss M. A. Digges La Touche		
‡ Strathfield Turgiss	Rev. C. H. Griffith, B.D., F.M.S.		
† St. David's, Pembroke	W. P. Probert, LL.D., F.C.S., F.M.S.		

Regular observations at 9 a.m. and 9 p.m. of pressure, temperature, wind, cloud and weather, with the daily maximum and minima of temperature, and rainfall, and remarks on the weather generally.

LIST OF DOCUMENTS—continued.

Stations.	Observers.	Nature of Information received.	Notes.
† Dublin (Phoenix Park)	Col. R. H. Stotherd, R.E.		
† Dublin (Botanic Gardens, Glasnevin).	F. W. Moore		
† Durham	G. A. Goldney		
† Gledston (Suffolk)	E. T. Dowson, F.M.S.		
‡ Hillington	Rev. H. Folkes, M.A., F.M.S.		
† Inverness	James Ferguson		
† Jersey (St. Aubin's)	J. E. Vibert, M.A.		
‡ Killarney	Rev. G. R. Wynne, F.M.S.		
† Laudaie (Argyleshire)	A. Fletcher, for T. H. G. Newton, M.A., F.M.S.		
‡ Llandudno	J. Nicol, M.D., F.M.S.		
† Leicester	J. C. Smith, for Museum Authorities		
Londonderry	J. Conroy, F.M.S.		
† Markree Castle, Sligo	E. Salles, for Col. Cooper, F.R.A.S.		
‡ Marlborough	Rev. T. A. Preston, M.A., F.M.S.		
Newton Reigny (Pentrit).	T. G. Benn		
Oscott	Rev. J. W. Browne		
† Parsonstown	George Phillips, for the Earl of Rosse, F.R.S.		
Prestwich	T. R. H. Clunn, M.D.		
† Sandwick	Rev. C. Clouston, LL.D.		
‡ Scabley	R. A. Allison, F.M.S.		
‡ Scarborough	F. Shaw, F.M.S.		
Seaham	G. H. Aird		
† Southampton	J. T. Cook, R.E., for Director General of Ordnance Survey.		
Stokesay	Miss M. A. Digges La Touche		
‡ Stratfield Turgiss	Rev. C. H. Griffith, B.D., F.M.S.		
† St. David's, Pembroke	W. P. Probert, LL.D., F.G.S., F.M.S.		

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.

LIST OF DOCUMENTS--continued.

Stations.	Observers.	Nature of Information received.	Notes.
St. Leonards	H. Colborne, M.R.C.S., F.M.S.	Regular observations at 9 a.m. and 9 p.m.	
Totnes	T. H. Edmunds, F.M.S.	of pressure, temperature, wind, cloud and weather, with the daily maxima and minima of temperature, and rainfall, and remarks on weather generally.	
Uppingham	Rev. G. H. Mullins, M.A., F.M.S.	Regular observations twice (and in some cases three times) daily of pressure, temperature wind, weather, and sea disturbance.	
† Wakefield	H. Clarke, L.R.C.P., F.S.S., F.M.S.	Pressure and temp. four times daily, and wind twice daily.	
York	W. Keeping, M.A., F.G.S.	Full return for 9 a.m. and 3 p.m.	
IV. The Telegraphic Stations, see List on p. 50		Monthly rainfall.	
V. Castletownsend	Lient. F. W. Cobb, R.N.	Daily rainfall.	
Crookhaven	Prof. H. McLeod, F.R.S.	Pressure and wind twice daily.	
Cooper's Hill (Egham)	R. Canfield, Ph.D.	Pressure, temperature, and wind, twice daily, with rainfall.	
Cork	J. Hill, C.E., F.M.S.	Pressure and temperature four times daily.	
Eunis	R. C. J. Day	Full return, except for barometer.	
Gorleston, Norfolk	T. Wilson, F.M.S.	Pressure and temperature twice daily, with rainfall.	
Harpenden		Pressure and temperature twice daily.	
Haslar	G. Coppen	Pressure and temperature twice daily, with rainfall.	
† Helston	J. Gill	Pressure and temperature four times daily.	
Limerick	Capt. C. M. Wilson	Full return, except for barometer.	
Llandoverly	J. Watkins, F.M.S.	Pressure and temperature twice daily.	
Rugby	Rev. F. N. Hutchinson, M.A.	Daily rainfall.	
Saffron Walden	J. G. Ballingham	Full 9 a.m. obs. with 9 p.m. temperatures, a.m. wind and rainfall.	
Sandend (Banffshire)	James McKay	Pressure and temperature twice daily, with rainfall.	
Sheffield	W. F. Cooper	Pressure, wind, and weather once daily.	
Sheffield (Weston Park)	Elijah Howarth	Full returns for 8 a.m. and 11 p.m.	
Tarbert (Harris)	Donald Bethune, for Sir E. Scott, Bt.	Pressure, wind, and weather, twice daily.	
Worksop	H. Mellish, F.M.S.	Full returns for 9 a.m. and 6 p.m.	
		Full return, except for 9 p.m. temperatures.	

The Stations in the above List marked "†" belong to the Meteorological Society: those marked thus † have been inspected during the year.

LIST OF DOCUMENTS—continued.

Stations.	Observers.	Nature of Information received.	Notes.
St. Leonards -	H. Colborne, M.R.C.S., F.M.S.	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.	
Totnes -	T. H. Edmunds, F.M.S.		
Uppingham -	Rev. G. H. Mullins, M.A., F.M.S.		
Wakfield -	H. Clarke, L.R.C.P., F.S.S., F.M.S.		
York -	W. Keeping, M.A., F.G.S.		
IV. The Telegraphic Stations, see List on p. 50			
V. Castletownsend -	Lieut. F. W. Cobb, R.N.	Pressure and temp. four times daily, and wind twice daily.	
Crookhaven -	"		
Cooper's Hill (Egham) -	Prof. H. McLeod, F.R.S.	Full return for 9 a.m. and 3 p.m.	
Cork -	R. Canfield, Ph.D.	Monthly rainfall.	
Ennis -	J. Hill, C.E., F.M.S.	Daily rainfall.	
Gorleston, Norfolk -	R. C. J. Day -	Pressure and wind twice daily.	
Harpenden -	T. Wilson, F.M.S.	Pressure, temperature, and wind, twice daily, with rainfall.	
Haslar -	G. Coppen -	Pressure and temperature four times daily.	
† Hasleston -	J. Gill -	Full return, except for barometer.	
Limerick -	Capt. C. M. Wilson -	Pressure and temperature twice daily.	
Llandoverly -	J. Watkins, F.M.S.	Daily rainfall.	
Rugby -	Rev. T. N. Hutchinson, 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.	
Sandend (Banffshire) -	James McKay -	Pressure, wind, and weather once daily.	
Sheffield -	W. F. Cooper -	Full returns for 8 a.m. and 11 p.m.	
Sheffield (Weston Park) -	Elijah Howarth -	Pressure, wind, and weather, twice daily.	
Tarbert (Harris) -	Donald Bethune, for Sir E. Scott, Bt. -	Full returns for 9 a.m. and 6 p.m.	
Workshop -	H. Mellish, F.M.S.	Full return, except for 9 p.m. temperatures.	

The Stations in the above List marked "†" belong to the Meteorological Society : those marked thus † have been inspected during the year.

APPENDIX XVI.

ACCESSIONS TO THE LIBRARY DURING THE YEAR ENDING
31ST MARCH 1883.

A—AGRICULTURE AND BOTANY.

Commissioner of Agriculture, Washington.—Annual reports . . . for the years 1880, and 1881-82. 2 vols., with plates, 8°. Washington, 1881-82.

Field and other Experiments.—Memoranda of the origin, plan, and results of the field and other experiments, conducted on the farm and in the laboratory of Sir **J. B. Lawes**, at Rothamsted, Herts; also a statement of the present and previous cropping, etc., of the arable land not under experiment. May 1882. 33 pp. la. 4°. (London, s.a.)

* **Linsler, C.**—Die periodischen Erscheinungen des Pflanzenlebens in ihrem Verhältniss zu den Wärmeerscheinungen. Mit Zugrundelegung einer Bearbeitung des von dem Herrn Director der Brüsseler Sternwarte, Professor A. Quetelet, publicirten Materials, sowie einiger nördlichen Beobachtungsreihen. 44 pp. sm. 8°. St. Petersburg, 1867. (*Mém. Acad. Imp. Sc. St. Pétersb.*, viii. série, Tome xi., No. 7.)

—.—.—.—.—. Untersuchungen über die periodischen Lebenserscheinungen der Pflanzen. Zweite Abhandlung. Resultate aus einer eingehenden Bearbeitung des europäischen Materials für die Holzpflanzen in Bezug auf Wärme und Regenmenge. 87 pp. sm. 8°. St. Petersburg, 1869. (*Mém. Acad. Imp. Sc. St. Pétersb.*, viii. série, Tome xiii., No. 8.)

* **Tschaplowitz, F.**—Untersuchungen über die Einwirkung der Wärme und der anderen Formen der Naturkräfte auf die Vegetations-Erscheinungen. Eine meteorologisch-physiologische Studie. iv. + 58 pp., 6 plates, sm. 8°. Leipzig, 1882.

Ufficio centrale di Meteorologia, Roma.—Servizio Meteorico-Agrario Anno III., 1882, Nos. 1-36. la. 8°. (Roma, 1882-83.)

B—ASTRONOMY.

‡ **Denza, F.**—Sulla connessione tra le eclissi di sole ed il magnetismo terrestre. Adunanza del 17 Dicembre 1882. 27 pp. la. 8°. Torino, 1882. (*Att. R. Accad. Sc. Torino*, xviii.)

K. K. Sternwarte zu Prag.—Astronomische, magnetische und meteorologische Beobachtungen an der K. K. Sternwarte zu Prag im Jahre 1881. Auf öffentliche Kosten herausgegeben von **C. Hornstein**. 32 Jahrg. xviii. + 57 pp. la. 4°. Prag, s.a.

(**Nautical Almanac Office, London.**)—The Nautical Almanac and astronomical ephemeris for the years 1881-82, for the meridian of the Royal Observatory at Greenwich. 2 vols. 8°. London, 1877-78.

(**Office of the Chief Signal Officer, Washington.**)—Information relative to the construction and maintenance of time-balls. Prepared under the direction of **W. B. Hazen**. 31 pp., 3 plates, la. 4°. Washington, 1881. (*Professional papers of the Signal Service*, No. 5.)

—.—.—.—.—. Report on the solar eclipse of July, 1878. By **C. Abbe**. Prepared under the direction of **W. B. Hazen**. 186 pp., 32 plates, la. 4°. Washington, 1881. (*Professional papers of the Signal Service*, No. 1.)

Prince, G. L.—Observations upon the late great comet and transit of Venus, made at Crawborough, Sussex, in the year 1882. 42 pp., 7 plates, 8°. Lewes, 1883.

—.—.—.—.—. The illustrated account given by Hevelius in his "Machina Celestis," of the method of mounting his telescopes and erecting an observatory. Reprinted from an original copy, with some remarks. 80 pp., 8 plates, 2 portraits, 8°. s.l. 1882.

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

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

APPENDIX XVI.

ACCESSIONS TO THE LIBRARY DURING THE YEAR ENDING
31ST MARCH 1883.

A—AGRICULTURE AND BOTANY.

Commissioner of Agriculture, Washington.—Annual reports . . . for the years 1880, and 1881–82. 2 vols., with plates, 8°. Washington, 1881–82.

Field and other Experiments.—Memoranda of the origin, plan, and results of the field and other experiments, conducted on the farm and in the laboratory of Sir J. B. Lawes, at Rothamsted, Herts; also a statement of the present and previous cropping, etc., of the arable land not under experiment. May 1882. 33 pp. la. 4°. (London, s.a.)

* Linsser, C.—Die periodischen Erscheinungen des Pflanzenlebens in ihrem Verhältniss zu den Wärmeerscheinungen. Mit Zugrundelegung einer Bearbeitung des von dem Herrn Director der Brüsseler Sternwarte, Professor A. Quetelet, publicirten Materials, sowie einiger nördlicheren Beobachtungsreihen. 44 pp. sm. 8°. St. Pétersbourg, 1867. (*Mém. Acad. Imp. Sc. St. Pétersb.*, vii^e série, Tome xi., No. 7.)

* ———.—Untersuchungen über die periodischen Lebenserscheinungen der Pflanzen. Zweite Abhandlung. Resultate aus einer eingehenden Bearbeitung des europäischen Materials für die Holzpflanzen in Bezug auf Wärme und Regenmenge. 87 pp. sm. 8°. St. Petersbourg, 1869. (*Mém. Acad. Imp. Sc. St. Petersb.*, vii^e série, Tome xiii., No. 8.)

* Tschaplowitz, F.—Untersuchungen über die Einwirkung der Wärme und der anderen Formen der Naturkräfte auf die Vegetations-Erscheinungen. Eine meteorologisch-physiologische Studie. iv. + 58 pp., 6 plates, sm. 8°. Leipzig, 1882.

Ufficio centrale di Meteorologia, Roma.—Servizio Meteorico-Agrario. Anno III., 1882, Nos. 1–36. la. 8°. (Roma, 1882–83.)

B—ASTRONOMY.

|| Denza, F.—Sulla connessione tra le eclissi di sole ed il magnetismo terrestre. Adunanza del 17 Dicembre 1882. 27 pp. la. 8°. Torino, 1882. (*Atti. R. Accad. Sc. Torino*, xviii.)

K. K. Sternwarte zu Prag.—Astronomische, magnetische und meteorologische Beobachtungen an der K. K. Sternwarte zu Prag im Jahre 1881. Auf öffentliche Kosten herausgegeben von C. Hornstein. 42 Jahrg. xviii. + 57 pp. la. 4°. Prag, s.a.

(Nautical Almanac Office, London.)—The Nautical Almanac and astronomical ephemeris for the years 1881–82, for the meridian of the Royal Observatory at Greenwich. 2 vols. 8°. London, 1877–78.

(Office of the Chief Signal Officer, Washington.)—Information relative to the construction and maintenance of time-balls. Prepared under the direction of W. B. Hazen. 31 pp., 3 plates, la. 4°. Washington, 1881. (*Professional papers of the Signal Service*, No. 5.)

———.—Report on the solar eclipse of July, 1878. By C. Abbe. Prepared under the direction of W. B. Hazen. 186 pp., 32 plates, la. 4°. Washington, 1881. (*Professional papers of the Signal Service*, No. 1.)

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

* **(Rigaud, G.)**—Dr. Demainbray and the King's Observatory at Kew. 7 pp. 8°. (*The Observatory*, v., 1882, p. 279.)

Royal Astronomical Society, London.—Monthly Notices . . . containing Papers, Abstracts of Papers, and Reports of the Proceedings of the Society, from November 1881 to November 1882. Vol. xlii., with plates, 8°. London, 1882.

Royal Observatory, Edinburgh.—Astronomical observations made at the Royal Observatory, Edinburgh, by **C. P. Smyth**. Vol. xi. for 1849–54. With plates, 1a. 8°. Edinburgh, 1857.

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, 1882, June 3. (By **W. H. M. Christie**.) 18 pp. 1a. 4°. [London, 1882.]

Smyth, C. P.—Madeira, spectroscopic, being a revision of 21 places in the red half of the solar visible spectrum with a Rutherford diffraction grating at Madeira (Lat. = 32° 38' N., Long. = 1h. 8m. W.) during the summer of 1881. x. + 32 pp., 19 plates, oblong 4°. Edinburgh, 1882.

United States Naval Observatory.—Astronomical and meteorological observations made during the year 1875, at the United States Naval Observatory. Rear-Admiral **C. H. Davis**, U.S.N., Superintendent. lxxxiv. + 501 + 63 + 16 + 280 + 33 pp., 4 plates, 1a. 4°. Washington, 1878.

C—ATMOSPHERIC PRESSURE.

|| **Augustin, F.**—Über den täglichen Gang des Luftdruckes und der Lufttemperatur in Prag. 15 pp., 1 plate, 8°. Prag, 1882. (*Sitzungsber. k. böhm. Gesellsch. Wissensch. Mitgetheilt am 14 April 1882.*)

Bebber, J. van.—Wissenschaftliche Ergebnisse aus den monatlichen Uebersichten der Witterung. (Weitere Folge III.) Die Geschwindigkeit, Tiefe und Aenderungen der barometrischen Minima in den Jahren 1876 bis 1880. 12 pp., 7 plates, 1a. 8°. (*Monatl. Uebers. Witterung, Hamburg*, vi. 1881, p. 20.)

|| **United States Coast and Geodetic Survey.**—Methods and results. Meteorological Researches. (By **W. Ferrel**.) Part III. Barometric hypsometry and reduction of the barometer to sea level. 46 pp., 1 plate, 1a. 4°. Washington, 1882. (*App. No. 10, Coast and Geodetic Survey Report for 1881.*)

* **Wenckebach, W.**—Over eene verbetering van den gemiddelden Barometerstand, wegens de hoogte van de waarnemingsplaats boven de zee. 4 pp. 1a. 8°. Dated, Breda, 1842.

* ———.—Over het bestaan eener achttienjarige periode in de gemiddelde jaarlijksche hoogte van den Barometer. 4 pp. 1a. 8°. Dated, Breda, 1842.

D—AURORA.

|| **Denza, F.**—Intorno alla aurora polare del 31 gennaio 1881. 8 pp. 1a. 8°. Torino, 1881. (*Atti R. Accad. Sc. Torino*, xvi., 1881.)

|| **Montigny, C.**—Notice sur une particularité de l'aurore boréale du 2 Octobre, 1882, et sur l'accroissement d'intensité de la scintillation des étoiles pendant les aurores boréales. 22 pp. 8°. Bruxelles, 1882. (*Bull. Acad. R. Belgique*. 3^{me} série, iv., 1882.)

(Office of the Chief Signal Officer, Washington.)—Chronological list of auroras observed from 1870 to 1879. Compiled by **A. W. Greely**. Prepared under the direction of **W. B. Hazen**. 76 pp. 1a. 4°. Washington, 1881. (*Professional papers of the Signal Service*, No. 3.)

|| **Rubenson R.**—Catalogue des Aurores Boréales observées en Suède depuis le XVI^{me} siècle jusqu'à l'année 1877 y comprise, rédigé par R. Rubenson. 2^{de} partie (1800–1877). Mémoire présenté à l'Acad. Roy. des Sciences de Suède le 12 Décembre 1877. 300 pp. 1a. 4°. Stockholm, 1882. (*K. Svenska Vetenskaps-Akad. Handl.*, Bd. 18, No. 1.)

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* (Rigaud, G.)—Dr. Demainbray and the King's Observatory at Kew. 7 pp. 8°. (*The Observatory*, v., 1882, p. 279.)

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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, 1882, June 3. (By W. H. M. Christie.) 18 pp. la. 4°. [London, 1882.]

Smyth, C. P.—Madeira, spectroscopic, being a revision of 21 places in the red half of the solar visible spectrum with a Rutherford diffraction grating at Madeira (Lat. = 32° 38' N., Long. = 1h. 8m. W.) during the summer of 1881. x. + 32 pp., 19 plates, oblong 4°. Edinburgh, 1882.

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* ————Over het bestaan eener achttienjarige periode in de gemiddelde jaarlijksche hoogte van den Barometer. 4 pp. la. 8°. Dated, Breda, 1842.

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F—CLIMATE AND HYGIENE.

Blavier, A.—Théorie explicative du régime climatologique observé en France sur le littoral océanien depuis 1880 et de la disparition de la sardine sur ce littoral depuis la même époque. 14 pp. 8°. Angers, 1882.

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|| **Borius, [A.]**—Nouvelle note sur le climat du Sénégal. 6 pp. la. 8°. [*Ann. Soc. météor. de France*, xxx., 1882, p. 149.]

|| **Brocard, H.**—Remarques sur le climat de l'Algérie. 4 pp. la. 8°. (*Ann. Assoc. franç. avanc. sc., Congrès d'Alger*, 1881, T. x.)

|| **Buchan, A.**—The climate of the British Islands.—I. The mean atmospheric pressure of the British Islands. II. The mean temperature of the British Islands. 37 pp., 8 plates, la. 8°. (*Journ. Scott. Meteor. Soc.*, vi., 1882, p. 4.)

|| **Harrington, M. W.**—Some meteorological aspects of ventilation. Read before the Sanitary Convention at Ann Arbor, March 1, 1882. 7 pp., 8°. (*Ann. Rep. Mich. State Board of Health*, 1882, p. 116.)

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Meldrum, C.—Sanitary statistics: a reply to statements and remarks made by Dr. Davidson in a paper entitled: "The sanitary state of Mauritius, past and present, and the causation of malarial fever." 29 pp. sm. 1°. Mauritius, 1882.

* **Moseley, G.**—Eastbourne as a residence for invalids and winter resort. vi. + 70 pp. 8°. London, 1882.

* **Parkin, J.**—Climate: its influence in the production and prevention of phthisis and other diseases. Second edition. 135 + 2 pp. sm. 8°. London, 1882.

|| **Physiographical Commission of the I. R. Academy of Science at Cracow.**—Materials for Galician climatology, collected by the meteorological section . . . 1881. 239 pp. la. 8°. Cracow, 1882. (*Extract Rep. Physiogr. Comm.*)

In the Polish language.

* **Proust, A.**—Traité d'hygiène. Deuxième édition, considérablement augmentée. vi. + 984 pp., 3 plates, la. 8°. Paris, 1881.

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— — — — — Weekly returns of births and deaths in Dublin (including its suburban districts), and in fifteen of the principal urban sanitary districts in Ireland, 1882. Vol. xix. la. 8°. Dublin, 1883.

(**Sanitary Commissioner of the Punjab.**)—Report on the Sanitary Administration of the Punjab for the year 1881. vi. + 10 + 131 + vii. + iv. + vi. + iv. + xxi. pp., 1 map, 7 diagrams, 1 tabular form, 12 unnumbered pages of tables. sm. 8°. Lahore, 1882.

Société de Médecine et de Climatologie de Nice.—Nice-Médical. 6^e Année, 1881-82, Nos. 1-12. la. 8°. Nice, 1881-82.

* **Whistlecraft, O.**—The climate of England; or a guide to the knowledge of the atmospheric phenomena of England, shewing the manner in which the changes succeed, with meteorological tables and general records; . . . the whole constituting some rules whereby to judge of the future, (a desirable acquisition,) as deduced from many years' observation. 12 + 236 pp. 8°. London, 1840.

H—ELECTRICITY AND MAGNETISM.

|| **Bezold, W. v.**—Die Untersuchungen über Gewitter in Bayern und Württemberg. 4 pp. la. 8°. Berlin, s.a. (*Separatdruck aus der "Elektrotechnischen Zeitschr."* 1883, März.)

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|| **Brioschi, F., Contarino, F., e Angelitti, F.**—Determinazioni assolute della inclinazione magnetica nel R. Osservatorio Astronomico di Capodimonte. 8 pp. sm. fº. Napoli, 1883. (*Rend. R. Accad. Sc. Fis. e Mat. di Napoli. Fasc. 2º. Feb. 1883.*)

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|| ———.—Détermination des valeurs absolues du magnétisme terrestre en Italie. 5 pp. la. 8º. (*Compt. rend. Assoc. franç. avanc. Sc., Congrès d'Alger, 1881.*)

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APPENDIX XVII.

METEOROLOGICAL OFFICE : ACCOUNT OF RECEIPTS AND PAYMENTS for the year ending 31st March 1883.

RECEIPTS.			PAYMENTS.		
	£	s. d.		£	s. d.
Balance from year 1881-82	1,803	2 3	ADMINISTRATION :		
Parliamentary Vote	15,300	0 0	Payment of Council	1,000	0 0
Repayment of expenses charged under—			Secretary	800	0 0
(1.) Incidental expenses	34	8 6	Salaries and wages	746	0 9
(2.) Special researches (Sunshine apparatus, &c.)	12	18 2	Rent, fuel, and lighting	675	8 7
			Incidental and contingent expenses :—		
		47 6 8	Attendance, cleaning, &c.	414	0 9
SUPPLY OF INFORMATION :—			Alteration of premises, furniture, and fittings	252	3 9
Special 8 p.m. reports	26	6 0	Expenses incidental to International Meteorological Congress	30	11 10
D.W. Charts and ordinary Forecasts	249	17 8	Pensions	19	15 4
Telegrams	347	13 8			3,938 1 0
Ordinary weather information	89	14 1	SPECIAL RESEARCHES AND EXPERIMENTS		877 3 9
		713 11 5	LAND METEOROLOGY :		
“Hourly Observations”	1	0 0	Observatories and stations	2,468	12 9
Miscellaneous data	23	12 0	Discussion and reduction of observations	1,406	16 5
SALE OF INSTRUMENTS, &c. :					3,875 9 2
Royal Navy account (A)	23	12 6	WEATHER INFORMATION AND FORECASTS :		
Mercantile Marine do. (B)	108	17 2	Telegraphic reports and storm warnings	3,277	4 9
		132 9 8	Preparation and issue of reports and forecasts	1,410	8 6
Commissions executed for Colonial and Foreign Institutions, &c. (C)	453	4 1			4,687 13 3
Commission charged on work done for Colonies, &c.	20	17 6	INSPECTIONS :		
			Salaries and travelling expenses	496	12 11
			OCEAN METEOROLOGY :		
			Discussion and reduction of observations	1,541	1 9
			Expenses incidental to the supply of instruments :—		
			Care and issue of instruments	200	0 0
			Royal Navy	277	6 9
			Mercantile Marine	693	17 8
			Distant island and coast stations	51	7 0
					2,763 13 2
			Commissions executed for Colonial and Foreign Institutions, &c.	768	10 5
					17,407 3 8
			BALANCE :		
			Cash in hand	102	12 0
			Bank of England	935	7 11
			Advance to Valencia Observatory	50	0 0
					1,087 19 11
					£18,495 3 7
					£18,495 3

APPENDIX XVIII.

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

OFFICIAL.

- No. 1. Report for 1867. Presented to Parliament. 1s.
2. Instructions for Meteorological Telegraphy. New Edition. (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 and 40).
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.
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. Contribution 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.—Part I., 6s.; Part II. (In the press.)
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. 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. 1s.
42. Report for 1880-81. 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. Toynece, 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. Price 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.—Part I., 10s. 6d. Parts II., III., and IV., 21s. each.

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.
5. On the Winds, &c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6d.
6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1s.
7. Notes on Form of Cyclones in the Southern Indian Ocean.—By C. Meldrum, Esq., M.A., F.R.S. 6d.
8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 6d.
9. Report of the Permanent Committee of the Vienna Congress for 1874. 1s. 6d.
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. 1s. 6d.
11. Report of the Permanent Committee of the Vienna Congress for 1876. 2s.

LIST OF PUBLICATIONS, &c.—continued.**NON-OFFICIAL—continued.**

12. Reports to the Permanent Committee of the Vienna Congress on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2s.
13. Report of the Permanent Committee of the Vienna Congress for 1878. 6d.
14. Report of the International Meteorological Committee, Meeting at Berne, 1880. 1s.
15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen August 1882. (In the Press.)

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