

~~Supplementary~~

R E P O R T  
OF THE  
METEOROLOGICAL COUNCIL,

For the Year ending 31st of March, 1905,

TO THE  
PRESIDENT AND COUNCIL  
OF THE  
ROYAL SOCIETY.

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

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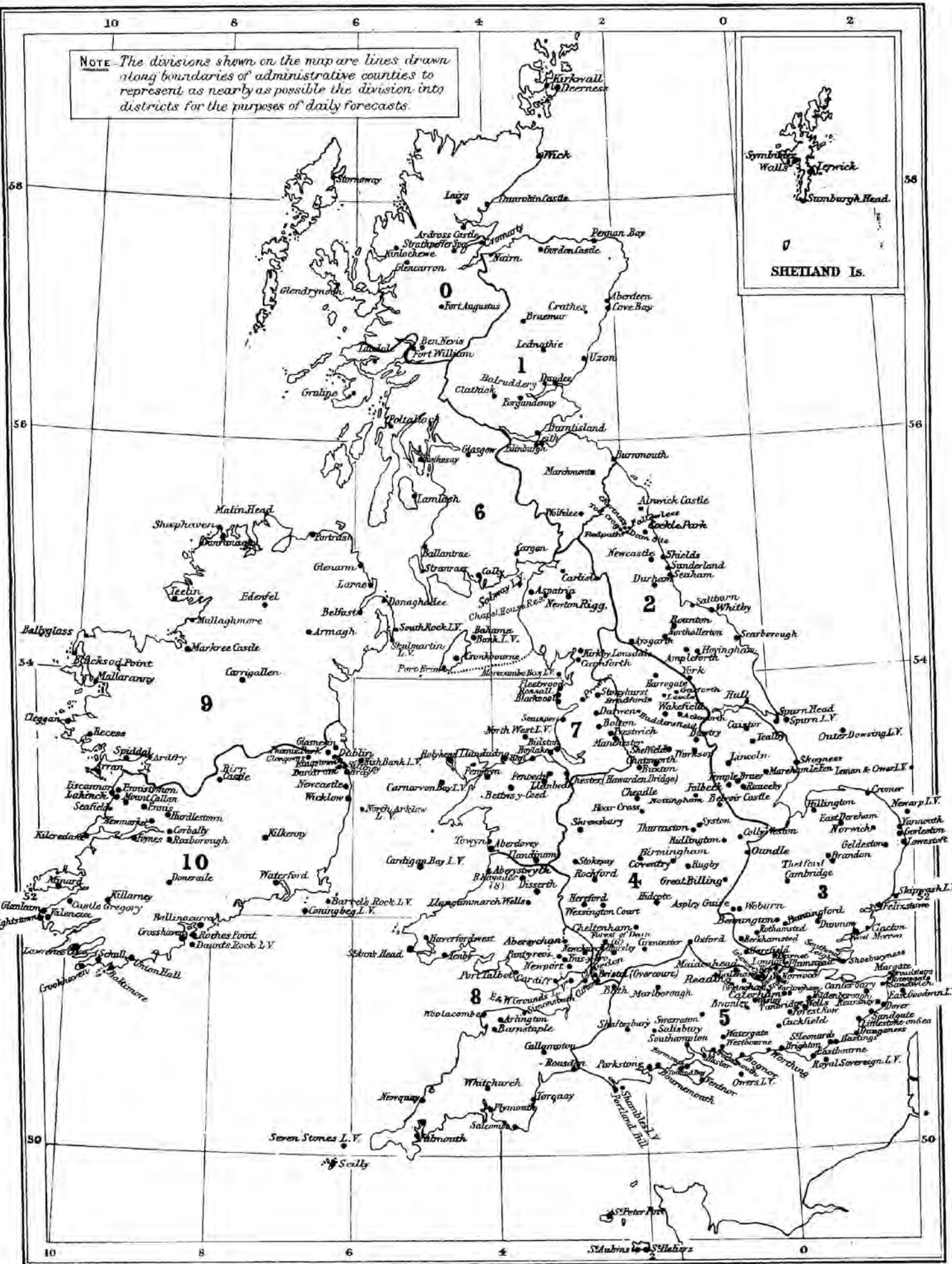
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To face Title

(REPORT OF METEOROLOGICAL COUNCIL 1904-1905)

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



# CONTENTS.

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MAP OF STATIONS IN CONNEXION WITH THE OFFICE ... ..	Faces	Title.
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LIST OF COUNCIL ... ..	PAGE.	
	3	

## REPORT.

General ... ..	5	
I.—Marine Branch ... ..	17	
II.—Forecast and Storm-warning Branch ... ..	20	
III.—Statistics and Library Branch ... ..	26	
IV.—Observatory Branch ... ..	31	
V.—Correspondence and Accounts Branch ... ..	32	

## APPENDICES.

I. Conspicuous Meteorological Occurrences in 1904 (Plate I.) ...	33	
Storm Warnings in 1904 ... ..	40	
Comparison of the Forecasts issued at 8h. 30m. p.m., with the Weather subsequently experienced, 1904-05 ... ..	42	
II. A brief account of the operations of the Office in the Fifty years since 1854 (Plate II.) ... ..	43	
Statement of provisions for the supply of information to the Public, including :—		
Telegraphic Information ... ..	65	
Forecasts and Storm Warnings ... ..	66, 68	
Information received weekly ... ..	70	
Other Information from Stations in the British Isles ...	72	
Information from Land Stations outside the British Isles...	74	
The Library ... ..	74	
Marine Observations ... ..	74	
Supply of Instruments to Observers ... ..	75	
Fishery Barometers, list of Stations, &c. ... ..	76	
List of Stations in the British Isles and on the Continent from which Observations are received ... ..	80	
List of Documents received from Foreign and Colonial Stations ... ..	102	
List of Office Publications ... ..	105	
III. List of Observers who have returned “excellent” Logs during the year ... ..	110	
IV. List of Logs and Documents received from Ships ... ..	111	
V. Disposal of Instruments (Royal Navy) ... ..	133	
VI. Disposal of Instruments (Mercantile Marine) ... ..	134	
VII. Reports on Inspections ... ..	135	
VIII. Accessions to Library ... ..	156	
IX. List of Persons and Institutions to whom the publications are presented ... ..	215	
X. Account of Receipts and Payments ... ..	220	
Index ... ..	221	

# THE METEOROLOGICAL COUNCIL,

1904-1905.

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## *Directors.*

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LL.D., F.R.S., Chairman.

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

Professor GEORGE HOWARD DARWIN, M.A., LL.D., Sc.D., F.R.S.

Rear-Admiral SIR WILLIAM J. L. WHARTON, K.C.B., F.R.S.,  
Hydrographer to the Admiralty, until July 31st, 1904.

Captain ARTHUR MOSTYN FIELD, R.N., F.R.S., Hydrographer to  
the Admiralty, from August 1st, 1904.

MR. WILLIAM NAPIER SHAW, M.A., Sc.D., F.R.S., Secretary.

## *Other Members of the Council.*

The EARL OF ROSSE, K.P., D.C.L., LL.D., F.R.S.

MR. JOHN YOUNG BUCHANAN, M.A., F.R.S., F.R.S.E.

MR. WILLIAM HENRY DINES, B.A.

SIR JOHN ELIOT, K.C.I.E., M.A., F.R.S.

Professor ARTHUR SCHUSTER, Ph.D., Sc.D., F.R.S.

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At intervals during the past year the Council have been in communication with the Royal Society on the subject of the proposals of the Treasury for the future management of the Meteorological Office, consequent upon the report of the Treasury Committee presided over by Sir H. Maxwell. Constitution of the Office

On March 8th the Council were informed by the Secretaries of the Royal Society that it was intended to transfer the control of the office to a body appointed by the Lords Commissioners of H.M. Treasury from the 1st April, 1905, or as soon thereafter as might be convenient. The constitution of the new body was not completed before the close of the year, but the Treasury announced that pending its completion the administration of the Office should be entrusted to Mr. W. N. Shaw, Secretary of the Council. This report of the Meteorological Council, the twenty-eighth, is, therefore, the last of the series to be made to the Royal Society.

As the past year has seen the completion of 50 years in the history of the assignment of a parliamentary grant to the meteorological service of the country, first made in 1854 to the Board of Trade and subsequently, since 1867, to the Meteorological Committee, or the Meteorological Council, in connexion with the Royal Society, the Council have thought it desirable to add to this report an Appendix, p. 43, giving a short account of the operations of the Meteorological Office since its establishment in 1854.

With one exception the Directors were unchanged during the year. In July, Sir William Wharton, upon whom the Council had relied for 20 years for the guidance of the Marine Work of the Office, Changes in the Council

vacated his place on the Council upon retiring from his post at the Admiralty as Hydrographer of the Navy. His tenure of the office was marked by the production of a series of charts embodying many important additions to our knowledge of the meteorology of the sea.

Captain A. Mostyn Field, R.N., his successor as Hydrographer, took his seat as one of the Directors on October 5th.

Of the other members of the Council, appointed by the Royal Society, Sir J. Eliot, K.C.I.E., late Meteorological Reporter to the Government of India, succeeded Dr. R. H. Scott, whose term of office expired on March 31st, 1904.

Miss Laura FitzRoy, daughter of the late Admiral R. FitzRoy, Superintendent of the Office under the Board of Trade, has presented to the Office a portrait of her father.

Administra-  
tion of the  
Office.

The administration of the Office remained, as heretofore, in charge of the Secretary, with the assistance of Commander Campbell Hepworth, C.B., R.N.R., Marine Superintendent, R. G. K. Lempfert, M.A., Special Scientific Assistant, and a staff of 43 clerks and attendants. In addition, towards the close of the year, upon the recommendation of Professor Schuster, Mr. G. C. Simpson, B.Sc., who had been selected for appointment as Lecturer in Meteorology in Victoria University, Manchester, joined the Office as honorary Scientific Assistant to the Secretary until the commencement of his duties at Manchester in the autumn of the current year.

Reduction of  
Antarctic  
observations.

The staff of the Office has also been temporarily increased in order to provide for the reduction and discussion of the meteorological observations of the National Antarctic Expedition and the associated observations obtained by international co-operation in connexion with the Expedition. At the request of the Royal Society the Council undertook the work upon receiving a guarantee from the Royal Geographical Society for the expenses, estimated to amount to £500. Subsequently observations on sea ice and sea water and other auxiliary observations, not strictly meteorological, were included, the guarantee being extended to meet the estimated additional cost.

The Council had some misgivings as to the effectiveness of dealing with the observations at the winter quarters of the Expedition, without close and continuous personal association in the work on the part of those who have handled the instruments, and they have made such provision as they could to obtain all necessary information from the observers.

In connexion with the reduction of the auxiliary observations an arrangement has been made with Professor von Drygalski, the leader of the German Expedition, for the exchange of observations collected by the two countries.

International  
co-operative  
observations  
of the upper  
air.

By appointment of the Board of Education, Mr. W. N. Shaw, Secretary of the Council, attended, as the representative of the British Government, the fourth International Conference of Scientific Aeronautics which was held at St. Petersburg, under the

presidency of Professor Hergesell, of Strassburg, in September, 1904. The object of the gathering of official representatives, which was arranged by the Russian Foreign Office, was to consider more particularly the means to be adopted to meet the cost of printing and publishing the observations of the temperature, &c., of the upper air and of the motion of clouds, made in connexion with the scheme of international kite and balloon ascents. Provision had been made up to April, 1905, by the German Imperial Government and beyond that date no provision was in prospect.

A report upon the proceedings at the conference has been duly presented to the Board of Education.

For reasons which have been explained in previous reports the Council have not been able to take part in the international investigation of the upper air which formed the subject of the conference. They again lent instruments and defrayed the expenses of a base station at Crinan Harbour during the continuance of Mr. W. H. Dines's experiments from the deck of H.M.S. "Seahorse," which was lent by the Admiralty to a Committee of the Royal Meteorological Society, acting in co-operation with a Committee of the British Association, for the purpose, upon the application of the Royal Society, for six weeks in June and July, 1904. They have also rendered some assistance in making arrangements for experiments in the Island of Barbados by Mr. C. J. F. Cave, of Ditcham Park, and off the West Coast of Africa by Mr. C. E. P. Cotton.

The Council regret that owing to the difficulty of finding a time convenient at once for the ship and Mr. Dines, who was to conduct the experiments, it has not hitherto been found practicable to carry out the trials of kite apparatus aboard the S.S. "Helga" belonging to the Department of Fisheries and Technical Instruction for Ireland.

The arrangements for cloud observations at Kew, Aberdeen, Valencia, and Greenwich, on the days of the international ascents have been continued, and similar observations at Fort William were continued until the closing of the Observatory there. Cloud observations.

Correspondence with the Deutsche Seewarte respecting the subjects to be discussed at the approaching conference of Directors of Meteorological Institutes and Observatories, at Innsbruck, has led to the comparison between the tables adopted in various countries for the reduction of barometer readings to sea level. The matter is not of serious practical importance in this country because the observing stations, with very few exceptions, are not at any considerable elevation, but it is of importance in some of the British Colonies and Dependencies, and it is in the highest degree desirable to have a uniform system. The tables printed at the end of the *Instructions in the use of Meteorological Instruments*, by Mr. Scott, are used by many British observers, and are based upon numerical data which have been revised since the tables were compiled. The Council consider that in the re-issue of the *Instructions* the question of the revision of the tables should be dealt with. International Conference at Innsbruck.



Index errors  
of marine  
barometers.

In the autumn of 1904 the Council received a request from the Hydrographic Office of the United States for assistance in the determination of the index errors of barometers used by ships crossing the Atlantic for observations contributed to the Hydrographic Office and incorporated in daily charts of pressure over the Atlantic. The adequate determination of the index error is an equally serious question for the work of the marine branch of the Office, in which a daily chart of the Atlantic is regularly prepared. It is moreover of vital importance to the successful use of messages transmitted by wireless telegraphy for the suspicion of an error in a wireless telegraphic message from the Atlantic which could neither be confirmed nor contradicted by comparison with observations in neighbouring positions in the manner customary in the preparation of synoptic charts, would reduce the value of the whole system to a very serious extent.

The Council were therefore anxious to take effective steps for obtaining information as to the index errors of barometers which are used for observation aboard ship and have not been supplied by the Office. They accordingly consulted the Board of Trade as to the best means of dealing with the question. They decided to invite the captains of the liners supplying the observations to give a barometric reading taken in port at 8 a.m. or 6 p.m., which could be referred to the working chart of the Office constructed daily from observations at the same hours at the telegraphic reporting stations with barometers of which the index errors are accurately known. They trust it will be possible in this way to furnish the necessary information to the Washington Bureau, which has taken over the work of compiling the charts from the Hydrographic Office since the application was made.

Report of  
cloud  
observations.

Among minor matters in connexion with international meteorology, it may be mentioned that the Council arranged with the Royal Meteorological Society for the publication in the Quarterly Journal of the Society of a translation by Mr. Lempfert of Professor Hildebrandsson's report upon international cloud observations referred to on page 6 of last year's Report. They contributed the reproductions of the necessary illustrations. They also agreed to support the publication of a new edition of the International Cloud Atlas, the first edition of which, drawn up by MM. Hildebrandsson, Teisserenc de Bort, and Ruggenbach, has unfortunately become exhausted.

At the request of Mr. R. H. Scott, the former Secretary of the Council, the Council have obtained the loan of a number of meteorological observations by the Army Medical Corps in the West Indies for the preparation of a summary of the observations in the anticyclonic region of the North Atlantic, which Mr. Scott has undertaken for Professor Hann of Vienna.

British Isles.  
Station for  
London.

An important event of the past year in connexion with the meteorology of the British Isles is the establishment of an official station for London in St. James's Park, through the courtesy of the Office of Works. The station which has been used for the past 32 years for the purposes of the Daily and Weekly Reports as



representing London is on private premises at Brixton. Changes in the surroundings and other circumstances made it necessary to take up the consideration of the question. It was arranged in consultation with Major Hussey to suggest that the Council should have the use of a site for the exposure of instruments in return for the supply of a MS. copy of the daily charts and forecasts, together with the continuous records of bright sunshine, rainfall and temperature, for exhibition in the park near the fence of the Horse Guards' Parade. The arrangement was approved by the First Commissioner of Works and by the Council, and came into operation on November 8th, 1904. The observations have been incorporated in the Daily Weather Report from January 1st, 1905. The equipment of the station comprises the usual set of thermometers in a Stevenson's screen, a terrestrial radiation thermometer, an ordinary rain-gauge, and a self-recording rain-gauge by Mr. F. L. Halliwell, of Southport. The duty of observing, which involves attendance in the park daily, including Sundays, at 8 a.m. and 6 p.m., has been carried out punctually and efficiently by the staff of the Office. The station at Brixton is, however, continued at present for the purpose of comparison, and the readings obtained there are still used in the *Weekly Weather Report*.

On the other hand the observatories at the foot and summit of Ben Nevis have been closed. Sir Herbert Maxwell's Committee recommended that the contribution of £350 hitherto made by the Council should be paid by H.M. Treasury to the Directors, but as they were unable to maintain the observatories without a substantial addition to the grant, the arrangement fell through, and the observatories were closed on October 1st, 1904.

Ben Nevis  
Observa-  
tories.

The Council have been in correspondence with the Duke of Northumberland with reference to the anemograph at Alnwick from which the Office has received copies of the records for many years. Records of other changes in stations will be found in Part II., and in the list of stations, pp. 91-101.

In the course of the fifty years of the operations of the Office, upwards of 200 barometers have been lent to fishing communities in all parts of the British Isles. A list of the stations is given on p. 76. The loan is in every case conditional upon appropriate steps being taken to secure proper care for the instrument, and an adequate use of it. The Council have reason to believe that this service is highly appreciated, and works on the whole very satisfactorily. At the same time it is inevitable that owing to change of circumstances and of occupations the original purpose and conditions of the loan should in some instances be overlooked. In the inspections of the past year special attention was paid to the fishery barometers, and the reports of the inspections (*see* pp. 145-152) show, as might be anticipated, that it is necessary in order to preserve the efficiency and utility of the system to keep in regular touch with those who are in charge of the instruments. Many of the stations are so remote that regular visitation of them for the purposes of inspection by an official sent from London would be very costly. The provisions made by Parliament for the

Fishery  
barometers

supervision of the fishing industry have, however, been very largely extended since the Meteorological Office was first constituted ; its interests are now entrusted to special Government Departments, and the Council decided to ask those departments to undertake the supervision of the instruments which have been supplied by the Office. The question might indeed fairly be raised whether if the loan of a barometer to a fishing community should continue to be a charge upon public funds it should not be supplied at the cost of the departments specially charged with the interests of the fisheries, but, apart from that question, the departments have greater facilities for supervising the use of the instruments than the Meteorological Office has.

The Council have already been in correspondence with Sir T. H. Elliott, of the Board of Agriculture, and satisfactory arrangements between the Council and the Board were in progress at the close of the year.

They have also been in correspondence with the Board of Agriculture and Technical Instruction for Ireland, but they have not yet been able to take up the question with the Scottish Fishery Board, to whom for some time past, however, they have been in the habit of applying for information upon all applications for fishery barometers for Scotland. Pending the completion of these arrangements the consideration of a number of applications for the loan of new barometers has been postponed.

Marine  
observations.

The Council have had under consideration a proposal to prepare and issue Monthly Pilot Charts of the Indian Ocean for the use of British ships on the Eastern routes. The charts would be drawn up on lines somewhat similar to those of the Monthly Charts for the North Atlantic and Mediterranean. The primary objects of such charts are to enable the Office to keep more effectively in touch with the volunteer observers who supply the meteorological information from which the Marine Meteorological Charts of the Office are compiled, and to promote the active interest in meteorological study of the Captains and Officers who are engaged in the work. Correspondence has passed between the Office and the Indian Meteorological Office with the object of securing the co-operation of the Meteorological Reporter to the Government of India in the project. The Council consider such a step would be found very useful if the suggestion made by Sir J. Eliot at the British Association Meeting at Cambridge and supported by other meteorologists, of bringing the observations over the Ocean into correlation month by month, or day by day, with those on the adjacent land areas, be taken up. The subject was still under consideration at the close of the year.

A paper on the Wind Charts of the South Atlantic, recently published by the Admiralty, was drawn up by the Marine Superintendent, and read before the British Association at Cambridge.

Miscellaneous  
investigations.

The work by the Secretary upon the Trajectories of Air in Travelling Storms and over the Atlantic, upon which Mr. Lempfert has been engaged, is completed and is ready for publication.

Mr. Simpson has been engaged upon the preparation for the press of Notes upon Instruments, including some observations by Dr. Chree upon the behaviour of solar radiation thermometers and earth thermometers. With them will be incorporated the comparison of the mercurial and electrical thermometers from observations by Dr. A. A. Rambaut, F.R.S., at the Radcliffe Observatory, Oxford. Dr. Rambaut has kindly undertaken some additional observations to elucidate some points arising in connexion with the observations made in 1903, which was an exceptional year on account of the heavy rainfall. An apparatus for testing the dimensions and adjustment of sunshine recorders has also been designed. The report on wind measurements and the Beaufort scale will be ready for issue at the close of the current year.

The inquiry into the characteristics of the individual stations in the several forecast districts for different types of weather has been continued. The results for 12 stations in the Midland Counties for January and July have been completed, and for 10 stations in Scotland, E., for January, three years being dealt with for each month. A paper on the subject by the Secretary was read before the Scottish Meteorological Society on December 6th, 1904, and is printed, with reproduction of the diagrams representing the results, in Vol. XIII. of the Society's Journal.

Forecast  
District  
Inquiry.

On March 21st, 1905, the Secretary presented a paper to the Royal Statistical Society on the Seasons in the British Isles since 1878. The year mentioned is the date of the commencement of the Weekly Weather Report of the Council, and the paper is based upon the data supplied by the Report.

Seasons in  
the British  
Isles from  
1878.

The information contained in the paper consists of—

1. The grouping of counties to represent the twelve forecast districts of the Office.
2. The meteorological and agricultural characteristics of the districts and of the counties comprised in them.
3. An examination of the statistical method adopted by the Council in the Weekly Report for representing the main features of the meteorology of different parts of the country.
4. The meteorological statistics of the successive seasons in one district, England E., and the corresponding phenological and crop statistics together with vital statistics, and the number of gales and wrecks for the same district.
5. The course of the seasons according to the weekly averages for the 20 years, 1881–1900, in the four divisions of the United Kingdom, described in the Weekly Report as the principal wheat producing districts (the Eastern side), the principal grazing districts (the Western side), Scotland North (the extreme North), and the Channel Islands (the extreme South), together with tables showing the variation from the average of the amounts of rainfall, accumulated temperature above and below 42° F., and of sunshine for each year in succession, for the four divisions of the British Isles.



The investigation led to the discovery of a remarkable relation between the yield of wheat in any year and the rainfall of the previous autumn, which was the subject of a communication to the "Times" on February 2nd, 1905, in which the average yield of wheat for England for 1905 was computed from the rainfall of the autumn of 1904 to be 34·5 bushels per acre. A paper on the same subject was read at the Royal Society on February 6th, 1905. A still more remarkable relation between the yields of wheat for the Eastern Counties before and after the years 1895-6 was also incidentally disclosed. It appears that the yield for 1896 "compensates" for that of 1895 in the sense that the mean of the yields for the two years is very nearly equal to the average for the 20 years 1885-1904. The same is true for the two years 1897 and 1893, and again for 1898 and 1892, and so on. The yields of two years at equal time distances from 1895-6 compensate one another throughout the whole series of years available. This again points to a large yield in 1905 to compensate for a small yield in 1886, and also to a yield below the average in 1906 to compensate for a large yield in 1885 the first year for which data are available in the form now adopted.

This remarkable relation appears to indicate that the fluctuations in the yield of wheat can be represented by the sum of a series of periodic fluctuations, and that the curves for a number of these component periodic fluctuations have a common nodal point in the interval 1895-6.

Various other important results follow immediately from the figures given in this paper, for example, the yield of barley as shown in a diagram prepared for exhibition at the Royal Agricultural Show at Park Royal is, generally speaking, good when the spring and summer are relatively cool, and *vice versa*.

The Council recommend that tables similar to those for England East be prepared for the 12 districts of the British Isles and issued with the introductory text of the paper as a publication of the Office.

Meteoro-  
logical obser-  
vations in the  
Colonies.

The meteorological work of the Colonies and Dependencies has engaged the attention of the Council during the year in various ways.

Supply of  
instruments  
to the Crown  
Agents.

In the first place, in June, 1904, they received a request from the Crown Agents for the Colonies to supply instruments, from time to time, upon receipt of demands from the Colonies, upon terms similar to those upon which instruments are supplied to observers in this country who undertake to forward returns to the Office, but modified to meet the special circumstances of the case. The Council have been in the habit of supplying instruments in this way when they are asked for directly by the Colonies, and they regarded the extension of the practice as desirable, because, in the first place it enables the Colonial Governments to take advantage of the expert knowledge of the Office, in the second place it tends to uniformity in the instruments and the methods of exposure, and in the third place it promotes the exchange of ideas between the meteorological organisations of the Colonies and that of the Home

Government. Such an exchange is of the highest value when the matter is regarded from the point of view of the combination of observations from various parts of the world for the solution of the wider meteorological problems. They therefore agreed to comply with the request, and a circular was drawn up for issue to the administrations of the various Colonies represented by the Crown Agents. As a result a large number of the Colonies have availed themselves of the arrangement, and instruments have been applied for.

Three of the West Indian Colonies indicated that they did not require to avail themselves of the suggestion, and one of them explained that as in regard to meteorology they were in daily communication with Washington, it was found more convenient to obtain their standard instruments from the United States.

The volume of summaries of observations in Tropical Africa compiled for the Council by Mr. Ravenstein has been published.

The question of the collection and publication of Colonial observations was raised by the transmission from the Secretary of State of a copy of a letter from the Librarian of the Weather Bureau of Washington asking for a copy of certain Colonial reports which contained meteorological returns, and suggesting an exchange of publications with the Colonial Office. In reply the Council expressed regret that they had been unable to provide for the regular issue of collections of meteorological reports from the Colonies such as would meet the wish of the Weather Bureau and meteorologists in other countries, and at the same time would in the opinion of the Council be important for the economic interests of the Colonies themselves. The Council desired a suggestion from the Colonial Office upon the matter, and have received an assurance of the Secretary of State's interest in the question and a request for further information as to the views of the Council upon the importance to the Colonies or to Imperial trade of the collection and publication of meteorological observations in the Colonies.

The  
collection  
and publica-  
tion of  
Colonial  
observations.

A more comprehensive question in connexion with the same subject was raised by a Committee of the Council of the British Association appointed to consider a proposal made by Sir J. Eliot in his address to the meeting of the Association at Cambridge, to establish an institution in this country with the co-operation of the Colonies and Dependencies for the special study of the meteorology of the Indian Ocean area and other oceanic areas, with the adjacent land areas. The ultimate purpose in view was expressed to be the identification of the meteorological conditions which are followed by anomalous seasons in the countries concerned. In view of the importance of the subject, the Council expressed their willingness to co-operate with the British Association in bringing to the notice of the Government the desirability of establishing effective means of co-ordinating meteorological observations made in British dominions beyond the seas.

The automatic records of wind velocity at St. Helena have been interrupted and the instrument returned to this country for repair.

St. Helena.



The constant wear of one part of the pencil in consequence of the persistence of the wind from the South-East had impaired the working of the apparatus.

The report on the observations in the island has been delayed by the work in the Antarctic observations and is not yet ready.

- East Borneo. Observations were received from Mr. J. B. H. Garrett, geologist to Messrs. M. Samuel & Co., made at Sanga Sanga, Koetei, East Borneo, with the offer to continue them regularly, which the Council accepted with thanks.
- Ocean Island. A commencement has been made with observations at Ocean Island for which instruments were lent in the previous year.
- Repulse Bay. A register of seven months observation at the Whaling Station in Repulse Bay, Davis Strait, has been received from Captain John Murray, of the whaler "Active," to whom instruments were lent for the purpose.
- Educational. At the request of Captain E. G. Slade, R.N., Captain of the Royal Naval College, Greenwich, the Secretary gave a course of lectures in November, 1904, to the Senior Officers' Class at the College.

In accordance with a long established practice the Council offered two aneroid barometers as prizes for proficiency in meteorology for competition among the cadets of H.M.S. "Conway" and H.M.S. "Worcester" respectively. The prizes were awarded upon the results of an examination to Mr. D. L. Vine of H.M.S. "Conway," and Mr. C. E. Graves of H.M.S. "Worcester."

Requests have been made from time to time for the supply of copies of the charts of the Daily Weather Report representing typical meteorological conditions over the British Isles for the purpose of class teaching in schools, and the Council have made suitable arrangements for an additional number to be printed off as required and supplied at a price fixed to cover the cost of printing.

They have also from time to time presented to schoolmasters or mistresses a number of consecutive copies of the MS. Charts prepared for exhibition at the Office door or in St. James's Park which have been found to be useful for class purposes.

The Council lent a number of instruments, charts and diagrams for an exhibition organised by the Royal Meteorological Society in March, 1905.

- Magnetic observations at Valencia. Magnetic observations at Valencia have been continued at the request of the Committee, consisting of the Earl of Rosse and Professor J. Joly. The results are reported to the National Physical Laboratory for incorporation with other magnetic observations.

- Acknowledgments. For many parts of the work of the Office the Council have depended upon the co-operation of public bodies and private

observers and they desire to make acknowledgment of such assistance received in the course of the past year from the following :—

The Lords of the Admiralty, for the loan of log books of H.M. Ships, for facilities for the use of Coastguard Stations as telegraphic reporting stations, storm signal stations and sea temperature stations.

The Board of Trade, for the sale of pilot charts to the captains and officers of the mercantile marine, for notices of ice in the Atlantic and for meteorological observations at lighthouses in the West Indies and the Falkland Isles.

The Foreign Office and the Colonial Office, for the collection of returns from the Dependencies and Colonies.

H.M. Postmaster-General, for the use of post offices for telegraphic reporting stations and for assistance in many other ways.

The Corporation of Trinity House, and other lighthouse authorities, for the use of lighthouses as telegraphic reporting stations, of lighthouses and light-ships as sea temperature stations, and for the loan of the log books of lighthouses and light-ships for the checking of storm warnings.

The Irish Lights Office and the Scottish Meteorological Society, for the loan of the log books of light-ships and lighthouses for checking storm warnings.

The Mersey Docks and Harbour Board, for similar assistance and for a telegraphic reporting station at Bidston.

Lloyd's, for the use of signal stations, at home or abroad, as telegraphic reporting stations or as observing stations.

The officers of the Navy and the captains and officers of the mercantile marine named in Appendix IV., and especially those named on p. 110, for observations at sea, and to the shipping companies there mentioned, for their assistance in the collection of marine observations, and in addition the following steamship companies : Compagnie Générale Transatlantique, Compania La Veloce, Navigazione Generale Italiana.

The authorities of the Observatories enumerated in Group A, p. 91.

The contributors of automatic records enumerated in Groups B, C, and S.

The Ordnance Survey Offices at Southampton, Shrewsbury and Phoenix Park; and the Corporations named in the lists of stations in Groups D, E, G, R, and W, for facilities afforded, and the observers named in the same lists for their skill and care in taking the observations and in replying to inquiries arising from their discussion.

Major Chaves, Director of the meteorological service of the Azores, and the Portuguese Government, for daily reports from the Azores.

The Commercial Cable Company and the Eastern Telegraph Company, for the free transmission of the reports. The Eastern Telegraph Company also for the free transmission of reports from Spain and Portugal.

The Corporations of Bath, Bettws-y-Coed, Blackpool, Bognor, Bournemouth, Brighton, Clacton-on-Sea, Eastbourne, Folkestone, Hastings, Harrogate, Llandudno, Lowestoft, Margate, Scarborough, Skegness, Torquay and Worthing, for telegraphic reports.

The observers named in the Colonial and Foreign lists, pp. 102–104, who forward returns to the Office.

The recipients of Harvest forecasts, named on p. 100, who have contributed returns for the purpose of checking the forecasts.

The Board of Agriculture, the Royal Agricultural Society, the Agricultural Organisation Society, the Central Chamber of Agriculture, the Royal Dublin Society, the Scottish Highland Society, and the Press, for the distribution of information.

The Council also desire to recognise the courtesy of many persons who have lent records from automatic instruments, etc., for the illustration of special meteorological occurrences.

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Information has been received with regret of the deaths of the following observers:—Mr. J. Sinclair, reporter at Wick from 1872 to 1904; the Rev. Fenwick W. Stow, of Aysgarth, who had observed from 1879 to 1904; Mr. A. Fletcher, of Laudale (1879–1903); the Rev. T. A. Preston, of Marlborough College (1878–85) and Thurcaston (1889–05); Mr. R. Hawkesworth Barnes, of Parkstone (1890–1904); Mr. E. E. Dymond, of Aspley Guise (1881–1904); Mr. Stratton C. Knott, H.M. Vice-Consul, who was observer at Majunga, Madagascar (1892–1903); Dr. Kelly, of Worthing (1899–1904); and Mr. W. H. Curtin, of Lincoln (1904–05).

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#### Office staff.

The staff of the Office is divided into five branches. The branches co-operate as may be required in the various scientific investigations indicated above. The work of a routine character which is assigned to the several branches will be referred to under the following headings:—

I. THE MARINE BRANCH, which deals with (a) ocean meteorology—the collection, tabulation and discussion of meteorological data for all parts of the ocean traversed by British ships; the preparation and issue of charts or other publications exhibiting the results obtained from the discussion of the observations; (b) the supply of meteorological instruments to the ships of the Royal Navy, to the mercantile marine, to the stations in connexion with the Office, and to observers in this country, in the Colonies or elsewhere.

II. THE TELEGRAPHIC (FORECAST AND STORM WARNING) BRANCH, which takes charge of the collection of daily telegraphic reports from stations in the United Kingdom, the Azores, and the Continent of Europe, and the preparation of reports, charts, forecasts, and storm warnings based upon them.



III. THE STATISTICS AND LIBRARY BRANCH, which deals with (a) the climatology of the British Isles, and takes charge of (b) meteorological information and statistics regarding British Colonies and dependencies, and foreign countries. This branch also deals with (c) the distribution of meteorological reports and publications, with (d) inquiries from all sources upon meteorological questions, not specifically assigned to one of the other branches, and (e) with the arrangement of the Library.

IV. THE OBSERVATORY BRANCH, which deals with the automatic registers received from self-recording instruments of all kinds at observatories and other stations in connexion with the Office.

V. CORRESPONDENCE AND ACCOUNTS BRANCH, which deals with finance, the arrangement of correspondence, and the registration of documents.

The general method of dealing with the information which is regularly collected by the Office is indicated in Appendix II. No important change has been made in the arrangements during the past year. Some details of the year's work of the several branches are given in the following notes.

## I.—MARINE BRANCH.

### (a.) OCEAN METEOROLOGY.

The arrangements for the systematic collection of data with respect to the meteorology of the ocean from the Royal Navy and the Mercantile Marine have been continued as heretofore. An indication of the system adopted is given in Appendix II.

The meteorological observations made on board H.M. ships are reported to the Admiralty.

A large number of ships' logs have been lent to the Council by the Admiralty for the purpose of extracting the meteorological data relating to the Indian Ocean.

The meteorological registers of all kinds, other than those from lighthouses, received by the Office during the year from Officers of the Navy or from the Mercantile Marine numbered 2,176. A list is given in Appendix IV.

Of the meteorological logs, 160 have been classed as "excellent" or "very good," as compared with 147 of the previous year.

The following list shows the number of vessels observing, for the different lines of route :—

North Atlantic ... ..	69	Far Eastern, viâ Cape of	
Mediterranean ... ..	28	Good Hope ... ..	34
South America (East Coast)	29	Far Eastern, viâ Suez	
" " (West " )	5	Canal ... ..	48
South Africa ... ..	14	Pacific ... ..	31
Eastern, viâ Cape of Good		North Polar ... ..	4
Hope ... ..	14	South Polar ... ..	3
Eastern, viâ Suez Canal...	30		

Appendix III. (p. 110) contains a list of the observers who, during the past year, have contributed logs classed as "excellent." Several of these observers have co-operated with the Office for many years. The names which appear in the list for the first time are as follows :—

Observer's Name.	Ship.
Andersson, C. B. ... ..	S.S. "Italian Prince."
Bayldon, F. J. ... ..	S.S. "Tambo."
Bennett, C. D. ... ..	S.S. "Macedonia."
Colbeck, W., R.N.R. ... ..	S.S. "Morning."
Hyde, G. ... ..	S.S. "Faraday."
Jones, O. ... ..	S.S. "Port Antonio."
Parsons, J. G. ... ..	S.S. "Port Antonio."
Paterson, A. L. ... ..	S.S. "Potomac."
Porterfield, W. M., R.N.R. ... ..	S.S. "Clan Ronald."
Staveley, W. E. ... ..	S.S. "Southwaite."
Sutcliffe, J. A. ... ..	S.S. "Tongariro."

Recognition  
of "excellent"  
observers.

As a mark of recognition of valuable co-operation, the Council have presented various publications of the Office to observers who have returned well-kept logs.

The Council note with regret the death of ten of their old marine observers :—Captain J. Steele, F.R.A.S., late Secretary, Local Marine Board, London, of S.S. "Erl King," in April, 1904; Captain J. N. Jackson, of ship "Pizarro," in April, 1904; Captain H. C. Bennett, R.N.R., of S.S. "Orotava," in May, 1904; Captain J. Davie, of S.S. "Lord Roberts," in May, 1904; Captain H. R. F. Plater, F.R.G.S., &c., of ship "Patriarch," in July, 1904; Captain F. S. Newton, of R.M.S. "La Plata," in July, 1904; Captain F. G. Major, of S.S. "Inch Keith," in December, 1904; Captain-Superintendent J. Henderson Smith, R.N.R., of H.M.S. "Worcester," in January, 1905; Captain J. B. Atkins, Elder Brother of Trinity House, of S.S. "Imperador," in March, 1905; and Captain R. C. MacCormaic, of ship "Alcinous," in March, 1905.

Supple-  
mentary  
Information.

The arrangements for obtaining meteorological registers from the captains and officers of ocean-going ships who use their own instruments, have been continued, and a large amount of information has thereby been collected, which is immediately utilised in the Monthly Pilot Charts of the North Atlantic and Mediterranean. The arrangements are indicated in Appendix II., p. 74.

Pilot charts

It may be noted that Monthly Pilot Charts for the North Atlantic and North Pacific are now issued by the U.S. Hydrographic Office, for the North Atlantic by the London Meteorological Office and



the German Seewarte, and Quarterly Charts of the North Sea and Baltic by the Seewarte. Quarterly Charts are proposed for the South Atlantic and the South Pacific by the U.S. Hydrographic Office.

Charts of the distribution of the temperature of the surface water of the Atlantic for successive months have been compiled for insertion in the Pilot Charts for the North Atlantic and Mediterranean as in the previous year. The maps thus prepared are issued within six weeks of the close of the month in which the observations are taken. For each of the months recently dealt with the number of observations tabulated extends to some 4,000.

Use of Information received.

Daily Charts of pressure over the North Atlantic showing the distribution of isobars are also prepared in the department, in order to obtain the mean pressure values for the month. The monthly results for pressure are shown on the sea temperature charts, and the daily charts are occasionally reproduced to illustrate any prominent meteorological occurrence which has been noted.

For the discussion of the weather over the ocean south of 30° S. Lat., in connexion with recent Antarctic exploration, there were tabulated about 19,000 sets of observations from ships taken at Greenwich Mean Noon, and about 7,000 from shore stations. Of these, about 12,000 and 6,000 respectively have been plotted in geographical position on the working charts.

Besides continuing the issue of the Monthly Pilot Charts and the examination of all logs and documents received, the marine department of the Office has been engaged upon the discussion of the meteorological data for the Indian Ocean, extending to 30° S.

Hydrographic notices have been extracted from the meteorological logs and forwarded to the Admiralty. Among those sent during the year were a series by Captain F. J. Bayldon, R.N.R., S.S. "Tambo," dealing with the New Hebrides and other islands of the Pacific Ocean; and notes by Captain G. P. Scott, ship "Netherby."

Information supplied for the Admiralty

#### (b.) SUPPLY OF INSTRUMENTS.

The arrangements for the supply of instruments are indicated in Appendix II. The Naval establishments at Bermuda, Halifax, Jamaica, Esquimalt, and Trincomalee, having been closed during the year, the instruments from these yards have been returned to store at the Meteorological Office.

Royal Navy

During the year 1,733 instruments of various kinds have been supplied for the use of H.M. ships as compared with 1,240 in the previous year. Particulars are given in Appendix V., p. 133.

Of the mercantile marine, 184 ships have been supplied with instruments and log-books, as compared with 153 in 1903-4. The total number of instruments issued to the mercantile marine in the past year was 1,058, as compared with 864 in the previous year. Details are given in Appendix VI. The approximate number of ships employing instruments belonging to the Office for observations during the year was 193, as compared with 162.

Mercantile Marine.

**Stations.** The instruments at the telegraphic reporting stations have been maintained in proper order and replaced when necessary.

**Fishery Barometers.** A fishery barometer has been supplied to Walls, in the Shetlands, on the recommendation of the Board of Fisheries, Edinburgh, and the instrument at Baltimore, Ireland, has been renewed. There are now 233 stations on the coast of the British Isles supplied by the Council with barometers for the benefit of sailors and fishermen. Of these, 67 stations are in England, 7 in Wales, 65 in Ireland, 89 in Scotland, 4 in the Isle of Man, and 1 in Jersey. A list of the stations is given in Appendix II.

The fishery barometer is in each case placed in charge of some responsible person who undertakes the duty of forwarding to the Office a chart of the readings of the barometer and thermometer during each month.

**Southampton Island.** Instruments have again been lent for a winter station at Southampton Island (Hudson's Bay).

**Observers.** A considerable number of instruments have been supplied upon repayment to observers, including the following :—

To The Urban District Council of Saltburn-by-the-Sea; Clongowes Wood College, Sallins; Captain L. H. Tamplin, ChinKiang; D. L. Thomas, Esq., M.P., Newport; the Agent-General for N. S. Wales; and the Merchant Taylors' School, Crosby, Liverpool.

New sunshine recorders have been supplied to Felixstowe, Clacton, Coventry, Guernsey, Bognor, Aberdovey, Totley Towyn, Southport, and Isle of Man.

The following have been supplied or inspected for the Crown Agents for the Colonies (*see* p. 13) :—

8 Mercury Barometers.	35 Additional Measuring Glasses.
2 Barographs.	3 Sunshine Recorders.
33 Ordinary Thermometers.	3 Earth Thermometers.
73 Maximum do.	1 Hygrometer.
75 Minimum do.	2 Anemometers.
8 Solar Radiation Thermometers.	6 Reading Glasses and Lenses.
22 Terrestrial Radiation Thermometers.	1 Evaporimeter.
12 Screens and Cages.	1 Lightning Recorder.
134 Rain-gauges.	700 Charts for Self-recording instruments.

Various other instruments have been supplied for use at stations.

## II.—FORECAST AND STORM WARNING BRANCH.

**Daily Weather Reports.**

Daily reports, giving the state of the weather over the British Isles and the adjacent parts of the Continent at 8 a.m. and the changes which have taken place in the previous 24 hours, together with forecasts of the probable weather over the United Kingdom for the period ending at noon on the following day, have been

regularly issued to certain public offices and institutions, to the press, and to subscribers. Similar reports referring to the weather at 6 p.m., with forecasts for the following civil day, have been issued each evening for the morning editions of the daily papers.

The stations from which telegraphic reports are received are shown in the lists given on pp. 99, 100.

Telegraphic reporting stations.

In November last a new meteorological station for London was established in an open situation, provided by H.M. Office of Works, in St. James's Park. Since January 1st, the observations at this station have been inserted in the Daily Weather Report in place of those made for so many years at Brixton (*see* p. 8).

*Inspection of the Telegraphic Reporting Stations.*—The stations indicated in the list in Appendix II., pp. 80–90, have been inspected during the year. The Reports of the Inspectors show that efficiency has been maintained.

Inspection of the Stations.

*Discussion and Publication of the Information received.*—A detailed account of the manner in which the meteorological information received by telegraph is utilised for the preparation of the Daily Weather Report is given in Appendix II. Since the close of June the Supplementary Chart IV., on page 2 of the Report, has been employed daily in illustration of the district values published in the Weekly Weather Report of the preceding week. The information is given in the following order, commencing in each case with Tuesday :—Extremes of Temperature, Last week's Rainfall, Last week's Sunshine, Rainfall of the year, Bright Sunshine of the year, Accumulated Temperature for the week, and Accumulated Temperature for the year.

The Daily Weather Report.

The information as to the weather in the British Islands has been supplemented by telegraphic reports sent daily from volunteer observers, by data as to sunshine for the preceding day from a number of coast stations which report by post, and by postal reports of maximum and minimum temperature, rainfall, and sunshine for a number of inland stations. These details have proved a useful addition to the telegraphic reports of the first page.

The arrangements for the issue of the Reports have remained as previously reported, except that at the request of the Admiralty special arrangements have been made for a number of copies to be supplied to the Admiral Superintendent of Naval Reserves for the use of Coast Guard stations. About 300 copies of the Reports have been distributed daily, without charge, to Government Offices and public institutions, to seaports for public exhibition, to newspapers, to correspondents of the Office, and to foreign meteorological institutions. The issue to subscribers has amounted to about 172 copies. The provisional arrangement for the sale of single copies of the Daily Weather Report at a penny each, from about 3 o'clock of the afternoon of the day of issue, has been continued. The places where single copies can be obtained have been, as before, the Meteorological Office, and the bookstalls of

Distribution of Daily Weather Reports.



the following terminal railway stations in London: Victoria (S. E. & C. and L. B. & S. C.), Charing Cross, St. Pancras, King's Cross, and Euston.

The substance of the morning and afternoon reports received by telegraph as to the state of the weather at certain stations on the sea coasts, has been displayed on the balcony of the Office at 63, Victoria Street, S.W. Charts have been suspended in the portico of the street door exhibiting the latest information from all our coasts, and the latest forecasts and storm warnings that have been issued. Since November last similar information has also been posted up on a notice board in St. James' Park, *see* p. 8.

#### Weather Forecasts.

*Weather Forecasts.*—The means adopted for the distribution of the forecasts drawn up in the Office have been continued during the past year. They are detailed in Appendix II., pp. 65–68.

In addition, at the request of a firm of opticians, arrangement has been made for communicating forecasts by telephone for exhibition, upon payment of a fee for the special service.

Copies of the 11 a.m. forecasts, based on the 8 a.m. observations, have been regularly called for by messengers from newspapers or news agencies, and printed or typed copies have been delivered, either by hand or through the post, to subscribers and distributed for exhibition as follows: in the City, at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's, Cornhill, Messrs. Hawes, 79, Leadenhall Street, and Messrs. Watson, 313, High Holborn; in the West End, in the Libraries of the House of Lords and the House of Commons; at Messrs. Elliott's, Leicester Square; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; Messrs. Hawes, 49, New Cavendish Street; Messrs. Webster Bros., 4, Porchester Road, W.; and at various Clubs.

Forecasts have been supplied occasionally to His Majesty's Yacht as requested by the Commadore. At the request of the Admiralty, forecasts for the S.W. of England and the Bay of Biscay have been regularly supplied to the Commander-in-Chief, Devonport. Arrangement has also been made with the Admiralty for the supply of forecasts to a number of H.M. ships as occasion requires. Forecasts for separate districts have been sent by telegraph to certain provincial newspapers.

#### Harvest Forecasts.

During the summer months (June to September inclusive) the special service of afternoon forecasts for the benefit of agriculturists and others was arranged as last year, and special telegraphic reports of observations at 2 p.m. were obtained for this purpose. These forecasts are sent by telegraph at 3.30 p.m. to those who express a wish to receive them regularly, and who defray the cost of the telegrams. On Saturday evenings a special forecast, giving in general terms the probable weather for the ensuing 48 hours, is sent to subscribers desirous of receiving such information in lieu of, or in addition to, that ordinarily issued at 3.30 p.m. The number of recipients of the forecasts for various periods was 39. There were no applications from persons residing in any part of Scotland. In other districts the number ranged from 10 in England, S., 9 in the Midland counties, and 8 in England, S.W., to only 1 in England, N.E., and Ireland, S.

By many of the recipients a record of the weather experienced during the time the forecasts were sent was kept and supplied to the Office. A comparison between the forecasts issued and the subsequent weather, as entered on the returns, shows that for the country generally 58 per cent. of the forecasts were completely successful, and 34 per cent. partially successful. The results are more satisfactory than those for the previous year, the percentage of completely successful forecasts in 1903 being only 48.

On the application of Dr. Tresidder special arrangements have been made for the supply of information and forecasts to those interested in the competitions of carrier pigeons in order that the atmospheric conditions favourable for the flight of pigeons may be examined.

The number of inquiries for forecasts by telegraph was 205.

Telegraphic inquiries for forecasts.

Special charts, transcripts of observations, or summaries, have been supplied to various newspapers, as in previous years.

Transcripts of observations.

A comparison for the year of the Forecasts for the United Kingdom issued at 8.30 p.m., with the subsequent weather actually experienced, is given in detail in Appendix I., p. 42. The complete success, partial success, partial failure, and complete failure of the forecast, are estimated according to definite rules which are designed to eliminate bias as far as possible.

Results of Forecasts.

It will here suffice to state that partial success means that the Forecast was correct for more than half the six elements (viz., wind direction and force, temperature, rainfall, state of the sky, thunderstorms, &c.) dealt with at the places of observation situated in the district in question, and a corresponding interpretation is to be applied to the term partial in the case of the failures.

The detailed comparison of the Forecasts with actuality may be summarised as follows :—

SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1904-1905.

Districts.	Per-centages.				
	Complete Success.	Partial Success.	Partial Failure.	Complete Failure.	Sum of Successes, Complete and Partial.
SCOTLAND, N. ...	58	31	10	1	89
" E. ...	57	30	11	2	87
ENGLAND, N.E. ...	61	31	7	1	92
" E. ...	58	32	8	2	90
MIDLAND COUNTIES...	57	31	11	1	88
ENGLAND, S. ...	62	30	7	1	92
SCOTLAND, W. ...	60	29	9	2	89
ENGLAND, N.W. ...	58	30	10	2	88
" S.W. ...	55	32	10	3	87
IRELAND, N. ...	56	30	12	2	86
" S. ...	50	31	16	3	81
Summary ...	57	31	10	2	88



The following table shows the success of the Forecasts of the year in comparison with those of previous years. It gives for each year of the decade 1895-1904 the percentages of complete and partial successes of the Forecasts issued at 8.30 p.m. The number of successes in the past year was considerably above the average for the 10 years.

PER-CENTAGES of SUCCESS in the FORECASTS for the whole of  
the BRITISH ISLES.

Year.			Complete Success.	Partial Success.	Sum of Successes, Complete and Partial.
1895-96	...	...	55	25	80
1896-97	...	...	54	27	81
1897-98	...	...	55	26	81
1898-99	...	...	55	28	83
1899-1900	...	...	55	27	82
1900-01	...	...	57	27	84
1901-02	...	..	58	26	84
1902-03	...	...	53	35	88
1903-04	...	...	56	30	86
1904-05	...	...	57	31	88
Average	...	...	55.5	28.2	83.7

Storm  
Warnings.

*Storm Warnings for the Coasts of the United Kingdom.*—Warnings of coming storms have been dispatched by telegraph to stations on the coast supplied with signals to be hoisted as warnings to mariners. The signals are defined in Circular 717 of the Board of Trade, issued in February, 1874.

A list of the stations at which the signals are exhibited is given in Appendix II., p. 68. At the end of March, 1905, there were 237, of which 127 were in England and Wales, 70 in Scotland, 33 in Ireland, 3 in the Isle of Man, and 2 in the Channel Islands. Gorleston has been added to the list in the course of the year.

Reference has been made in previous reports to the disadvantages which exist with regard to the issue of storm warnings. In order to ascertain more precisely the extent to which these disadvantages affect the various stations, the Council have made arrangements for the telegrams conveying the warnings to be

endorsed with the time of hoisting the signal at the station and other particulars, and to be returned to the office for examination. The arrangements were completed in the early part of the year, but it was thought better to postpone further action till the commencement of the season of storms.

A comparison between the warnings issued during the year and the subsequent weather, in accordance with the method indicated in the Report for 1888-9, p. 64, is given in Appendix I., p. 40.

The following table contains a statement of the amount of success of storm warnings in each year and the average for the decade 1895-1904 :—

Comparison of results for 1904 with previous years.

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
1895 ...	523	p.c. 63·3	p.c. 26·4	p.c. 89·7	p.c. 8·0
1896 ...	467	67·7	23·8	91·5	5·6
1897 ...	596	60·1	31·7	91·8	4·5
1898 ...	581	59·8	27·5	87·3	8·2
1899 ...	504	59·3	31·9	91·2	4·8
1900 ...	512	66·2	25·8	92·0	6·3
1901 ...	498	62·3	26·1	88·4	7·4
1902 ...	535	55·5	32·0	87·5	9·0
1903 ...	757	62·6	27·3	89·9	7·3
1904 ...	539	59·4	30·4	89·8	6·7
1895-1904	551	61·6	28·3	89·9	6·8

The corresponding figures for the average of the ten years 1874-1883, 1884-1893, and 1894-1903 are as follows :—

Averages.

Decade.	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.
1874-83...	426	54·3	25·2	79·5	16·8
1884-93...	499	57·9	26·9	84·8	12·6
1894-1903	548	62·4	27·7	90·1	6·7

## III.—STATISTICS AND LIBRARY BRANCH.

## (a.) CLIMATOLOGY. BRITISH ISLES.

Returns of various kinds from stations in all parts of the kingdom have been received as indicated in the table on pp. 80-90. Some of these returns are from the stations which are supported by the Office, but the greater number are furnished by volunteer observers. The nature of the information supplied is indicated by the letters in the fifth column of the table, which are explained on pp. 78 and 79. § The names of the observers at the stations belonging to the several groups are given on pp. 91-99. The stations which have been added to the list since last year are printed in **Clarendon** type, and those which have been discontinued since the close of last year are printed in *Italics*.

The list may be summarised as follows :—

Number and Description.						Class.	Nature of the Information received. (See p. 78.)
13	Observatories	...	...	...	...	I.	A.
11	Additional Anemograph stations	...	...	...	...	—	B.
23	„ Barograph stations	...	...	...	...	—	C.
2	„ Thermograph stations	...	...	...	...	—	C <sup>1</sup> .
8	„ Pluviograph stations	...	...	...	...	—	C <sup>2</sup> .
98	„ Sunshine stations	...	...	...	...	—	S.
1	Hygrograph station	...	...	...	...	—	C <sup>3</sup> .
92	Normal Climatological stations. (Second Order stations.)	...	...	...	...	II.	D.E.
28	Telegraphic stations—British	...	...	...	...	III.	T.
31	„ Foreign	...	...	...	...	—	—
48	Auxiliary Climatological stations	...	...	...	...	III.	G.
87	Additional Rainfall stations	...	...	...	...	III.	R.
27	Fishery Barometer stations	...	...	...	...	—	H.
57	Sea Temperature stations	...	...	...	...	—	W.

STATIONS OF THE FIRST ORDER : OBSERVATORIES.—The Council have continued to maintain the observatory at Valencia (Cahirciveen), and have also continued their contributions to the maintenance of the meteorological observatories at Kew, Falmouth, Aberdeen, and Fort William (until 30th September, 1904), at which the self-recording instruments, installed by the Council, are under the management of the National Physical Laboratory,

§ Particulars as to the principles of classification of stations, and the instruments in use at the stations in connexion with the Office are given in the Report for 1901-2, p. 20, and in previous Reports.

the Royal Cornwall Polytechnic Society, the University of Aberdeen, and the Scottish Meteorological Society respectively. The arrangement with the observatories at Glasgow and Stonyhurst, under which copies of the records of the self-recording instruments are supplied to the Office, have been likewise continued. The records obtained from the observatories and the anemograph stations are dealt with in the Observatory Branch, *see* p. 31. The cards from the sunshine stations are also examined in that branch.

**ANEMOGRAPH STATIONS.**—No change has been made in the list of anemograph stations in connexion with the Office.

**SUNSHINE STATIONS.**—Complete returns of the original cards for the year have been received from 82 stations, including the Colonial stations, and for a portion of the year from 13 stations.

Sunshine stations.

In addition to these records, which are all from instruments of the Campbell-Stokes design, tabulations of the daily amount of sunshine have been received from 16 other stations for insertion in the Weekly Weather Report, &c.

Of those stations which previously sent in records from photographic recorders all except two (Llangamarch Wells and Westbourne) have provided themselves with instruments on the Campbell-Stokes principle, and—as intimated in the last report—only the results from burning recorders are included in the official publications. This change took effect at the beginning of 1905.

The distribution of the Sunshine Stations on the 31st March, from which cards were received, was as follows :—

SUNSHINE STATIONS (111) AT MARCH 31, 1905.

Stations.	No.	Stations.	No.
Scotland, N. ... ..	6	England, N.E. ... ..	11
„ E. ... ..	5	„ N.W. and N. Wales	15
„ W. ... ..	4	„ Midland Counties	13
Ireland, N. ... ..	2	„ E. ... ..	10
„ S. ... ..	6	„ S. ... ..	22
Channel Islands ... ..	3	„ S.W. and S. Wales	14

The Council would welcome additional observations, especially from Scotland and Ireland and the inland parts of Wales and of the south-west of England.

Additions stations desired.

**NORMAL CLIMATOLOGICAL STATIONS. STATIONS OF THE SECOND ORDER OF THE INTERNATIONAL CLASSIFICATION.**—These stations, as well as many of the sunshine stations, and all the stations supplying information indicated by the letters F, G, and R, are maintained by private persons or local authorities or institutions, who provide their own outfit of instruments.



Returns for 1904 were received from 92 stations. The arrangement with the Royal Meteorological Society and the Scottish Meteorological Society, under which, for a certain payment, the Societies forward to the Office returns already prepared for publication, as well as returns for the Weekly Weather Report, has been continued. These returns are incorporated with those received directly from the observers and prepared for publication in the Office. Under this arrangement the Royal Meteorological Society has forwarded to the Office copies of observations from 4 stations on the International Form A, from 12 on Form B, and from 10 on the Weekly Forms; the Scottish Meteorological Society observations from 3 stations on Form A, from 15 on Form B, and from 7 on the Weekly Forms. The stations from which these returns have been received are marked *M.* and *S.* respectively in the list of stations in Appendix II.

The stations of the Second Order for 1904 were distributed as follows :—

Stations.	No.	Stations.	No.
Scotland, N. ... ..	7	England, N.E. ... ..	13
„ E. ... ..	7	„ N.W., and N. Wales	8
„ W. ... ..	10	„ Midland Counties	13
Ireland, N. ... ..	3	„ E. ... ..	10
„ S. ... ..	7	„ S. ... ..	9
Channel Islands ... ..	1	„ S.W., and S. Wales	4

**AUXILIARY CLIMATOLOGICAL STATIONS.**—These include all stations which make climatological returns of a less complete character than those of a normal station, or at which the hours of observation do not correspond with those of a normal station. Particulars of the information received from the several stations are given in the general list of stations, pp. 78, 79, under groups G, H, and R.

Sea temperature stations.

**W. SEA TEMPERATURE STATIONS.**—At one station, Minard, the observations have been discontinued, but at six light-ships, through the courtesy of the several lighthouse authorities, they have been commenced.

The returns from these stations are used in connexion with monthly charts of the surface temperature of the North Atlantic Ocean, embodied in the Monthly Pilot Charts.

Inspection of stations.

*Inspection of the Stations.*—In order to secure uniformity of method and to guard against instrumental errors, the stations classified under the heads A, B, C, D, S, and T, in the list on pp. 91–99, are regularly inspected, while the others are visited as opportunity offers. The stations which belong to the Royal Meteorological Society, are visited by an Inspector appointed by that Society. In accordance with the recommendation of the

Treasury Committee (1877), a contribution towards the cost of this inspection is made by the Office. An account of the inspections in the year 1904 is given in Appendix VII., p. 135.

The information collected from the stations is carefully arranged and kept ready for reference. The returns required for the current publications of the Office referred to in (c.), Part III., p. 30, are examined, checked and prepared for the press; the information is also utilised in other ways.

Use of the information from climatological stations.

The statistical tables of the Weekly Weather Report and its monthly, quarterly, and annual summaries have been prepared as in previous years.

*Normal Climatological Stations.*—The returns from all the Second Order Stations are arranged to give monthly means of pressure and temperature at 9 a.m. and 9 p.m., with the means of maximum and minimum temperature for the month, as well as data concerning rainfall, the direction and force of the wind, &c. These are arranged in a Form "B," adopted for International use by the Meteorological Congress at Rome in 1879; while for certain selected stations the details of the actual observations made at 9 a.m. and 9 p.m. are set out *in extenso* in a Form "A," adopted in a similar manner. These returns are prepared with a view to the publication of an annual volume, which is entitled "*Meteorological Observations at Stations of the Second Order*," of which twenty-five volumes have been issued, the last being that for 1900.

Weekly summaries for 22 stations, and monthly summaries for 73 stations have been prepared for the reports of the Registrars-General of Births, Deaths, and Marriages for England and Wales and for Ireland.

Reports supplied to Registrars-General for England and Ireland.

Copies of observations at Rainfall Stations have also been sent for the use of the British Rainfall Organisation to Dr. H. R. Mill.

Rainfall observations.

Until the closing of the Observatory a transcript of Ben Nevis observations was sent to Dr. Hergesell at his request, in connexion with the International Aeronautical Investigation.

Ben Nevis observations.

#### (b.) CLIMATOLOGY. FOREIGN AND COLONIAL STATIONS.

A list of Foreign and Colonial Stations from which documents have been received in the course of the year is given in Appendix II., p. 102.

Of these stations, one, St. Helena, has an anemograph in addition to the usual climatological instruments. Six are in Cyprus and have been in operation since 1882. Eight are in the West Indies, of which six are in the Bahamas. Five of the Bahamas returns are lighthouse registers. Nine stations are in West Africa, 10 in Central Africa, and one in British East Africa. Six are on the Mediterranean Coast. Two are in Central or South America, one in the Falkland Islands, and one in the Indian Ocean (Mauritius). One register has been received from Hudson Bay (Southampton Island) and two from stations in China.

*(c.) PUBLICATIONS.*

Applications for free copies of one or more of the current publications of the Office, from the Bureau of the International Council for the Study of the Sea, Copenhagen; M. A. Lancaster, Director of the Meteorological Service of Belgium; Institute of Jamaica, Kingston; Sociedad Malaguena de Ciencias Fisicas y Naturales, Malaga; Central Meteorological Station, Havana; Bureau Météorologique du Musée de l'Industrie, Varsovie; Sir John Eliot, F.R.S.; Mr. P. H. Burns, Government Superintendent of Bahamas Cable, Nassau; Yorkshire University, Leeds; Malta Observatory; Tidal and Coast Survey, Ottawa; and Administration of Maritime Territory, Section of Meteorology, Valparaiso, have been granted.

The following publications have been issued:—i. The Daily Weather Report (*see* p. 21); ii. The Weekly Weather Report (*see* p. 21), with monthly, quarterly, and annual supplements; iii. Monthly Pilot Chart of the Atlantic and Mediterranean; iv. Hourly Readings at four observatories, 1900, 1901; v. Observations at stations of the Second Order, 1900; vi. Climatological observations in Tropical Africa, 1900–1902; vii. Report of the London Fog Inquiry; viii. Report of the Meeting of International Meteorological Committee at Southport, 1903. New editions of two of the office publications have been called for, namely:—The “Barometer Manual for the use of Seamen” (O. 61), and “Charts showing the Surface Temperature over the Atlantic, Indian and Pacific Oceans” (O. 59).

The volume of Wind Charts of the South Atlantic, prepared in the Marine Department of the Office, has been published by the Hydrographic Office of the Admiralty.

A complete list of the publications which have been issued by the Office is given in Appendix II., p. 105, and in Appendix XI., p. 184, of last year's report, is given a list of important contributions to meteorology, which have not been issued as separate publications, but have been included in various Reports issued by the Office since 1866.

*(d.) INQUIRIES.*

The inquiries dealt with in the Statistical and Library Branch during the year were 932 in number, of which 189 were by letter and the rest personal inquiries. The whole number may be classified as follows:—Inquiries for scientific and industrial purposes, 328; for evidence in legal proceedings, 157; for forecasts of weather, 114; from newspaper correspondents for special weather information, 252; miscellaneous, 81.

Among the special inquiries dealt with during the year the following may be mentioned:—

- (1.) From the Hydrographer to the Admiralty: for a revision of the gale tables for the East Coast of England, for use in a new edition of the “Sailing Directions.”
- (2.) From the Board of Agriculture: for a comparison of the weather experienced in the various agricultural divisions in the years 1879 and 1903, for use in the Annual Report.



- (3.) Sir Oliver Lodge, F.R.S. : as to the electrical potential of the air during fog.
- (4.) From the Mersey Docks and Harbour Board : for a statement of the rainfall in the catchment area of the Mersey over a series of years.
- (5.) From Mr. Money Wigram : for a statement of the variation of the seasons in England, N.W., over a series of years.

(e.) LIBRARY.

The main part of the Library consists of the weather maps and other publications of the Weather Offices of different countries, and meteorological reports and publications received from all quarters of the globe. Most of these are presented or obtained by way of exchange, but a few standard works and serial publications are purchased. The Library consists at present of about 18,400 volumes and pamphlets.

Appendix VIII., p. 156, gives a list of the accessions to the Library during the year. These amounted to 570 books and pamphlets. The list has been arranged as nearly as possible on the lines of the International Catalogue of Scientific Literature, so that the nature of the contents of the various contributions to the Library may be more easily understood.

Among the publications presented to the Library may be mentioned the series of Climate and Crop Service Reports issued by the United States Weather Bureau, and the charts of the region of the Guinea current by the Meteorological Institute of the Netherlands; among those acquired by purchase have been the set of daily synoptic charts of the North Atlantic and adjacent countries, for the year from December, 1897, to November, 1898, prepared by the German and Danish Meteorological Authorities jointly, and a selection of the volumes of the International Catalogue of Scientific Literature.

The Library is available for the use of students and others between the hours of 10 a.m. and 4 p.m. A number of persons have availed themselves of this accommodation.

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IV.—OBSERVATORY BRANCH.

The curves received from the observatories (*see* p. 72) and the tabulations of readings at each hour made by the observers up to the close of the year have been carefully examined.

The form adopted for the publication of these observations is that adopted in 1902.

The first two volumes of the new series giving hourly readings have been published, and the volume for 1902 was in the press at the close of the year. They contain readings for each hour of barometric pressure, temperature of the dry and wet bulbs, wind direction and velocity, rainfall and sunshine, with the hourly means for the month and for a long series of years.

The records from the auxiliary anemographic stations have been tabulated up to date for the purpose of checking the storm warnings.

The sunshine cards for the year from all stations have been examined, and any questions arising from the examination have been dealt with.

The supervision of the anemometric experiments at Holyhead, the discussion of the relation between the numbers of Beaufort's scale of wind forces and the corresponding wind velocities, and the discussion of the records of the St. Helena anemometer, also devolve upon the Observatory Branch.

The reduction and tabulation of the land observations of the National Antarctic expedition have also been undertaken by this branch.

#### V.—CORRESPONDENCE AND ACCOUNTS BRANCH.

Appendix X., p. 220, shows the receipts and payments during the year ending 31st March, 1905. The amount voted by Parliament was £15,300, as in the previous year, and the miscellaneous receipts amounted to £2,225 16s. 1d.

The following abstract of expenditure shows approximately the net charge against the Parliamentary grants of this and the preceding year, together with the increase or decrease in 1904-5, as compared with the previous year :—

NET EXPENDITURE.	1903-4.	1904-5.	Increase.	Decrease.
GENERAL ADMINISTRATION :				
	£	£	£	£
<i>Payment of Council and Secretary</i> ... ..	1,451	1,464	13	—
<i>Office</i> ... ..	1,082	1,087	5	—
<i>Rent, Fuel, and Lighting</i> ... ..	717	723	6	—
<i>Alterations to premises and contingencies</i> ... ..	449	545	96	—
<i>Expenses incidental to International Meteorological Congress</i> ... ..	85	29	—	56
SPECIAL RESEARCHES ... ..	842	869	27	—
LAND METEOROLOGY ... ..	4,109	4,075	—	34
WEATHER INFORMATION ... ..	3,029	2,866	—	163
INSPECTIONS ... ..	405	427	22	—
OCEAN METEOROLOGY ... ..	2,209	2,766	557	—
SUPERANNUATION ACCOUNT	1,261	1,248	—	13
Total ... ..	15,639	16,099	726	266

NOTE.—The increase under "Ocean Meteorology" is chiefly due to the supplies of instruments for the Royal Navy, Mercantile Marine, and stations. £1,660 was paid to the Post Office during the year 1904-5, on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires, &c.

R. STRACHEY,  
Chairman.





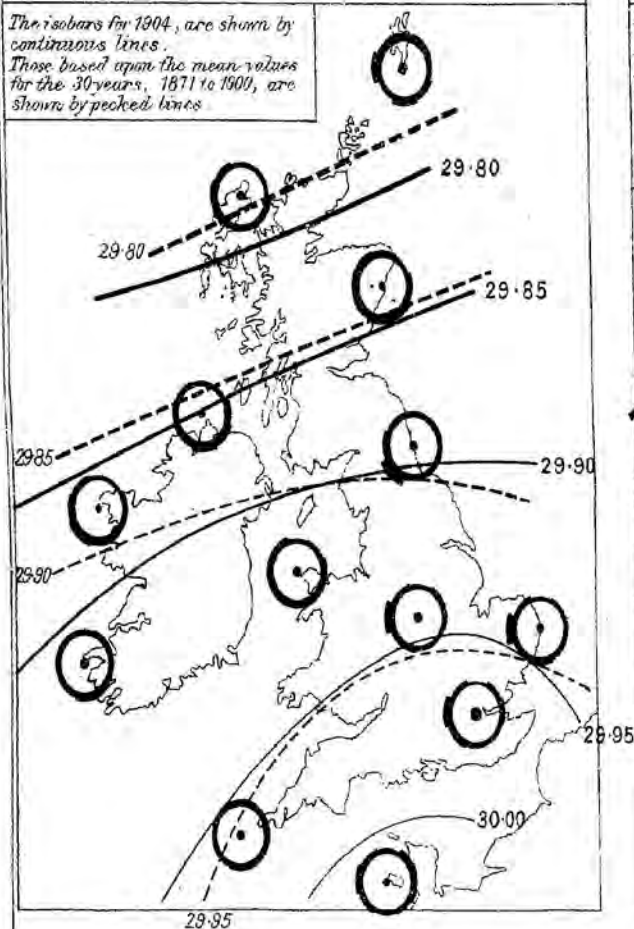
# ANNUAL WEATHER CHART, 1904.

PLATE I.

To face p. 33.

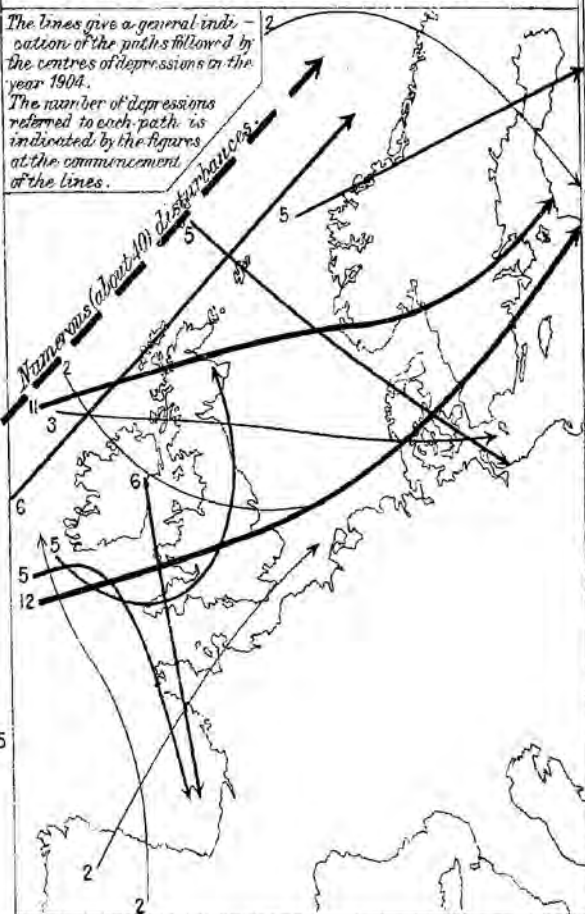
## 1. BAROMETER AND WIND AT 8 A.M.

The isobars for 1904, are shown by continuous lines.  
Those based upon the mean values for the 30 years, 1871 to 1900, are shown by pecked lines.



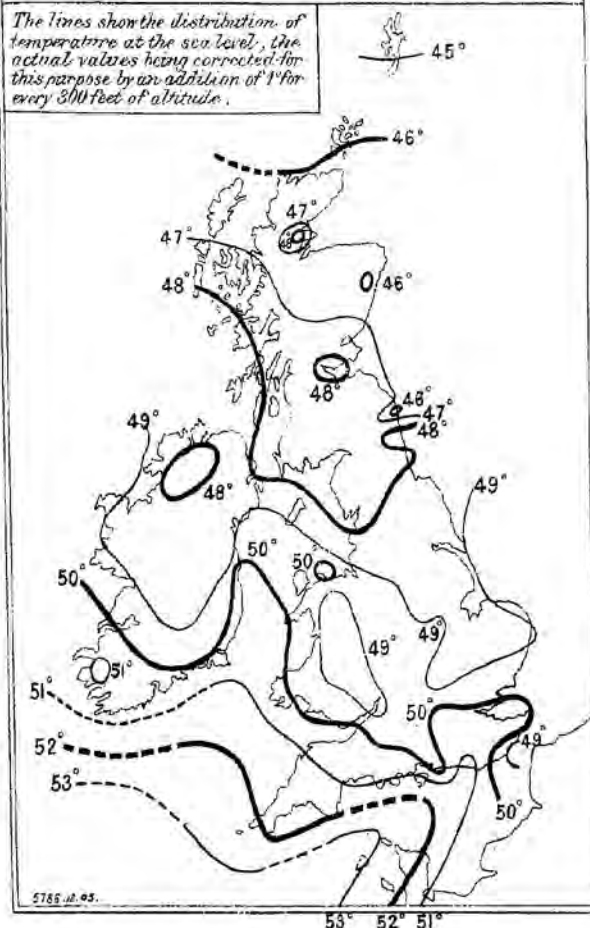
## 2. MOVEMENTS OF DEPRESSIONS.

The lines give a general indication of the paths followed by the centres of depressions in the year 1904.  
The number of depressions referred to each path is indicated by the figures at the commencement of the lines.



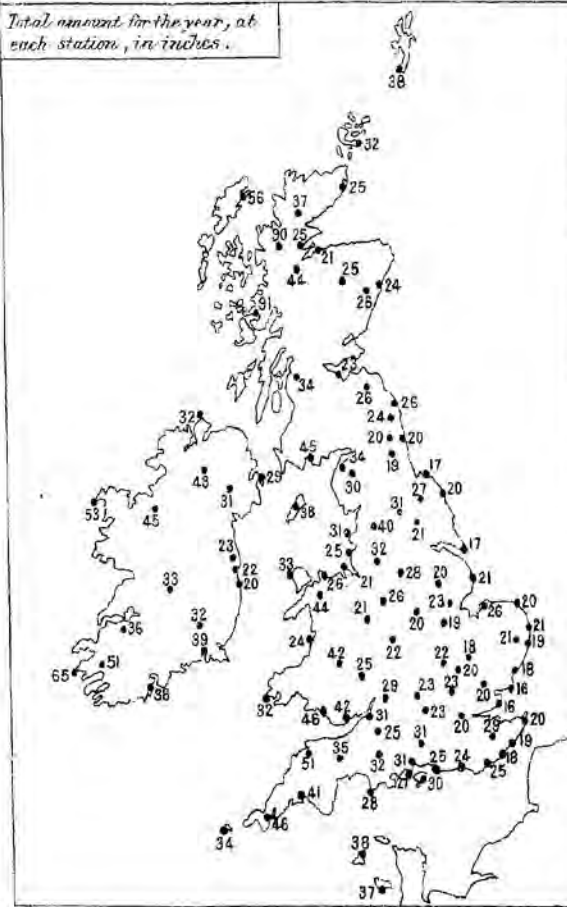
## 3. DISTRIBUTION OF MEAN TEMPERATURE.

The lines show the distribution of temperature at the sea level, the actual values being corrected for this purpose by an addition of 1° for every 300 feet of altitude.



## 4. RAINFALL.

Total amount for the year, at each station, in inches.



## A P P E N D I X .

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### APPENDIX I.

#### CONSPICUOUS METEOROLOGICAL OCCURRENCES DURING 1904.

In many respects the year under review differed very greatly from its immediate predecessor, which was remarkably wet. The following remarks as to the more prominent features in the weather of 1904 have been compiled mainly from information contained in the Daily and Weekly Reports, supplemented by the records from various Second Order Stations, and those made at the Anemograph Stations in connexion with the Office.

1. *Gales.*—The year was, comparatively speaking, a very quiet one, the gales experienced being, as a rule, of no great strength. The most important were :—

- (a.) On January 13th to 15th, when a Westerly to North-Westerly gale was felt very generally, the storm being rather severe in the West. The anemometers at Holyhead and Fleetwood registered 65 miles, Factor 3 (48 miles, Factor 2·2), and at Scilly 66 miles of wind in an hour, Factor 3 (62 miles, Factor 2·8), with a maximum velocity at Scilly of 75 miles,—as recorded by a pressure tube anemometer—in a squall.
- (b.) Towards the end of January the conditions became very disturbed, and for about three weeks there was an almost uninterrupted succession of deep cyclonic systems. The storm of February 12th and 13th was the most important of the series, a whole gale from South-West and West blowing in many districts. Kingstown reported a velocity of 65 miles in an hour, Factor 3 (48 miles, Factor 2·2), and Scilly 70 miles in an hour, Factor 3 (65 miles, Factor 2·8), the maximum in a squall being at the rate of 77 miles per hour. At Falmouth (Pendennis Castle) the pressure tube anemometer registered a mean hourly velocity of 59 miles, while in a gust the wind blew with a velocity of 93 miles per hour.
- (c.) On April 6th a strong or whole gale from South-West to North-West visited many parts of the Kingdom, but the south coasts of England and Ireland were not affected by it.
- (d.) The gale of October 5th was felt in nearly all parts, and in various localities it was strong to a whole gale from South-West and West.

- (e.) In December the severest and most general gales were from the Northward and North-Westward, many places experiencing a strong or whole gale on the 12th and 30th.

A record of the extreme wind velocities recorded during these gales, and others of less importance, is given in the following Table :—

READINGS OF ANEMOMETERS amounting to, or exceeding, a VELOCITY OF 44 MILES per hour, as recorded on the "Dines" Pressure-tube anemometer, or upon the "Robinson" anemometer with the factor adjusted to give the corresponding result, equivalent to an Estimated Force of 9 by Beaufort's Scale.

Date.	Station.	Duration of Severe Gale, 44 miles per hour, or above.	Wind Direction.	Maximum	
				Mean Velocity in an Hour (Actual).	Rate in a Gust.
1904.				Miles.	Miles.
Jan. 2-3..	Falmouth (Pendennis Castle).	2.45 p.m. to 5.15 p.m. 2nd ; and 7.15 a.m. to 8.40 a.m. 3rd.	S. to S.S.E.	46	62
" 7 ..	Falmouth (Pendennis Castle).	10 a.m. to 2.15 p.m. ..	S.S.W.	49	65
" 10 ..	Falmouth (Pendennis Castle).	0.10 a.m. to 1 a.m., 1.45 a.m. to 2.45 a.m., and 6 a.m. to 8.50 a.m.	S.W.	51	66
" 12-15	Falmouth (Pendennis Castle).	9.15 p.m. 12th to 4 p.m. 13th ; 7.30 p.m. 13th ; and 2.10 a.m. to 2.40 p.m. 14th.	S.W. to W.S.W.	57	82
" "	Scilly (1)	1.30 p.m. to 4.30 p.m. 13th ; and 11.30 p.m. 13th to 6.30 p.m. 14th.	W. to W.N.W.	62	75
" "	Kingstown	4.30 p.m. to 5.30 p.m. 13th.	W.S.W.	45	—
" "	Holyhead	2 p.m. to 7.30 p.m., and 8.30 p.m. to 9.30 p.m. 14th.	W.N.W.	48	65
" "	Fleetwood	5.30 p.m. 14th to 0.30 a.m. 15th ; and 5.30 a.m. to 6.30 a.m. 15th.	W.N.W.	48	—
" 26-27	Falmouth (Pendennis Castle).	11.30 p.m. 26th to 1 a.m. 27th ; and 4 p.m. to 10.30 p.m. 27th.	S.S.W.	48	62
" 29-30	Falmouth (Pendennis Castle).	1.30 p.m. to midnight 29th.	—	58	73
" "	Deerness	9.30 p.m. 29th to 0.30 a.m. 30th.	S.S.E.	50	—
Feb. 8 ..	Falmouth (Pendennis Castle).	4.20 a.m. to 9.30 a.m. ..	S.W.	54	74
" " ..	Scilly ..	4.30 a.m. to 7.30 a.m. ..	W.S.W.	48	—
" 10 ..	Scilly ..	1.30 p.m. to 9.30 p.m. ..	W.S.W.	52	66
" "	Falmouth (Pendennis Castle).	2.30 p.m. to 9.30 p.m. ..	W.S.W.	54	69
" 12-14	Falmouth (Pendennis Castle) (2).	10 a.m. 12th to 4 p.m. 13th ; and 11.50 a.m. to 4.30 p.m. 14th.	S. to W.S.W.	59	93

(1) The pressure-tube Anemometer at Scilly showed signs of imperfect working during the year, and it is probable that the maximum rates of wind-velocity quoted for that place are too low.

(2) The gale began before the time mentioned but the Anemometer record was lost in transit to Meteorological Office.



READINGS OF ANEMOMETERS amounting to, or exceeding a  
VELOCITY OF 44 MILES per hour, &c.—*continued.*

Date.	Station.	Duration of Severe Gale. 44 miles per hour, or above.	Wind Direction.	Maximum	
				Mean Velocity in an Hour (Actual).	Rate in a Gust.
1904. Feb. 12-14	Scilly ..	0.30 a.m. to 5.30 p.m. and 9.30 p.m. to 10.30 p.m. 13th; 11.30 p.m. 13th to 2.30 a.m. 14th; 3.30 a.m. to 6.30 a.m. and 7.30 a.m. to 10 p.m. 14th.	S.W. to W.N.W.	65	77
" "	Holyhead	1.15 p.m. to 2.45 p.m. and 10.20 p.m. 12th.	S.S.E. to S.S.W.	46	70
" "	Kingstown	9.30 a.m. to 10.30 a.m. 13th.	S.W.	48	—
" "	Shoebury- ness.	6.30 p.m. to 9.30 p.m. 12th; and 3.30 a.m. 13th.	S. (?)	46	67
" 16-18	Scilly ..	9.30 p.m. 16th to 0.30 a.m. 17th; 6.30 p.m. to 8.30 p.m. 17th; and 9.30 p.m. 17th to 2.30 a.m. 18th.	W.N.W. to N.W.	49	57
" 21-22	Falmouth (Pendennis Castle).	11.40 a.m. to 2.45 p.m. 21st.	S.W.	46	59
" "	Kingstown	5.30 p.m. to 10.30 p.m. 21st.	W.	53	—
" "	Holyhead	11.10 p.m. 21st to 0.10 a.m. 22nd.	W.	45	60
" "	Fleetwood	1.30 a.m. to 3.30 a.m. 22nd.	W.N.W.	48	—
Mar. 5 ..	Falmouth (Pendennis Castle).	7.10 a.m. to 11.30 a.m. ..	E.N.E.	48	58
April 2-3	Falmouth (Pendennis Castle).	11 p.m. 2nd to 3.20 a.m. 3rd.	S.S.W.	51	64
" "	Fleetwood	3.30 a.m. to 4.30 a.m. 3rd ..	W.	47	—
" 5-6	Kingstown	11.30 p.m. 5th to 3.30 a.m. 6th.	W.	47	—
" "	Alnwick (3)	1.30 a.m. to 2.30 a.m. 6th..	N.	44	—
" "	Falmouth (Pendennis Castle).	1.40 a.m. to 2.50 a.m. 6th..	S.W.	44	54
" "	Aberdeen	6.30 a.m. to 7.30 a.m. 6th..	W.N.W.	45	—
" 15	Deerness	10.30 a.m. to 1.30 p.m. ..	W.S.W.	48	—
May 1-2..	Falmouth (Pendennis Castle).	9.20 p.m. to 11.20 p.m. 1st; 0.30 a.m. to 2.20 a.m. and 8 a.m. to noon 2nd.	S.W.	50	66
" " ..	Holyhead	11.45 p.m. 1st(hard squall).	S.W.	—	68
" " ..	Fleetwood	4.30 a.m. to 5.30 a.m. 2nd..	W.S.W.	48	—
June 14 ..	Falmouth (Pendennis Castle).	5 p.m. to 7.45 p.m. ..	S. to S.S.W.	50	64
Aug. 6 ..	Fleetwood	6.30 p.m. to 8.30 p.m. ..	W.S.W.	45	—
Oct. 5-8..	Fleetwood	9.30 p.m. 5th to 9.30 a.m. 6th.	W. to W.N.W.	60	—
" " ..	Holyhead	0.30 a.m. to 2.30 a.m. 6th..	W.N.W.	46	62
Nov. 7-8..	Scilly ..	1.30 p.m. to 6.30 p.m. 7th .	N.W.	56	74
" " ..	Fleetwood	1.30 a.m. to 3.30 a.m., 6.30 a.m. to 7.30 a.m., and 8.30 a.m. to 9.30 a.m. 8th.	N.W. to W.N.W.	62	—
" 9 ..	Falmouth (Pendennis Castle).	1.45 p.m. to 6.30 p.m. 9th..	W.	47	66

(3) The Alnwick Anemometer was out of order during the months of January  
February, and part of March.

READINGS OF ANEMOMETERS amounting to, or exceeding a  
VELOCITY OF 44 MILES per hour, &c.—*continued.*

Date.	Station.	Duration of Severe Gale, 44 miles per hour, or above.	Wind Direction.	Maximum	
				Mean Velocity in an Hour (Actual).	Rate in a Gust.
1904, Nov. 25 ..	Scilly ..	7.30 p.m. to 11.30 p.m. ..	W.N.W.	46	53
Dec. 4 ..	Falmouth (Pendennis Castle).	2.45 p.m. to 8.15 p.m. ..	S.S.W.	52	66
.. 6 ..	Falmouth (Pendennis Castle).	11.30 a.m. to 0.10 p.m. ..	S.W.	55	73
.. 8-9	Scilly ..	11.30 p.m. 8th to 1.30 a.m. 9th.	S.E.	45	54
.. ..	Falmouth (Pendennis Castle).	0.45 a.m. to 4.30 a.m. 9th.	S.S.E.	51	59
.. 12 ..	Scilly ..	5.20 a.m. to 11.30 p.m. ..	W. to N.W.	56	73
.. ..	Holyhead	7.30 p.m. to 11 p.m. ..	N.N.W.	48	63
.. 29 ..	Deerness	7.30 a.m. to 8.30 a.m. ..	W.	51	—
.. 30 ..	Alnwick ..	0.30 a.m. to 1.30 a.m. ..	W.S.W.	49	—
.. ..	Fleetwood	4.30 a.m. to 11.30 a.m. ..	W. to N.W.	58	—
.. ..	Holyhead.	5.30 a.m. to 10.30 a.m. ..	W.N.W.	46	62
.. ..	Shoebury- ness.	11.20 a.m. to 1.40 p.m. ..	W.	44	70

At Dublin (Phoenix Park), Armagh, Glasgow, Stonyhurst, North Shields, Yarmouth, Kew, and Falmouth (the Observatory) a mean hourly velocity of 44 miles was not recorded during the year.

Map 2, Plate I., gives the mean paths of the classified low pressure systems traversing our area within the year. The thickness of the lines is proportional to the frequency of the class, the number of instances being shown at the commencement of the path. A very large proportion of the centres moved on a North-Easterly course outside our western coasts, in most instances too far distant to be definitely located.

2. *Rainfall.*—Except in a few isolated situations about the western half of the English Channel, in the extreme west and north of Ireland and north-west of Scotland, the rainfall for the year was less than usual, the deficiency exceeding 5 ins. in many localities, and amounting to between 8 ins. and 9 ins. in places, and to as much as 11.1 ins. at Braemar. The largest aggregates were 90.6 ins. at Laudale, 89.6 ins. at Glencarron, and 64.7 ins. at Valencia; the smallest, 17.0 ins. at Spurn Head, 16.0 ins. at Shoeburyness and 15.7 ins. at Clacton-on-Sea. The number of days on which rain was measured ranged from 289 at Blacksod Point, and above 250 at various other far western and northern stations, to 150 or less in some parts of England, and to 129 at Shoeburyness. Falls of as much as an inch in a day were infrequent and seldom distributed over a considerable area, the only instances of more than 2 ins. being 2.3 ins. at Glencarron on June 16th, 2.2 ins. at Hillington on July 30th, 2.1 ins. at Thurcaston on August 22nd, 2.2 ins. at Laudale on September 29th, 2.1 ins. at Jersey and 2.7 ins. at

Guernsey on October 2nd, 2·1 ins. at Bettws-y-Coed on the 16th, and 2·4 ins. at Glencarron on December 29th. Practically, the only general heavy falls were those of July 25th over the greater part of England, 1·7 in. being measured at Shrewsbury and Geldeston, and 1·8 in. at Skegness and Hereford; and on August 17th across the middle region of England and Wales, when 1·6 in. fell at Aberystwyth and Ampleforth, and 1·9 in. at Cheadle.

3. *Snowstorms*.—In the early months there were no snowfalls of any importance, and in the closing months, although there were several falls, the only noteworthy one occurred on November 21st, during the passage of a disturbance down the North Sea, producing a Northerly type of conditions, with snow over nearly the whole Kingdom. As a rule, however, the falls were not large, except locally in the northern districts, the day's snow at Harrogate yielding 1·85 in. of water.

4. *Thunderstorms*.—During the month of July thunderstorms were frequently experienced in different parts of the country, being reported on at least 22 separate days. They were not of more than ordinary intensity, and were of a sporadic rather than of a general character. In May and August the storms were moderately frequent, and in some cases were accompanied by sharp falls of hail. The other nine months of the year had comparatively few storms; indeed, after August they were almost entirely absent, but on November 21st thunder and lightning occurred at Scilly during the progress of a snowstorm. In the early part of December thunderstorms, or thunder or lightning alone, occurred in some English and Welsh localities. The region of greatest frequency of thunderstorms was Jersey, where they were recorded on 24 days, Dunmow and Stonyhurst returning 15 days, Southampton, London and Clacton-on-Sea 12 days, Durham 11 days, and Holyhead, Lincoln and Portland 10 days. At Bath neither thunder nor lightning was reported throughout the entire year.

5. *Droughts*.—It is not a little singular that while, as already mentioned above, the rainfall for the year was generally, and in many localities largely, below the normal, there were no lengthy periods in which there was an entire absence of any precipitation, the year, in fact, being marked by frequent falls of small amounts and unusually few instances of very large quantities. Over the south and east of England the weather of the second half of April was dry, but there were occasional showers in nearly all places. In the extreme north-east of Scotland a rainless spell of 16 or 17 days set in near the close of May. The most important dry spell of the year occurred over the southern and eastern counties of England in July, there being very little rain between the 3rd and 24th. At Reading the whole period of 22 days was rainless, while Caterham and Geldeston had 19 consecutive dry days. The effect of this droughty period was greatly enhanced by the brilliancy of the weather and the intense heat of the sun's rays, the solar radiation thermometer frequently recording 140° and upwards, and in places exceeding 150°. The soil consequently became very dry and hard, and vegetation suffered considerably. The second half of September was rather dry over the country



generally, with from 7 to 10 rainless days in many localities, but only Bath had as many as 15. During the second half of December most parts of the Kingdom experienced only an occasional light shower. This dry spell lasted well into 1905.

6. *Temperature.*—The *highest* temperatures registered during the year occurred generally round the middle of July and in the opening days of August. In Scotland, Cally, with a maximum of  $83^{\circ}$  on July 11th, was the only station which exceeded  $79^{\circ}$ , while at Deerness and Sumburgh Head the maximum of  $65^{\circ}$  was reached on August 4th. At the Irish stations four turned  $80^{\circ}$ , on July 11th or 12th, Edenfel  $80^{\circ}$ , Birr Castle  $81^{\circ}$ , Foynes  $82^{\circ}$ , and Killarney  $83^{\circ}$ , but Donaghadee and Malin Head did not rise above  $70^{\circ}$  at any time. Over England and the Channel Islands there were numerous records of  $80^{\circ}$  and upwards. Between July 15th and 17th, Geldeston and Tunbridge Wells registered  $86^{\circ}$ , Cromer and Southampton,  $87^{\circ}$ , and Bramley and Maidenhead,  $91^{\circ}$ . High values were even more numerous on August 4th, when Cromer, Rauceby, Fulbeck, Lincoln, Dunmow, Hillington, Colly Weston, Tunbridge Wells, and Reading mounted to  $88^{\circ}$ , Margate to  $90^{\circ}$ , and London and Maidenhead to  $91^{\circ}$ . At Scilly the year's maximum was  $70^{\circ}$  only.

As is almost invariably the case, the month of May was marked by some days of winter cold. Round the 8th, afternoon maxima under  $50^{\circ}$  were reported in many districts, Lairg  $40^{\circ}$ , Braemar  $41^{\circ}$ , Darwen  $42^{\circ}$ , Cheadle, Hillington, and Marchmont  $43^{\circ}$ . Temperature remained below  $50^{\circ}$  in various localities between the 20th and 22nd, and on the 28th also.

On the other hand there were some very warm days in January and December, there being, on various dates, many afternoon maxima of  $58^{\circ}$  to  $60^{\circ}$ .

The *lowest* temperatures of the year over the extreme southern and western portions of England and Wales occurred on very irregular dates between January 1st and March 18th. A minimum of  $20^{\circ}$  occurred at Blackpool on February 29th,  $22^{\circ}$  at Arlington on January 1st and at Littlestone-on-Sea on March 18th,  $23^{\circ}$  at Tunbridge Wells on January 1st and at Liverpool on February 29th, and  $24^{\circ}$  at Dungeness and Southampton on January 1st and at Clifton on February 29th. In Ireland, Markree Castle fell to  $19^{\circ}$  on March 2nd, and Glasnevin to  $23^{\circ}$  on March 11th. An interesting feature of the opening months of the year was the general absence of anything like severe frost. Although Braemar touched  $11^{\circ}$  and Bramley  $12^{\circ}$ , comparatively few of the minima during the three months January to March were below  $25^{\circ}$ , London's lowest reading for the whole winter being only  $27^{\circ}$ .

By far the coldest part of the year occurred between November 21st and 29th, exceptionally, even unprecedentedly, low temperatures for the period being registered, mainly on the 24th over northern and eastern England, when the minimum was  $7^{\circ}$  at Woburn,  $8^{\circ}$  at Cambridge,  $9^{\circ}$  at Oundle,  $10^{\circ}$  at Garforth and Buntingford,  $11^{\circ}$  at Hereford, and below  $20^{\circ}$  at many other stations. In Ireland the lowest was  $20^{\circ}$  at Armagh and Edenfel on the 22nd, and Birr Castle had  $21^{\circ}$  on the 25th. About this time Scotland's lowest was  $7^{\circ}$  at Braemar on the 26th, and  $12^{\circ}$  at



Nairn and Fort Augustus on the 22nd, and at Crathes on the 26th, but a fortnight later Lairg went down to  $10^{\circ}$  on December 10th, and next day Braemar touched  $6^{\circ}$ , the lowest value of the year in the whole Kingdom.

In the inland parts of England the annual range of temperature exceeded  $70^{\circ}$  in many localities, being more than  $79^{\circ}$  at Cambridge and Woburn and  $76^{\circ}$  at Buntingford. The range was smallest in the extreme north and south-west,  $40^{\circ}$  at Sunburgh Head,  $39^{\circ}$  at Deerness, and  $37^{\circ}$  at Scilly.

7. *The Brilliant Summer.*—One of the most interesting climatic features of the year was the abnormal brightness of the four months, June to September, when there was an appreciable excess of sunshine all round, in many places the aggregate for the entire period being an hour or more per day above the average. At Westminster the total duration of bright sunshine for the 122 days was 823 hours, being 202 hours more than usual. At Margate the excess was 179 hours, at Llandudno 172 hours, at Cambridge 157 hours, and even in the Hebrides it was 134 hours. The month which had the largest excess was July, with totals which were two hours or more per day above the average in various localities in the south-eastern quarter of England, the Margate total showing an excess of 70 hours, Westminster 80 hours, and St. Leonards 88 hours. It would be natural to infer from these remarkable records that there was a preponderance of very warm weather during the four months, but this was not so. With the exception of the brief spells of high temperatures in the middle of July and in the first four days of August the period, taken as a whole, was rather cool, the air temperature being below the average generally in June and August, and over England and Ireland in September; July showing an excess nearly everywhere, but in comparatively few places did it amount to  $2^{\circ}$ , and Scotland had a small excess in September.

8. *Fog.*—During the earlier months fog was both rare and unimportant. On May 27th London was visited by a singular and intensely dark foggy gloom, which necessitated general recourse to artificial light at midday, both indoors and in the streets. The phenomenon was attended by oscillations of the barometer of a somewhat unusual character. Towards the end of September fog became abnormally frequent and extensive, often exceedingly dense, and in parts of England at times lasting through one to four days without any interruption. Each of the closing months was marked by very foggy periods, the culminating point being reached on nearing Christmas, when the atmosphere became so thick and foggy over the region between the Straits of Dover and the Irish Sea that for days traffic by sea and land was seriously delayed, and in some cases entirely suspended. It was not until December 27th that the air was finally cleared.

9. *Rapid Barometric Changes.*—On the passage of some of the deep disturbances of the year unusually rapid fluctuations of pressure were experienced in the extreme north of Scotland. Between 3 a.m. and 7 a.m., April 6th, the barometer at Stornoway rose 0.71 in.; in the night of October 5th-6th it fell at the same station for eight hours at the rate of more than 0.1 in. per

hour, and on the morning of December 5th it rose 0·33 in. in two hours. From 7 a.m. to 8 a.m., December 30th, it rose 0·19 in. at Aberdeen and 0·23 in. at Wick.

10. *High Tides*.—At the beginning of February an exceptionally high spring tide flooded the low-lying portions of the southern and south-western coasts of England, being coincident with the advance of a deep barometric depression (below 29 ins.) over the English Channel. In the night of December 30th–31st a similar high tide flooded the east coast of England and the Thames Valley, a deep barometric depression (below 29 ins.) and a North-Westerly gale moving across the North Sea.

11. *Dust Storm*.—During the intense heat experienced on August 4th, the observers at Lincoln and Colly Weston reported a severe dust storm in the middle of the afternoon, the weather in surrounding districts being marked by thunderstorms. At Lincoln the dust obscured trees at a distance of half a mile.

12. *Earthquake Shocks*.—In the middle of the afternoon of July 3rd shocks of earthquake were felt in many places within the area from Gloucestershire to Yorkshire, and from North Wales to Lincolnshire. On November 9th earth tremors were reported at Isleworth, and two days later at Oundle.

#### STORM WARNING CHECKING.

COMPARISON between the WARNINGS and the subsequent WEATHER in 1904.

Coasts.	Total No. of Warnings.	Warnings justified by subsequent Gales. Force 8 and upwards.	Warnings justified by subsequent strong Winds. Forces 6 & 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 issued in consequence of telegraphic errors.	Storms for which no Warning was issued.
Scotland, N.E. ...	41	27	8	5	—	1	—	June 16 ; Dec. 29.
.. E. ...	30	15	9	6	—	—	—	June 16.
.. N.W. ...	50	23	21	5	1	—	—	
.. W. ...	49	27	14	7	1	—	—	Sept. 9.
Ireland, S.W. ...	51	30	13	1	2	2	—	Sept. 9.
.. N.W. ...	56	31	23	1	—	1	—	Sept. 9.
Irish Sea ...	43	34	5	1	—	3	—	Sept. 9.
St. George's Channel	37	18	17	1	—	1	—	
Bristol Channel ...	40	29	8	1	1	1	—	Oct. 3.
England, S.W. ...	36	26	8	1	—	1	—	Oct. 3.
.. S. ...	29	17	12	—	—	—	—	Oct. 3.
.. S.E. ...	28	21	4	1	1	1	—	
.. E. ...	22	9	12	1	—	—	—	
.. N.E. ...	27	13	10	2	1	1	—	June 16.
Totals ...	539	320	164	36	7	12	—	
Percentages...	—	59·4	30·4	6·7	1·3	2·2	—	

GALES EXPERIENCED in 1904 for which no WARNINGS  
were issued.

These were few in number, and, as a rule, of little severity. They occurred on the following dates :—

*June 16th, in Scotland, N.E. and E., and England, N.E.*—A South-westerly gale, due to the passage north-eastwards of a depression of unusual intensity for the time of year. The west and north-west coasts were all warned, but the disturbance extended laterally eastwards further than was anticipated, and the gale spread down the north-east coasts as far south as the Tyne.

*September 9th, on nearly all the western coasts, from Scotland, W., to the Bristol Channel, and including Ireland.*—This was quite a sporadic gale, less than half the stations in the districts reporting a wind force exceeding 7 (Beaufort scale). It was due to an unexpectedly brisk increase of pressure which took place in the rear of a disturbance travelling north-eastwards along our extreme N.W. and N. coasts, and on to Norway. The wind consequently blew very strongly from the Westward, and reached the force of a gale at some of the more exposed stations.

*October 3rd, in the Bristol Channel, England, S.W., and England, S.*—In the course of Sunday, October 2nd, a small depression was developed near the mouth of the English Channel, and at 6 p.m. the wind in that neighbourhood was blowing strongly from the North-eastward. The disturbance was, however, expected to move away to the southward during the night, so that no warnings were issued. The southerly movement took place, but more slowly than was anticipated, and as the barometer rose briskly in the rear of the depression, a gale from E. to N.E. prevailed for a short time in the districts named.

*December 29th, in Scotland, N.E.*—A strong to whole gale from the Westward, caused by a depression which moved quickly down from north-west on the night of the 28th. At 6 p.m. of the 28th the conditions in the west appeared rather threatening, and warnings were issued to Ireland and the west of Scotland. By the following morning the gale in the N.E. had already set in, and it was therefore too late to take further action.

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COMPARISON OF THE FORECASTS ISSUED AT 8h. 30m. p.m., WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 months April, 1904, to March, 1905. The results are for the United Kingdom as a whole.

The letters used have the following signification :—

a=complete success.

b=partial (more than half) success.

c=partial failure.

d=total failure.

The checking has been conducted on the same system as that employed in previous years, *i.e.*, each forecast has been considered under the separate headings of "Wind" and "Weather." The results are for the 8.30 p.m. Forecasts only.

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 various districts is given at page 23.

Months.		Percentages.			
		Wind.	Weather.	Average.	a + b.
April	a	45	61	53	90
	b	42	32	37	
	c	10	6	8	
	d	3	1	2	
May	a	55	69	62	89
	b	29	24	27	
	c	13	5	9	
	d	3	2	2	
June	a	53	63	58	92
	b	35	32	34	
	c	11	4	7	
	d	1	1	1	
July	a	63	65	64	89
	b	24	25	25	
	c	11	8	9	
	d	2	2	2	
August	a	38	66	52	87
	b	41	28	35	
	c	18	4	11	
	d	3	2	2	
September	a	58	72	65	89
	b	24	23	21	
	c	14	5	9	
	d	4	0	2	
October	a	43	64	54	85
	b	34	27	31	
	c	19	8	13	
	d	4	1	2	

Months.		Percentages.			
		Wind.	Weather.	Average.	a + b.
November	a	54	59	57	87
	b	28	33	30	
	c	14	6	10	
	d	4	2	3	
December	a	46	69	58	86
	b	33	23	28	
	c	17	7	12	
	d	4	1	2	
January	a	51	65	58	90
	b	34	30	32	
	c	14	4	9	
	d	1	1	1	
February	a	51	63	57	89
	b	31	32	32	
	c	17	4	10	
	d	1	1	1	
March	a	33	66	50	86
	b	45	28	36	
	c	20	5	13	
	d	2	1	1	
The entire year	a	49	65	57	88
	b	33	28	31	
	c	15	6	10	
	d	3	1	2	



## APPENDIX II.

THE METEOROLOGICAL OFFICE, 63, Victoria Street, London, S.W.

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### AN ACCOUNT OF THE WORK OF THE METEOROLOGICAL OFFICE DURING THE PAST FIFTY YEARS.\*

#### I.—THE METEOROLOGICAL DEPARTMENT OF THE BOARD OF TRADE.

On June 15th, 1854, the President and Council of the Royal Society were informed by the Board of Trade, then under the presidency of Mr. Cardwell, that it was proposed to establish a Department for the discussion of Meteorological observations made at sea in all parts of the Globe; and their opinion was asked as to the desiderata of Meteorological Science to which that Department should direct its attention.

The reply of the Royal Society is dated February 22nd, 1855, but before that time Captain FitzRoy, of the Royal Navy, who had commanded the "Beagle," when Charles Darwin made his voyage, had been appointed to assist the Board in the discussion of the observations. A circular was prepared for issue in September, 1854, asking for the co-operation of the captains of vessels and inviting their attention to the Report of the Conference "which, at the suggestion of Lieutenant Maury, of the United States navy, was held at Brussels (in 1853) on the subject of establishing an uniform system of meteorological observations at sea, and concurring in a general plan of observations on the winds and currents of the ocean, with a view to the acquirement of a more correct knowledge of the laws which govern the motion of those elements, and to the improvement of navigation." "At the beginning of 1855 an Office was established at the Board of Trade."

In the first "Report of the Meteorological Department of the Board of Trade," presented to Parliament in 1857, Admiral FitzRoy

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\* The early history of the Office is taken from the following publications:—Report of a Committee (Francis Galton, Esq., F.R.S., Staff-Commander Evans, R.N., F.R.S., and T. H. Farrer, Esq.) appointed to consider certain questions relating to the Meteorological Department of the Board of Trade, presented to Parliament, 1866; the official publications of the Department; "An explanation of the Meteorological Telegraphy and its basis now under trial at the Board of Trade," Lecture at the Royal Institution by Rear-Admiral FitzRoy, F.R.S., Friday, March 28th, 1862. "On the Work of the Meteorological Office, Past and Present," Lecture at the Royal Institution, Friday, April 30th, 1869, by Robert H. Scott, Esq., M.A., Director of the Meteorological Office.

gives an indication of the steps which led up to the establishment of the Office as follows :—

“In the early part of this century, while Mr. Marsden was Secretary of the Admiralty, the want of collected and combined information respecting the ocean was so often felt by that able public servant that he suggested a plan for arranging, or grouping, all that could be obtained in certain convenient divisions of the seas. He then proposed the method of squares as suitable and convenient in practice.

“In 1831 a systematic commencement of a collection and discussion of Meteorological observations made at sea was undertaken at the Hydrographical Office of the Admiralty, upon a similar principle; but pressure of other duties, and the limited extent of means then applicable, impeded a continuance of the collection, which was scarcely more than commenced.

“The 12 large volumes (one for each month) prepared for the Indian Ocean, as being less known than the Atlantic, are now in this Office, with their corresponding charts subdivided into numbered squares.

“This useful arrangement, dividing the Ocean into squares, which affords the means of grouping and averaging observations, as well as identifying spaces of sea, like provinces of land, was thus originated at the Admiralty.

“In the year 1838 a system of Meteorological observations on an extensive scale was strenuously advocated by the author of the ‘Law of Storms’ (Sir William Reid), and chiefly in consequence of his arguments, officers of the Royal Engineers at detached stations and Consuls in foreign ports, were requested to collect and transmit such observations.\*

“But probably the more immediate object in view at that time was the investigation of storms affecting the safety of ships rather than the duration of their passages; and it was not till Lieutenant Maury, of the United States, fully appreciating what had been previously done in the wide field of research which he was then contemplating, commenced those extensive undertakings, already so useful, which have earned deserved praise for their accumulation of facts, for their useful advice, and valuable results.

“The maritime commerce of nations having been extended over the world to an unprecedented degree, and competition having reached such a point that the value of cargoes and the profits of enterprise depend more than ever on the duration and nature of voyages, it is obviously a question of the greatest importance to

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\* As it has been said that “we want observations in unknown, unfrequented places, rather than in the beaten tracks,” it may here be remarked that we require to know all particulars about the most frequented localities, as a first necessity, besides what can be collected about other places generally. Mercantile navigation cannot be too much facilitated by information of the most complete description. The wants of inexperienced persons should be kept in view, not the fleeting acquirements of those who have passed their ordeal.

determine the very best tracks for ships to follow in order to make the quickest as well as the safest passages. The employment of steamers in such numbers, the prevalent endeavour to keep as near the *direct* line between two places (the arc of a great circle) as intervening obstacles, currents, and winds allow, and the general improvement in navigation, cause a demand for more precise and readily available information respecting all frequented parts of the oceans.

“Not only greater accuracy of detail, but more concentration and arrangement of the existing though scattered information (so difficult to obtain speedily), are now required. Besides which instrumental errors have vitiated many results, and have prevented a considerable portion of the meteorological observations made at sea from being considered better than rough approximations.

“‘It is one of the chief points of a seaman’s duty to know where to find a fair wind, and where to fall in with a favourable current;’\* but with means hitherto accessible the knowledge of such matters has only been acquired by individuals after years of trial and actual experience at sea; of which the results have not been conveyed adequately to their successors.”

The Parliamentary grants for the expenses of the Office in the years 1855–6 and 1856–7 were £3,200 in the vote for the Board of Trade and £1,000 in the Admiralty vote. In return for the latter the ships of the Navy were supplied with instruments and the contribution also provided for one-half of Admiral FitzRoy’s salary as Superintendent of the Office and some clerical assistance.

The functions of the department as originally constituted may be taken as laid down in the letter of the Royal Society of February, 1855, already referred to, as the opinions therein expressed were approved by the Government. The letter is a statement of the meteorological requirements of the time, and may be briefly summarised as the determination by trustworthy observations of normal values for barometric pressure, aqueous vapour and temperature, together with the variability of each, for suitable geographical spaces. The temperature of the surface of the sea, the temperature, direction and velocity of ocean currents and their variations in different months and in different years. An examination of the varying limits of the trade winds and monsoons. The fluctuations of temperature on a large scale such as might affect simultaneously great portions of the Globe, and, as shown by a comparison of Five-day Means at fixed stations, the evaluation of diurnal corrections. Statistics of the direction and force of the wind in the most frequented parts of the Atlantic Ocean, and the establishment of stations for the continuous record of winds at the Azores, Madeira, Bermuda, Ascension, and St. Helena, are subjects included in the programme.

At the outset co-operation with the Kew Observatory, then under the control of a Committee of the British Association, in order to secure that observations should be made by comparable instruments, was a prominent feature of the operations of the

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\* Basil Hall.



Office. It has remained a prominent feature throughout the whole history of the two institutions. The effective assistance of those in control of the Meteorological Office in placing upon a satisfactory footing the system of testing meteorological instruments as practised at the present day is one of the important public services which has resulted from the establishment of the Office. The Kew-pattern Marine Barometer was one of the earliest contributions of the Observatory to the requirements of accurate meteorological observations at sea.

The collection of marine observations in accordance with the Royal Society's proposals went on as practically the sole object of the Office until Admiral FitzRoy turned his attention to the development of telegraphic weather intelligence. Weather maps based on telegraphic intelligence had been constructed during the Exhibition of 1851, and the interest in the comparison of weather reports from distant stations had developed gradually. The subject of storm warnings was discussed at the meeting of the British Association, at Aberdeen, and a resolution upon it was communicated to the Board of Trade. Admiral FitzRoy was thereupon placed in communication with a Committee of the British Association consisting of General Sabine, Professor Walker and Mr. Gassiot, and a scheme was reported to the Council of the Association under which trials were to be made of obtaining telegraphic reports from observers in various parts of the country and posting the messages received at Lloyd's or transmitting them to other selected stations.

The scheme received the approval of the authorities and out of this, after some correspondence with M. Le Verrier, Senator, and Director of the Imperial Observatory at Paris, who had established a system of telegraphing to Paris the state of the weather daily from various ports in France and other parts of Europe, Admiral FitzRoy developed a system of Storm Warning and of Weather "forecasting" as he termed it.

"Arrangements were made during the summer of 1860 for the regular daily communication by telegraph to London of the state of the weather at 15 stations in the United Kingdom, for receiving daily telegrams of weather from various places in Europe through Paris, and for the daily communication by telegram to Paris of the state of the weather at certain points in the United Kingdom.

"The facts thus communicated to the Meteorological Department were thenceforth published in the daily papers."

"At the same time Admiral FitzRoy made arrangements for hoisting Storm Signals and Weather Warnings at certain ports and they were hoisted for the first time in February, 1861. In August, 1861, a great extension of the weather predictions took place, first in extending the Storm Signals to many places not previously warned, viz., to 130, as it would seem, instead of to 50 places as at first; and in making Daily Forecasts of the Weather in the newspapers."\*

The Committee continue "The system of Telegraphy, of Storm Warnings, and of Daily Forecasts has since been continued, and is

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\* Report of 1866 Committee, p. 19.



now carried on with great zeal and intelligence by Mr. Babington, who, during the latter months of Admiral FitzRoy's life, had the principal management of it. The public have taken great interest in it, and there can be no doubt that the Storm Warnings are very popular at the ports. Foreign Governments have shown much interest in the system. The predictions of the English office have been sent daily to Paris. M. Le Verrier has organized a system of Storm Warnings similar to our own, and also publishes daily a very full Bulletin of the actual weather, illustrated with maps of barometric pressure and of wind. The Bulletin and map are published by a private person, but under the control of the Imperial Observatory, and may be subscribed for like any other newspaper. For some time his Bulletin contained predictions of the probable weather for different parts of France, but we observe that these daily predictions have been recently discontinued. Professor Dove, at Berlin, has recently organized a system of occasional Storm Warnings, similar, we believe, to our own. Italy has lately been establishing a system of Storm Warnings on an independent plan.\* Holland has also established a system of occasional Storm Warnings, and Russia is doing the same. Occasional Storm Warnings are sent from the English Meteorological Office to Denmark, Sweden, Hanover, Hamburg, and Oldenburgh, at the request of the authorities in those countries."

The expenditure of the department had diminished to £3,107 in 1860-1, which amount included £218 for Telegraphy and Storm Warnings, but it was increased to £7,104 in 1863-4 including £2,989 for the same item of account.

In April, 1865, Admiral FitzRoy died. His name will be remembered by Meteorologists not only on account of the introduction of the practice of issuing Storm Warnings with the arrangement of the cone-and-drum system of signalling and the initiation of Weather Forecasts,† but also as the author of the "Weather Book," and as associated with the form of the barometer which was issued by this Office under his direction for the use of fishing communities, and with the so-called "Storm Glass" which has dropped out of scientific practice. To this period must be referred the original editions of the "Barometer Manual for the use of Seamen," and the "Fishery Barometer Manual" which are still continued as publications of the Office in an altered form. The official meteorological publications during the period of his superintendence include various quarterly wind charts and other marine charts and 14 meteorological papers on

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\* See correspondence between M. Matteucci and Admiral FitzRoy in Report of Meteorological Department for 1864, pp. 33 to 36.

† The concluding paragraph of the report of the Committee of 1866, is as follows: "We feel moreover that we should be doing great injustice to ourselves if we were to allow it to be supposed that we undervalue either what the late Admiral FitzRoy attempted or what he effected. To his zeal and perseverance is due the credit of establishing a system of Storm Warnings which is already highly prized by the seafaring class; and, if a more scientific method should hereafter succeed in placing the practice of foretelling weather on a clear and certain basis, it will not be forgotten that it was Admiral FitzRoy who gave the first impulse to this branch of inquiry, who induced men of science and the public to take interest in it and who sacrificed his life to the cause."

miscellaneous subjects. The latter include synoptic charts of the weather during the "Royal Charter" Storm, October 21st to November 2nd, 1859; a translation of Dove's "Law of Storms," with an appendix by FitzRoy; and observations from various parts of the World. The last three papers were issued after Admiral FitzRoy's death.

While the further provision for its constitution was under consideration the superintendence of the Office was in the hands of Mr. T. H. Babington, who retired in December, 1866.

## II.—THE METEOROLOGICAL COMMITTEE OF THE ROYAL SOCIETY.

The next period in the history of the Office extends from the beginning of the year 1867 to June, 1877. The Board of Trade had taken notice of the fact that the Storm Warnings and Forecasts engaged more and more of Admiral FitzRoy's attention and that "the whole or almost the whole of the funds originally voted for the purpose of observations were thus diverted from their original scientific object to an object deemed more immediately practical," and in 1863 they asked the opinion of the Royal Society upon the course then being pursued. On 26th May, 1865, after the death of Admiral FitzRoy, the Board of Trade made a further application to the Royal Society for advice, and in consequence the Committee, already referred to, was appointed to consider and report upon the progress made with the marine work of the Office, and the question of its continuance, and upon the possibility of improvement in the system of Weather Telegraphy assuming it to be continued.

The Committee went very thoroughly into the work of the Office and recommended the continuation "of the meteorological observations at sea, until a sufficient number of observations has been obtained to fulfil the requirements of the Royal Society for the accessible parts of the Ocean," the discontinuance of the Daily Forecasts, the improvement of the Storm Warnings, and "above all we think that steps should be taken for establishing a full, constant and accurate system of shewing changes of weather in the British Isles."

They gave detailed recommendations of the mode of dealing with the weather of the British Isles, which included the establishment of six self-recording observatories, the daily collection of observations by telegraph and the issue of a daily report. They looked forward to the establishment at no distant period of a regular record of the weather changes over the greater portion of the Globe through international effort, and especially by means of the observations of British subjects ashore and afloat, but they made no specific recommendations on the subject. They estimated the annual cost of the operations at £10,500 a year, besides £2,500 for outfit. Part of the annual cost was expected to cease apparently when the marine work had been completed.

As the result of this report, after further correspondence with the Royal Society, a sum of £10,000 was assigned in the Estimates for 1867, as a "grant in aid" for the service of the Office, and the Royal Society was asked to nominate a Committee to control the administration of the grant. Communications with the Government took place through the Board of Trade, but the Office ceased to be a department of that Board.

The Committee appointed by the Royal Society consisted of:—

Lieut.-General Sabine,	}	Members of the Kew Committee.
President of the Royal Society.		
Mr. Gassiot,		
Dr. W. A. Miller,		
Mr. de la Rue,	}	Officers of the British Association,
Mr. Francis Galton,		
Mr. W. Spottiswoode,		
The Hydrographer to the Admiralty.		
Colonel Smythe.		

"The Committee, whose services were rendered gratuitously, met for the first time at Burlington House, on the 3rd January, 1867, and at once selected the following gentlemen to fill the superior offices at the disposal of the Committee:—

Mr. Robert H. Scott, Director of the Office.

Capt. Henry Toynbee, of the Mercantile Marine, as Marine Superintendent.

Mr. Balfour Stewart, as Secretary to the Committee, and Director of the Normal (Kew) Observatory." \*

It will be noticed that the close relations between the Office and the Kew Observatory were fully maintained and, indeed, emphasized. In the course of the administration of the grant by the Committee there was some danger of the operations of the Office being seriously crippled in the year 1871 "when the British Association withdrew its annual subsidy to Kew Observatory. . . Had not Mr. Gassiot, one of their own body, come forward and most munificently placed in the hands of the Royal Society a sum of £10,000 for the endowment of the establishment, thereby affording ample funds for the continuance of the Observatory in full activity."

In 1869 Dr. Balfour Stewart resigned the office of Secretary and such portions of his duties as were connected with the secretaryship and the relations with the outlying observatories devolved upon Mr. Scott. Otherwise the chief appointments of the Office remained in the same hands throughout the period of the administration of the Committee.

The changes in the Committee were not numerous. In 1870, Dr. W. A. Miller died, and in April, 1871, Sir Charles Wheatstone was

\* Report for 1867, p. 5.



appointed in his place. In 1873 Major-General R. Strachey took the place of Mr. Spottiswoode who resigned, Captain Evans succeeded Rear-Admiral Richards as Hydrographer, but the retiring Hydrographer was continued as a member of the Committee, and the Earl of Rosse was named as an additional member, the number being increased to ten. In 1875 Sir Charles Wheatstone died, and his place was not filled.

At the outset the Committee were somewhat unfortunate. Their grant of £10,000 made no provision for the initial outlay contemplated by the Committee of Inquiry and the contribution from the Admiralty votes of £570 for meteorological work for the Admiralty was withdrawn after the first year. Moreover at the commencement of operations the Committee had the advantage of the use of an office in Parliament Street belonging to H.M. Office of Works rent free, and this advantage also came to an end after about one year. By June 1st, 1868, the Committee had rented and furnished rooms at 116 (now 63) Victoria Street, where the Office is still housed.

The work of the Committee is set forth in a Report presented by them to the President and Council of the Royal Society in 1876. The system of collecting observations at sea had been re-introduced and discussion had been undertaken of the observations, particularly those relating to square 3 of Marsden's chart  $0^{\circ}$  to  $10^{\circ}$  N. and  $20^{\circ}$  to  $30^{\circ}$  W. (Publication O. 20.) "This is the most elaborate paper ever published for any portion of the Ocean; and the large relative proportion of labour bestowed on the district is justified by the considerations that the amount of material existing for it is quite exceptional, and that it lies in the high-road between the North and South Atlantic, and is the meeting place of the two trade-winds." Charts for the nine squares (lat.  $10^{\circ}$  S.- $20^{\circ}$  N., long.  $10^{\circ}$ - $40^{\circ}$  W.), of which square 3 forms the centre were in the press at the time the report was prepared.

Other marine publications of this period were :—

- "O. 4. Charts of Surface Temperature for the South Atlantic."
- "O. 11. Contributions to our knowledge of the Meteorology of Cape Horn and the West Coast of South America."
- "O. 12. The Currents and Surface Temperature of the North Atlantic."
- "O. 13. On the Weather in the North Atlantic in February, 1870."
- "O. 18. Contributions to our knowledge of the Meteorology of the Antarctic Regions." A discussion of the materials contained in the logs of H.M.S. "Erebus" and "Terror."

The following works were translated or reprinted by the Office:—

- "N.O. 4. Routes for Steamers from Aden to the Straits of Sunda and back." Translated from a paper of Lieut. J. E. Cornelissen of the Royal Meteorological Institute, Utrecht.



“N.O. 5. On the Winds, &c., of the North Atlantic along the tracks of Steamers between Europe and America.” Translated from a paper of Herr von Freeden, of the Deutsche Seewarte, Hamburg.

“N.O. 7. Notes on the Form of Cyclones in the Southern Indian Ocean.” Reprint of a paper by C. Meldrum, M.A., F.R.S., Secretary of the Meteorological Society of Mauritius.

In Weather Telegraphy the improvement of the instrumental equipment and the inspection of the stations was the primary step. The inspections were carried out annually. “Much that was objectionable has been gradually improved and at present 16 out of the 29 stations are provided with the Stevenson’s Thermometer Screen.”\* The Daily Weather Report had been gradually developed; 8 a.m. observations were received from 29 stations in the United Kingdom and from 22 on the Continent, instead of 16 in this country and 4 on the Continent as previously. The stations were regularly inspected, telegraphic errors were corrected as far as possible, and a monthly sheet of corrections and additions was initiated. In place of an issue of “a very few copies only to certain newspapers and one or two subscribers,” 10 written copies were prepared for newspapers and 595 lithographed copies of the observations, illustrated by charts—a novel feature—were printed of which 300 were issued to subscribers and the others sent free to Public Offices or for exhibition at seaports, or in return for observations from volunteer observers. Furthermore the information was supplemented by a weekly summary of the weather over North-Western Europe, “calling attention to the more general changes reported.” Since January 1st, 1876, arrangements had been in operation by which a chart for 6 p.m. is supplied to the “Times” at the expense of that journal—it is still continued.

In December, 1866, immediately before the first appointment of the Committee, the issue both of Storm Warnings and Forecasts had been discontinued on the ground that the state of meteorological science was not sufficiently advanced to enable the predictions to be placed upon a sound basis of principle. “The warnings, however, were very popular; several memorials were presented to Parliament, praying for their restitution; and ultimately in May, 1867, the Committee were requested by the Board of Trade to give some intimation of Storms.”† They commenced by announcing to various ports the state of the weather at other ports where storms had set in, leaving the people in the locality to make their own inferences from the information, supplemented by what could be obtained from the variations of the barometer supplied by the Office or the National Lifeboat Institution, interpreted with the assistance of the Fishery Barometer Manual. Captain Toynbee devised a system of semaphore telegraphy to convey the information to ships but after some time it was discontinued. The practice of sending information seems to have developed into a regular system of Storm-warning for we find that in the Committee’s report of 1876

\* Report (Proc. Roy. Soc., Vol. 24, 1876, No. 166, p. 196).

† Scott, R. J. lecture. p. 5.

(Proc. Roy. Soc., Vol. 24, 1876, p. 200), Mr. Scott to whom "the issue of Storm Warnings, &c., has necessarily been confided by the Committee," makes reply to the inquiry "How far the principles by which he is guided admit of being formulated." In that reply we find an indication of the general introduction of the isobaric method of dealing with weather, with its cyclones or depressions, and secondary cyclones or satellite depressions. The introduction of these ideas, the common application of Buys Ballot's Law, and the idea of barometric gradients are the characteristics of the advance in the scientific treatment of meteorology by synoptic charts since FitzRoy's time. A comparison of FitzRoy's synoptic charts of the "Royal Charter" Storm with a weather chart of to-day would put in concise form an effective comparison between the two periods.

The papers which are referred to by the Committee as the work effected in the department of Weather Telegraphy are :—

N.O. 1. By Mr. Scott on Buys Ballot's Law and barometric gradients.

N.O. 2. By Captain Toynbee on the barometric variations experienced by Steamers crossing the Atlantic in either direction.

N.O. 3. By Captain Toynbee on the use of isobaric curves.

O. 13. By Captain Toynbee, undertaken to throw light on the storm in which the "City of Boston" is supposed to have foundered. "It is the most elaborate discussion of Atlantic weather which has appeared."

But the Committee's most important contribution to meteorological science is their organisation of the Land Meteorology of the British Isles, "in accordance with the plan sketched out in the letter of the President and Council of the Royal Society to the Board of Trade of June 15th, 1865, approved by the Committee of Inquiry (1866) and sanctioned generally by the Treasury in a letter to the Board of Trade, dated November 30th, 1866."

Meteorological observatories with a full equipment of self-recording instruments were established at Kew, Falmouth, and Stonyhurst in England, at Aberdeen and Glasgow in Scotland, and at Armagh and Valencia in Ireland. With the exception of Valencia, for which a building had to be specially provided, the instruments were entrusted to existing scientific institutions. A most careful and effective system of recording, tabulating and checking was elaborated. At Kew, Falmouth, Aberdeen, and Valencia, the recording and tabulating has gone on practically in the form originally adopted for the past 36 years. The instruments have also remained at Glasgow and Stonyhurst in active operation though, since 1884, the Office has only made a small annual contribution to the expense of maintaining them. The publication of the Quarterly Weather Report was initiated, it included the actual reproduction of the autographic curves by means of plates produced upon a system devised by Mr. Galton and Mr. de la Rue. "It may be asserted without fear of contradiction that no record of a completeness and accuracy at all approaching that attained by the plates in question, has yet been

attempted in any other country, and that, moreover, the Meteorological Office is the only meteorological establishment which itself publishes the materials for testing the accuracy of its own numerical values." \*

Mr. Galton also devised an instrument for determining vapour pressure from the curves of the wet or dry bulb which is still at the Office. "The text of the Quarterly Weather Report has been a consecutive journal of the weather, and the tables have given the five-day means of the barometer and the dry and wet thermometers from hourly measurements of the curves, together with the monthly means of the same elements, and of vapour tension and deduced dry air pressure as well as the extreme readings of the barometer and dry thermometer."

"A request having been made for the publication of the actual hourly readings of the measurements of the curves, this has been complied with. These volumes have been issued since January, 1874, and distributed to the principal libraries at home and abroad."

The Quarterly Weather Report was also used as the medium of publication of various contributions to meteorological science, the following papers are mentioned by the Committee :—

1869. Notes on Easterly gales.

1870. Mean barometrical pressure at telegraphic reporting stations.

Rainfall at telegraphic reporting stations.

A translation of Bessel's paper on the Determination of the Law of a Periodical Phenomenon.

1871. A discussion of the anemometrical results for Sandwick Manse, Orkney.

Mean monthly rainfall at certain stations in the United Kingdom.

Constants for Bessel's Formula for the Observatories for 1869–70.

1872. Discussion of the anemometrical results at Bermuda.

1873. Rainfall of the London district for 60 years, 1813–1872, by G. Dines, F.M.S.

Results of observations taken at certain stations of the Second Order for the year 1873.

The last-mentioned paper suggests a reference to the development of what may be called International Meteorology. It will be remembered that the Committee of Inquiry in 1866 suggested that it might be possible by international co-operation to obtain an indication of the course of important meteorological changes over the greater part of the Globe. Agreement as to the form and extent of the material which could be contributed by the several organisations is one of the preliminary steps in such an enterprise and is a natural subject for discussion at an International Congress. During the administration of the Committee, Mr. Scott was authorised to attend a conference held at Leipzig in 1872. At this conference a permanent international committee was appointed, with M. Buys Ballot as secretary. This led up to an

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\* Report Proc. Roy. Soc., Vol. 24, 1876, p. 206.



International Congress at Vienna, in 1873, at which Mr. Scott was appointed Secretary of the Permanent Committee. The Committee drew up a statement as to the form in which observations should be published for the common purposes of meteorologists, and suitable hours of observation, and suggested the number of stations from which observations should be contributed by the several countries. A station with continuous automatic records or hourly readings was denoted a "First order station," a station observing twice a day at least (9 a.m. and 9 p.m. in this country) with certain supplementary observations was called a "Second Order Station." From this country observations were asked for from 15 stations. To comply with the request negotiations were opened with the Meteorological Society of London (now the Royal Meteorological Society) for the supply of copies of suitable observations, as the office stations for the most part did not fully comply with the requirements of a Second Order Station. This was the commencement of an arrangement which was subsequently extended to the Scottish Meteorological Society and has been continued with certain modifications until the present time.

Among the subjects to which the attention of the Committee was directed may be mentioned the improvement of deep sea thermometers, with which Dr. W. A. Miller in particular was concerned,\* and the provision of self-recording rain gauges for the Observatories in connexion with the Office.†

In concluding their report the Committee express the general principles which guided them in their administration from which the following paragraphs may be selected :—

"They have also felt that, in the existing condition of meteorological knowledge, it would have been not only presumptuous on their part, but positively mischievous to have attempted to assume a position of authority in enunciating new doctrines of their own or in criticising the opinions of others, and that their power of producing useful results would have been seriously impaired if they had in any way departed from the purely neutral attitude of accumulating a faithful record of facts destined to furnish materials for scientific discussion.

"Although there exists a large quantity both of published and unpublished data in the possession of the Office, which places their staff in an exceptional position for conducting elaborate investigations into the conditions of the weather, nevertheless the Committee have found it impossible to provide for the adequate carrying on of such investigations by means of their own staff, the time of their chief executive officers being so much occupied by the heavy current business of the Office, as to leave them no leisure for the purpose; nor have the Committee been able to assign out of the funds at their disposal enough to secure additional assistance of a proper scientific character. If they had diverted any of these funds to purely scientific discussions it would have crippled other parts of their work, which appeared to them, under the existing conditions and for the time being, to be still more important and to be, in a measure, obligatory on them.

\* Proc. Roy. Soc., Vol. 17, p. 482.

† Report, 1869, p. 36.



"Lastly. They feel it necessary to say that for the further advancement of Meteorology greater attention to its more strictly scientific aspect will in the future be essential. Merely empirical rules, however sound be their foundation, can never become really trustworthy guides of action until the principles that underlie them are established, and the circumstances are appreciated under which deviations from the ordinary course of events arise. It can hardly be disputed that in the course of the past nine years, since the appointment of the Committee, the general progress of the science of Meteorology in this country and abroad, has been such that the application to it of exact principles seems to have become not only possible but requisite; without them the full practical advantage of existing means of observation will not be secured, and it is only by aid of scientific discussion of the facts that these principles are to be ascertained."

The superintendence and control of a number of stations at a distance from a central office, in such a manner as to obtain an effective system of observations, are a work of no little difficulty, and the success which attended the efforts of the Meteorological Committee in this direction must be regarded as an achievement of no inconsiderable magnitude. So long as an investigation is limited to observations at a single station, incidental errors and indeed constant differences from the readings of normal instruments are of comparatively little importance, but for observations made at one place and by one observer with one set of instruments, to be usefully employed by an investigator who compares the results with observations made elsewhere, the most elaborate precautions are necessary to avoid chaotic results. The admirable arrangements made by the Committee are successfully followed to this day.

### III.—THE METEOROLOGICAL COUNCIL.

The third period in the history of the Office is by far the longest; it extends from the beginning of July, 1877, to the 31st March, 1905, during which the Office was under the direction of the Meteorological Council.

It was understood when the Committee was first constituted in 1867 that the arrangement was provisional, and indeed a period of three years was suggested in the first instance. But the Government took no steps in the matter until the Scottish Meteorological Society made an application for a separate grant for its general purposes. Thereupon the Treasury appointed a Committee, with Sir William Stirling Maxwell as chairman, to inquire into the administration of the Parliamentary Grant and make recommendations for its future management. The Committee recommended that the Meteorological Committee of the Royal Society should be replaced by a paid Council of six members, of whom the Hydrographer of the Navy was to be a member, *ex officio*, and the remaining five were to be nominated by the Royal Society. The Council was to make an annual report of its proceedings to the Royal Society and to account to the Treasury for the expenditure of the grant, which was increased

to £14,500 a year in accordance with the recommendation of Sir W. Stirling Maxwell's Committee. The Committee had indeed recommended the transfer of the ordinary marine work of the Office to the Admiralty, but this recommendation was not carried out. In the appropriation of the grant suggested by the Committee a sum was expressly assigned for special researches, an assignment which had been desired by the Meteorological Committee in its report upon the work of the Office.

The first Council was constituted as follows :—

Professor H. J. S. Smith, F.R.S., Chairman.

Mr. Warren de la Rue, D.C.L., F.R.S.

Captain F. O. Evans, C.B., F.R.S., Hydrographer.

Mr. Francis Galton, F.R.S.

Professor George Gabriel Stokes, F.R.S.

Lieutenant-General Richard Strachey, C.S.I., F.R.S.

Mr. Scott remained in charge of the Office as Secretary of the Council and Captain Toynbee continued to act as Marine Superintendent. Provision was made for additional scientific inspectors of the stations in connexion with the Office, the duty of inspection, except for the self-recording instruments, having previously fallen to the Director. Mr. Alexander Buchan, Secretary of the Scottish Meteorological Society, was appointed inspector of the stations in Scotland, and, somewhat later, the Reverend Clement Ley, inspector for England. Mr. Scott continued to carry out the inspection of the Irish Stations.

At the first appointment of the Council it was suggested that the new arrangement for the administration of the grant should be reconsidered after five years. At the close of that period, after correspondence between the Treasury and the Royal Society, it was agreed that the Council should be continued without any prescribed limit on the understanding that the arrangement might be terminated by a year's notice on the part either of the Treasury or the Royal Society.

The changes in the membership of the governing body during the period of the Council's administration were again not numerous. In the early part of the period Sir J. H. Lefroy acted as member *ad interim* while General Strachey was absent in India. In February, 1883, the Council lost its first chairman through the lamented death of Professor Henry Smith. The Royal Society appointed General Strachey to the office, and Mr. E. J. Stone, F.R.S., of the Radcliffe Observatory, Oxford, to take the vacant place on the Council. In July, 1884, Captain W. J. L. Wharton became a member of the Council upon his appointment to succeed Captain Sir F. O. Evans, K.C.B., as Hydrographer. In February, 1885, Mr. Warren de la Rue retired on account of failing health and his place was taken by Professor G. H. Darwin. Mr. Buchan succeeded to the place vacated at the end of 1887 by Professor Stokes upon his election as representative of the University of Cambridge in Parliament. No further change took place till 1897, when Mr. W. N. Shaw, F.R.S., was appointed to fill the vacancy caused by the death of Mr. E. J. Stone.

In 1891, partly in consequence of the difficulties connected with the acquirement of the lease of new premises at Cahirciveen for the Valencia Observatory, the Council, with the concurrence of the Royal Society, the Board of Trade, and the Treasury, secured a legal status by incorporation with the name of the Meteorological Council as an association under the "no profit clauses" of the Companies Acts. For the purpose of incorporation, which requires at least seven members, the Secretary became a member of the Association. In 1900, upon the retirement of Mr. Scott, the arrangements were revised in communication with the Royal Society with the sanction of the Treasury. Mr. Shaw became Secretary while retaining his place as a member of the Council, and Mr. Galton, who had been on the governing body of the Office from its first constitution in connexion with the Royal Society, retired. Fresh Articles of Association were adopted, under which the number of members of the Association was increased to ten, of whom five, comprising the original members of the Council, were named as Directors and continued the management of the grant, the whole body being called for consultation on the occasion of preparing the annual report and estimates. Simultaneously with this change the sum assigned for the payment of the Council was somewhat reduced.

The additional members appointed by the Royal Society were:—

The Earl of Rosse, K.P., F.R.S.; Mr. J. Y. Buchanan, F.R.S.; Mr. W. H. Dines; Professor A. Schuster, F.R.S.; Mr. R. H. Scott, F.R.S.; and subsequently—Sir J. Eliot, K.C.I.E., F.R.S.

In 1888 Captain Toynbee, the first Marine Superintendent, retired and was succeeded by the Assistant Superintendent, Lieutenant Baillie, R.N. Upon the death of that officer in 1899, Captain Campbell Hepworth, Lieut. R.N.R., at that time Commander of the S.S. "Aorangi," was appointed to the office.

From their first appointment in 1877, the Council, acting in accordance with the original intention, devoted a portion of the grant to special scientific researches. Without going into details, the following subjects taken from the reports of the Council may be mentioned with the names of those with whom they were particularly associated:—

*Phenomena of Weather and Forecasting:—*

Waves and their Relation to Storms. (Stokes.)<sup>1</sup>

Severe Storms crossing the Atlantic. (Scott.)<sup>2</sup>

\*The Abnormal Winter of 1898-9 on the Atlantic.

\*Aids to the Study and Forecast of Weather. (Clement Ley.)

\*Principles of Forecasting by Weather Charts. (Abercromby.)

The Storm of February 27, 1903. (Shaw.)<sup>3</sup>

<sup>1</sup> See O 27, p. 564.

<sup>2</sup> Report, 1887-8, p. 22; 1888-9, p. 22.

<sup>3</sup> Q. J. Roy. Met. Soc. Vol. XXIX., 1903.

\* Official publication. Nos. 142, 40, 60.



*High Level Stations and Investigation of the Upper Air:—*

- Hawes Junction Station.<sup>1</sup>
- Ben Nevis. (Scottish Meteorological Society.)<sup>2</sup>
- Observations at the Pagoda, Kew Gardens. (Scott.)<sup>3</sup>
- Measurement of the Height and Velocity of Clouds. (Strachey, Whipple.)<sup>4</sup>
- Cloud Photography. (Abney,<sup>5</sup> Stokes.<sup>6</sup>)
- Observations of Cirrus Clouds. (Clement Ley, Gaster.)<sup>7</sup>
- Determination of Upper Currents by Firing Light Shells. (Galton, Noble.)<sup>8</sup>
- Investigation by manned Balloons. (Templer.)<sup>9</sup>

*Physics of the Atmosphere:—*

- Atmospheric Electricity. (Everett,<sup>10</sup> Whipple,<sup>11</sup> Wilson.<sup>12</sup>)
- London Fog. (Abel, Frankland, W. J. Russell,<sup>13</sup> Carpenter,\* Lempfert.\*)
- Fogs in the British Isles. (Scott.)<sup>13a</sup>
- Thermodynamics of Floating Clouds. (Shaw.)<sup>14</sup>

*Wind Measurements:—*

- Bridled Anemometer. (Dines,<sup>15</sup> Stokes, Curtis.)<sup>16</sup>
- Determination of Anemometer Constants. (Stokes,<sup>17</sup> Dines.<sup>18</sup>)
- Experiments at the Office, Hersham, and at Holyhead. (Dines,<sup>19</sup> R. H. Curtis.<sup>20</sup>)

*Instruments, Apparatus, and new Observations:—*

- Barometers with Constricted Tubes. (Stokes.)<sup>21</sup>
- Sunshine Recorder. (Stokes.)<sup>22</sup>
- Hygrometers<sup>23</sup> and Evaporimeters<sup>24</sup>. (Shaw.)
- Thermometer Screen Experiments. (Gaster<sup>25</sup>, Whipple.<sup>26</sup>)
- Electrical Anemometer. (Preece.)<sup>27</sup>
- Violle's Actinometer. (Kew Committee.)<sup>28</sup>
- Pantagraphs and other Instruments for preparing Diagrams for publication. (Galton.)<sup>29</sup>
- Observations of Sea Temperature. (Evans.)<sup>30</sup>
- Earth Temperature by Electrical Thermometer. (Kew Committee.)<sup>31</sup>

*Discussion of Observations:—*

- \*Daily Synoptic Charts of the Atlantic Ocean for the Polar Year, 1882-3.

<sup>1</sup> Report, 1879-80, p. 11. <sup>2</sup> —, 1881-82, p. 18. <sup>3</sup> Quarterly Weather Report, 1876, p. [20]. <sup>4</sup> Proc. Roy. Soc., vol. 49, 1891, p. 467. <sup>5</sup> Report, 1878-79, p. 25; 1880-81, p. 33. <sup>6</sup> —, 1885-86, p. 22. <sup>7</sup> —, 1880-81, p. 31, and "Instructions for Meteorological Telegraphy." <sup>8</sup> —, 1881-82, *et seq.* <sup>9</sup> —, 1881-82, p. 111. <sup>10</sup> —, 1877-78, p. 21. <sup>11</sup> —, 1881-82, p. 29, and Rep. Brit. Assoc., 1881. <sup>12</sup> Phil. Trans., vol. 193, A., p. 289. <sup>13</sup> Monthly Weather Report, 1884, p. [i.]; 1885, p. [i.]. <sup>13a</sup> Q. J. Roy. Met. Soc., vol. 19, 1893, p. 229. <sup>14</sup> Q. J. Roy. Met. Soc., vol. 28, 1902. <sup>15</sup> Report, 1889-90, p. 42. <sup>16</sup> —, 1897-98, p. 28. <sup>17</sup> Proc. Roy. Soc., vol. 32, 1881, p. 170. <sup>18</sup> Report, 1889-90, p. 36. <sup>19</sup> Q. J. Roy. Met. Soc., vol. 15, 1889, p. 183, vol. 18, 1892, p. 165; Proc. Roy. Soc., vol. 48, 1890, p. 233. <sup>20</sup> Report, 1893-94, p. 20; 1894-95, pp. 27 and 29; 1895-96, p. 24; 1897-98, p. 21; 1899-1900, p. 104. <sup>21</sup> —, 1879-80, p. 28. <sup>22</sup> Q. J. Roy. Met. Soc., vol. 6, 1880, p. 83. <sup>23</sup> Phil. Trans., vol. 179, 1888, A., p. 73. <sup>24</sup> Quarterly Weather Report, 1877, p. [35]. <sup>25</sup> Quarterly Weather Report, 1879, p. [13]. <sup>26</sup> Quarterly Weather Report, 1880, p. [13]. <sup>27</sup> Reports, 1883-84, p. 24, *et seq.* <sup>28</sup> Report, 1889-90, p. 46. <sup>29</sup> —, 1870, p. 31; 1871, p. 24; 1878-79, p. 21. <sup>30</sup> —, 1878-79, p. 10. <sup>31</sup> —, 1895-96, p. 20.

\* Official publication.

- The Computation (1) of true average daily Means of Temperature from daily observations of maxima and minima, and (2) of Accumulated Temperatures. (Strachey.)<sup>32</sup>
- The Atmospheric Effects of the Krakatoa Eruption. (Strachey, Scott,<sup>33</sup> and Committee of the Royal Society.<sup>34</sup>)
- Harmonic Analyser. (Stokes,<sup>35</sup> Scott, Curtis.)<sup>36</sup>
- Harmonic Analysis. (Strachey<sup>37</sup>, Darwin.)
- Rainfall at Self-Recording Observatories. (Scott.)<sup>38</sup>
- Gales on Coasts of British Isles. (Brodie.)<sup>39</sup>
- \*Meteorological Atlas. (Marriott.)
- \*Systematic Tables of Monthly Rainfall in the British Isles. (Symons.)
- Seasonal Variations of Temperature in the British Isles. (Shaw and Cohen.)<sup>40</sup>
- The Treatment of Climatological Observations. (Shaw.)<sup>41</sup>
- Relation between Autumn Rainfall and Yield of Wheat. (Shaw.)<sup>42</sup>
- \*Arctic and Antarctic Meteorology. (Strachan.)
- \*The Relation between Pressure, Temperature, and Air Circulation over the South Atlantic Ocean. (Hepworth.)

To this list might be added nearly all the publications on marine meteorology issued by the Council, as shown in the list on p. 105, as these publications embody the result of the discussion of observations for specified parts of the ocean. The Barometer Manual for the use of Seamen, of which upwards of 17,500 copies have been called for, was brought up to date from time to time, and is practically a text book of marine meteorology.

Moreover, in connexion with the development of meteorological science, it may be here recalled that in addition to the researches undertaken or supported by the Council out of the funds at their disposal, others have been carried out by various members of the Office staff upon their own initiative, and contributed as a rule to the journal of the Royal Meteorological Society. The Office has been fortunate in obtaining the services of a considerable number of gentlemen who originally joined the department of the Board of Trade under Admiral FitzRoy, and their names are prominent among those who have devoted their spare time to the discussion of meteorological data.

Among the papers in the Society's Journal by members of the staff of the Office, the following may be mentioned :—

- Remarks on the Weather and Conditions of the Steamship Tracks between Fiji and Hawaii. (Hepworth.)
- The Great Frost of 1890-1891. (C. Harding.)
- Gale of October 13th-14th, 1881, over the North Atlantic. (C. Harding.)
- Storm of December 8th-9th, 1886. (C. Harding.)

<sup>32</sup> Quarterly Weather Report, 1878, p. [13]. <sup>33</sup> Proc. Roy. Soc., vol. 36, 1883-84, p. 139. <sup>34</sup> The eruption of Krakatoa, and subsequent phenomena, London, 1888. <sup>35</sup> Report, 1879-80, p. 46; 1880-81, p. 25. <sup>36</sup> Proc. Roy. Soc., 40, 1886, p. 382. <sup>37</sup> Proc. Roy. Soc., 42, 1889, p. 61; Phil. Trans., vol. 184, 1893, A., p. 617. <sup>38</sup> Quarterly Weather Report, 1877, p. [13]; Q. J. Roy. Met. Soc., vol. 25, 1889, p. 317. <sup>39</sup> Report, 1887-88, p. 26. <sup>40</sup> Proc. Roy. Soc., vol. 69, 1901, p. 61. <sup>41</sup> Journ. Scott. Met. Soc., ser. 3, 1905. <sup>42</sup> Proc. Roy. Soc., vol. 74, 1905, p. 552.

\* Official publication.

- Prevalence of Gales over British Isles, 1871-1900. (F. J. Brodie.)
- Experiments on the Distribution of Pressure upon flat surfaces, &c. (R. H. Curtis and C. E. Burton.)
- An attempt to determine the Velocity equivalents of Wind Forces estimated by Beaufort's Scale. (R. H. Curtis.)
- Prevalence of Fog in London, 1871-1890. (F. J. Brodie.)
- The Great Drought of 1893. (F. J. Brodie.)
- Decrease of Fog in London. (F. J. Brodie.)
- Sunshine Recorders and their Indications. (R. H. Curtis.)
- The Diurnal Variation of the Barometer in the British Isles. (R. H. Curtis.)
- Considerations suggested by the depressions which passed over the British Islands during September, 1873. (F. Gaster.)
- Principle and working of Jordan's Sunshine Recorder. (F. Gaster and Jas. B. Jordan.)
- Suggestions for a new Classification of Cloud Forms. (F. Gaster.)
- Means of Temperatures at the Daily and Weekly Weather Report Stations, 1871-1895. (F. Gaster and R. H. Scott.)
- Weather experienced in the North Atlantic, February and March, 1880, in relation to the loss of H.M.S. *Atalanta*. (C. Harding.)
- Contributions to the Meteorology of Natal. Observations taken by Dr. R. J. Mann. (J. S. Harding.)
- On the Weather of London from 13 years Observations. (R. Strachan.)
- The Diurnal Range of Atmospheric Pressure. (R. Strachan.)
- Height of the Barometer and Direction and Force of the Wind at London. (R. Strachan.)
- The Frequency, Size, and Distribution of Hail at Sea. (H. Harries.)
- Arctic Hail and Thunderstorms. (H. Harries.)
- Climatological Observations at an Arctic Station in Repulse Bay. (Hepworth.)

And the following translations (J. S. Harding) :—

- Frequency and Duration of Rain by Dr. W. Köppen.
- Deduction of Mean Results from Meteorological Observations by Dr. F. L. Kämtz.
- The Temperature Zones of the Earth, considered in relation to the effect of temperature upon the organic world by Dr. W. Köppen.

A few words may be added concerning the gradual development of the normal work of the Office. A weekly report upon the weather in the British Isles for agricultural and sanitary purposes was initiated in 1878 and altered in 1884 to the form in which it now appears. It was for the purpose of this report that the method of computation of mean daily temperatures and of accumulated temperatures, already referred to, was elaborated by the chairman. The purpose of the report and some of its applications were set out in a paper by the Secretary before the Royal Statistical Society in March last. (Journal R.S.S., vol. LXVIII., Part II.)

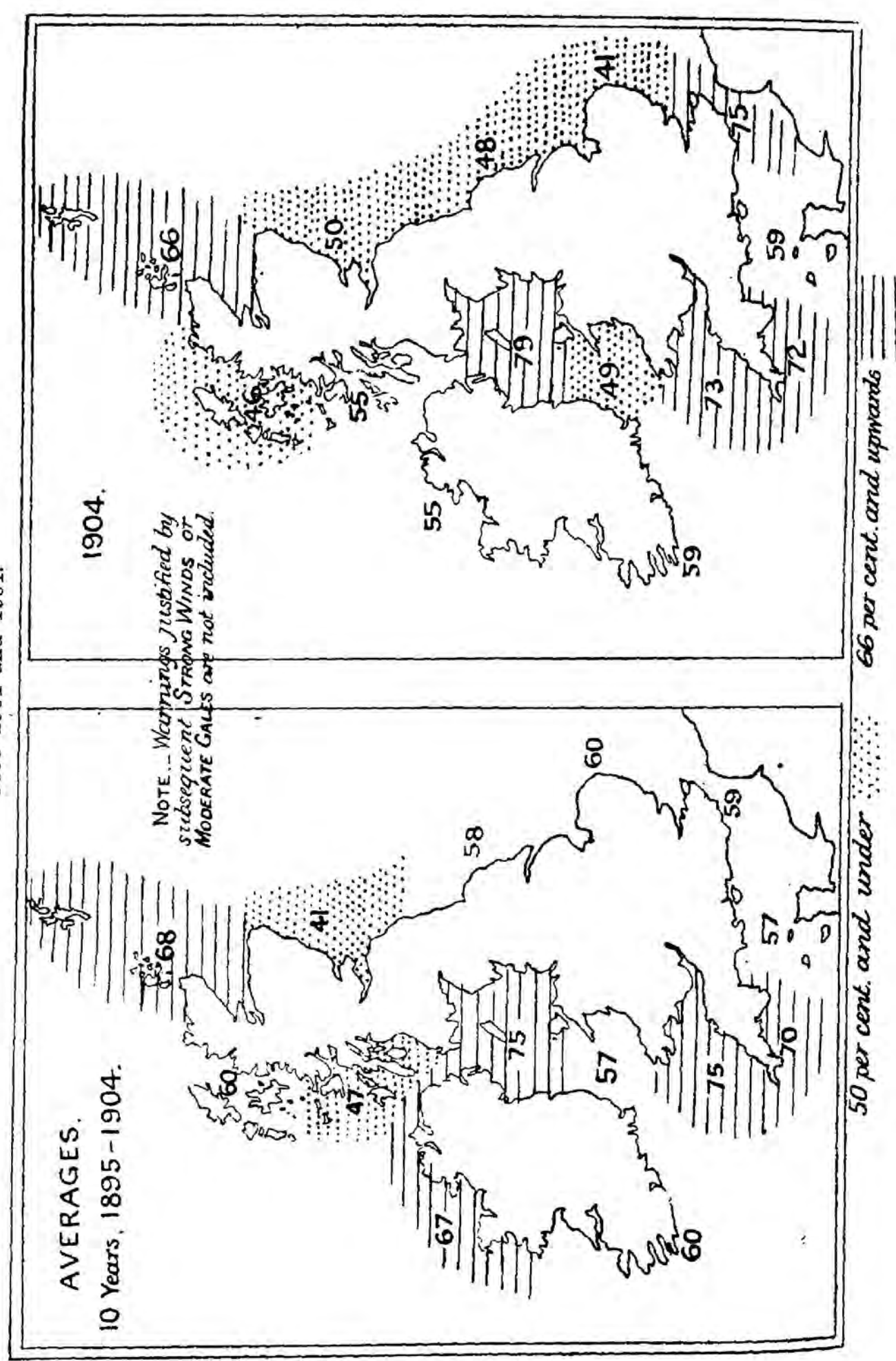
In 1879 the Council decided that the knowledge of the sequence of weather had been so much extended by the study of synoptic charts, that the issue of forecasts, which had been discontinued in 1866, might be again commenced. Forecasts were accordingly prepared and in 1881 the form of the daily Weather Report was modified and arranged to include the forecasts drawn up at 11 a.m. With the issue of the forecasts was introduced a carefully considered and systematic plan for setting out the reasons for the





PLATE II

PERCENTAGES OF STORM WARNINGS JUSTIFIED BY SUBSEQUENT STRONG GALES.  
1895-1904 and 1904.



several forecasts and for checking the accuracy of the results. The evening telegrams obtained since 1876 at the request of the "*Times*," and at the outset wholly at the cost of that journal, were utilised for evening forecasts for publication on the following morning. Subsequently, other newspapers joined and contributed their share of the expenses, and ultimately the Parliamentary Grant was increased to £15,300 in order that the evening report and forecasts might be placed at the disposal of the public Press without charge.

In 1879 the system of issuing special forecasts during the harvest season was arranged. All these issues of forecasts have been continued with certain modifications to the present time. It is of no little interest to trace the gradual progress of this service to the easy organisation of the present day from the time when the telegraphs were in the hands of private companies, and when Wick was beyond the most northern point available.

An examination of the monthly analysis of the checking of the forecasts, which has been conducted on the same system throughout, does not indicate any marked progressive change in the accuracy of the forecasts. It would appear that soon after the introduction of the system the practical limit of the accuracy of the direct application of the principles of forecasting by synoptic charts was reached. Experience and attention to detail bear fruit in the general improvement of the service, as reports from time to time received from outside the office testify, but further progress of a conspicuous character in forecasting must await the further general development of meteorological science.

On the other hand the storm warning system has shown in practice continuous improvement. The checking which is conducted in the Office, depending upon the observations at exposed lighthouses and at lightships as well as land stations, is very rigorous, and shows continuous diminution in the number of warnings not justified, and in the number of unforeseen gales. It should be noted, however, in comparing the times of warning and the occurrence of gales, the time of issue of the warning from the office is taken. From the point of view of the stations warned, the telegraphic delays have also to be taken into account. Arrangements have already been made for obtaining regular information upon this question (p. 24).

A curious point about the checking of the warnings is the comparative immunity from gales of certain parts of the British seas. The maps here reproduced (Plate II.) show the comparative success of the warnings in the different parts of the coast. Very marked differences are shown for which no satisfactory meteorological reason can be given. It is possible that the differences may be accounted for by the difference of exposure of the stations and vessels used for checking the warnings. Otherwise it would be necessary to conclude that barometric gradient is less effective in producing wind in certain parts of the coast than in others.

In 1884, after careful consideration, the number of observatories fully equipped with self-recording instruments and maintained at the expense of the Council, was reduced.



Kew, Falmouth, Aberdeen, and Valencia were continued on the same footing as before, the instruments from Armagh, with the exception of the anemometer and raingauge, were established at Fort William to form a base station in connexion with the observatory on the summit of Ben Nevis. Glasgow and Stonyhurst were allowed to retain their instruments, and they are now maintained by the University and the College Authorities. A spare set of instruments was lent to the Radcliffe Observatory at Oxford.

The reason for reducing the number of observatories of the highest and most expensive type was that, after the 15 years' experience, a smaller number of such observatories, supplemented by a number of other stations supplied with aneroidographs to serve as instruments for interpolation, would afford sufficient information for the study of the phenomena of weather. On this ground the Falmouth observatory was originally included in the list of observatories to be discontinued, but a strong representation from a number of prominent scientific men induced the Council to reconsider their decision.

The discussion of the observations at the observatories and the form of publication of the results continually engaged the attention of the Council. For the study of the details of the phenomena of weather the curves themselves are alone of service, and the curves for 12 years were drawn and reproduced by special processes devised by Mr. Galton and Mr. de la Rue for the Committee or the Council. If, however, we look beyond the details of weather and desire to use the curves to throw light upon the general connexion of meteorological phenomena in different parts of the world, the curves themselves are not a suitable mode of expressing the quantities to be compared. For this purpose we must aim at dealing with the underlying regularities rather than with temporary incidents, and on that account a great deal of attention was paid to the application of the methods of harmonic analysis.

A mechanical harmonic analyser designed by Lord Kelvin was obtained for the Office and used to find the harmonic components of individual curves. After long trial it was found that it was better to group the curves for every five days by taking the means of corresponding hourly readings, and use numerical methods of computation. The use of the apparatus was accordingly given up in 1890, and the Chairman prepared a scheme for dealing with the observations harmonically, which has since been in continuous use. The necessity for grouping the data into five days, in order to avoid the predominant effect of temporary variations, led to the publication of five-day means of the hourly values of the elements instead of the hourly readings.

In the last few years, however, in deference to the wish of Continental meteorologists, the publication of hourly readings for four observatories has been resumed; and as a series of five-day means for upwards of thirty years is already available for purposes of study the publication of further similar values has been suspended.

While the number of observatories has been reduced, a considerable extension of the number of anemograph stations has

taken place, and special experiments upon wind measurements have been initiated at Holyhead ; but the general discussion of the anemographic observations requires to be taken in hand.

The work in the branch that deals with the statistics of land stations has gradually increased with the increase in the number of stations of various kinds which contribute observations to the Office. Climato-  
logical  
Stations.

The following is a comparative statement of the number of stations in the British Islands, of different types, contributing observations to the Office in 1880 and 1905 respectively :—

	NUMBER OF STATIONS.	
	1880.	1905.
Observatories ... ..	7	11†
Anemograph Stations ... ..	6	11†
Barograph Stations ... ..	1	19†
Sunshine Stations* ... ..	—	110†
Second Order Stations ... ..	37	87†
Auxiliary Climatological and Rainfall Stations.	32	150†
Telegraphic Reporting Stations—		
British ... ..	29	28†
Foreign ... ..	23	31†

\* Instruments, then newly designed, were sent to 30 stations at the close of the year 1879-80.

† Including observatories and stations which contribute observations to the Office, but are not maintained by the Council.

The development of the work in this direction is mainly due to the encouragement afforded by the Council to voluntary observers using their own instruments, in accordance with the suggestion of Sir W. Stirling Maxwell's Committee.

As regards Colonial observations a reference to the reports shows that the development has been less than the Council desired to see. Various steps have been taken, but the Council have been unable to deal with the collection and publication of the observations from the Crown colonies in a systematic manner, *see p. 13.*

The work in the Marine branch has been principally devoted to the preparation of the charts of the average distribution of the various meteorological elements and of currents over the oceans, as indicated in the list of marine publications. The publication of the most recent meteorological charts prepared in the Office has been undertaken by the Hydrographer of the Admiralty.

In 1901 the Council undertook the preparation and issue of monthly pilot charts of the North Atlantic and Mediterranean, and the publication has been continued; with it has come a considerable development of observations for the special purposes of this chart.

The index number of the meteorological logs, &c., has moved from 4,408 in 1879 to 11,851 in 1905, and the following comparison shows the general progress during that period of the work in the Marine department in connexion with the collection of observations.

Year.	Register Number.	Meteorological Logs.	Other Marine Registers.	Total Marine Documents.
1879-1880 ...	4,408-4,656	148	35	183
1899-1900 ...	10,343-10,552	159	14	173
1904-1905 ...	11,511-11,851	237	1,946*	2,183

In addition to the work for the publications of the Office or scientific periodicals it may be mentioned that the preparation of a number of tabular statements for other official bodies have been gradually undertaken by the Office. The meteorological tables in the sailing directions of the Admiralty are prepared in this Office for the use of the Hydrographer, and with this service has grown up the practice of lending instruments to remote ports in various parts of the world in order to obtain trustworthy observations for this purpose.

Upon the acquisition of Cyprus the Office supplied instruments for six stations, and has always reduced the observations and prepared them for publication in the Cyprus Blue Book.

In recent years the Office has taken over the supply of meteorological summaries to the Registrar General in place of those supplied by the late Mr. James Glaisher. This should form part of the regular discussion of the observations received by the Office, but as the work on the second order stations is considerably in arrear, and the Registrar General's work refers to the current quarter, the preparation of two sets of tables has to be conducted simultaneously and a temporary pressure is the result.

It will thus be seen that a gradual extension of the work in all branches has taken place, for the proper execution of which the Council desire to recognise the devotion and energy of the staff with which they have been so long related.

The present organization of the Office for the supply of information to the public is given below.

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\* Including 1853 "North Atlantic Registers" not enumerated under register number.



STATEMENT OF PROVISIONS FOR THE SUPPLY OF INFORMATION  
TO THE PUBLIC.

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The Office receives a large number of daily reports, and has gradually accumulated a valuable store of information about the weather in all parts of the world. The arrangements specified below have been made to enable the public to take advantage of this information.

The Office is open for general inquiries between the hours of 10 a.m. and 4 p.m. on week days (Saturdays, 1 p.m.), and for telegraphic inquiries from 8.30 a.m. to 8 p.m. on week days, and from 6 to 8 p.m. on Sundays. Office hours.

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A.—TELEGRAPHIC INFORMATION.

DAILY WEATHER REPORTS. FORECASTS AND STORM  
WARNINGS.

Between 8 a.m. and 10 a.m. telegraphic messages are received daily, reporting meteorological observations at 27 stations (see list of stations, p. 99) in the British Isles, chiefly on the coast, and at 29 stations (p. 100) on the Continent of Europe. The observations in the British Isles are made at 8 a.m., and on the Continent partly at 7 a.m. and partly at 8 a.m. A certain number of stations report evening observations (6 p.m.), also by telegram and those that do not report in the evening include the evening observations with the following morning reports, so that a complete schedule of morning and evening observations is drawn up daily. The information refers to the readings of the barometer, dry and wet bulb thermometers, maximum and minimum thermometers, rainfall, and in some cases, sunshine, with estimates of the direction and force of the wind, and reports of the weather and state of the sea. Daily information received

These reports are supplemented by telegraphic reports from the Azores, through the courtesy of the Portuguese Government and the Eastern Telegraph Company and the Commercial Cable Company, and by a number of additional observations made at various stations in the United Kingdom, and sent either by telegram or by post through the courtesy of private persons or local officials. Moreover, the "Bulletin International" published in Paris, reproducing meteorological telegrams from the whole of Europe, is received by post on the morning of the day after publication, and supplements the information previously received in the Office by telegram.

The telegraphic information is tabulated and charted by about 10 a.m. for the morning observations, and 7 p.m. for the evening

ones. A general report is then drawn up, and forecasts of the weather for the twenty-four hours following the next noon, or midnight, as the case may be, are formulated.

**Daily  
Weather  
Report.**

A Daily Weather Report, which includes a transcript of the observations for the day, with some of those for the previous day, illustrative charts, descriptive remarks on the state of the weather, and forecasts for the several districts of the British Isles, is prepared for press and sent to the lithographers at 12 noon daily, except Sundays and Bank Holidays. It is ready for issue by 2 p.m., and is then delivered by hand or posted by book post at 2.30 p.m. to those addresses which can be reached in the regular course of post on the same day. Copies for those who are outside this limit are posted by the evening mails.

**Subscrip-  
tions.**

The Daily Weather Report may be obtained on payment at the Meteorological Office of a subscription in advance (for not less than a quarter of a year ending at the official quarter days, *e.g.*, March 31, June 30, &c.) at the rate of £1 per annum for delivery by book post, £2 for delivery, where feasible, by hand. Single copies, price 1*d.* each, can be obtained after 3 p.m. on the day of issue at the Office, and the railway bookstalls at the following terminus stations:—Victoria (L. B. S. C., and S. E. and C. Railways), Charing Cross, King's Cross, St. Pancras, Euston.

**Special  
Reports for  
the Press.**

Special advance copies of the descriptive remarks on the state of the weather and forecasts, based upon the morning or evening observations, are prepared at 11 a.m. and 8 p.m. respectively, and supplied gratis to the representative of any newspaper or press agency calling for them at the Office, at the hours named.

As far as practicable the Director will make arrangements for daily or weekly reports of the state of the weather, in special form, upon terms which may be had upon application at the Office personally or by letter.

**Printed  
forecasts.**

Printed or typewritten copies of the morning forecasts for all districts are ready at 11 a.m., and are distributed by hand to clubs and societies situated in or near Pall Mall at a charge of 10*s.* per annum. They are sent by post at a charge of 2*s.* 6*d.* per official quarter or any part thereof, in addition to the cost of transmission. Copies of the evening forecasts are sent by post for a similar charge.

**Written  
forecasts for  
separate  
districts, and  
other extracts  
from the  
daily Reports.**

For the purposes of the forecasts of weather the British Isles are divided into eleven districts, as indicated in the accompanying map. A written copy of the latest forecast for a single district can be obtained at the Office between 9.30 a.m. and 8 p.m. upon payment of 6*d.* A written copy of the latest information in possession of the Office as to the state of the weather in any district of the British Isles, and for the neighbouring parts of the continent of Europe, can be obtained in like manner. The latest reports, with a map, are exhibited as early as possible for the information of the public at the entrance to the Office, and abbreviated reports for a few coast stations are displayed in the street, on the balcony of the Office.

FORECAST DISTRICTS.\*



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

By arrangement with H.M. Postmaster-General the latest information as to the state of the weather in various parts of the United Kingdom, or the Continent, and forecasts for one day in advance, can be obtained from the Meteorological Office, upon payment at any Postal Telegraph Office of a fee of 6*d.* in addition to the cost of a telegram of inquiry addressed "Weather, London," and of the reply. Ten words, in addition to the address, must be allowed for the reply. Inquiries by telegraph.

Telegrams of inquiry should state the nature of the information required, and the name and address to which the information is to be sent, as in the following examples :—

To "Weather, London."

*Latest Information from [Straits of Dover].*

or,

*Latest Forecast for [Forfarshire].*

or,

*Next Forecast for [Dublin].*

From

(Name),

(Address)

The latest information for any district, or the latest forecast, will be sent by telegraph to any address if a request be received by post stating when the information or forecast is to be sent, and enclosing 6*d.* in addition to the cost of a telegram, allowing ten words in addition to the address. It should be noted that forecasts are prepared for issue at 11 a.m. and 7.30 p.m. To avoid delay, letters of request for information or forecasts should be marked on the outside "Forecast Branch." Inquiries by post.

Forecasts for a single district will be sent regularly to public bodies for exhibition without any charge beyond the cost of the telegrams, and to private persons at an additional charge of 3*d.* per telegram for a forecast for a single district, and 6*d.* for two or more districts.

\* For the grouping of the counties to represent approximately the forecast districts, see Lists of Stations, pp. 80 to 90, or Frontispiece Map.



**Harvest forecasts.**

Arrangements have been made for a special service of afternoon reports during the season of the Hay and Corn Harvests (June 1st to September 30th), with a view to a special series of forecasts daily (Sundays excepted) at 3.30 p.m. The forecasts for any district are supplied by telegraph to agriculturists and others upon prepayment of the cost of the telegrams (nine words daily, in addition to the address) for the period during which the forecasts are required. Forms of application for these forecasts can be obtained at the Office.

The Postmaster-General has sanctioned the exhibition of Forecasts at Local Post Offices, provided space is available, if the persons to whom they are addressed desire them to be so exhibited.

**Transcripts of the observations.**

As far as practicable the Director, upon application, will make arrangements for the transcription of the whole or a selection of the morning or evening telegraphic reports, to be sent by telegraph, in code form, to newspapers or public associations desiring to make use of this means of accelerating the distribution of the latest information about the weather. The special terms for this service can be obtained on application to the Office.

**STORM WARNINGS.**

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

**Storm Signals.**

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

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

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

The following is a LIST of STATIONS to which STORM-WARNING telegrams are sent :—

**NORTHERN.**

*Scotland, N.E.*—Lerwick, Scalloway, \*Sunrossness, Dumburgh Head L.H., Fair Isle L.H., Noup Head L.H., Stromness, Kirkwall, Cantick Head L.H., Holborn Head, Dunnet Head, Wick, Tarbet Ness L.H., Avoch, Inverness, Nairn, Burghead, Lossiemouth, Buckie, †Port Knockie, Cullen, Portsoy, Banff, Fraserburgh, Peterhead, †Aberdeen, Girdleness L.H.

\* Telegrams only exhibited.

† Arrangements made for showing signals or illuminating the cone at night.

*Scotland, E.*—Stonehaven, Montrose, Scurdy Ness L.H., Broughty Ferry, Dundee, St. Andrews, Anstruther, Pittenweem, Buckhaven, Methil, Wemyss West, Burntisland, \*Grangemouth, Bo'ness, Granton, \*Newhaven, †Leith, Fisherrow, \*Dunbar, Cockburnspath, St. Abb's Head, Eyemouth.

*Scotland, N.W.*—Cape Wrath L.H., Stourhead L.H., Port of Ness, Stornoway, Island Glass L.H., Portnaguran.

*Scotland, W.*—\*Glasgow, Greenock, Rothesay, Lamlash, Carradale, Campbeltown, Mull of Cantire L.H., Rhuvaaal L.H., Rhinns of Islay L.H., Ardrossan, Girvan, Ballantrae, Cairn Ryan, Corsewall Point L.H., Mull of Galloway L.H.

#### WESTERN.

*Ireland, S.*—Tuskar L.H., New Ross, Dunmore East, Dungarvan, Helvick Head, Minehead L.H., Youghal, Queenstown, Cork, Passage, Kinsale, Kinsale (Old Head), Galley Head L.H., Castletownshend, Fastnet Rock L.H., Brow Head, Tralee, †Limerick, Loophead L.H., Galway.

*Ireland, N.*—Killybegs L.H., Tory Island L.H., Lough Swilly L.H., Rathmullen, Malin Head, Portrush, Port Ballintrae, Ballycastle.

*Irish Sea.*—†Belfast, \*Donaghadee, Burr Point, Howth, Kingstown, Point of Ayre, Ramsey, Douglas, Sillioth, Maryport, Workington, Whitehaven, Barrow, Walney Island L.H., Morecambe, Fleetwood, Blackpool, Preston, †Southport, Formby, Liverpool, Runcorn, Hoylake, New Brighton, \*Connah's Quay, Penmaenmawr, Port Penrhyn, Point Lynas L. H., Holyhead, South Stack L.H., Carnarvon, Port Dinorwic.

*St. George's Channel.*—Aberystwyth, Smalls L.H., \*Milford.

*Bristol Channel.*—Caldy L.H., †Tenby, Pembrey, Llanelly, Swansea, Briton Ferry, Porthcawl, Nash L.H., Penarth, Cardiff (Bute Dock and Barry Dock), Newport, Weston-super-Mare, Burnham, \*Bridgwater, Ilfracombe, Bull Point L.H., \*Barnstaple, Appledore, Hartland Point L.H., Lundy Island, \*Boscastle, Port Isaac, Newquay, Godrevy L.H., Hayle, St. Ives, St. Sennen, Newlyn West, Penzance.

#### SOUTHERN.

*England, S.W.*—Scilly, The Lizard, Falmouth, Pendennis Castle, Mevagissey, Plymouth (Mount Batten and \*Milbay Docks), Devonport (Mount Wise and the †Dockyard), Prawle Point, Salcombe, Teignmouth, Exmouth.

*England, S.*—Guernsey, Jersey (St. Helier's), Portland L.H., Weymouth, Anvil Point L.H., Poole, Hurst Castle L.H., Southampton, Yarmouth (I. of W.), Cowes, Ryde, St. Catherine's Point, Portsmouth (Dockyard and Noman's Fort), Littlehampton, Brighton, †Newhaven.

\* Telegrams only exhibited.

† Arrangements made for showing signals or illuminating the cone at night.

*England, S.E.*—Beachy Head, Eastbourne, †Hastings, Rye, Sandgate, Folkestone, Dover, Deal, Ramsgate, Margate, Faversham, Sheerness, Chatham, Greenhithe.

#### EASTERN.

*England, N.E.*—Berwick-on-Tweed, Cullercoats, North Shields, \*Tynemouth, South Shields, Souter Point L.H., Sunderland, Hartlepool, †Middlesborough, Redcar, Whitby, Filey, Flamborough Head, Bridlington, Hull, \*Goole, Grimsby, Boston.

*England, E.*—\*Sutton Bridge, Lynn, Sheringham, Cromer, Great Yarmouth, Gorleston, Southwold, Orford Ness L.H., Ipswich, Harwich, Gunfleet L.H., West Mersea.

#### B—INFORMATION RECEIVED WEEKLY.

##### METEOROLOGICAL STATISTICS FOR AGRICULTURAL AND SANITARY PURPOSES.

##### WEEKLY WEATHER REPORT, WITH MONTHLY AND ANNUAL APPENDICES.

Weekly  
Weather  
Report.

The Weekly Weather Report, which has been continued in its present form since 1890, is published on Thursdays, and gives, for the week ended on the preceding Saturday, a summary of temperature, rainfall, and duration of bright sunshine in the United Kingdom, for agricultural and sanitary purposes. To this is added a series of maps showing the distribution of pressure and wind over the whole of Europe at 8 a.m. and 6 p.m. on each day, and the temperature, weather, and sea disturbance at 8 a.m. each day. The maps for each day are accompanied by a brief account of the distribution of weather for that day and the changes that have taken place. There is also appended a general summary of the weather over Europe for the week.

For the maps and descriptive account, the daily telegraphic reports are used, and are supplemented by the information contained in the "Bulletin International" already referred to (p. 65), so that the area represented is much larger than that covered by the Daily Weather Report.

For the statistical summaries, the information from the 27 telegraphic reporting stations in the British Isles is supplemented by returns of daily observations supplied by volunteer observers from about 96 other stations. Of these 37 supply only the daily amounts of bright sunshine. The summaries refer to districts which are identical with the forecast districts of the Daily Weather Report, and they are grouped into wheat-producing districts and grazing districts.

In the data for temperature are included not only statistics of mean and extreme temperatures for the week, but also weekly and progressive statistics of *Accumulated Temperature*, of which the following brief explanation may be given.

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\* Telegrams only exhibited.

† Arrangements made for showing signals or illuminating the cone at night.



The tables of Accumulated Temperature are designed to give persons engaged in agriculture better means for estimating the manner in which vegetation is affected by temperature than that afforded by the more usual methods of treating the readings of the thermometer. They show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard, or *base temperature*. The base value adopted is 42° Fahr.

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

Subscribers for the Weekly Weather Report receive also the following supplements and appendices:—

(a). *A Monthly Supplement* giving (1) a general account of the weather for the month under the headings—Pressure, Depressions, Anticyclones, Winds, Temperature, Rainfall and Bright Sunshine; (2) a complete summary of the observations at the Telegraphic Reporting Stations, and at certain of the Normal Climatological Stations; (3) a summary of maximum and minimum temperature, rainfall, and sunshine at the additional stations which furnish weekly returns, and at certain other Climatological Stations, (4) the differences where possible from the average pressure, temperature, rainfall and sunshine; (5) four maps showing the monthly distribution of barometer and wind, the movements of barometric depressions, the distribution of mean temperature, and the distribution of rainfall.

Beginning with January, 1902, this Monthly Summary has been enlarged, and the number for March, 1905, contains complete tables of results for 150 stations, namely:—26 telegraphic stations and 30 selected normal climatological stations, together with a summary of temperature, rainfall and sunshine, or one or more of these elements, at 94 other stations.

An Annual Summary on similar lines was added for the year 1904.

(b). *An Appendix*, issued quarterly and annually, containing—

- (1) *Quarterly and annual summaries of the rainfall and mean temperature* of each district compared with the corresponding quarter, or the whole year, for each of certain recent years, and with each of the corresponding five-yearly means for thirty-five years;
- (2) A table of the *driest and wettest the coldest and warmest* corresponding *quarters and years* since 1866;
- (3) The *totals for periods of four weeks and five weeks* of rainfall, accumulated temperature and sunshine, together with the progressive totals for each period of the quarter.

\* A full explanation of the principles on which the rules for computing accumulated temperature are based will be found in Appendix II. to the Quarterly Weather Report for 1878. See also Journal Royal Statistical Society, Vol. XLVIII., Part II.

Tables of  
Accumulated  
Temperature.

Monthly,  
Annual, and  
Quinquennial  
Supplements  
to the Weekly  
Weather  
Report.

(c). An *Appendix*, also issued annually, giving *weekly and progressive totals* of rain-days, rainfall, accumulated temperature, and duration of sunshine with percentage of its possible amount, for the several districts.

(d). An *Appendix* computed every fifth year and giving the *weekly and progressive values* of the different elements in the *five years*, and for the whole period, since 1881.

(e). An *Appendix* which also appears every fifth year and gives for each district a comparison of the mean of the *average temperature of successive weeks for the preceding five years* with the corresponding value for the whole period defined above.

(f). An *Appendix*, which is also prepared every fifth year, giving the *monthly averages* of rainfall, rain-days, maximum temperature, minimum temperature, mean temperature, duration of bright sunshine and percentage of possible bright sunshine, for as many as possible of the stations included in the Weekly Weather Report.

Advance  
copy for the  
use of  
newspapers.

An advance copy in MS. of the first page of the Report is prepared on Tuesday in each week, and is supplied free of charge to newspapers.

The Report is published every Thursday afternoon by the Publishers to H.M. Stationery Office, Messrs. Wyman & Sons, Fetter Lane, E.C., Oliver & Boyd, Edinburgh, and E. Ponsonby, 116, Grafton Street, Dublin. The annual subscription is £1 10s., post paid. Single copies are sold at 6d. each, exclusive of postage, and the separate appendices are priced at from 4d. to 1s.

#### C. — OTHER INFORMATION FROM STATIONS IN THE BRITISH ISLES.

Observatories  
with self-  
recording  
instruments.

The Committee maintain a fully equipped meteorological Observatory at Valencia (Cahiriveen), Co. Kerry, Ireland. They have also established instruments and subsidised the observatories at Kew, Falmouth, and Aberdeen. They receive in return curves and hourly tabulations of pressure, dry bulb temperature, wet bulb temperature, rainfall, direction and velocity of the wind, and sunshine, together with regular observations of the character and movement of the clouds and the state of the weather.

An annual volume embodying the results of the observations at the four Observatories is issued in the usual way. That for 1901 has recently been issued, price 6d. per month each station.

The Office also receives, in return for an annual grant, duplicates of the curves from the self-recording instruments at Glasgow, Armagh, and Stonyhurst, and the tabulations of these curves are available if required.

Anemographic records are also received from Alnwick Castle, Deerness, Dublin, Falmouth (Pendennis Castle), Fleetwood, Holyhead, Kingstown, North Shields, Scilly, Shoeburyness, and Yarmouth.

Sunshine returns are received from 111 stations, 93 of which furnish a continuous record from the Campbell-Stokes Recorder, while the remaining stations report the daily amounts.

Continuous records of pressure by some form of self-recording aneroid are received from 19 stations.

Continuous records of temperature are received from two stations in addition to the observatories; of humidity from one station; and of rainfall from seven stations.

Normal climatological stations, equipped and maintained by volunteer observers or by local authorities at their own expense, supply monthly returns of readings of all the meteorological elements at 9 a.m. and 9 p.m. each day.

Normal Climatological Stations

The following extract from the complete Form will show the headings under which observations are recorded :—

Twice daily (at 9 a.m. and 9 p.m.).							Once daily.			
Barometer.	Temp.	Humidity.†	Wind.	Cloud.	Weather	Rain.	Temp.	Additional Observations.		
Attached Thermometer	Uncorrected.	Corrected.								
	Corrected and reduced to 32° Fahr. at mean sea level.									
	Dry bulb.	Wet bulb.	Dew point.	Vapour Pressure	Percentage.	Direction.	Force (0-12).	Amount (0-10).	Form.	Direction of lower stratum, whence coming.
										At time of Observation.
										Since last Observation.
										At 9 a.m.
										Estimated duration.
										Corrected readings at 9 p.m.
										Max
										Min.
										Duration of Bright Sunshine.
										Weather Symbols.
										Remarks.
										Earth Temp. 1 ft.
										Earth Temp. 4 ft.

† Deduced from readings of dry-bulb and wet-bulb.

An annual volume embodying the results of these observations is published; that for 1900 has been issued, price 22s. 6d.

Other Climatological Stations (including those which have already been referred to as contributing weekly returns) equipped and maintained in like manner, furnish periodical returns with less extensive information than that supplied by the normal climatological stations, or information of the same extent but with different hours of observation. Other stations furnish daily readings of sea temperature.

Other stations.

The names of all the stations in the British Isles from which information of any kind is received, and a statement of the nature of the information, are given in the list of stations appended hereto, pp. 78 to 101.

The returns thus collected, whether published in the manner described or in manuscript, may be consulted or copied at the Office between 10 a.m. and 4 p.m., by any person, by permission of the Director. Extracts from them are supplied to any person making written application to the Director specifying precisely the details of the information required. For these extracts a charge is made to cover the cost of the time required for selecting and making them.

Supply of information and charges



The extracts will, if required, be attested by a sworn declaration before a Commissioner for oaths, at a fee of £1 1s. (in addition to the charge of 1s. 6d. made by the Commissioner for oaths). A special fee of £2 2s. for each day's attendance is charged if a representative is required to attend in court with reference to the statements contained in the extracts supplied.

#### D.—INFORMATION FROM LAND STATIONS OUTSIDE THE BRITISH ISLES.

Periodical returns are received from stations in different British Colonies and dependencies, or in foreign countries, as follows :—Bahamas (6 stations), Barbados, Beyrout, British East Africa (1 station), Falkland Islands, Cyprus (6 stations), Eastern Soudan, British Guiana, Gibraltar, Gold Coast (8 stations), Mauritius, Southampton Island, Panama, St. Helena (3 stations), Sierra Leone, Sombrero, Uganda (9 stations), Morocco (4 stations), and China (2 stations).

From the Falkland Islands, and from Georgetown, Demerara, continuous records of sunshine are received ; and from St. Helena continuous records of wind direction and velocity.

A list of the stations is given on pp. 102 to 104.

The information contained in these returns is available upon the same conditions as that contained in the returns of British Stations.

#### E.—THE LIBRARY.

In return for copies of publications the Office receives the weather reports and other publications of the official meteorological organisations of the world, and of many private organisations. (*See Appendix IX., pp. 215 to 219.*)

The library has also gradually acquired a large collection of pamphlets and books bearing upon meteorological subjects. These publications are available, free of charge, for the purposes of study and research, upon application at the Office, between the hours of 10 a.m. and 4 p.m.

#### F.—MARINE OBSERVATIONS.

The information as to the meteorology of the sea collected by the Office since 1855, is contained in a large number of logs kept by the officers of the Royal Navy, or of the Mercantile Marine, and forwarded to the Office. The information is regularly discussed and arranged according to the squares of latitude and longitude, embracing 10 degrees in each direction, and again sub-divided according to one degree squares. The information is then compiled statistically, and is represented by a series of publications, of which a list is appended. *See pp. 107 and 109.*

*Pilot charts:*

A series of Pilot Charts of the North Atlantic and Mediterranean was commenced in April, 1901, and is still being issued. These

are supplied by the Superintendents of the Mercantile Marine Offices at the principal British ports to captains and officers of merchant ships, at the price of 6*d.* each. Copies can also be obtained from the Admiralty Agents for the sale of charts, and from the Agents for H.M. Stationery Office at Edinburgh and at Dublin, at the price of 5*s.* for an annual series of 12 charts, or 6*d.* for each chart, in addition to the cost of transmission.

The marine observations are by voluntary observers. Those officers whose names are on the list of observers for the Office receive the Pilot Charts free, and also receive from time to time copies of the other marine publications issued by the Office.

#### G.—SUPPLY OF INSTRUMENTS TO OBSERVERS.

In accordance with the terms of the Parliamentary grant the Office does not lend instruments for the use of observers except in the following cases :—

Loan of  
instruments

- (1.) To the Captains of vessels who undertake to keep a Meteorological log during their voyage and forward it to the Office.
- (2.) To the Telegraphic Reporting Stations in the British Isles.
- (3.) To the First Order Stations in connexion with the Office.
- (4.) To selected Stations in less frequented parts of the world where observations are deemed to be specially desirable.
- (5.) To fishing communities in various districts of the British Isles, which are supplied on certain conditions with suitable mercury barometers.

The outfit of instruments lent to captains of ships consists of one mercury barometer ; six thermometers, with a screen ; four hydrometers.

The ships are supplied either directly from the Office or through the following agents :—

Cardiff—Mr. T. L. Ainsley, Bute Dock.

Dundee—Mr. C. H. Brown, 33, Dock Street.

Glasgow—D. McGregor & Co., Ltd., 37 & 38, Clyde Place.

Greenock—D. McGregor & Co., Ltd., 32, Brymner Street.

Hull—Messrs. Castle & Co., 56, Lister Street.

Liverpool—D. McGregor & Co., Ltd., 39, South Castle Street.

Southampton—Captain D. Forbes, 169, High Street.

Sunderland—Messrs. J. J. Wilson & Son, 18, Hudson Road.

Sets of instruments are kept in working order at the Office in London, and at each agency, for the purpose of instructing observers in the method of observation.

Fishery  
barometers.

It is a long established practice of the Office to supply Barometers for the use of fishing communities, after due inquiry into the requirements and the resources of the localities applying for them, where it is shown that the instrument will be of material service. As a condition of the loan the community is required to provide for the housing of the instrument and to keep and forward to the Office a record of daily readings. A copy of a manual specially compiled for the purpose accompanies the instrument, and is intended to point out in simple language the practical use of the Barometer, with a view to anticipating important changes in the weather in the neighbourhood of the fishing stations. The following is a list of stations that have been supplied with Fishery Barometers:—

#### LIST of STATIONS supplied with FISHERY BAROMETERS.

*Shetland Isles.*—Balta Sound, Uya Sound, Burravoe, Nesting, Lerwick, Sandwick, Scalloway, Symbister, Hamnavoe, Walls.

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

*Scotland, East coast.*—Duncansbay, Freswick, Auchengill, Keiss, Ackergill, Staxigoe, Wick, Lybster, Dunbeath, Inver, Portmahomack, Ballintore, Cromarty, Avoch, Nairn, Burghead, Portessie, Port Knockie, Portsoy, Whitehills, Gardenstown, Roseheart, Pitullie, Fraserburgh, Inverallochy, Pointlaw, Portlethen, Skateraw, Stonehaven, Arbroath, East Haven, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monance, Burntisland, Newhaven.

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

*England, South coast.*—\*Bognor, \*Ryde, \*Bembridge, \*Brixton, \*Atherfield, \*Ventnor, \*Yarmouth (Isle of Wight), Gorey (Jersey), \*Haslar Hospital, \*Poole, \*Weymouth, \*Portland.

*England, South-West coast.*—\*Budleigh Salterton, \*Exmouth, \*Cawsand, Mevagissey, Gorranhaven, Devoran, Portscatho, Penryn, Dargan, Porthallow, Falmouth, Coverack, Newlyn (2), Mousehole, Penberth Cove, Porth Guarra, St. Ives, Hayle, Port Isaac, Boscastle, \*Bideford, Burnham, Highbridge, Weston-super-Mare.

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



*England, North - West coast.*—\*Fleetwood, \*Morecambe, \*Maryport.

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

*Scotland, South-West coast.*—Port Patrick, Stranraer, Cairn Ryan, Port William.

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

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

*Ireland, West coast.*—Valencia, Dingle, Tralee, Ballyheigue, Tarbert, Kilcredane, Kilronan, Galway, Spiddal, Cleggan, Elly Bay, Ballyglass, Ballycastle (Co. Mayo), Mullaghmore, Donegal, Tribane, Killybegs, Teelin, Malinmore, Port Noo, Burton Port, Kincashla, Bunbeg, Inniscree Island.

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

*Scotland, West coast.*—Lamlash, Tarbert (Loch Fyne), Loch Ranza, Campbeltown, Carradale; Portnahaven, Port Wemyss, and Bowmore (Islay); Mallaig; Portree and Armadale (Isle of Skye); Isle of Soay, Kyle of Lochalsh, Plockton, Ardneaskan, Shieldaig, Gruinard, Badachro, Ullapool, East Mey, Gills, Stroma (2).

*Hebrides.*—Ness, Carloway, Marvaig, Crossbost, Stornoway, Portnaguran, Valtos, Obb, Bernera, Boreray.

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The Director is authorised to supply, at a cost of 5 per cent. in addition to the contract prices and the cost of carriage, trustworthy instruments for standard meteorological observations to those who are willing to send copies of their observations to the Office. The risk of breakage in transit must be undertaken by the consignee. The Director will also supply, free of cost, blank registers for the returns of the observations and forms for anemographs and sunshine recorders, and will, if desired, give advice about the site and exposure of the instruments.

Supply of instruments on commission for observers at Land Stations.

For further information as to the supply of instruments, application should be made to the Office.

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H.—LIST of STATIONS in the BRITISH ISLES and on the CONTINENT from which INFORMATION has been received at the METEOROLOGICAL OFFICE during the Year ended March 31st, 1905.

The returns from Stations marked “S” are supplied by the Scottish Meteorological Society, and those from Stations marked “M” by the Royal Meteorological Society.

Where necessary, the name of the nearest well-known village or town has been inserted within brackets, following the name of the station.

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

- A. Observatories.—Continuous records or hourly readings of pressure, temperature, wind, sunshine, and rain, with eye observations of the amount, form, and motion of the clouds, and notes on the weather. The indication (A.) in the fifth column denotes that the station is included in Group A. on p. 91, although the information regularly received by the Office is confined to that denoted by the other letters in the column.
- B. Additional Anemograph Stations.—Continuous record of the direction and velocity (or force) of the wind.
- C. Additional Barograph Stations.—Continuous record of pressure
- C'. Additional Thermograph Stations.—Continuous record of temperature.
- C<sup>2</sup>. Additional Pluviograph Stations.—Continuous record of rainfall.
- C<sup>3</sup>. Hygrograph Stations.—Continuous record of the humidity of the air.
- D. Normal Climatological Stations : Second Order Stations of the International Classification.—Monthly sheets, containing regular observations at 9 a.m. and 9 p.m. (or other accepted combination of hours) each day, local time, of pressure, temperature (dry bulb and wet bulb), wind, cloud, and weather, with the daily maximum and minimum of temperature, the daily rainfall, and remarks on the weather. Those marked ☉ contribute records of sunshine in addition.
- E. Normal Climatological Stations : Second Order Stations of the International Classification.—Monthly means and summaries of observations taken at 9 a.m. and 9 p.m. each day as above.

- F. Climatological Returns.—Weekly reports of maximum and minimum temperature, and the rainfall for each day, with remarks on the weather. This information is received in the Meteorological Office each week for use in the “Weekly Weather Report,” and for the Tables compiled in the Meteorological Office for the Registrar General’s Weekly Returns. Returns of sunshine are included in many cases.
- G. Auxiliary Climatological Stations: Third Order Stations of the International Classification.—Observations of the same kind as at Stations under D and E, but either—*(a)* less full, *(b)* taken only once daily, *(c)* taken at hours other than 9 a.m. and 9 p.m.
- H. Fishery Barometer Stations:—Monthly Charts of daily readings of the Fishery Barometer and attached Thermometer, with, in most cases, wind and weather observations in addition.
- R. Additional Rainfall Stations.—Monthly sheets containing the daily observations of the amount of rainfall, with remarks on the weather.
- S. Additional Sunshine Stations.—Continuous record of bright sunshine.
- T. Telegraphic Stations.—Regular observations at 8 a.m. and 6 p.m. G.M.T. (and from some stations at 2 p.m. in addition), of pressure, temperature, wind and weather, with the daily maximum and minimum of temperature, the daily rainfall, and, where possible, the sea disturbance at 8 a.m. each day, and the daily amount of bright sunshine. This information is received each day by telegraph, for use in the “Daily Weather Report” and in the “Weekly Weather Report.”
- W. Sea Temperature Stations.—Observations of the temperature of the air and sea water, and of the weather, twice daily.
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# LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES.

The Counties are grouped in Districts which are numbered as follows :—

- |                             |                            |
|-----------------------------|----------------------------|
| 0. Scotland, N.             | 6. Scotland, W. (including |
| 1. Scotland, E.             | Cumberland and the Isle    |
| 2. England, N.E.            | of Man).                   |
| 3. England, E.              | 7. England, N.W., and      |
| 4. Midland Counties.        | North Wales.               |
| 5. England, S., and English | 8. South Wales, and        |
| Channel.                    | England, S.W.              |
|                             | 9. Ireland, N.             |
|                             | 10. Ireland, S.            |

County and Station.		Lat.	Long.	Height in feet above M.S.L.	Nature of Infor- mation received. <i>See p. 78.</i>	Year of last Inspection.
<b>0. SCOTLAND, NORTH.</b>						
Caithness :—	Wick ... ..	58 27	3 6 W.	80	T.	04
	" ... ..	58 27	3 6 W.	—	W.	—
Cromarty :—	Cromarty ... ..	57 41	4 0 W.	—	W.	—
	Strathpeffer Spa... ..	57 37	4 28 W.	253	D.F.S.	03
Inverness :—	*Ben Nevis ... ..	56 48	5 0 W.	4,405	A.E.	04
	*Fort Augustus ... ..	57 8	4 40 W.	68	E.F.S.	04
	Fort William ... ..	56 49	5 7 W.	31	A.F.	04
	Glendrynoch ... ..	57 18	6 22 W.	39	R.	—
Orkney :—	Deerness ... ..	58 56	2 45 W.	160	B.D.S.	04
	Kirkwall ... ..	58 59	2 57 W.	—	W.	—
Ross :—	Ardross Castle ... ..	57 45	4 21 W.	449	R.	—
	*Glencarron ... ..	57 30	5 14 W.	489	E.F.	03
	Kinlochewe ... ..	57 36	5 24 W.	—	R.	—
	Stornoway ... ..	58 11	6 22 W.	29	C.S.T.	04
	" (Mar- vig). ... ..	58 11	6 22 W.	—	H.W.	—
Shetlands :—	Lerwick ... ..	60 9	1 8 W.	—	H.W.	—
	Sumburgh Head... ..	59 51	1 17 W.	126	C.T.	04
	Symbister ... ..	60 14	1 25 W.	—	H.	—
	Walls ... ..	60 13	1 35 W.	—	H.	—
Sutherland :—	*Dunrobin Castle... ..	57 59	3 56 W.	12	D.	04
	*Laing ... ..	58 1	4 22 W.	335	E.F.	04
<b>1. SCOTLAND, EAST.</b>						
Aberdeen :—	Aberdeen Observa- tory. ... ..	57 10	2 6 W.	46	A. T.	04
	*Braemar ... ..	57 0	3 24 W.	1,111	D.F.	03
	Pennan Bay ... ..	57 40	2 16 W.	—	W.	—
Banff :—	*Gordon Castle ... ..	57 37	3 5 W.	101	E.	03
Berwick :—	Burnmouth ... ..	55 51	2 4 W.	—	W.	—
	*Marchmont ... ..	55 44	2 25 W.	498	E.F.S.	02

LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES—continued.

County and Station.	Lat.	Long.	Height in feet above M.S.L.	Nature of Informa- tion received. See p. 78.	Year of last Inspection.	
1. SCOTLAND, EAST—cont.						
Clackmannan :—	No station.					
Edinburgh :—	Edinburgh ...	55 57	3 12 W.	253	S.	—
	Leith ...	55 58	3 10 W.	19	T.	04
Elgin :—	No station.					
Fife :—	Burntisland ...	56 4	3 14 W.	—	W.	—
Forfar :—	*Dundee ...	56 28	2 56 W.	160	D.	04
	*Lednathie ...	56 45	3 7 W.	719	E.	03
	Uzon ...	56 40	2 28 W.	—	W.	—
Haddington :—	No station.					
Kincardine :—	Cove Bay ...	57 6	2 5 W.	—	W.	—
	Crathes ...	57 3	2 25 W.	140	G.S.	04
Kinross :—	No station.					
Linlithgow :—	No station.					
Nairn :—	Nairn ...	57 36	3 52 W.	82	T.	04
Peebles :—	No station.					
Perth :—	Clathick ...	56 24	3 53 W.	296	E.F.	04
	Forgandenny...	56 21	3 29 W.	175	C.C <sup>2</sup> .	—
	Balruddery ...	56 29	3 8 W.	276	S.	04
Roxburgh :—	*Wolfelee ...	55 23	2 39 W.	587	E.	04
Selkirk :—	No station.					
2. ENGLAND, NORTH EAST.						
Durham :—	Durham ...	54 46	1 35 W.	336	D.F.S.	02
	Seaham Har- bour.	54 50	1 19 W.	148	D.	02
	Sunderland ...	54 54	1 23 W.	—	W.	04
Lincolnshire :—	Caistor ...	53 30	0 20 W.	266	R.	04
	Fulbeck ...	53 3	0 37 W.	185	C.D.F.	04
	Lincoln ...	53 14	0 33 W.	—	D.	04
	Mareham - le - Fen.	53 8	0 5 W.	33	R.	01
	Rauceby Hall..	53 0	0 29 W.	125	G.S.	03
	Skegness ...	53 9	0 21 E.	12	G.S.	04
	Tealby ...	53 24	0 16 W.	251	D.	03
	Temple Bruer..	53 4	0 30 W.	—	R.	03
Northumber- land :—	Alnwick Castle	55 25	1 43 W.	210	B.F.	03
	Chertners ...	55 16	2 0 W.	1,000	R.	—
	Cockle Park, Morpeth.	55 13	1 41 W.	324	D.S.	04
	Dam Site ...	55 14	1 54 W.	620	R.	—
	Fallowlees ...	55 15	1 57 W.	850	R.	—
	Newcastle-on- Tyne.	54 59	1 36 W.	152	G.S.	03
	North Shields	55 0	1 27 W.	99	T.	04
	„ High Lighthouse.	55 0	1 27 W.	—	B.	04
	Red Path ...	55 13	2 0 W.	850	R.	—
	Tod Crag ...	55 15	2 1 W.	1,000	R.	—
Yorkshire, N. Riding :—	Ampleforth ...	54 12	1 5 W.	349	D.	03
	Aysgarth ...	54 18	1 58 W.	646	D.	99

LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES—*continued.*

County and Station.	Lat.	Long.	Height in feet above M.S.L.	Nature of Infor- mation received. <i>See p. 78.</i>	Year of last Inspection.
<b>2. ENGLAND, NORTH EAST</b>					
— <i>cont.</i>					
<b>Yorkshire, N.</b>					
Riding— <i>cont.</i> Hovingham Hall ...	54 10	0 59 W.	120	R.	—
Northallerton ...	54 20	1 26 W.	129	R.	95
W Rounton ...	54 24	1 18 W.	242	E.	02
Saltburn-by-the-Sea.	54 35	0 58 W.	116	G.S.	04
W Scarborough ...	54 18	0 24 W.	62	D.F.S.	04
" ...	54 17	0 23 W.	—	W.	02
Whitby ...	54 29	0 37 W.	88	D.S.	04
York, Deighton Grove.	53 54	1 3 W.	38	R.	—
" The Museum	53 57	1 5 W.	56	D.	03
" Bootham ...	53 57	1 5 W.	105	S.	03
" The Mount...	53 56	1 5 W.	—	S.	—
<b>Yorkshire, E.</b>					
Riding:— Hull ...	53 45	0 16 W.	2	D.F.S.	04
Spurn Head ...	53 34	0 7 E.	26	T.	04
<i>Light Ships:—</i>					
Leman and Ower	53 9	1 59 E.	—	W.	—
Outer Dowsing ...	53 27	1 5 E.	—	W.	—
Spurn ...	53 34	0 13 E.	—	W.	—
<b>3. ENGLAND, EAST.</b>					
<b>Bedford:—</b>					
Aspley Guise ...	52 1	0 38 W.	410	S.	—
Woburn, Ridgmount.	52 1	0 36 W.	291	D.	02
<b>Cambridge:—</b>					
Cambridge Bot. Gardens.	52 13	0 6 E.	83	C.C. <sup>2</sup> .	03
" Newnham Coll.	52 13	0 5 E.	—	D.F.S. C. <sup>2</sup> .	03
<b>Essex:—</b>					
Clacton-on-Sea ...	51 48	1 9 E.	—	D.S.T.	04
Dunmow ...	51 53	0 23 E.	297	D.S.	04
East Ham ...	51 32	0 3 E.	12	R.	—
Leigh-on-Sea ...	51 33	0 40 E.	—	H.	—
Shoeburyness ...	51 32	0 47 E.	—	B.F.	04
Southend-on-Sea ...	51 32	0 43 E.	111	R.	—
West Mersea ...	51 47	0 54 E.	—	H.	—
<b>Hertford:—</b>					
W Bennington ...	51 54	0 5 W.	407	E.	03
W Berkhamsted ...	51 46	0 34 W.	400	E.	03
Buntingford ...	51 56	0 0 W.	314	G.	04
Rothamsted ...	51 48	0 22 W.	368	F.G.S.	02
<b>Huntingdon:—</b>					
No station.					
<b>Norfolk:—</b>					
Cromer ...	52 56	1 17 E.	139	D.S.	02
East Dereham ...	52 41	0 57 E.	158	R.	—
Geldeston ...	52 28	1 31 E.	37	D.F.S.	04
W Hillington ...	52 48	0 33 E.	88	D.F.S.	02
Norwich (Brundall)	52 38	1 23 E.	—	F.	03
Thetford ...	52 25	0 45 E.	169	R.	—
Yarmouth ...	52 37	1 43 E.	10	B.C.T.	04



LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES—continued.

County and Station.		Lat.	Long.	Height in feet above M.S.L.	Nature of Infor- mation received. See p. 78.	Year of last Inspection.
<b>3. ENGLAND, EAST—cont.</b>						
Suffolk :—	Brandon ...	52° 27'	0° 37' E.	487	R.	—
	Felixstowe ...	51 58	1 22 E.	10	F.S.	04
	Gorleston ...	52 35	1 43 E.	—	H.	04
	Lowestoft ...	52 29	1 44 E.	84	E.S.	02
	" ...	52 29	1 44 E.	—	H.	—
<i>Light Ships :—</i>						
	Newarp ...	52 45	1 53 E.	—	W.	—
	Shipwash ...	52 2	1 38 E.	—	W.	—
<b>4. MIDLAND COUNTIES.</b>						
Buckingham :— No station.						
Derby :—	Buxton ...	53 14	1 54 W.	987	E.	02
	Chatsworth ...	53 14	1 37 W.	—	C.C.G.	02
Gloucester :—	Bristol, Over Court	51 32	2 35 W.	147	F.	04
	Park.					
	„ Clifton Col- lege.	51 27	2 37 W.	230	F.	03
	Cheltenham ...	51 54	2 3 W.	184	E.	04
	Cirencester ...	51 43	1 57 W.	446	F.S.	03
	Dursley ...	51 41	2 21 W.	250	R.	96
Forest of Dean :—						
	Blakeney Hill ...	51 46	2 30 W.	500?	R.	—
	Braceland ...	51 49	2 38 W.	500	R.	—
	Edgehills Lodge	51 51	2 29 W.	700	R.	—
	Ruardean Hill ...	51 50	2 32 W.	900	R.	—
	Whitemead Park	51 46	2 34 W.	200	R.	—
	Worcester Lodge	51 48	2 35 W.	550	R.	—
	Hidcote ...	52 5	1 46 W.	524	R.	97
Hereford :—	Hereford ...	52 5	2 45 W.	291	D.F.	04
	Wessington Court	52 1	2 35 W.	439	D.	03
Leicester :—	Belvoir Castle ...	52 54	0 47 W.	259	D.	02
	Syston ...	52 43	1 5 W.	178	R.	96
	Thurcaston ...	52 42	1 10 W.	253	R.S.	96
	Barnet ...	51 39	0 10 W.	212	G.	04
Middlesex :—	Harefield ...	51 36	0 29 W.	247	R.	—
	Isleworth ...	51 29	0 20 W.	—	R.	—
	Laleham ...	51 25	0 29 W.	—	R.	—
	Northampton :—					
	Colly Weston ...	52 37	0 31 W.	280	F.	04
	Great Billing ...	52 16	0 50 W.	273	R.	—
	Oundle (The School).	52 29	0 28 W.	144	G.	04
	" ...	52 29	0 28 W.	—	R.	04
Nottingham :—	Bawtry, Hesley Hall.	53 27	1 4 W.	65	F.	04
	Nottingham, The Castle.	52 57	1 9 W.	192	F.G.	04
	" The Pumping Sta- tion.	52 56	1 9 W.	82	T.S.	04
	Worksop... ..	53 22	1 5 W.	56	S.	96
Oxford :—	Oxford ...	51 46	1 16 W.	208	(A.)T.	04
Rutland :—	Ridlington ...	52 37	0 45 W.	522	R.	—

LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES—*continued.*

County and Station.	Lat.	Long.	Height in feet above M.S.L.	Nature of Infor- mation received. <i>See p. 78.</i>	Year of last Inspection.
<b>4. MIDLAND COUNTIES—<i>cont.</i></b>					
Shropshire :— Shrewsbury ...	52° 43'	2° 45' W.	191	D.	04
Stokesay ...	52° 26'	2° 52' W.	370	D.	04
Stafford :— M.Cheadle ...	52° 58'	1° 57' W.	646	E.F.	02
Hear Cross...	52° 48'	1° 49' W.	396	R.	—
Warwick :— Birmingham, Edg- baston.	52° 28'	1° 56' W.	534	D.F.S.	02
Coventry ...	52° 25'	1° 30' W.	269	G.S.	04
Rugby School ...	52° 22'	1° 15' W.	379	G.	04
Worcester :— Rochford ...	52° 18'	2° 36' W.	316	C.R.	01
Yorkshire, W. Riding :— Ackworth ...	53° 39'	1° 20' W.	—	D.	03
Bradford ...	53° 48'	1° 45' W.	—	F.S.	03
Garforth ...	53° 48'	1° 22' W.	195	D.S.	04
Harrogate ...	54° 0'	1° 33' W.	480	F.S.	02
Huddersfield ...	53° 39'	1° 47' W.	—	F.	02
Leeds ...	53° 48'	1° 33' W.	132	F.G.	04
Sheffield ...	53° 23'	1° 29' W.	429	D.S.	02
„ Attercliffe...	53° 24'	1° 25' W.	—	S.	02
„ Abbey Dale	53° 20'	1° 30' W.	—	S.	—
M.Wakefield ...	53° 11'	1° 30' W.	96	E.	02
<hr/>					
London, County :— Brixton ...	51° 27'	0° 8' W.	77	T.	02
Camberwell Green	51° 28'	0° 5' W.	—	C <sup>2</sup> .	03
Camden Square ...	51° 33'	0° 8' W.	110	D.	—
Chelsea ...	51° 29'	0° 10' W.	—	R.	—
City ...	51° 31'	0° 5' W.	80	S.	—
Dulwich ...	51° 27'	0° 5' W.	—	C <sup>2</sup> .	—
Forest Hill ...	51° 26'	0° 4' W.	—	C <sup>2</sup> .	03
Hampstead ...	51° 34'	0° 10' W.	—	C.	—
Leyton Square, S.E.	51° 29'	0° 4' W.	—	C <sup>2</sup> .	03
Pall Mall ...	51° 30'	0° 7' W.	—	C.	—
Peckham Road ...	51° 28'	0° 5' W.	—	C <sup>2</sup> .	03
M.Norwood ...	51° 26'	0° 6' W.	220	E.	03
Westminster ...	51° 30'	0° 8' W.	27	C.C <sup>1</sup> .C <sup>2</sup> .T	04
„ Training Coll.	51° 30'	0° 8' W.	107	S.	—
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<b>5. ENGLAND, SOUTH, AND ENGLISH CHANNEL.</b>					
Berkshire :— Maidenhead ...	51° 30'	0° 43' W.	99	G.	04
Reading ...	51° 26'	0° 57' W.	261	G.	04
Wokingham, Pine- wood.	51° 23'	0° 48' W.	219	C.G.	03
Dorset :— Parkstone ...	50° 43'	1° 56' W.	197	R.	00
Portland Bill ...	50° 32'	2° 27' W.	177	T.	03
M.Shaftesbury ...	51° 1'	2° 12' W.	722	F.	04
Hampshire :— Bournemouth ...	50° 43'	1° 53' W.	—	G.S.	02
Haslemere ...	50° 47'	1° 7' W.	—	H.	04

LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES—*continued*.

County and Station.	Lat.	Long.	Height in feet above M.S.L.	Nature of Information received. See p. 78.	Year of last Inspection.
<b>5. ENGLAND, SOUTH, AND ENGLISH CHANNEL—<i>cont.</i></b>					
<b>Hampshire</b>					
— <i>cont.</i> Portsmouth ... ..	50 48	1 6 W.	11	F.G.S.	04
Southampton ... ..	50 55	1 24 W.	78	D.F.S.	04
Swarraton ... ..	51 8	1 11 W.	310	F.	03
Totland Bay ... ..	50 41	1 33 W.	84	G.	04
Ventnor ... ..	50 36	1 13 W.	80	G.S.	04
Yarmouth, I. of Wight	50 42	1 29 W.	—	H.	04
<b>Kent :—</b>					
Broadstairs ... ..	51 21	1 26 E.	—	R.S.	—
Canterbury ... ..	51 16	1 5 E.	39	D.	03
Dover ... ..	51 7	1 18 E.	198	R.	96
Dungeness ... ..	50 55	0 58 E.	26	T.	04
Greenwich ... ..	51 28	0 0	155	(A.)E.F.	—
Hildenborough ... ..	51 13	0 15 E.	160	R.	—
Kearsney Abbey ... ..	51 8	1 17 E.	100 ?	R.	96
Chilton Farm ... ..	51 8	1 17 E.	135	R.	—
Littlestone-on-Sea ... ..	50 59	0 59 E.	—	G.S.	03
Margate ... ..	51 24	1 24 E.	83	G.S.	03
Plumstead ... ..	51 29	0 6 E.	300	S.	01
Ramsgate ... ..	51 20	1 25 E.	—	S.	04
Sandgate ... ..	51 4	1 9 E.	56	R.	99
Sandwich ... ..	51 17	1 20 E.	6	R.	03
Tunbridge Wells ... ..	51 8	0 16 E.	419	G.S.	—
<b>Surrey :—</b>					
Bramley ... ..	51 11	0 33 W.	148	D.	03
Caterham ... ..	51 17	0 5 W.	609 ?	G.	03
Epsom ... ..	51 20	0 17 W.	160	G.	—
Kew ... ..	51 28	0 19 W.	18	A.	04
Worlingham ... ..	51 18	0 3 W.	709	R.	—
Wisley, Royal Hort. Soc.	51 17	0 26 W.	150	G.S.	03
<b>Sussex :—</b>					
Bognor ... ..	50 47	0 40 W.	20	G.S.	—
Brighton ... ..	50 49	0 8 W.	65	F.S.	03
Cuckfield ... ..	51 1	0 9 W.	389	R.	97
Eastbourne ... ..	50 46	0 17 E.	39	D.S.	03
Forest Row ... ..	51 7	0 2 E.	619	R.	—
Hastings ... ..	50 51	0 34 E.	149 ?	R.	00
" Cemetery ... ..	50 52	0 34 E.	—	R.	—
" Waterworks ... ..	50 51	0 34 E.	—	S.	03
St. Leonards ... ..	50 51	0 33 E.	178	D.F.	03
" West Marina ... ..	50 51	0 32 E.	—	G.	03
Watergate Park ... ..	50 56	0 55 W.	236	R.	99
Westbourne ... ..	50 52	0 55 W.	30	S.	99
Worthing ... ..	50 49	0 22 W.	38	S.	04
<b>Wilts :—</b>					
Marlborough ... ..	51 25	1 44 W.	424	G.S.	—
Salisbury ... ..	51 4	1 51 W.	186	D.	04
<b>Channel Islands :—</b>					
Guernsey, Villa Carey ... ..	49 27	2 32 W.	180	S.	04
" Brooklyn ... ..	49 27	2 31 W.	297	D.S.	04
Jersey, St. Aubin's ... ..	49 12	2 11 W.	25	T.	04
" St. Helier's ... ..	49 11	2 6 W.	—	S.	04
<b>Lightships :—</b>					
East Goodwin ... ..	51 13	1 36 E.	—	W.	—
Owers ... ..	50 39	0 41 W.	—	W.	—
Royal Sovereign ... ..	50 43	0 27 E.	—	W.	—
Shambles ... ..	50 31	2 20 W.	—	W.	—



LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES—*continued.*

County and Station.	Lat.	Long.	Height in feet above M.S.L.	Nature of Infor- mation received. <i>See p. 78.</i>	Year of last Inspection.
<b>6. SCOTLAND, WEST (INCLUDING PART OF CUMBERLAND), AND ISLE OF MAN.</b>					
Argyleshire:— Gruline, Isle of Mull	—	—	100	R.	—
Landale ... ..	56 41	5 41 W.	14	D.F.	04
Poltalloch ... ..	56 8	5 30 W.	132	E.	04
Ayr:— Ballantrae ... ..	55 6	5 0 W.	—	W.	—
Bute:— Lamblash ... ..	55 32	5 8 W.	—	H.W.	—
Rothesay ... ..	55 50	5 4 W.	115	E.	04
Cumberland:— Aspatria ... ..	54 46	3 21 W.	250	D.S.	04
Carlisle ... ..	54 53	2 57 W.	111	D.	04
Chapel House Reservoir.	54 43	3 9 W.	599	R.	—
Newton Rigg ... ..	54 40	2 49 W.	559	D.S.	03
Dumbarton:— No station.					
Dumfries:— No station.					
Kirkcudbright:—					
Cally ... ..	54 52	4 12 W.	120	E.F.	04
Cargen ... ..	55 2	3 37 W.	72	E.	04
Lanark:— Glasgow ... ..	55 53	4 18 W.	180	A.D.F.	04
Renfrew:— No station.					
Stirling:— No station.					
Wigton:— Stranraer ... ..	54 54	5 2 W.	—	H.	—
Isle of Man:— Cronkbourne ... ..	54 10	4 29 W.	137	C.D.F.S.	04
Port Erin ... ..	54 5	4 45 W.	—	W.	04
Lightships:—					
Bahama Bank ... ..	54 20	4 13 W.	—	W.	—
Solway ... ..	54 48	3 32 W.	—	W.	—
<b>7. ENGLAND, NORTH WEST, AND NORTH WALES.</b>					
Cheshire:— Bidston ... ..	53 24	3 4 W.	188	(A.)D.T.	04
Chester (Howard-en Bridge).	53 12	3 1 W.	22	F.	04
Hoyle ... ..	53 23	3 12 W.	307	G.S.	02
Lancashire:— Blackpool ... ..	53 48	3 3 W.	62	C.F.S.	03
Bolton ... ..	53 35	2 27 W.	389	G.	—
Carnforth (Over Kellet).	54 8	2 44 W.	174	G.	—
Darwen ... ..	53 41	2 28 W.	710	G.S.	02
Fleetwood ... ..	53 56	3 1 W.	—	B.	04
Rossall ... ..	53 55	3 2 W.	—	C.	—
Manchester (Oldham Road).	53 29	2 13 W.	190	D.S.	04
„ (Whitworth Park).	53 28	2 14 W.	125	D.S.	04
„ (Prestwich)	53 32	2 17 W.	320	D.F.S.	04
Preston ... ..	53 46	2 42 W.	148	F.	04
Southport ... ..	53 39	2 59 W.	37	(A.)G.S.	03
Stonyhurst ... ..	53 51	2 28 W.	375	A.D.F.	04
Westmorland:—					
Kirkby Lonsdale ... ..	54 12	2 36 W.	304	R.	—

LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES—*continued.*

County and Station.	Lat.	Long.	Height in feet above M.S.L.	Nature of Infor- mation received. <i>See p. 78.</i>	Year of last Inspection.
<b>7. ENGLAND, NORTH WEST, AND NORTH WALES—<i>cont.</i></b>					
Anglesey:— Holyhead (Harbour Office).	53° 18'	4° 39' W.	57	B.W.	04
" (Sailor's Home).	53 18	4 39 W.	48	T.	04
Carnarvon:—					
Llandudno ...	53 21	3 50 W.	72	D.E.F.S.	04
Penrhyn Quarry ...	53 10	4 6 W.	—	R.	01
Denbigh:— Bettws-y-Coed ...	53 7	3 53 W.	101	D.S.	01
Llanbedr Hall (Ruthin).	53 8	3 17 W.	449	R.	—
Flint:— Penbedw ...	53 12	3 11 W.	650	C.	—
Rhyl ...	53 19	3 29 W.	30	G.S.	03
Merioneth:— Aberdovey ...	52 33	4 4 W.	—	S.	03
Towyn ...	52 35	4 5 W.	10	G.S.	—
Montgomery:—					
Llandinam ...	52 29	3 26 W.	500	R.	—
Lightships:—					
Carnarvon Bay ...	53 6	4 49 W.	—	W.	—
Liverpool, North West.	53 31	3 31 W.	—	W.	—
Morecambe Bay ...	54 2	2 59 W.	—	W.	—
<b>8. SOUTH WALES AND ENGLAND, SOUTH WEST.</b>					
Brecknock:—Llangammarch Wells	52 7	3 34 W.	550	G.S.	04
Cardigan:— Aberystwyth ...	52 25	4 4 W.	—	G.S.	04
Carmarthen:—					
No station.					
Glamorgan:—Cardiff ...	51 28	3 10 W.	50	G.	04
Port Talbot ...	51 34	3 45 W.	179	R.S.	03
Pembroke:—Haverfordwest ...	51 48	4 58 W.	—	S.	01
St. Ann's Head ...	51 41	5 30 W.	150	S.T.W.	03
Tenby ...	51 41	4 42 W.	79	S.	03
Radnor:— Disserth ...	52 13	3 24 W.	711	R.	00
Rhayader Watershed,					
Nantgwillt, Old...	52 18	3 29 W.	767	R.	—
" New..	—	—	753	R.	—
Abergwngy ...	—	—	1,199	R.	—
Bwlchyrhendre ...	—	—	1,584	R.	—
Claerwen ...	—	—	1,249	R.	—
Nant-y-car ...	—	—	1,544	R.	—
Pryddellau ...	—	—	1,709	R.	—
Tremynydd ...	—	—	831	R.	—
Cornwall:— Falmouth ...	50 9	5 4 W.	167	A.F.	04
" Pendennis Castle	50 8	5 3 W.	—	B.	04
Newquay ...	50 25	5 4 W.	250?	G.S.	04
" ...	50 25	5 5 W.	—	W.	—
Scilly ...	49 56	6 18 W.	65	B.C.S. T.W.	04

LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES—*continued*.

County and Station.	Lat.	Long.	Height in feet above M.S.L.	Nature of Infor- mation received. <i>See p. 78.</i>	Year of last Inspection.
<b>8. SOUTH WALES AND ENGLAND, SOUTH WEST—<i>cont.</i></b>					
Devonshire:— Arlington Court...	51° 8'	3° 58' W.	613	F.	04
Barnstaple ...	51° 5'	4° 4' W.	24	G.	04
McCullompton ...	50° 51'	3° 23' W.	202	F.S.	04
Plymouth ...	50° 22'	4° 8' W.	116	D.F.S.	04
MRousdon ...	50° 43'	3° 0' W.	515	E.	04
Salcombe ...	50° 14'	3° 46' W.	—	S.	04
" ...	50° 14'	3° 46' W.	—	W.	—
Torquay ...	50° 28'	3° 31' W.	286	S.	00
MWhitchurch ...	50° 32'	4° 6' W.	593	E.	04
MWoolacombe ...	51° 10'	4° 12' W.	59	D.	04
Monmouth:— Abersychan ...	51° 44'	3° 5' W.	688	R.	—
Newchurch ...	51° 41'	2° 48' W.	—	R.	—
Newport ...	51° 35'	3° 0' W.	—	G.R.	04
Pant-y-reos ...	51° 38'	3° 4' W.	449	R.	00
Ynis-y-bro ...	51° 38'	3° 3' W.	115	R.	00
Somerset:— Bath ...	51° 23'	2° 21' W.	66	G.T.S.	04
Simonsbath ...	51° 8'	3° 45' W.	1,099	R.	—
Clevedon ...	51° 26'	2° 52' W.	—	H.	—
Lightships:— Cardigan Bay ...	52° 25'	5° 1' W.	—	W.	—
English and Welsh Grounds.	51° 27'	3° 0' W.	—	W.	—
Seven Stones ...	50° 4'	6° 5' W.	—	W.	—
<b>9. IRELAND, NORTH.</b>					
Antrim:— Belfast ...	54° 35'	5° 56' W.	61	D.	03
" ...	54° 35'	5° 56' W.	—	H.	—
Glenarm ...	54° 58'	5° 56' W.	44	R.	—
" ...	54° 55'	5° 56' W.	—	H.	03
Larne Harbour ...	54° 51'	5° 49' W.	—	C.	—
Portrush ...	55° 13'	6° 40' W.	—	W.	03
Armagh:— Armagh ...	54° 21'	6° 39' W.	196	(A.)D.F.	04
Cavan:— No station.					
Donegal:— Dunfanaghy ...	55° 11'	7° 58' W.	54	G.	—
Malin Head ...	55° 23'	7° 24' W.	230	C.T.	04
Sheephaven ...	55° 11'	7° 58' W.	—	W.	—
Teelin ...	54° 38'	8° 39' W.	—	W.	—
Down:— Donaghadee ...	54° 38'	5° 32' W.	40	T.	04
Fermanagh:— No station.					
Galway:— Ardfry ...	53° 19'	9° 0' W.	—	C.	—
Arran ...	53° 6'	9° 40' W.	—	H.W.	—
Cleggan ...	53° 33'	10° 8' W.	—	W.	—
Recess ...	53° 28'	9° 44' W.	90	R.	—
Spiddal ...	53° 15'	9° 17' W.	—	H.	90
Leitrim:— Carrigallen ...	53° 58'	7° 38' W.	350?	R.	—
Londonderry:— No station.					
Longford:— No station.					
Louth:— No station.					
Mayo:— Ballyglass ...	54° 17'	9° 52' W.	—	W.	—
Blacksod Point ...	54° 6'	10° 4' W.	37	T.W.	04
Mallaranny ...	53° 55'	9° 40' W.	119	R.	02



LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES—*continued.*

County and Station.		Lat.	Long.	Height in feet above M.S.L.	Nature of Infor- mation received. <i>See p. 78.</i>	Year of last Inspection.
<b>9. IRELAND, NORTH—<i>cont.</i></b>						
Meath :—	No station.					
Monaghan :—	No station.					
Roscommon :—	No station.					
Sligo :—	Markree Castle ...	54 11	8 27 W.	122	D.F.S.	03
	Mullaghmore ...	54 28	8 28 W.	—	H.	—
Tyrone :—	Edenfel, Omagh ...	54 36	7 19 W.	300	F.	03
Westmeath :—	No station.					
Lightships :—	Skulmartin ...	54 52	5 26 W.	—	W.	—
	South Rock ...	54 25	5 22 W.	—	W.	—
<b>10. IRELAND, SOUTH.</b>						
Carlow :—	No station.					
Clare :—	Ennis ...	52 51	8 59 W.	38	R.	—
	Ennistymon ...	52 57	9 17 W.	131	R.	—
	Hurdlestown ...	52 48	8 38 W.	157	R.	—
	Kilcredane ...	52 35	9 47 W.	—	W.	—
	Lahinch ...	52 55	9 21 W.	52	R.	99
	Liscannor ...	52 56	9 23 W.	—	W.	—
	Mount Callan ...	52 53	9 16 W.	479	R.	98
	Newmarket - on - Fergus.	52 46	8 53 W.	—	R.	98
	Seafeld ...	52 48	9 30 W.	—	W.	—
Cork :—	Ballinacurra ...	51 52	8 10 W.	—	G.S.	04
	Ballydonegan ...	51 38	10 3 W.	—	W.	—
	Baltimore ...	51 28	9 22 W.	—	H.	90
	Crookhaven ...	51 28	9 43 W.	—	H.	90
	Crosshaven ...	51 48	8 18 W.	—	H.	01
	Doneraile ...	52 13	8 34 W.	266	R.	—
	Lawrence Cove ...	51 17	9 49 W.	—	H.	—
	Roche's Point ...	51 47	8 15 W.	42	T.	04
	Schull ...	51 32	9 32 W.	—	H.	90
	Union Hall ...	51 33	9 8 W.	—	H.	90
Dublin :—	Dublin City ...	53 20	6 15 W.	47	D.F.	03
	„ Phoenix Park ...	53 22	6 21 W.	155	B.D.S.	04
	„ Botanic Gardens	53 23	6 16 W.	67	D.	04
	„ Trinity College	53 21	6 16 W.	12	D.S.	04
	Dundrum ...	53 16	6 14 W.	—	G.	—
	Killiney ...	53 16	6 7 W.	249	R.	—
	Kingstown ...	53 17	6 8 W.	—	G.S.	03
	„ Harbour ...	53 17	6 8 W.	—	B.	03
	„ Sandy Cove	53 17	6 8 W.	—	W.	—
Kerry :—	Castle Gregory ...	52 15	10 1 W.	34	R.	—
	Killarney ...	52 4	9 30 W.	174	F.	03
	Minard ...	52 7	10 8 W.	—	W.	—
	Valencia ...	51 56	10 15 W.	30	A.T.	04
	„ Glanleam ...	51 56	10 20 W.	—	R.	01
	„ Knightstown	51 55	10 20 W.	—	H.	01
Kildare :—	Clongowes Wood College.	53 19	6 41 W.	237	D.	—
Kilkenny :—	Kilkenny ...	52 39	7 14 W.	212	C.F.	02
King's Co. :—	Birr Castle ...	53 6	7 55 W.	175	D.S.T.	03

LIST OF STATIONS ARRANGED ACCORDING TO DISTRICTS AND COUNTIES—*continued.*

County and Station.		Lat.	Long.	Height in feet above M.S.L.	Nature of Infor- mation received. <i>See p. 78.</i>	Year of last Inspection.
<b>10. IRELAND, SOUTH—<i>cont.</i></b>						
Limerick :—	Corbally ...	52° 39'	8° 36' W.	59	R.	02
	Foynes ...	52° 37'	9° 7' W.	108	F.	02
	Roxborough ...	52° 35'	8° 36' W.	111	R.	02
Queen's Co. :—	No station.					
Tipperary :—	No station.					
Waterford :—	Waterford ...	52° 16'	7° 7' W.	—	C.	02
	" ...	52° 16'	7° 7' W.	—	F.	—
Wexford :—	No station.					
Wicklow :—	Bray ...	53° 12'	6° 6' W.	—	H.	—
	Newcastle ...	53° 5'	6° 6' W.	256	D.	02
	Wicklow ...	52° 58'	6° 2' W.	—	H.	—
<i>Lightships</i> :—	Barrel's Rock ...	52° 7'	6° 24' W.	—	W.	—
	Coningbeg ...	52° 2'	6° 40' W.	—	W.	—
	Daunt's Rock ...	51° 43'	8° 16' W.	—	W.	—
	Kish Bank ...	53° 19'	5° 55' W.	—	W.	—
	North Arklow ..	52° 54'	5° 50' W.	—	W.	—

LIST OF OBSERVERS AT THE STATIONS OF THE SEVERAL ORDERS.

Name of Station.	Observer.
GROUP A.—OBSERVATORIES.	
Aberdeen ... ..	Professor C. Niven, F.R.S., for the Meteorological Office.
<sup>1</sup> Armagh ... ..	J. L. E. Dreyer, Ph.D., for the Meteorological Office.
<sup>2</sup> Ben Nevis ... ..	A. Rankin, for Directors of Ben Nevis Observatory.
<sup>2</sup> Bidston ... ..	W. E. Plummer, M.A., F.R.A.S., for the Mersey Docks and Harbour Board.
Falmouth ... ..	E. Kitto, for the Meteorological Office.
<sup>3</sup> Fort William ... ..	A. Rankin, for the Meteorological Office.
Glasgow ... ..	Professor L. Becker, Ph.D., for the Meteorological Office.
Greenwich ... ..	The Royal Observatory.
Kew ... ..	C. Chree, Sc.D., F.R.S., Superintendent of the Observatory Department, National Physical Laboratory, for the Meteorological Office.
Oxford ... ..	The Radcliffe Observatory, Dr. A. Rambaut, M.A., F.R.S.
Southport ... ..	J. Baxendell, for the Corporation.
Stonyhurst College ... ..	Rev. W. Sidgreaves, S.J., for the Meteorological Office.
Valencia ... ..	J. E. Cullum, for the Meteorological Office.
GROUP B.—ADDITIONAL ANEMOGRAPH STATIONS.	
Alnwick Castle ... ..	Robert Kyle, for the Duke of Northumberland, K.G.
Deerness, Orkney Islands ... ..	M. Spence, for the Meteorological Office.
Dublin, Phoenix Park ... ..	Colonel A. D. Meeres, R.E., Ordnance Survey Office.
Falmouth, Pendennis Castle ... ..	Coast Guard, for the Meteorological Office.
Fleetwood ... ..	The Urban District Council, for the Meteorological Office.
Holyhead (Harbour Office) ... ..	F. M. Cotton, C.E., for the Meteorological Office.
Kingstown ... ..	Robert Gray, C.E., for H.M. Office of Works.
Scilly Islands (St. Mary's) ... ..	A. Hicks, for the Meteorological Office.
Shields, North ... ..	Capt. T. Robson, for the Meteorological Office.
Shoeburyness ... ..	The Superintendent of Experiments.
Yarmouth ... ..	G. T. Watson, for the Meteorological Office.
GROUP C.—ADDITIONAL BAROGRAPH STATIONS.	
Ardfry, Co. Galway ... ..	W. M. Tattersall, for the Department of Agriculture for Ireland.
<sup>4</sup> Blackpool ... ..	F. J. H. Coutts, M.D., for the Corporation.
Cambridge Botanic Gardens ... ..	R. Irwin Lynch, for University of Cambridge.
Chatsworth ... ..	The Duke of Devonshire, K.G.
Cronkbourne, Isle of Man ... ..	A. W. Moore, M.A., J.P., C.V.O.

<sup>1</sup> Automatic Records of Wind, Sunshine, and Rainfall.

<sup>2</sup> Automatic Records of Pressure, Temperature, Hygrometry, Wind, and Rain.

<sup>3</sup> There is no Anemograph at this Observatory.

<sup>4</sup> There is a Dines' Anemometer and a recording Rain-gauge at this Station.

The names of Stations added to the list since last Report are printed in **Clarendon type**; those of Stations now discontinued are printed in *Italic type*.



LIST OF OBSERVERS AT THE STATIONS OF THE SEVERAL  
ORDERS—*continued.*

Name of Station.	Observer.
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GROUP C.—ADDITIONAL BAROGRAPH STATIONS—*continued.*

Forquhenny ... ..	C. L. Wood.
Fulbeck ... ..	Rev. Vere F. Willson, M.A.
Kilkenny ... ..	H. Carlton, for the Marquis of Ormonde, K.P.
Larne Harbour ... ..	E. W. L. Holt, for Department of Agriculture for Ireland.
London, Hampstead ... ..	H. R. Beeton.
"    Pall Mall ... ..	Athenæum Club.
"    Westminster ... ..	The Staff of the Meteorological Office.
Malin Head ... ..	Lloyd's Signalman, for the Meteorological Office.
Penbedw, Mold ... ..	H. W. Buddicom.
Rochford, Tenbury ... ..	Rev. John Tomson.
Rossall ... ..	T. G. Benn.
Scilly Islands (St. Mary's) ... ..	A. Hicks, for the Meteorological Office.
Stornoway ... ..	J. Mackenzie, for the Meteorological Office.
Sumburgh Head ... ..	Rev. W. Brand, for the Meteorological Office.
Waterford ... ..	Harbour Authorities.
Wokingham, Pinewood San- torium.	Dr. Roland A. Stevenson.
Yarmouth ... ..	G. T. Watson, for the Meteorological Office.

GROUP C<sup>1</sup>.—ADDITIONAL THERMOGRAPH STATIONS.

Chatsworth ... ..	The Duke of Devonshire, K.G.
London, Westminster ... ..	The Meteorological Office.

GROUP C<sup>2</sup>.—ADDITIONAL PLUVIOGRAPH STATIONS.

Cambridge, Botanic Gardens	R. Irwin Lynch.
Forquhenny, Perth ... ..	C. L. Wood.
London, Camberwell Green...	W. Oxtoby, M.I.C.E., for the Camberwell Borough Council.
"    "    Dulwich, Grove Vale.	"    "    "
"    "    Forest Hill, Cemetery.	"    "    "
"    "    Leyton Square	"    "    "
"    "    Peckham Road	"    "    "
"    Westminster ... ..	The Staff of the Meteorological Office.

GROUP C<sup>3</sup>.—HYGROGRAPH STATION.

Cambridge, Newnham Col- lege.	Miss Stephen.
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The names of Stations added to the list since last Report are printed in Clarendon type.

LIST OF OBSERVERS AT THE STATIONS OF THE SEVERAL  
ORDERS—continued.

Name of Station.	Observer.
GROUP S.—SUNSHINE STATIONS IN ADDITION TO THE OBSERVATORIES IN GROUP A, AND THE STATIONS MARKED ○ IN GROUPS D, E, G, T, AND R.	
†Aberdovey ... ..	<i>The late Captain John Edwards.</i>
Aspley Guise ... ..	<i>The late E. E. Dymond, J.P., and Mrs. H. S. Dymond.</i>
†Balrudderry ... ..	R. Cairns, for J. White.
†Edinburgh ... ..	Prof. I. B. Balfour, F.R.S.
†Guernsey (St. Peter Port) ...	F. E. Carey, M.D.
†Hastings, Waterworks ...	—, Farnham, for the Corporation.
Haverfordwest ... ..	J. W. Phillips.
Jersey (St. Helier's) ...	Signal Officer, Fort Regent, for Meteorological Office.
†London, City ... ..	Messrs. De la Rue.
† „ Westminster ... ..	J. H. Cowham.
†Newquay, Cornwall ... ..	C. C. Vigurs, B.A., M.D., for the Urban District Council.
Plumstead ... ..	J. G. Waller.
†Ramsgate ... ..	T. J. Taylor, C.E., for the Corporation.
Salcombe ... ..	W. Barrington Prowse, M.D.
Sheffield (Attercliffe) ...	J. Robertson, M.D., B.Sc., for the Corporation.
Sheffield (Abbey Dale) ...	C. J. Barker.
†Tenby ... ..	R. J. Truscott, for the Corporation.
†Torquay ... ..	F. March, for the Corporation.
Towyn ... ..	E. Lewys Lloyd, M.D.
†Westbourne, Sussex ...	Rev. L. B. Birkett.
†Worksoy ... ..	H. Mellish, J.P.
†Worthing ... ..	Frank Roberts, A.M.I.C.E., for the Corporation.
†York (Bootham) ... ..	Hugh Richardson, M.A.
„ (The Mount) ... ..	R. Thompson.
GROUP D. AND GROUP E.—NORMAL CLIMATOLOGICAL STATIONS. <sup>(1)</sup>	
Ackworth ... ..	E. B. Ludlam, M.Sc.
Ampleforth ... ..	Rev. J. B. McLaughlin, B.A., O.S.B.
†○Aspatia ... ..	J. Smith Hill, B.Sc., Agricultural College.
<i>Aysgarth</i> ... ..	<i>The late Rev. F. W. Stow, M.A.</i>
Belfast, Queen's College ...	John Wylie, B.A.
○Belvoir Castle ... ..	W. H. Divers, for the Duke of Rutland, K.G.
Bennington ... ..	Rev. J. Dunne Parker, LL.D.
○Berkhamsted ... ..	E. Mawley, F.R. Met. Soc.
†○Bettws-y-coed ... ..	D. Macdonogh, L.R.C.P., L.R.C.S.I.
†○Birmingham ... ..	Alfred Cresswell, for the Midland Institute.
†○Birr Castle... ..	W. J. Roe and J. H. Skerritt, for the Earl of Rosse, K.P.
‡†Braemar ... ..	J. Aitken, J.P.
<i>Bramley</i> ... ..	J. Bartlett, M.A.
‡Buxton ... ..	W. Pilkington.
‡†Cally ... ..	W. Thomson, for H. G. Murray Stewart.
†○Cambridge Bot. Gardens	R. Irwin Lynch.
○Canterbury ... ..	A. Lander.
‡Cargen ... ..	A. Peacock.
Carlisle ... ..	Studholme Cartmell, for the Corporation.

<sup>(1)</sup> Second Order Stations of the International Classification.

† There is a Lander's Anemograph at this Station.

‡ Information received weekly for use in the Weekly Weather Reports.

○ Record of bright sunshine received.

The names of Stations added to the list since last Report are printed in Clarendon type those of Stations now discontinued are printed in *Italic* type.

LIST OF OBSERVERS AT THE STATIONS OF THE SEVERAL  
ORDERS—*continued.*

Name of Station.	Observer.
GROUP D AND GROUP E.—NORMAL CLIMATOLOGICAL STATIONS— <i>continued.</i>	
Carnforth (Over Kellet)	W. Farrer.
†⊕ Cheadle ... ..	J. C. Philips.
†⊕ Cheltenham ... ..	A. C. Saxby, for the Corporation.
†⊕ Clacton-on-Sea ... ..	A. W. Shadick, for Urban District Council.
†⊕ Clathick ... ..	Alex. Hendry.
Clongowes Wood Col- lege, Co. Kildare.	A. E. Coulthard, B.Sc.
†⊕ Cockle Park, Morpeth ...	A. G. Birt, for the Northumberland County Council.
†⊕ Cromer ... ..	W. H. Archer, for Urban District Council.
†⊕ Cronkbourne ... ..	A. W. Moore, M.A., J.P., C.V.O.
†⊕ Deerness, Orkney ... ..	M. Spence.
Dublin, Botanic Gardens...	F. W. Moore, M.R.I.A.
† " City ... ..	Sir John W. Moore, M.D., D.Sc.
†⊕ " Phoenix Park ... ..	Colonel A. D. Meeres, R.E., Ordnance Survey Office.
⊕ " Trinity College ...	Arthur R. Moore and Maurice S. Moore.
†⊕ Dundee ... ..	J. Carnochan.
†⊕ Dunmow ... ..	Thos. Hacking, for the Countess of Warwick's Agricultural School.
†⊕ Dunrobin Castle ... ..	D. Melville, for the Duke of Sutherland, K.G.
†⊕ Durham ... ..	Professor R. A. Sampson, M.A., F.R.S.
†⊕ Eastbourne ... ..	R. Sheward, for the Corporation.
†⊕ Fort Augustus ... ..	Rev. C. von Dieckhoff.
† Fulbeck ... ..	Rev. Vere F. Willson, M.A.
⊕ Garforth ... ..	Prof. Seton, B.Sc., for the University of Leeds.
†⊕ Geldeston ... ..	E. T. Dowson.
†⊕ Glencarron... ..	D. D. Munro, for Lord Maclaren.
†⊕ Gordon Castle ... ..	C. Webster, for the Duke of Richmond and Gordon, K.G.
⊕ Guernsey (St. Peter Port)	Adolphus Collenette.
†⊕ Hillington ... ..	Rev. H. E. B. Ffolkes, M.A.
†⊕ Hull ... ..	H. B. Witty, for the Corporation.
†⊕ Lairg ... ..	Rev. John K. Maclean.
†⊕ Laundale ... ..	J. A. Fletcher, for T. H. G. Newton, M.A.
†⊕ Lednathie ... ..	W. Morrison, for P. Stormonth Darling.
†⊕ Lincoln ... ..	<i>The late</i> W. H. Curtin, and S. R. Moss, for the Corporation.
†⊕ Llandudno... ..	William Little, for the Town Council.
London (Camden Square)	H. Robert Mill, D.Sc., LL.D.
†⊕ Lowestoft ... ..	C. W. Edwards, for the Corporation.
⊕ Manchester, Oldham Road	J. Niven, M.A., M.B., for the Corporation.
⊕ " Whitworth Park.	Prof. Schuster, Ph.D., F.R.S.
†⊕ " Prestwich ... ..	T. R. H. Clunn, M.D.
†⊕ Marchmont ... ..	J. A. Wood, for Sir H. P. Campbell, Bart.
†⊕ Markree Castle ... ..	J. R. Armstrong, for the Trustees of <i>the late</i> Colonel Cooper.
Newcastle, Co. Wicklow ...	B. H. Steede, M.A., M.D.
†⊕ Newton Rigg ... ..	W. T. Lawrence, for the Cumberland County Council.

† Information received weekly for use in the Weekly Weather Reports.

⊕ Record of bright sunshine received.

The names of Stations added to the list since last Report are printed in **Clarendon type.**



LIST OF OBSERVERS AT THE STATIONS OF THE SEVERAL  
ORDERS—*continued.*

Name of Station.	Observer.
GROUP D AND GROUP E.—NORMAL CLIMATOLOGICAL STATIONS— <i>continued.</i>	
✠Norwood ... ..	W. Marriott ( <i>Asst.-Sec.</i> , Royal Met. Soc.).
✠ <i>Ochtertyre</i> ... ..	G. Croucher, for Sir P. K. Murray, Bart.
†⊙Plymouth ... ..	H. Victor Prigg, A.M.I.C.E., for the Corporation.
✠Poltalloch ... ..	D. S. Melville, for the Rt. Hon. Lord Malcolm.
Ridgmont (Woburn) ...	H. M. Freear, F.C.S., for the Royal Agri- cultural Society.
✠Rothesay ... ..	J. Kay.
✠Rounton ... ..	<i>The late</i> Sir I. Lothian Bell, Bart., F.R.S.
✠Rousdon ... ..	The Hon. Lady Peek.
†St. Leonard's ... ..	H. Colborne, M.R.C.S., for the Corporation.
Salisbury ... ..	Thos. Challis, for the Earl of Pembroke, G.C.V.O.
✠⊙Scarborough ... ..	W. W. Larkin, for the Corporation.
Seaham Harbour ... ..	G. H. Aird.
†⊙Sheffield, Weston Park Museum.	E. Howarth, F.R.A.S.
†Shrewsbury ... ..	Capt. W. E. Manser, R.E.
†⊙Southampton ... ..	A. Vaughan, for Director-General of Ordnance Survey.
Stokesay ... ..	Rev. W. M. D. La Touche, B.A.
†⊙Strathpeffer Spa ... ..	J. McLean, for R. Fortescue Fox, M.D.
Tealby ... ..	Rev. S. Lewin, B.A.
✠Wakefield ... ..	A. Clyde.
Wessington Court ...	S. Lomas, for Miss L. Grafton.
⊙Whitby ... ..	Thos. Newbitt.
✠Whitchurch, Devon ...	E. E. Glyde.
✠Wolfelee ... ..	Thos. Arthur, for Major Elliot.
✠Woolacombe, Devon ...	B. Fanshawe.
York, The Museum ...	H. M. Platnauer, B.Sc., and Oxley Grabham, M.A.

Monthly returns are also furnished for the Registrar-General's report, or for the publications of the Office, by the Royal Observatory, Greenwich, the Radcliffe Observatory (Oxford), Bidston Observatory, the Observatory of Stonyhurst College, Glasgow Observatory, and the Armagh Observatory.

## GROUP G.—AUXILIARY CLIMATOLOGICAL STATIONS. (2)

⊙Aberystwyth ... ..	A. Thomas, M.D., for the Urban Council.
†Alnwick Castle ... ..	Robert Kyle, for the Duke of Northumberland, K.G.
†Arlington Court, Devon ...	Lady Chichester.
⊙Ballinacurra ... ..	John H. Bennett.
Barnet ... ..	T. H. Martin, A.M.I.C.E.
Barnstaple ... ..	Thos. Wainwright, for the North Devon Athenæum.
†Bath ... ..	W. H. Symons, M.D., for the Corporation.
†Bawtry (Hesley Hall) ...	B. I. Whitaker, J.P.
†⊙Blackpool ... ..	F. J. H. Coutts, M.D., for the Corporation.
†⊙Bognor ... ..	H. C. L. Morris, M.B., and A. G. Thompson.
Bolton ... ..	W. W. Midgley and Thos. Midgley, for the Corporation.

<sup>1</sup> There is a Dines Anemograph at this Station.

(2) Third Order Stations of the International Classification.

† Information received weekly for use in the Weekly Weather Reports.

⊙ Record of bright sunshine received.

The names of Stations added to the list since last Report are printed in Clarendon type ; those of Stations now discontinued are printed in *Italic* type.

LIST OF OBSERVERS AT THE STATIONS OF THE SEVERAL  
ORDERS—*continued*.

Name of Station.	Observer.
<b>GROUP G.—AUXILIARY CLIMATOLOGICAL STATIONS—<i>continued</i>.</b>	
†⊙ Bournemouth ... ..	C. Dales, for Town Council.
†⊙ Bradford ... ..	H. A. Johnson, M.Inst.C.E.
†⊙ Brighton ... ..	A. Newsholme, M.D., for the Corporation.
† Bristol (Over Court Park)	R. C. Cann Lippincott, F.R. Met. Soc.
†⊙ Broadstairs ... ..	W. H. White, for District Council.
Buntingford ... ..	Dr. G. M. Smith.
Cambridge, Newnham Col.	Miss Stephen.
† Cardiff ... ..	E. Walford, M.D., for the Corporation.
Caterham ... ..	P. E. Campbell, M.B.
† Chatsworth ... ..	The Duke of Devonshire, K.G.
† Chester (Hawarden Br.)	F. B. Summers.
†⊙ Cirencester ... ..	Prof. G. T. Locke, M.A., for the R.A. College.
† Clifton College ... ..	D. Rintoul, M.A.
† Colly Weston ... ..	Miss A. Tasker.
⊙ Coventry ... ..	E. Hugh Snell, M.D., for the Corporation.
†⊙ Crathes ... ..	J. Smith.
†⊙ Cullompton ... ..	T. Turner, J.P.
⊙ Darwen ... ..	G. Mainland, for the Corporation.
† Dundrum ... ..	Dr. Arthur S. Goff.
Dunfanaghy ... ..	J. J. Macgrath, L.R.C.P.
† Edenfel (Omagh) ... ..	Col. Buchanan, C.B.
† Epsom ... ..	S. C. Russell.
†⊙ Felixstowe ... ..	J. Mills, for the Corporation, and S. Alexander.
† Foynes ... ..	W. H. Ward, for Lord Monteagle, K.P.
†⊙ Harrogate ... ..	G. Paul, F.R.Met.Soc., for the Corporation.
† Hereford (Belmont) ... ..	Rev. F. B. Harrington, O.S.B.
†⊙ Hoylake ... ..	Tom Robinson, for Urban District Council.
† Huddersfield ... ..	J. Firth.
† Kilkenny ... ..	H. Carlton, for the Marquis of Ormonde, K.P.
† Killarney ... ..	E. W. Griffin, M.D.
⊙ Kingstown ... ..	Dr. J. B. Power, for the Corporation.
† Leeds ... ..	H. Crowther.
†⊙ Littlestone-on-Sea ... ..	H. T. Tubbs.
†⊙ Llangammarch Wells ... ..	W. Black Jones, M.D., B.S., D.P.H.
Maidenhead ... ..	G. H. Palmer.
†⊙ Margate ... ..	J. Stokes, J.P.
†⊙ Marlborough ... ..	J. C. Alsop.
†⊙ Newcastle-on-Tyne ... ..	N. H. Martin, F.R.S.E., F.C.S.
Newport, Monmouth ... ..	C. Cullum, for the Corporation.
†⊙ Newquay, Cornwall ... ..	C. C. Vigurs, B.A., M.D., for Urban District Council.
† Norwich (Brundall) ... ..	A. W. Preston.
†⊙ Nottingham ... ..	Arthur Brown, M.Inst.C.E., and Philip Boobyer, M.D., for the Corporation.
⊙ Oundle School ... ..	J. O. Morris, for F. W. Sanderson, M.A., Headmaster.
†⊙ Portsmouth ... ..	A. Mearns Fraser, M.D., for the Corporation.
⊙ Port Talbot, Margam Park	G. Lipscomb, for Miss Talbot.
† Preston ... ..	H. O. Pilkington, M.R.C.S., for the Corporation.
†⊙ Raunceby Hall ... ..	J. Hope, for General Sir M. Willson, K.C.B.
Reading ... ..	Edward Little, for J. Ridger, M.A.
†⊙ Rhyl ... ..	A. A. Goodall, for District Council.

† Information received weekly for use in the Weekly Weather Reports.

⊙ Record of bright sunshine received.

The names of Stations added to the list since last Report are printed in clarendon type.

LIST OF OBSERVERS AT THE STATIONS OF THE SEVERAL  
ORDERS—*continued.*

Name of Station.	Observer.
GROUP G.—AUXILIARY CLIMATOLOGICAL STATIONS— <i>continued.</i>	
†⊙ Rothamsted ... ..	A. B. Hall, M.A., for the Lawes Agricultural Trust.
Rugby School ... ..	O. M. Samson, M.A.
St. Leonard's, West Marina	T. Eldridge, for the Corporation.
†⊙ Saltburn - by - the - Sea	J. Allan Bennett, M.D.
†⊙ Shaftesbury ... ..	Rev. F. Ehlers.
†⊙ Shobery Ness ... ..	The Superintendent of Experiments.
†⊙ Skegness ... ..	S. Coetmore Jones, for the District Council.
†⊙ Swarraton ... ..	Rev. W. L. W. Eyre, M.A.
†⊙ Tharcaston ... ..	<i>The late</i> Rev. T. A. Preston, M.A.
⊙ Totland Bay, Isle of Wight	J. Dover, M.A.
†⊙ Tunbridge Wells ... ..	F. G. Smart, M.B.
†⊙ Ventnor ... ..	Miss M. Gibson, for Royal National Hospital for Consumption.
† Waterford ... ..	J. N. White.
†⊙ Wisley, Royal Horticultural Gardens.	The Superintendent, for the Royal Horticultural Society.
Wokingham, Pinewood Sanatorium.	R. A. Stevenson, M.D.

## GROUP R.—ADDITIONAL RAINFALL STATIONS

Abersychan ... ..	W. P. James.
Ardross Castle ... ..	W. Minty.
Brandon ... ..	Lt.-Col. B. E. Spragge, D.S.O.
Caistor, Lincolnshire ... ..	Thos. Ford.
Carrigallen ... ..	Mrs. J. Godley and Miss Morrow.
Castle Gregory, co. Kerry...	Admiral E. F. Jeffreys, C.V.O.
Chapel House Reservoir...	T. Strong.
Chertners, Northumberland ...	Francis R. Hull, C.E.
Corbally, Limerick ... ..	Poole Gabbett.
Cuckfield ... ..	John Howe.
Dam Site, Northumberland ...	Francis R. Hull, C.E.
Disserth, Llandrindod... ..	Rev. J. Le Herbert.
Doneraile ... ..	Capt. J. W. Evans, J.P.
Dover ... ..	H. E. Stilgoe, C.E.
Dursley ... ..	J. Richards.
East Dereham ... ..	G. H. Cooper.
East Ham ... ..	J. G. Banks, for the Corporation.
Ennis (Roslevan), Co. Clare ...	Miss A. L. Scott.
Ennistymon ... ..	Rev. C. W. McDowell, M.A.
Fallowlees, Northumberland...	Francis R. Hull, C.E.
Forest of Dean :—	
Blakeney Hill ... ..	E. Allford and J. Tyler, for Philip Baylis, Esq.
Braceland ... ..	E. A. Popert,
Edgehills Lodge ... ..	Campbell Anderson,
Ruardean Hill ... ..	John Morris,
Whitemead Park ... ..	Kate Roberts,
Worcester Lodge ... ..	Fred Morris,

† Information received weekly for use in the Weekly Weather Reports.

⊙ Record of bright sunshine received.

The names of Stations added to the list since last Report are printed in clarendon type; those of Stations now discontinued are printed in *Italic* type.

LIST OF OBSERVERS AT THE STATIONS OF THE SEVERAL  
ORDERS—*continued.*

Name of Station.	Observer.
GROUP R.—ADDITIONAL RAINFALL STATIONS— <i>continued.</i>	
Forest Row, Sussex ... ..	Rt. Hon. J. Bryce, D.C.L., M.P.
Glenarm ... ..	The Earl of Antrim.
Glendrynoch (I. of Skye) ...	Rev. H. Harbord, M.A.
Great Billing ... ..	Rev. G. H. Mullins, M.A.
Gruline, Isle of Mull ... ..	J. W. Melles.
Harefield ... ..	G. Eland.
Hastings, Borough Cemetery	Walter Field.
Hastings, St. Helen's Crescent	Rev. H. H. Breton, M.A.
Hidcote, Campden ... ..	Major W. Wright, R.A.
Hildenborough, Kent ... ..	Charles H. Scott.
Hoar Cross ... ..	F. W. Lycett.
Hovingham Hall, Yorks ...	Bingley Day, for Sir W. Worsley, Bart.
Hurdlestown ... ..	Lt.-Col. W. O. Bentley, R.A.
Isleworth ... ..	A. Worsley.
Kearsney Abbey (Dover) ...	<i>The late</i> C. W. Curtis, J.P.
" Chilton Farm ... ..	H. E. Stilgoe, C.E.
Killiney, Co. Dublin ... ..	R. O'Brien Furlong, C.B.
Kinlochewe ... ..	A. McLennan, for Hon. W. Peel, M.P.
Kirkby Lonsdale (Casterton)	R. A. Clarke.
Lahinch, Co. Clare ... ..	Miss I. F. K. Bowes.
Laleham (Middlesex) ... ..	W. Trusler, for J. Thornton.
Llanbedr Hall near Ruthin ...	George A. Grace-Calvert, M.B.
Llandinam ... ..	David Bowen.
London, Chelsea ... ..	T. W. E. Higgins, C.E., for the Chelsea Borough Council.
Mallaranny ... ..	Miss M. Kilsby and M. Macarthy.
Mareham-le-Fen ... ..	Mrs. G. L. Kime.
Mount Callan, Inagh ... ..	Lt. Col. Tottenham.
Newchurch Reservoir, Mon- mouth.	C. Cullum.
Newmarket-on-Fergus ... ..	W. W. A. Fitzgerald.
Northallerton ... ..	W. Stead, C.E.
Oundle ... ..	N. E. Dixon, C.E.
Pant-y-reos, Monmouth ... ..	C. Cullum.
Parkstone, Dorset ... ..	C. Mabey.
Penrhyn Quarry ... ..	E. A. Young.
Recess, Co. Galway ... ..	A. A. Smith.
Redpath, Northumberland ...	Francis R. Hull, C.E.
Rhayader Watershed :—	
Abergwngy ... ..	} The Engineer-in-Charge, for the Corporation of Birmingham.
Bwlchyrhendre ... ..	
Claerwen ... ..	
Nantgwillt, Old Gauge ... ..	
" New Gauge ... ..	
Nant-y-car ... ..	
Pryddallau ... ..	
Tremynydd ... ..	
Ridlington ... ..	N. W. Wortley.
Rochford, Tenbury ... ..	Rev. John Tomson.
Roxborough ... ..	A. W. Shaw.
Sandgate ... ..	A. Robert Bowles, C.E.
Sandwich ... ..	Royal St. George's Golf Club.
Simonsbath ... ..	Rev. John S. Martin.
Southend-on-Sea ... ..	C. S. Bilham.
Syston ... ..	S. K. Daniels.

The names of Stations added to the list since last Report are printed in clarendon type.



LIST OF OBSERVERS AT THE STATIONS OF THE SEVERAL  
ORDERS—*continued.*

Name of Station.	Observer.
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GROUP R.—ADDITIONAL RAINFALL STATIONS—*continued.*

Temple Bruer (Lincolnshire)...	Miss Alice S. Morley.
Thetford, Norfolk ... ..	E. S. Greenwood.
Tod Crag ... ..	Francis R. Hull, C.E.
Valencia Island, Glanleam ...	Miss E. Fitzgerald.
Warlingham, Surrey ... ..	R. H. Curtis.
Watergate (Emsworth) ... ..	W. M. Christy.
Ynis-y-bro, Newport ... ..	C. Cullum.
York, Deighton Grove ... ..	M. L. Whitehead.

GROUP T.—TELEGRAPHIC REPORTING STATIONS.

⊙ Aberdeen Observatory ... ..	G. A. Clarke.
⊙ <sup>1</sup> Bath ... ..	W. H. Symons, M.D., for the Corporation.
Bidston Observatory, Liverpool.	W. E. Plummer, M.A., F.R.A.S., for the Mersey Docks and Harbour Board.
⊙ Birr Castle ... ..	W. J. Roe.
Blacksod Point, Co. Mayo ...	J. Heddon, Coastguard.
⊙ Clacton-on-Sea ... ..	A. W. Shadick, for the Town Council.
Donaghadee ... ..	R. Damerell, Coastguard.
Dungeness ... ..	J. G. Williams, Lightkeeper.
Holyhead ... ..	T. Choze, Sailors' Home.
Jersey (St. Aubin's) ... ..	J. Fisher.
Leith ... ..	D. Drummond, Post Office.
London, Brixton ... ..	F. Gaster.
⊙ London, Westminster ... ..	The Staff of the Meteorological Office.
Malin Head, Co. Donegal ...	Lloyd's Signalmen.
Nairn ... ..	Miss Penny.
⊙ <sup>2</sup> Nottingham ... ..	Arthur Brown, A.M.Inst.C.E., for the Corporation.
⊙ Oxford ... ..	W. Wickham, Radcliffe Observatory.
Portland Bill ... ..	W. J. Batton, Lightkeeper.
Roche's Point, Co. Cork ...	M. FitzMahony, Post Office.
⊙ St. Ann's Head, Pembroke...	G. H. Dunsford, Lightkeeper.
⊙ Scilly Islands (St. Mary's)	Alfred Hicks.
Shields, North ... ..	R. Moat, Post Office.
Spurn Head ... ..	A. S. Badcock, Lightkeeper.
⊙ Stornoway ... ..	J. Mackenzie, Lloyd's Agent.
Sumburgh Head ... ..	Rev. W. Brand.
⊙ Valencia Observatory ... ..	J. E. Cullum.
Wick ... ..	Miss Sinclair.
Yarmouth, Norfolk ... ..	G. T. Watson, Sailors' Home.

<sup>1</sup> There is a Dines Anemograph at this Station.

<sup>2</sup> There is a Dines Anemograph, and a self-recording Rain gauge at this Station.

⊙ Record of bright sunshine received.

The names of Stations added to the list since last Report are printed in clarendon type.

LIST OF FOREIGN STATIONS FROM WHICH REPORTS ARE  
RECEIVED DAILY BY TELEGRAPH. See PAGE 65.

Name of Station.	Authority.
Haparanda ... ..	} Meteorological Office, Stockholm.
Hernösand ... ..	
<sup>2</sup> Stockholm ... ..	
Wisby ... ..	
Karlstad ... ..	
Bodö ... ..	} Meteorological Institute, Christiania.
<sup>2</sup> Christiansund... ..	
<sup>2</sup> Skudesnaes ... ..	
Færder ... ..	} Meteorological Institute, Copenhagen.
<sup>2</sup> The Scaw ... ..	
Fanö ... ..	
Cuxhaven ... ..	} Deutsche Seewarte, Hamburg.
Berlin ... ..	
Frankfurt ... ..	
Munich ... ..	
<sup>2</sup> The Helder ... ..	} Bureau Central Météorologique, Paris.
Brussels ... ..	
Cape Gris Nez... ..	
<sup>2</sup> Brest (St. Mathieu) ... ..	
Lorient (Ile de Groix) ... ..	
<sup>2</sup> Rochefort (Ile d'Aix) ... ..	
<sup>2</sup> Biarritz ... ..	
<sup>2</sup> Paris ... ..	
Belfort ... ..	
Lyons ... ..	
Nice ... ..	} Observatory, Lisbon.
Perpignan ... ..	
Corunna ... ..	} Meteorological Service of the Azores.
Lisbon ... ..	
<sup>2</sup> Azores (Ponta Delgada) ... ..	
" (Horta) ... ..	

*Note.*—The stations marked <sup>(1)</sup> report also at 2h. p.m., and those marked <sup>(2)</sup> at 6h. p.m. Lisbon reports at 4h. p.m. instead of 6h. p.m., and Ponta Delgada at 3h. p.m.  
No reports are received from the Helder at 6 p.m. on Sundays.

LIST OF RECIPIENTS OF HARVEST FORECASTS (*see* p. 23) who have kept and returned to the Office a daily record of weather experienced, for the purpose of an independent checking of the forecasts as issued.

T. Thompson, Welburn, York.  
M. R. Pryor, Weston Hall, Stevenage, Herts.  
G. S. Flowerdew, South Green, Eye, Suffolk.  
T. G. Binney, Guisnes Court, Tolleshunt D'Arcy, Essex.  
W. A. Sandeman, Morden House, Royston.  
T. Coker, Wigginton, Tring, Herts.  
R. Hussey-Freke, Manor Farm, Hannington, Highworth, Wilts.  
N. V. Bowater, Bury Hall, Lower Edmonton.  
J. Norris, Pagehurst, Staplehurst.  
J. Welsh, Laglands, Reigate.  
A. Burch, Chiddingfold, Surrey.  
A. Radford, Bradfield Hall, Berks.  
G. J. H. Pearse, Vagg, Yeovil.  
R. M. Greaves, Portmadoc.  
W. Little, Town Hall, Llandudno.  
D. A. Thomas, M.P., Llanwern, Newport, Mon.  
Thomson Bros., Tregony, Cornwall.  
Sir Thomas Dyke Acland, Killerton, Exeter.

LIST OF OBSERVERS AT THE STATIONS OF THE SEVERAL  
ORDERS—*continued.*

Name of Station.	Observer.
GROUP W.—SEA TEMPERATURE STATIONS.	
Aberdeen, Cove Bay ...	Coastguard.
Arran, North, Galway ...	"
Bahama Bank Lightship ...	Lightkeepers.
Ballantrae, Ayrshire ...	Coastguard.
Ballydonegan, Co. Cork ...	"
Ballyglass, Co. Mayo ...	"
Barrels Rock Lightship ...	Lightkeepers.
Blacksod Point, Co. Mayo ...	Coastguard.
Burnmouth, Ayton, Berwick...	"
Burntisland ...	"
Caernarvon Bay Lightship ...	Lightkeepers.
Cardigan Bay Lightship ...	"
Cleggan, Co. Galway ...	Coastguard.
Coningbeg Lightship ...	Lightkeepers.
Cromarty ...	Coastguard.
Daunts Rock Lightship ...	Lightkeepers.
East Goodwin Lightship ...	"
English and Welsh Grounds Lightship.	"
Holyhead Harbour Office ...	F. M. Cotton, C.E.
Kilcredane, Co. Clare ...	Coastguard.
Kingstown, Sandy Cove ...	A. Carson.
Kirkwall ...	Coastguard.
Kish Bank Lightship ...	Lightkeepers.
Lamlash, Isle of Arran ...	Coastguard.
Leman and Ower Lightship ...	Lightkeepers.
Lerwick ...	Coastguard.
Liscannor, Co. Clare ...	"
<i>Minard</i> , Co. Kerry ...	"
Morecambe Bay Lightship ...	Lightkeepers.
Newarp Lightship ...	"
Newquay, Cornwall ...	Coastguard.
North Arklow Lightship ...	Lightkeepers.
North-West Lightship ...	"
Outer Dowsing Lightship ...	"
Owers Lightship ...	"
Pennan Bay, Aberdour ...	Coastguard.
Port Erin ...	"
Portrush ...	"
Royal Sovereign Lightship ...	Lightkeepers.
St. Ann's Head, Pembroke ...	"
Salcombe, Devon ...	Coastguard.
Scarborough ...	"
Scilly Islands, St. Mary's ...	A. Hicks.
Seafeld, Co. Clare ...	Coastguard.
Seven Stones Lightship ...	Lightkeepers.
Shambles Lightship ...	"
Sheephaven, Dunfanaghy ...	Coastguard.
Shipwash Lightship ...	Lightkeepers.
Skulmartin Lightship ...	"
Solway Lightship ...	"
South Rock Lightship ...	"
Spurn Lightship ...	"
Stornoway ...	Coastguard.
Sunderland ...	"
Teelin, Co. Donegal ...	"
Uzon, Montrose ...	"
Wick ...	"

The names of Stations added to the list since last Report are printed in *clarendon* type, those of Stations now discontinued are printed in *italic* type.

LIST OF STATIONS in the COLONIES and DEPENDENCIES and in FOREIGN COUNTRIES from which RETURNS are received in MANUSCRIPT.

NOTE.—Returns received in printed form are included in the list of additions to the Library. Appendix VIII., p. 156.

Station.	Latitude.	Longitude.	Height in Feet above M.S.L.	Nature of Information Received. (See p. 78.)	Year of Commencement of Observations.	Observer.
MEDITERRANEAN.						
Cyprus, Famagusta	35 7 N.	33 57 E.	34	D.	1881	L. Berand, for Dr. Heidenstam, C.M.O.
" Kyrenia	35 21 N.	33 19 E.	54	D.	1881	P. Michaelides "
" Larnaca	34 55 N.	33 37 E.	19	D.	1881	P. Nicopoulles "
" Limassol	34 40 N.	33 1 E.	26	D.	1881	M. Theodorides "
" Nicosia	35 11 N.	33 22 E.	493	D.	1881	J. Josif and J. P. Samaras, for Dr. Heidenstam, C.M.O.
" Papho	34 46 N.	32 25 E.	202	D.	1881	M. Enotiades and Y. V. Zachariades, for Dr. Heidenstam, C.M.O.
Gibraltar	30 6 N.	5 21 W.	48	D.	1883	Sergt. M. Davis, for Col. J. McNamara, M.D., C.M.O.
Morocco, Cape Spartel	35 47 N.	5 55 W.	191	D.	1893	Edwin C. Hathaway.
" Casablanca	33 37 N.	7 34 W.	24	R.	1896	G. H. Lerman.
" Mogador	31 30 N.	9 42 W.	72	R.	1903	A. M. Madden, H.B.M. Vice-Consul.
" Sathi	32 17 N.	9 8 W.	—	R.	1905	John Aussi.
Syria, Beyrout	33 54 N.	35 28 E.	172	D.	1883	Robt. H. West, M.A., and George Maier, M.S.
AFRICA.						
East :—						
Upper Sheikh	9 56 N.	45 11 E.	4,595	G.	1903	Dr. R. E. Drake Brockman.
Central :—						
Eastern Soudan, Wadelai	12 40 N.	31 35 E.	2,200	G.	1901	M. T. Dawe, P. H. Hooper and C. Tubuteou.
Uganda, Butiaba	—	—	—	R.	1904	R. K. Mitter.
" Bugala, Serre Island	—	—	—	R.	1904	Rev. H. T. C. Weatherhead.
" Entebbe	0 4 S.	32 30 E.	3,906	D.	1896	M. T. Dawe and T. Remedios.



"	Fort Portal ...	...	+0	40 N.	30	20 E.	5,299	D.	1901	C. J. Yorke and E. Coutinho.
"	Gondokoro ...	...	+4	54 N.	31	44 E.	1,500	G.	1901	J. R. M. Silva.
"	Jinja ...	...	0	24 N.	33	13 E.	3,650	G.	1901	Dr. H. A. E. Noble and V. Raghoba.
"	Masaka ...	...	+0	20 S.	31	50 E.	—	G.	1902	C. G. Dislei.
"	Mbarara ...	...	+0	39 S.	30	49 E.	4,500	G.	1901	F. A. Knowles and J. J. de Sousa.
"	Nimule ...	...	3	38 N.	32	11 E.	2,083	G.	1903	J. S. Rodrigues and A. S. Pinto.
West:—										
"	Gold Coast, Aburi ...	...	—	—	—	—	—	G.	1893	J. C. Glover, E. C. Andrews, for Director of Agriculture.
"	" Accra ...	...	+5	35 N.	0	6 W.	—	G.	1893	Dr. G. J. Rutherford and Dr. R. H. Kennan.
"	" Axim ...	...	+4	50 N.	2	12 W.	—	G.	1895	Dr. M. J. Loughrey and Dr. A. Macqueen.
"	" Cape Coast Castle ...	...	+5	15 N.	0	30 W.	—	G.	1895	Dr. G. L. Barker and Dr. W. W. Claridge.
"	" Gambaga ...	...	+10	31 N.	0	26 W.	—	G.	1899	Dr. H. B. Montgomery and Dr. W. M. Graham.
"	" Kumasi ...	...	+6	50 N.	2	16 W.	—	G.	1899	Dr. P. J. Garland and Dr. E. H. Tweedy.
"	" Kwitta ...	...	+5	59 N.	0	59 E.	—	G.	1895	Dr. H. A. Chaplin and Dr. F. S. Harper.
"	" Sekondi ...	...	5	0 N.	1	40 W.	—	G.	1904	Dr. J. H. Collier and Dr. E. L. Hunt, C.M.G.
"	Sierra Leone ...	...	8	30 N.	13	9 W.	179	D.	1895	Dr. E. F. L'Estrange, Capt. R.A.M.C. and Dr. H. S. Taylor, Capt. R.A.M.C.
WEST INDIES.										
"	Bahamas, Abaco ...	...	25	52 N.	77	11 W.	70	D.*	1859	J. W. Roberts.
"	" Cay Lobos ...	...	22	33 N.	77	36 W.	15	D.*	1877	C. S. E. Lotmore and S. W. Roberts.
"	" Cay Sal ...	...	23	42 N.	80	25 W.	30	D.*	1859	Lightkeepers.
"	" Inagua ...	...	21	21 N.	73	1 W.	21	D.*	1871	J. A. Williams.
"	" Nassau ...	...	+25	2 N.	77	25 W.	—	G.	1895	H. P. Burns, Supt. Bahamas Cable.
"	" Watling's Island ...	...	23	57 N.	74	28 W.	60	D.*	1889	T. R. Thompson, senr.
"	Barbados ...	...	+13	12 N.	59	35 W.	181	E.	1895	John R. Bovill.
"	Sombrero ...	...	18	36 N.	63	28 W.	30	D.*	1867	J. A. Richardson and A. L. Richardson.

\* Lighthouse Register containing observations every 4 hours.

† The positions and heights of the stations are those given by the observers, except in cases marked †, for which the information given has been obtained from other sources.

LIST OF STATIONS in the COLONIES, &amp;c., from which RETURNS are received in MANUSCRIPT—continued.

Station.	Latitude.	Longitude.	Height in Feet above M.S.L.	Nature of Information Received. (See p. 78.)	Year of Commencement of Observations.	Observer.
<b>AMERICA.</b>						
North :— Repulse Bay (Southampton Island).	66° 30' N.	86° 20' W.	—	Log.	1904	J. W. Murray.
Central :— Panama, Colon...	†9° 23' N.	79° 23' W.	—	D.	1897	The Ven. Archdeacon S. P. Hendrick.
South :— British Guiana, Georgetown...	6° 42' N.	56° 10' W.	0	D.S.	1887	E. S. Christiani.
<b>ATLANTIC.</b>						
South :— Falkland Islands (Cape Pembroke).	51° 41' S.	57° 42' W.	70	D.S.*	1859	J. Pearce.
St. Helena, St. Matthew's Vicarage.	16° 0' S.	5° 40' W.	1,887	B.D.	1885	A. L. C. Hands.
" Central, Oak Bank	—	—	1,696	R.	1902	J. Homagee.
" Mount Pleasant ...	—	—	1,997	R.	1896	T. C. Barker.
<b>INDIAN AND PACIFIC OCEANS, &amp;c.</b>						
China :—	32° 10' N.	119° 40' E.	36	D.	1905	Capt. Louis H. Tamplin.
Chinkiang ...	31° 21' N.	118° 21' E.	—	D.	1901	Capt. Louis H. Tamplin.
Wuhu ...	20° 6' S.	57° 31' E.	181	D.	1901	T. F. Claxton.
Mauritius, Royal Alfred Observatory.						

\* Lighthouse Register containing observations every 4 hours.

† The positions and heights of the stations are those given by the observers, except in cases marked †, for which the information given has been obtained from other sources.

# I.—LIST OF PUBLICATIONS ISSUED UNDER THE AUTHORITY OF THE METEOROLOGICAL COUNCIL.\*

The list is arranged under the following headings :—

1. Periodical Publications.†
2. Occasional Publications and Reports.
3. Instructions in the use of Instruments, &c.
4. Marine Meteorology.
5. Miscellaneous Publications.

## 1. Periodical Publications.

*Daily Weather Reports.* Subscription, 5s. per quarter.

*Weekly Weather Reports.* With Appendices and Monthly Supplements priced separately :—

‡1888. Vol. V. (Official, No. 85.) 4d. per week. Annual Volume, including Supplements and Appendices, 21s. 2d.

1889-1905. Vols. VI.-XXII. 6d. per week. Annual subscription, including Supplements and Appendices, 30s.

*Monthly Pilot Charts of the North Atlantic and Mediterranean.* See Marine Meteorology.

*Monthly Weather Reports :—*

§1884-1887. In Monthly Parts, 1s. 6d. to 2s. 6d. each, except May to December 1887, which is in wrapper, price 12s.

*Quarterly Weather Reports :—*

1869-1880. At prices varying from 4s. to 10s. each Quarterly Part.  
1877-1880 :—Appendices and Plates are published for these years at 27s. or 28s. per yearly set.

**ANNUAL Volumes :—**

*Reports of the Meteorological Committee of the Royal Society :—*

1867-1877. At prices varying from 4d. to 1s. per Report, except 1876-1877 3s. 5d.

*Reports of the Meteorological Council :—*

1878-1905. At prices varying from 5d. to 1s. 2d., except 1884-5, 4s.

*Observatories and Stations.*

||Hourly Readings from the Self-Recording Instruments at the . . . Observatories under the Meteorological Council :—

1881-1886. In Parts, varying in price from 10s. to 30s. each.

1900 and 1901. 25s. each, or 6d. per month each station. 1902 (in the press).

\* Sold by Messrs. Wyman and Sons and other agents for the sale of the publications of H.M. Stationery Office; Annual Reports by Parliamentary Booksellers; Pilot Charts and Charts published by the Admiralty, by Messrs. J. D. Potter & Co.

† These have from time to time contained Tables of Mean Values and papers on various Meteorological Investigations. A List of the more important of these contributions to Meteorological knowledge will be found in Appendix XI. of the Report for 1903-04.

‡ The publication of the Weekly Weather Report began in February 1878. Annual subscription, including Supplements and Appendices, post paid, 1878-1883, 12s. 6d.; 1884-1887, 21s. 2d.

§ The publication of the Monthly Weather Report was continued after 1887 as a Supplement to the Weekly Weather Report.

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

**1. Periodical Publications—continued.***Observatories and Stations—continued.*

Hourly Means of the Readings obtained from the Self-Recording Instruments at the . . . Observatories under the Meteorological Council :—

1887-1899. In Annual Volumes, at prices varying from 15*s.* to 38*s.*

Meteorological Observations at Stations of the Second Order :—

\*1876-1900. At prices varying from 20*s.* to 35*s.*

**2. Occasional Publications and Reports.****ATLAS :—**

Meteorological Atlas of the British Isles. (Official, No. 53. 1883.) 5*s.* 6*d.*

**CONGRESSES, CONFERENCES, &c., Reports of Proceedings :—**

Leipzig. 1872. (Non-Official, No. 6.) 1*s.*

Vienna. 1873. (Official, No. 21.) 1*s.*

Vienna and Utrecht. 1873 and 1874. (Non-Official, No. 9.) 1*s.* 6*d.*

London. 1874. Maritime Meteorology. (Official, No. 23.) 2*s.*

London. 1876. With Supplement. (Non-Official, No. 11.) 2*s.*

Utrecht. 1878. (Non-Official, No. 13.) 6*d.*

Rome. 1879. (Official, No. 36.) 1*s.* 6*d.*

Berne. 1880. (Non-Official, No. 14.) 1*s.*

Copenhagen. 1882. (Non-Official, No. 15.) 2*s.* 6*d.*

Paris. 1885. (Non-Official, No. 16.) 1*s.*

Zürich. 1888. (Non-Official, No. 17.) 4*d.*

Munich. 1891. (Official, No. 102.) 1*s.* 6*d.*

Upsala. 1894. (Official, No. 115.) 1*s.*

Paris. 1896. (Official, No. 127.) 1*s.*

St. Petersburg. 1899. (Official, No. 148.) 2*s.*

Southport. 1903. (Official, No. 164.) 2*s.*

Report on Weather Telegraphy and Storm Warnings. 1873. (Non-Official, No. 8.) 6*d.*

Reports . . . on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy. 1878. (Non-Official, No. 12.) 2*s.*

**Fog :—**

London Fog Inquiry, 1901-03. (Official, No. 160. 1904) :—

Report of the Council, with Report by R. G. K. Lempfert, M.A. (1904). 2*s.* 6*d.*

Report by Captain Alfred Carpenter, R.N., D.S.O. (1903). 2*s.*

**FOREIGN AND COLONIAL STATIONS :—**

Contribution to the Meteorology of Japan.—By Staff-Com. Thomas H. Tizard, H.M.S. "Challenger." (Official, No. 28. 1876.) [Out of Print.]

Report on the Meteorology of Kerguelen Island.—By Rev. S. J. Perry, S. J., F.R.S. (Official, No. 37. 1879.) 3*s.*

Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers, and the Army Medical Department, 1852-1886. (Official, No. 83. 1890.) 23*s.*

Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo, 1886-1888.—By the late W. Reid, M.D. (Official, No. 89. 1890.) 8*s.* 6*d.*

Climatological Observations at Colonial and Foreign Stations :—

I. :—Tropical Africa, 1900-1902, with Summaries and Map.—By E. G. Ravenstein, F.R.G.S. (Official, No. 165. 1904.) 6*s.*

**RAINFALL :—**

Rainfall Tables of the British Isles for 1866-80. Compiled by G. J. Symons, F.R.S. (Official, No. 47. 1883.) 7*s.* 6*d.*

Rainfall Tables of the British Islands, 1866-90. (Official, No. 114. 1897.) 6*s.*

Diurnal Range of Rain at the Seven Observatories in connection with the Meteorological Office, 1871-1890. (Official, No. 143. 1900.) 2*s.* 6*d.*

\* The Observations at Stations of the Second Order for 1873-75 will be found in the Quarterly Weather Report for the respective years.



**2. Occasional Publications and Reports—continued.**

**SUNSHINE :—**

Sunshine Records of the United Kingdom for 1881. (Official, No. 56. 1883.) 4s.

Ten Years' Sunshine in the British Isles, 1881-90. (Official, No. 98. 1891.) 2s.

**TEMPERATURE :—**

Temperature Tables for the British Islands. 10s. 6d. Supplement :—

Difference Tables for each Five Years for the Extrapolation of Mean Values. 3s. (Official, No. 154. 1902.)

**3. Instructions in the use of Instruments, &c.**

Barometer Manual. (Official, No. 8. 1871.)

Barometer Manual for the Use of Seamen. With an Appendix on the Thermometer, Hygrometer, and Hydrometer. Fifth Edition, extensively Revised. 1905. (Official, No. 61.) 3d.

Fishery Barometer Manual. New Edition. 1837. (Official, No. 3.) 6d.

Instructions for Meteorological Telegraphy. New Edition in preparation. (Official, No. 2.) Prepared for the use of Observers exclusively.

Instructions in the use of Meteorological Instruments. Reprinted 1892. (Official, No. 24.) [Out of Print.]

Hints to Meteorological Observers in Tropical Africa, with Instructions for taking Observations, and Notes on Methods of recording Lake Levels. (Official, No. 162. 1902.) 9d.

**FORECASTING :—**

Aids to the Study and Forecast of Weather.—By W. Clement Ley, M.A. (Official, No. 40. 1880.) 1s.

Principles of Forecasting by means of Weather Charts.—By the Hon. Ralph Abercromby, F.R.Met.Soc. Second Edition, Revised, 1885. (Official, No. 60.) [Out of Print.]

**4. Marine Meteorology.**

**CHARTS :—**

*Arabian Sea :—*

Daily Weather Charts for the period of six weeks ending June 25, 1885, to illustrate the tracks of two cyclones in the Arabian Sea. (Official, No. 80. 1891.) 10s.

*Atlantic :—*

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. (Official, No. 27. 1876.) 24s.

Monthly Current Charts for the Atlantic Ocean. From information collated and prepared in the Meteorological Office. Published by the Admiralty. (Official, No. 132. 1897.) 7s.

*Atlantic (North) :—*

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. (Official, No. 20. 1874.) 20s.

Charts illustrating the Weather of the North Atlantic Ocean in the Winter of 1898-99 (Official, No. 142. 1901.) 6s. 6d.

Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Latitude 40° N., for each Month of the Year. With a General Current Chart. (Official, No. 12. 1872.) 2s. 6d.

## 4. Marine Meteorology—continued.

## CHARTS—continued.

*Atlantic (North)*—continued.

Discussion of the Meteorology of that Part of the Atlantic lying North of 30° N., for the eleven days ending 8th February, 1870. With Charts. (Official, No. 13. 1872.) 5s.

Meteorology of the North Atlantic during August, 1873, with 31 Synoptic Charts. (Official, No. 32. 1878.) 15s.

Synchronous Weather Charts of the North Atlantic and the Adjacent Continents, 1st August, 1882, to 3rd September, 1883. Parts I. to IV. (33 sheets each). (Official, No. 71. 1886.) 17s. each part.

*Atlantic (South)* :—

Charts showing the Surface Temperature of the South Atlantic Ocean in each month of the Year. (Official, No. 4. 1869.) 2s. 6d.

Wind Charts for the Coastal Regions of South America, from information collated and prepared in the Meteorological Office. Published by the Admiralty. (Official, No. 159. 1902.) 7s.

Monthly Wind Charts of the South Atlantic. Published by the Admiralty. (Official No. 168. 1903.) 6d. each.

The relation between Pressure, Temperature, and Air Circulation over the South Atlantic Ocean. (Official No. 177, 1905.) 9d.

*Atlantic, Indian, and Pacific Oceans* :—

Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. (Official, No. 59. 1884.) 21s.

Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. (Official, No. 76. 1887.) 10s. 6d. Supplementary Chart. 6d.

\* *Atlantic (North) and Mediterranean* :—

Monthly Pilot Charts, commencing April, 1901. (Official, No. 149.) 6d. each. Subscription for one year, 5s. (exclusive of postage).

*Indian Ocean* :—

Monthly Current Charts for the Indian Ocean. From Information collated and prepared in the Meteorological Office. Published by the Admiralty. (Official, No. 124. 1896.) 7s.

*Indian Ocean (North)* :—

Meteorological Charts of the portion of the Indian Ocean adjacent to Cape Guardafui and Ras-Hafun. (Official, No. 92. 1891.) 6s.

*Indian Ocean (South)* :—

Meteorological Charts for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. (Official, No. 43. 1882.) Charts, 25s.; Remarks, 7s.

Cyclone Tracks in the South Indian Ocean. From information compiled by Dr. Meldrum, C.M.G., F.R.S. (Official, No. 90. 1891.) 7s. [Out of print.]

*Pacific Ocean* :—

Quarterly Current Charts for the Pacific Ocean. From Information collated and prepared in the Meteorological Office. Published by the Admiralty. (Official, No. 134. 1897.) 5s.

Wind Charts for the Coastal Regions of South America from information collated and prepared in the Meteorological Office. Published by the Admiralty. (Official, No. 159. 1902.) 7s.

*Red Sea* :—

Meteorological Charts of the Red Sea. (Official, No. 106. 1895.) 21s.

*Southern Ocean* :—

Meteorological Charts of the Southern Ocean between the Cape of Good Hope and New Zealand. (Official, No. 123. 1899.) [Out of print. New Edition in preparation.]

#### 4. Marine Meteorology—continued.

##### OTHER PUBLICATIONS ON MARINE METEOROLOGY :—

- Report to the Committee of the Meteorological Office on the Meteorology of the North Atlantic.—By Capt. H. Toynbee, F.R.A.S. (Non-Official, No. 2. 1869.) 1s.
- Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. (Official, No. 11. 1871.) 2s. 6d.
- Routes for Steamers from Aden to the Straits of Sunda and back Translated from a Paper issued by the R. Meteor. Inst. of the Netherlands. (Non-Official, No. 4. 1872.) [Out of print.]
- 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. (Non-Official, No. 5. 1872.) 6d.
- Notes on the Form of Cyclones in the Southern Indian Ocean.—By C. Meldrum, M.A., F.R.S. (Non-Official, No. 7. 1873.) [Out of print.]
- Contributions to our Knowledge of the Meteorology of the Antarctic Regions. (Official, No. 18. 1873.) 2s.
- 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. H. Toynbee, F.R.A.S. (Non-Official, No. 10. 1876.) [Out of print.]
- Contributions to our Knowledge of the Meteorology of the Arctic Regions. (Official, No. 34. 1885.) Vol. I.: Part I., 2s.; II., 10s.; III., 6s.; IV., 5s.; V., 6s.
- Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope between Lat. 30° and 50° S., and Long. 10° and 40° E.—By Capt. H. Toynbee, F.R.A.S. (Official, No. 44. 1882.) 7s. 6d.

#### 5. Miscellaneous Publications.

- Report of an Inquiry into the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott. (Non-Official, No. 1. 1868.) 6d.
- Report to the Committee of the Meteorological Office on the use of Isobaric Curves.—By Capt. H. Toynbee, F.R.A.S. (Non-Official, No. 3. 1869.) [Out of print.]
- Report on the Storm of October 13–14, 1881.—By Robert H. Scott, F.R.S. (Official, No. 46. 1882.) 1s. 6d.
- Harmonic Analysis of Hourly Observations of Air Temperature and of Pressure at British Observatories. (Official, No. 93. 1891.) 12s.
- Trajectories of Air in Travelling Storms. (Official, No. 174. 1905.) Part I. (*In the press.*)
- The Beaufort Scale of Wind-Force. Report of the Director of the Meteorological Office upon an Inquiry, with a Paper by G. C. Simpson, M.Sc., Vict., and Notes by Sir G. H. Darwin, K.C.B., F.R.S., W. H. Dines, F.R.S., and Comdr. Campbell Hepworth, C.B., R.N.R. (Marine Superintendent). (Official, No. 180. 1906.) (*In the press.*)

## APPENDIX III.

LIST of CAPTAINS who have sent in Logs classed as "Excellent" during the year ending March 31, 1905. Figures are attached to the name of each observer to show the number of "Excellent" logs which he has supplied during the whole time of his co-operation with the Office.

Name of Captain.	Number of "Ex- cellent" Logs.	Ship.
Alsop, J. J. ... ..	7	Hermione.
Anderssen, C. B. ... ..	1	S.S. Italian Prince.
Bayldon, F. J., R.N.R.,...	1	S.S. Tambo.
Bennett, C. D. ... ..	1	S.S. Macedonia.
Colbeck, W., R.N.R. ... ..	1	S.S. Morning.
Hyde, G.... ... ..	1	S.S. Faraday.
Jones, O. ... ..	1	S.S. Port Antonio.
Millican, J. W. ... ..	25	S.S. Greta Holme.
Moffatt, T. F. ... ..	1	S.S. Maori.
Mullan, F. C., F.R.G.S. ...	16	S.S. Ramsay.
Parsons, J. G. ... ..	1	S.S. Port Antonio.
Paterson, A. L.... ... ..	2	S.S. Potomac.
Pattman, R. ... ..	3	Loch Torridon.
Porterfield, W. M., R.N.R. ...	1	S.S. Clan Ronald.
Robinson, J. C.... ... ..	6	S.S. Armadale Castle.
Ruthven, J. F. ... ..	2	S.S. Orontes.
Simpson, A. ... ..	40	S.S. Moravian.
Squares De Carteret, W. G. ...	22	S.S. Minia.
Staveley, W. E.... ... ..	1	S.S. Southwaite.
Sutcliffe, J. A. ... ..	2	S.S. Tongariro.
Webster, G. S., R.N.R.... ...	4	S.S. Mount Royal.



## APPENDIX IV.

METEOROLOGICAL REGISTERS received during the Year 1904-05.

(1)—From the ROYAL NAVY.—*Meteorological Logs* (14).

Ship.	Commanding Officer.	Officers Observing.	No. of Registers received.	Duration of Observations.	Voyage.
H.M.S. "Dart" ...	F. C. C. Pasco (Commander).	Surgeon A. A. Forester; Lieutenants C. E. Stainer, J. D. Nares, E. St. M. Delins.	1	Mths. Days. 6 12	On E. Coast of Australia.
" " "Egeria" ...	J. F. Parry (Captain) ...	Sub-Lieutenant J. H. Nankivell ...	1	8 19	Surveying on Coast of British Columbia.
" " "Goldfinch" ...	F. C. Learmonth (Captain).	Assistant Paymaster R. Sydney Smith	3*	12 7	Halifax (N.S.) to West Coast of Africa thence to Mediterranean.
" " "Leander" ...	T. Dannreuther (Lieutenant).	... ..	†	—	To British Columbia (outward passage).
" " "Rambler" ...	Morris H. Smyth (Captain).	Lieutenants W. T. Randle Ford, Kenelon E. L. Creighton.	2	17 5	Surveying in Chinese Waters.
" " "St. George" ...	Frank Finnis, A.D.C. (Commodore).	Lieutenant Chas. W. C. Strickland, assisted by the Officers of Watches.	2*	2 3	From Gibraltar to South America, Sierra Leone, and home.
" " "Thrasher" ...	N. H. Carter (Lieutenant-Commander).	Sub-Lieutenant O. T. H. Phillips ...	1	2 29	In the Mediterranean.
" " "Waterwitch" ...	E. C. Hardy (Commander).	Lieutenant G. B. Alexander; Sub-Lieutenant P. R. Stevens.	3	12 2	Surveying in Chinese Waters.

\* And Aneroidograms.

† Aneroidograms only.

METEOROLOGICAL REGISTERS received during the Year 1904-05—*continued*.(2.)—SPECIAL SERVICE.—*Uncommissioned Ships (7).*

Ship.	Captain.	Officers Observing.	No. of Registers received.	Duration of Obser- vations.	Voyage.
"Conway," School Ship.	H. W. Broadbent, R.N.R.	The Cadets... ..	1	Mths. Days. 2 6	At Birkenhead.
"Maine," Hospital Ship.	F. J. Languedoc	J. R. Williams; H. A. Lloyd; and W. R. Tilling.	1	4 3	At Malta.
"Monarch," T.S.S. ...	J. Wrake	A. Broadbridge; B. Blyth; H. A. Ridsdale.	1	2 22	In English Channel and off Coast of Holland. Cable repairing.
"Morning," S.S. ...	Wm. Colbeck, R.N.R. ...	G. Doorly, R.N.R.; Sub-Lieutenant G. F. A. Mulsock, R.N.	1	16 4	To Antarctic Seas: Relief Ship to the National Antarctic Ex- pedition.
"Richmond," Light- house Tender.	F. J. Lobb, R.N.	F. W. Holden ... ..	1	16 7	At the Bahamas.
"Terra Nova," S.S. ...	Harry McKay ...	W. Clark Souter (Surgeon) ...	1	10 5	To Antarctic Seas: Relief Ship to the National Antarctic Ex- pedition.
"Worcester," Training Ship.	D. Wilson Barker, R.N.R.	The Cadets ... ..	1	4 2	At Greenhithe, River Thames.

## (3.)—From the MERCANTILE MARINE.—Meteorological Logs (216).

"Ailsawald," S.S. ...	M. T. Hardy ...	C. Vickers ...	2	4	17	To Bahia Blanca.
"Alabama," S.S. ...	R. Götsche ...	T. Voldborg ...	1	3	10	To New Orleans.
"Alliance," Barque ...	R. H. Potter ...	A. L. Clarke and J. R. Colvin ...	1	9	22	To Newcastle (N.S.W.), Callao, and Chile.
"Alnwick Castle," R.M.S.	L. A. Millard ...	C. M. Roberts ...	1	1	17	To Cape Town.
"Alva," S.S. ...	A. Heron ...	J. Vaughan and T. Robinson ...	2	6	9	To Alexandria and the Black Sea.
"Anchoria," S.S. ...	F. H. Wadsworth ...	...	1	3	20	To Monte Video.
"Arcadia," S.S. (P. & O.).	F. C. H. Lyon ...	J. W. Parker; H. R. Rivers; W. H. F. Warren; R. T. Gallon; C. G. Byron; C. J. Smart.	1	2	25	To New York.
"Aorangi," S.S. ...	J. D. Sydney Phillips ...	G. Mortimer; E. C. Mason; A. Shipwright; and P. W. Grierson.	1	4	3	From Victoria (B.C.) to Brisbane, <i>via</i> ports.
"Appomattox," S.S. ...	E. W. Castle ...	R. S. Osborn; F. H. Swain; and H. N. Edmonds.	1	3	24	To Jamaica.
"Armada Castle," R.M.S.	J. C. Robinson ...	W. C. L. Gilham; C. J. Duncan; R. Venning; A. L. Parkinson; G. Flavel.	2	6	22	To Cape Town.
"Assyria," S.S. ...	F. Blight ...	G. B. W. McNeill ...	3	6	15	To Calcutta.
"Astoria," R.M.S. ...	T. H. Wadsworth ...	...	1	0	21	To New York.
"Asuncion de Larra- naga," S.S.	H. C. Kramer ...	J. Duncan; J. V. de A'Echevarria; and H. Neligan.	2	11	13	To Southern ports of U.S. To Monte Video, returning to Genoa. From Genoa to Black Sea, thence to U.S.A., returning to Hamburg.
"Athenic," S.S. ...	C. H. Kempson, R.N.R.	G. A. Alcock, R.N.R.; W. Dean, R.N.R.; L. Vaughan Davies; W. B. Starr; and J. A. Alcock.	1	2	28	To Eastern Seas, <i>via</i> Cape of Good Hope, thence to Norfolk (Va.), U.S., <i>via</i> Suez and Monte Video. To New Zealand.

## METEOROLOGICAL REGISTERS received during the Year 1904-05—continued.

(3.)—From the MERCANTILE MARINE.—*Meteorological Logs*—continued.

Ship.	Captain.	Officers Observing.	No. of Registers received.	Duration of Observations.	Voyage.
"Atrato," R.M.S.	H. Rudge ( R. H. Stranger ...	S. Burst and R. Dadd ... W. Kennett; C. Cleaver; R. N. Dods- worth; A. G. Miles; M. Taylor; and J. J. Day.	1 1	Mths. Days. 3 0 4 6	To West Indies and Panama.
"Australia," S.S. (P. & O.).	Francis Cole ...	D. Stratton, R.N.R.; E. Th. Hursey- Cooper, R.N.R.; L. Bedwell; E. Robinson, R.N.R.; R. G. Pearce. B. Naughan and J. J. Lewis ...	1 1	2 28 5 25 3 2	To Sydney. To Japan. To Algoa Bay and Kurachee, returning, <i>viâ</i> Suez. To Old Calabar and ports.
"Barton," S.S.	H. Haines ( B. Maughan ...	G. Worley; W. H. Richardson; and H. J. Dickinson.	1 1	1 25 5 27	To New York.
"Biafra," R.M.S.	H. G. Harrison ...	A. Steede (1st Off.); J. Vettle (2nd Off.); C. Colebrook (3rd Off.). M. D. Kellock; J. E. Tripp; and A. K. Athersutch.	1 1	1 25 5 27	To Japan and San Francisco, thence to China and Barcelona, <i>viâ</i> Suez.
"Brooklyn City," S.S.	J. J. Bailey ( — Williams ... W. T. Atkinson ...	N. D. Kellock and J. E. Tripp ... J. R. Jones and D. McGallimay ...	1 2	1 7 5 14	To Rio de Janeiro.
"Caledonia," S.S.	W. Mallett ...	A. Jensen ...	1	1 27	To New York.
"Campania," R.M.S....	J. Pritchard ...	E. A. Woodward; J. Park; and M. R. W. Higginson.	1	3 0	To Cape Town.
"Carisbrook Castle," R.M.S.	J. Tyson ...	F. Tunbridge; S. Symons; E. A. Comley; F. Stanley.	2	7 4	



"Cevic," S.S. ...	W. H. Clarke ...	W. Molley; — Saunders; — Price; C. Rowlinson, R.N.R.; E. Jones; R. G. W. Mason, R.N.R.; E. Jonas; F. C. Cross, R.N.R.; F. Brown; and W. Paul.	2	7 29	To New York.
"Chickahominy," S.S.	E. H. Jones ...	F. E. Tordiffe and W. J. Swords ...	2	6 13	To West Indies.
"China," S.S. (P. & O.)	G. K. Wright, R.N.R. ...	A. V. Worthington; J. McGregor; J. Plumpton; R. Alder, R.N.R.; and V. Bowles.	3	8 21	To Sydney.
"Clan MacIntyre," S.S.	H. G. Fishenden, R.N.R.	R. Pill; W. P. Smith; A. W. Gibb; F. S. Piper; F. Seddon; and J. Mackenzie.	3	8 21	To India, <i>via</i> Suez or <i>via</i> Cape of Good Hope.
"Clan MacKinnon," S.S.	C. Jones ...	J. E. McLean; W. F. West; W. Boyd; and G. Kemp.	2	4 14	(a) To India, <i>via</i> Cape of Good Hope, returning <i>via</i> Suez. (b) To Bombay.
"Clan Ranald," S.S.	T. A. Brown, R.N.R. ...	J. E. McLean; W. F. West; and R. Logan.	1	2 27	To Ceylon, <i>via</i> Cape of Good Hope, returning <i>via</i> Suez.
"Clan Urquhart," S.S.	Wm. Porterfield, R.N.R.	W. Boyd; H. V. Hart, R.N.R.; R. Seed.	2	6 0	To India and Cochin China, <i>via</i> Cape of Good Hope, returning <i>via</i> Suez.
"Corinthic," S.S.	J. A. McPherson	H. Wilson; C. Stewart; J. Taylor; T. C. Barker; A. Macpherson.	2	5 0	To Calcutta, <i>via</i> Cape of Good Hope, returning <i>via</i> Suez.
"Danube," R.M.S. ...	Inman Sealby, R.N.R. ...	A. J. Coles; R. G. Pardoe ...	1	2 27	To New Zealand.
"Darien," S.S.	Hugh F. David, R.N.R.	J. G. Lincoln Netherton, M.S.G. ...	1	3 0	To New Zealand, <i>via</i> Cape of Good Hope.
"Diana," S.S.	L. R. Dickinson	L. A. Steele; E. A. Bridges; G. E. D. Hyatt; and O. V. Schlanburch.	2	7 21	Lisbon to Monte Video.
"Dilwara," S.S.	C. E. Shacklock	F. Mercer; F. Smith; F. Martin; — Robb; — Atkinson; and Schofield.	2	5 4	To Gulf of Mexico.
"Druidstone," S.S. ...	W. Adams ...	... ..	1	5 10	To Davis' Straits.
	A. W. Mann ...	{ C. T. Wilson; J. A. Wright; and A. Varian.	{ 1	3 18	To Alexandria.
	S. W. Decent ...	... ..	1	3 13	To Hong Kong. To Constantinople.

METEOROLOGICAL REGISTERS received during the Year 1904-05—*continued*.(3.)—*From the MERCANTILE MARINE.—Meteorological Logs—continued.*

Ship.	Captain.	Officers Observing.	No. of Registers received.	Duration of Observations.	Voyage.
"Dunera," S.S. ...	Jas. Smith ...	{ E. J. P. Clowser; V. Arnold; F. St. C. Johnson; F. A. Bond; C. T. Strickland; W. G. Shillingham.	{ 2	{ 7 9	To Durban. To Alexandria and Cape Town.
"Earl of Derby," Barque.	W. C. Jackson ...	D. Macdonald ...	3	9 6	From Chile to Newcastle (N.S.W.), and home, <i>via</i> Chile.
"East Point," S.S. ...	L. R. W. Beavis ...	H. A. Dawes; G. R. Parker; and J. Jones.	3	9 11	To Philadelphia.
"Eclipse," S.S. ...	W. Milne ...	...	1	5 26	To Davis' Straits.
"Edendale," S.S. ...	Thos. McDonald ...	W. B. Snowden and A. Leask.	1	2 9	To the Mediterranean.
"Egypt," S.S. (P. & O.)	J. R. Lendon ...	H. T. Finch; G. W. Taylor; A. H. Ayres, R.N.R.; S. P. Sabin; M. H. N. Hood, R.N.R.; K. A. Yates; W. H. Hallam; P. Rolt; W. H. Swern; W. F. Cosser; J. W. Parker; H. Morton-Jack; J. Skearney; F. S. Murray; and F. Higgins.	3	9 22	To Bombay and Sydney.
"Elstree Grange," S.S.	Hy. A. Hooper ...	J. D. Anderson ...	1	2 4	To Buenos Aires.
"Empress of China," R.M.S.	R. Archibald, R.N.R. ...	{ G. E. Bridge, R.N.R. ...	1	{ 2 28	Between British Columbia and China, <i>via</i> Japan.
"Empress of India," R.M.S.	E. Beetham, R.N.R. ...	{ R. L. Fortier, R.N.R. ...	1	{ 1 6	Between British Columbia and China, <i>via</i> Japan.
	O. P. Marshall, R.N.R. ...		1	5 28	
	R. Archibald, R.N.R. ...		1	1 16	

"Empress of Japan," R.M.S.	H. Pybus, R.N.R.	...	W. W. Hopcraft, R.N.R.; F. W. Wilsden, R.N.R.; A. H. Read, R.N.R.; W. O. C. Whall, R.N.R.; J. Stewart; and — Cross.	1	4	27	Between British Columbia and China, <i>via</i> Japan.
	E. Beetham, R.N.R.	..	W. W. Hopcraft, R.N.R.; F. W. Wilsden, R.N.R.; A. H. Read, R.N.R.; and W. O. C. Whall, R.N.R.	1	2	25	
"Faraday," S.S.	G. Hyde	...	A. D. Gange, R.N.R.	1	1	21	To 47° N. lat. To 44° W. long. (cable repairing).
"Goorkha," S.S. (B.I. Co.).	S. Kerr, R.N.R.	...	F. D. McArthur; H. Borders; and H. W. Mathews.	2	4	15	To Calcutta.
"Goorkha," R.M.S. (U.C. Co.).	F. J. Moseley	...	T. Vincent; J. W. Black; H. E. Jackson; and J. Mumford.	2	6	10	To Cape Town.
"Greenbrier," S.S.	D. Reside	...	E. West; W. B. Davis; and L. Sinclair.	1	3	26	To West Indies.
"Greta Holme," S.S.	J. W. Millican	...	T. Stark and W. E. Parkes.	1	6	9	From 31° W. long. to Ipswich.
"Heraclides," S.S.	H. R. C. Lockyer	...	— Walsh; G. McColl; — Payn; A. Kelso; and Hugh McCulloch.	2	7	22	To Buenos Aires. To Monte Video, East London (S.A.), and home, <i>via</i> Monte Video.
"Hermione," Barque	J. J. Alsop	...	...	1	8	24	To Monte Video.
"India," S.S. (P. & O.)	F. W. Vibert, R.N.R.	...	C. H. Clark; C. D. Fisher; A. H. Hignett; A. T. MacIntosh; S. Bickley; R. C. Dime; H. W. A. Clark; C. D. Forbes; F. H. Ayres; C. Short; H. E. Bickley; E. C. Deane; and E. C. Downes.	3	8	8	To New Zealand, Melbourne, and home.
"Italian Prince," S.S.	C. B. Anderssen	...	J. P. Jones.	2	8	26	To Sydney.
"Jason," S.S.	T. G. Steeves	...	S. J. Phillips and T. W. Phillips.	1	3	4	To South American Ports.
"Kaikoura," S.S.	R. C. Clifford	...	J. B. Makepeace; H. Wynyard; and W. S. Wade.	1	3	4	To New York, Cape Town, East Africa, India, and home, <i>via</i> Suez.
							To China and Japan.
							To New Zealand, Monte Video, and home.

## METEOROLOGICAL REGISTERS received during the Year 1904-05—continued.

(3.)—From the MERCANTILE MARINE.—*Meteorological Logs*—continued.

Ship.	Captain.	Officers Observing.	No. of Registers received.	Duration of Observations.	Voyage.
"Kaipara," S.S.	H. C. Kiddle	R. Huntriss	1	Mths. Days 2 28	To New Zealand.
"Kilbride," S.S.	Thos. Smith	{ A. Rennie ; J. C. McFarlane ; J. Waddell ; J. McMurdo ; W. Lane ; and R. Sowerby.	2	6 16	To India, <i>via</i> Cape of Good Hope, and home, <i>via</i> Suez.
"Kumara," S.S.	W. Scotland	W. Culbert ; H. Aikins ; and F. Elliott.	1	3 5	To Calcutta. To New Zealand.
"Leopoldville," S.S.	G. B. Sparrow	A. Puckley ; A. Jones ; and — Peters	2	4 28	To the Congo.
"Llandaff City," S.S.	J. J. Bailey	J. E. Tripp and D. Cooke	1	1 6	To New York.
"Loch Katrine," Barque.	Wm. Anderson	A. Duncan and P. Fenton	1	7 3	To Adelaide.
"Loch Tay," Barque.	T. C. Martin	J. E. Owen	1	7 6	"
"Loch Tay," S.S.	J. Stephen	H. Hay ; W. H. Bevan ; W. Yule ; &c.	2	5 7	To India and Singapore.
"Loch Torridon," Barque.	R. Pattman	C. N. Wright	1	5 11	To Sydney.
"Lord Dufferin," S.S.	J. Dunn	...	1	5 20	To China, Savannah (U.S.A.), <i>via</i> Suez, and Bremen.
"Lord Roberts," S.S.	J. Adams	W. L. Clibborn and R. L. Hatton	1	3 26	To Hong Kong.
"Lothian," S.S.	J. C. Williamson	2nd, 3rd, and 4th Officers	1	11 24	To China and Japan. From Hong Kong to and from Mexico, <i>via</i> St. Francisco.
"Lutterworth," Barque.	H. Hicks	A. Cant and A. Davies	1	2 24	From 43° N. lat. to 46° S. lat. From 12° W. long. to 128° E. long.
"Lynton," Ship	E. Gates James	C. G. Parkes and F. R. Bishop	1	9 17	<i>via</i> Cape of Good Hope. To Cape Town, New South Wales, and Chili, thence to Genoa.



"Manchester Shipper," S.S.	Louis Morton	...	A. J. Quick; W. Humphreys; and H. H. Heraud.	1	3	6	To New York and New Orleans.
"MacDuff," S.S.	Robt. Glegg	...	R. Steele	1	3	21	To Hong Kong and thence to New York, <i>via</i> Suez, returning to Havre.
"Macedonia," S.S. (P. & O.).	T. S. Angus	...	H. C. Stone; P. O. Britten; and H. Hillcoat.	1	1	26	To Bombay.
"Manistee," S.S.	C. Douglas Bennett, R.N.R.	...	H. C. Stone; P. O. Britten; H. Hill- coat; C. G. Byron; B. J. Ohlom; W. D. Smith; P. N. Layton, R.N.R.; F. B. Owen; and R. G. Reeves.	3	6	27	To Bombay or Sydney.
"Maori," S.S.	H. H. Neale	...	H. Halpin; E. P. Green; R. Lloyd; R. Owen; and J. Swords.	2	7	15	To Port Simon and Costa Rica.
"Minia," S.S.	T. F. Moffatt	...	— Lambert; — Lewis; and — Gilli- main.	1	3	7	To New Zealand.
"Moravian," S.S.	W. G. Squares de Carteret	...	J. Adams; R. Wylie; G. Hawes; M. Comyn.	1	8	14	To Newfoundland and Nova Scotia (cable repairing).
"Mount Royal," R.M.S.	A. Simpson	...	G. Elrick; A. Corbett; and P. Shaw	2	8	28	To Melbourne, <i>via</i> Cape of Good Hope.
"Netherby," Ship.	G. S. Webster, R.N.R.	...	J. Gillies and J. W. Griffiths...	3	8	16	To Gulf of Mexico.
"Numidian," R.M.S.	G. P. Scott	...	H. Curtis and T. Beavitt	1	8	8	To Montreal.
"Ocean Prince," S.S.	W. S. Main	...	Alex. Campbell and W. Fraser	2	7	23	To Honolulu, Paget Sound, end- ing in lat. 36° S. and 114° W.
"Omrah," R.M.S.	Robert Kirkwood	...	C. R. Jowsey	3	9	21	To Halifax (N.S.) and New York.
"Ophir," R.M.S.	F. S. Symons	...	W. S. Shelford; T. Taylor; L. A. Brooke-Smith; and R. M. D. Sutor.	2	4	27	To Mediterranean ports.
	F. W. Kershaw, R.N.R.	...	R. M. D. Sutor, R.N.R.; H. T. Jones; W. Cox; W. McGrath; D. Dowdy, R.N.R.; H. Seale; and A. H. Fraser, R.N.R.	2	5	22	To Sydney.
"Oracabessa," S.S.	O. M. Lund	...	M. J. Swords	1	1	15	To Costa Rica.
	W. Long.	...	J. Clarke; F. H. Swain; M. J. Swords; and F. Downes.	1	6	21	"
"Orient," R.M.S.	Colin Nicholson, R.N.R.	...	D. Dowdy, R.N.R.; H. Seale; and A. H. Fraser, R.N.R.	2	5	13	To Sydney.

## METEOROLOGICAL REGISTERS received during the Year 1904-05—continued.

(3.)—From the MERCANTILE MARINE.—*Meteorological Logs*—continued.

Ship.	Captain.	Officers Observing.	No. of Registers received.	Duration of Observations.	Voyage.
"Ormuz," R.M.S. ...	A. J. Coad, R.N.R. ...	P. N. Layton, R.N.R.; F. B. Owen; R. G. Reeves; and C. G. Matheson.	2	Mths. Days. 5 22	To Sydney.
"Orontes," R.M.S. ...	J. F. Ruthven ...	J. F. Healey, R.N.R.; F. E. Bushby Owen; W. T. Cox. R.N.R.; J. Avern; and R. M. J. Marshall, R.N.R.	3	8 8	" "
"Pacific," S.S. ...	T. E. Thompson ...	... ..	1	1 29	To Buenos Aires.
"Papanui," S.S. ...	T. S. Weston ...	G. E. Worthington ... ..	1	3 8	To New Zealand.
"Paparoa," S.S. {	R. Jaggard ...	M. E. Bower; C. G. Tonge; P. P. Crawford; and M. Paramoor.	1	1 18	" "
"Persia," S.S. {	A. H. Vine ...	G. K. Wilson; — Shewan; and N. Campbell.	1	1 15	To India.
"Planet Mars," S.S. ...	Geo. Mitchell ...	— Masson and — Finnie ... ..	3	7 7	To Singapore, Calcutta, Aden, Calcutta to 37½° N. lat. 4° E. long.
"Port Antonio," R.M.S. {	J. G. Parsons ...	W. G. Palmer; W. T. Forrester; and B. S. Caws.	1	2 24	To West Indies.
"Port Kingston," R.M.S. {	Owen Jones ...	R. B. Skelton; W. T. Forrester; J. T. Davies; and A. Morrison.	2	4 22	" "
"Port Morant," R.M.S. {	J. G. Parsons ...	B. G. Drake; W. G. Palmer; and J. G. Little.	1	2 29	" "
"Port Royal," R.M.S. {	E. W. Harvey ...	A. C. Selfe; E. W. Forrester; T. C. Hill; J. T. Davies; and S. Beatie.	2	5 27	" "
"Port Royal," R.M.S. {	W. B. Rowe ...	S. H. Simmons; G. Petheran; J. D. Ashworth; F. M. R. Carter; and G. A. Griffin.	2	7 5	" "



## METEOROLOGICAL REGISTERS received during the Year 1904-05—continued.

(3.)—From the MERCANTILE MARINE.—*Meteorological Logs*—continued.

Ship.	Captain.	Officers Observing.	No. of Registers received.	Duration of Observations.	Voyage.
"Sophocles," S.S.	H. A. Schleman	A. Thomson; F. Plater; — Pope; H. C. Allingham, R.N.R.; J. Townshend; — Smith; and W. Williams.	1	Mths. Days. 5 29	To Melbourne, <i>viâ</i> Cape of Good Hope.
"Soudan," R.M.S. (P. & O.).	A. Walker	A. Thomson; — Laird; H. C. Allingham, R.N.R.; and — Smith.	1	2 27	To Bombay.
"South America," S.S.	G. C. Henning, R.N.R.	{ C. H. Allin; E. G. O. Bentler; C. Newton; and C. N. Dickenson.	2	4 28	To Malta and Cape Town.
"Southwaite," S.S.	J. Watson	{ T. Watson; — Matthews; — Thomas; — Henderson; — Freemantle; — McClean; and — Hutchings.	2	9 6	To Valparaiso.
"Tagus," R.M.S.	W. E. Staveley	{ ... ..	1	2 0	To New York, Australia, South America, and home.
"Tolosa," S.S.	R. H. Stranger	{ 3rd, 4th, and 5th Officers ... ..	1	1 12	To Buenos Aires.
"Tongariro," S.S.	H. E. Rudge	{ J. Gordon and W. Burns ... ..	1	1 11	To West Indies and Spanish Main.
"Tudor Prince," S.S.	J. A. Sutcliffe	{ F. Barker Thornton; A. E. Beaton; W. B. Holdstich; and C. de Vincilez Le Seur.	2	0 28	To Alexandria.
"Turakina," S.S.	T. E. Curtis	F. C. Purkins ... ..	1	1 0	From Cape Town to New Zealand, thence to Monte Video.
	Francis Forbes	N. Shore Nye; — Wingate; J. H. Swan; F. Beirs; C. B. Simmons; and L. Hooper.	2	4 5	From Tenerife to Tasmania, <i>viâ</i> Cape of Good Hope, and home, <i>viâ</i> Cape Horn and Monte Video.
				3 8	To New York, India, <i>viâ</i> Cape of Good Hope, and home, <i>viâ</i> Suez.
				5 16	To New Zealand, <i>viâ</i> Cape of Good Hope, returning <i>viâ</i> Cape Horn.



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METEOROLOGICAL REGISTERS received during the year 1904-05  
—continued.

(5.)—NORTH ATLANTIC REGISTERS :—FORM NO. 51 (1853).

Line.	Ship.	Captain.	No. of Registers.
Aberdeen ...	Damascus ...	R. V. B. McWilliam ...	2
Allan ...	Bavarian ...	A. Macnicol ...	16
		J. Brown ...	
	Buenos Ayrean...	G. Caie ...	11
		B. T. Eastaway...	
	Carthaginian ...	H. Gunson ...	6
		G. Caie ...	
	Corean ...	T. Pickering ...	10
		A. Rennie ...	
		W. S. Main ...	
		J. W. Nunan ...	
	Corinthian ...	T. Pickering ...	8
		E. Pitts, R.N.R...	
	Damara ...	J. E. Gorst ...	10
	Hungarian ...	W. Wallace ...	16
	Ionian ...	J. Brown ...	20
		J. W. Nunan ...	
	Laurentian ...	A. G. Stewart ...	15
	Livonian ...	J. Hamilton ...	2
	Monte Videau ...	B. Hendry ...	3
	Numidian ...	W. S. Main ...	16
	Orcadian ...	H. Imrie... ..	5
		G. Caie ...	
	Parisian ...	A. G. Braes ...	7
	Pomeranian ...	J. Harrison ...	16
	Pretorian ...	J. M. Johnston ...	18
	Sardinian ...	T. Moar ...	15
	Sarmatian ...	E. Pitts, R.N.R.	15
		A. Rennie ...	
	Siberian ...	E. Outram ...	16
	Sicilian ...	J. Fairfull ...	18
	Tunisian... ..	A. H. Vipond ...	10
	Ulunda ...	F. W. Chambers ...	1
Americoan ...	Friesland ...	G. C. Apfeld ...	13
		C. J. Rogers ...	
	Haverford ...	H. O. Nielsen ...	14
	Merion ...	J. Dann ...	15
		A. W. V. Trant...	
	New York ...	W. J. Roberts ...	9
	Noordland ...	J. Daddow ...	4
		W. W. D. Turner ...	
	Philadelphia ...	A. R. Mills ...	24
	St. Louis ...	J. C. Jamison ...	7
	St. Paul ...	W. J. Roberts ...	16
		F. M. Passow ...	
	Westernland ...	J. B. Hill ...	6
Anchor ...	Astoria ...	J. Lumsdane ...	7
	Ethiopia... ..	J. Lumsdane ...	8
" Arana " S.S. Co.	Arana ...	R. Walton ...	12
Atlantic Trans- port.	America... ..	G. T. Goudie ...	2
	Asian ...	J. E. Bartlett ...	7
	Europe ...	J. T. J. Wylie ...	3

METEOROLOGICAL REGISTERS received during the year 1904-05  
—continued.

## (5.)—North Atlantic Registers (Form No. 51)—continued.

Line.	Ship.	Captain.	No. of Registers.
Atlantic Trans- port— <i>cont.</i>	Mackinaw ... ..	A. T. Musselwhite ... ..	10
	Manhattan ... ..	S. Watkins ... ..	1
	Manitou ... ..	T. F. Gates ... ..	4
	Marquette ... ..	E. G. Cannons ... ..	2
	Maryland ... ..	O. P. Clarke ... ..	12
		W. H. Whittle, R.N.R. ... ..	
	Menominee ... ..	E. G. Cannons ... ..	9
	Minneapolis ... ..	T. F. Gates ... ..	20
	Minnehaha ... ..	J. Robinson ... ..	4
	Minnesota ... ..	F. C. Pike ... ..	14
		O. P. Clarke ... ..	
	Minnetonka ... ..	S. Layland ... ..	22
	Mississippi ... ..	J. B. Findley ... ..	1
	Montana ... ..	P. Laverock ... ..	9
		J. T. J. Wylie ... ..	
"Bellailsa" S.S. Co.	Bellailsa ... ..	O. O. Aagaard ... ..	8
"Bellona" S.S. Co.	Bellona ... ..	F. Rollo ... ..	4
Booth S.S. Co. ...	Amazonense ... ..	W. J. Hughes ... ..	2
	Dominic ... ..	G. C. Westray ... ..	10
Brightman C.E. ...	Zuleika ... ..	J. Hutchison ... ..	3
Bristol "City" ...	Exeter City ... ..	B. King ... ..	2
	Llandaff City ... ..	E. Andrews ... ..	6
Britain S.S. Co. ...	Henley ... ..	W. F. Turner ... ..	1
Bucknall ...	Bloemfoutein ... ..	G. E. Roberts, R.N.R. ... ..	3
Canadian - Pacific Railway Co.	Lake Erie ... ..	F. Carey ... ..	18
	Lake Manitoba ... ..	J. A. Murray ... ..	14
	Milwaukee ... ..	J. H. Moore ... ..	1
	Monmouth ... ..	C. E. Birchman ... ..	8
	Montcalm ... ..	A. E. Evans ... ..	17
	Monteagle ... ..	H. Parry ... ..	11
	Montezuma ... ..	W. D. Jones ... ..	3
	Mount Royal ... ..	G. S. Webster, R.N.R. ... ..	2
Chesapeake and Ohio S.S. Co.	Powhatan ... ..	E. Trinick ... ..	9
Clan ... ..	Clan Macneil ... ..	S. Beer ... ..	3
	Clan Stuart ... ..	W. J. Lennox ... ..	13
Compagnie Génér- ale Transat- lantique.	La Champagne ... ..	— Verlynde ... ..	4
	La Lorraine ... ..	A. Alix ... ..	13
	La Touraine ... ..	— Fajolle ... ..	2
	Martinique ... ..	A. Gosselin ... ..	1
"Crown" S.S. Co.	Yanariva ... ..	G. Grindlay ... ..	8

METEOROLOGICAL REGISTERS received during the year 1904-05  
—continued.

(5.)—North Atlantic Registers (Form No. 51)—continued.

Line.	Ship.	Captain.	No. of Registers.
Cuban S.S. Co. ...	Cayo Blanco ...	E. C. Radder ...	4
Cunard ...	Aurania ...	D. Dow, R.N.R. ...	3
	Campania ...	J. Pritchard ...	23
	Carpathia ...	W. T. Turner ...	16
	Cypria ...	J. Barlow ...	14
	Etruria ...	R. C. Warr ...	3
		T. Potter ...	
	Ivernia ...	G. F. Jeffries ...	24
	Lucania ...	J. B. Watt ...	8
	Pannonia ...	D. Dow, R.N.R. ...	5
	Pavia ...	D. P. Thomson, R.N.R. ...	9
		C. Morison ...	
		W. B. Cresser, R.N.R. ...	19
	Saxonia ...	T. Potter ...	
		R. C. Warr ...	
		J. C. Barr ...	14
	Slavonia ...	J. C. Barr ...	
		J. T. W. Charles, R.N.R. ...	11
	Tyria ...	J. S. Carlines ...	1
	Ultonia ...	T. Potter ...	14
	Umbria ...	T. Stephens ...	7
	Veria ...	T. Hewitson ...	
"Devona" S.S. Co.	Devona ...	D. R. Murray ...	7
Dixon, Sir Daniel	Belfast ...	J. B. Boal ...	2
	Larne ...	C. W. S. Fausset ...	3
Dominion ...	Canada ...	R. O. Jones ...	18
	Cornishman ...	A. Fortay ...	20
		J. H. A. Thornton ...	
	Irishman ...	W. Roberts ...	6
	Kensington ...	M. H. Morle ...	5
	Norseman ...	W. Japha ...	1
	Ottoman ...	T. Howell ...	6
	Southwark ...	J. O. Williams ...	5
	Vancouver ...	W. Japha ...	
		J. Evans ...	
Ellerman ...	City of Khios ...	D. Cruickshank ...	7
Elder, Dempster	Banana ...	J. J. Painter ...	3
	Bathurst ...	E. C. Taylor ...	4
	Dahomey ...	W. E. Potter ...	2
	Egwanga ...	J. C. Hannay ...	3
	Fantee ...	H. A. Yardley ...	1
	Olenda ...	E. J. Hughes ...	3
	Port Antonio ...	J. G. Parsons ...	
		O. Jones ...	6
	Port Morant ...	S. H. Simmons ...	
		O. Jones ...	16
	Port Royal ...	W. R. Rowe ...	
	Sobo ...	H. A. Yardley ...	4
	Sokoto ...	J. A. Windham ...	7
	Zaria ...	R. Roberts ...	



METEOROLOGICAL REGISTERS received during the year 1904-05  
—continued.

## (5.)—North Atlantic Registers (Form No. 51)—continued.

Line.	Ship.	Captain.	No. of Registers.
Elders & Fyffes...	Appomattox ... ..	H. Neale... ..	1
	Greenbrier ... ..	D. Reside ... ..	7
	Manistee... ..	H. Neale... ..	14
English & American Shipping Co.	Inca ... ..	G. W. Muir ... ..	5
	Mokta ... ..	E. C. Cooper ... ..	5
(Foreign) ...	Canadia ... ..	E. Horn ... ..	4
	Dania ... ..	P. Paulsen ... ..	5
Forwood Bros. ...	Orotava ... ..	H. C. Bennett, R.N.R....	4
Glasgow Navigation Co.	Atbara ... ..	W. Madel ... ..	1
Gulf Transport...	Ikbal ... ..	A. Jennings ... ..	2
	Imani ... ..	T. B. Peabody ... ..	3
	Indore ... ..	C. Mytton ... ..	12
	Irada ... ..	A. W. Roberts, R.N.R....	9
	Irak ... ..	A. Delargy ... ..	5
	Iran ... ..	C. M. M. Jacob ... ..	7
	Istrar ... ..	G. F. Perks ... ..	5
Harrison ...	Colonial ... ..	C. S. Rhodes ... ..	8
	Historian ... ..	J. Valiant ... ..	6
	Logician... ..	R. Owen... ..	9
	Musician ... ..	H. McKee ... .. G. B. Woolfenden ... ..	5
Hine, W.... ...	Greta Holme ... ..	F. W. Millican ... ..	3
Holman, R. H. ...	Archtor ... ..	W. Sturgeon ... .. H. Sydney ... ..	4
	Kingtor ... ..	W. Sturgeon ... ..	1
Houston... ..	Heraclides ... ..	H. R. C. Lockyer ... ..	7
"Hurona" S.S. Co.	Hurona ... ..	J. Dorward ... ..	16
"Jacob Bright" S.S. Co.	Jacob Bright ... ..	L. Anderson ... ..	9
"Jacona" S.S. Co.	Jacona ... ..	W. Lindsay ... ..	5
Johnston ...	Foylemore ... ..	E. Ellis ... ..	8
	Rowanmore ... ..	W. Henry ... .. I. Jones ... ..	7
	Vedamore ... ..	W. Henry ... .. D. Richardson ... ..	7
Lancashire Shipping Co.	Richmond Castle ...	F. McDowell ... ..	3

METEOROLOGICAL REGISTERS received during the year 1904-05  
—continued.

(5.)—North Atlantic Registers (Form No. 51)—continued.

Line.	Ship.	Captain.	No. of Registers
"La Veloce" ...	Centro America ...	D. Cassella ...	8
	Città di Napoli ...	E. Lavarello ...	9
	Città di Torino ...	F. Galletto ...	2
	Nord America ...	R. Raffo ...	12
	Venezuela ...	G. B. Carbone ...	9
Leyland ...	Cuban ...	T. W. Lofthouse ...	6
	Darien ...	C. E. Shacklock ...	3
	Devonian ...	R. Ridley ...	16
	Jamaican ...	A. H. Highton ...	4
	Philadelphian ...	W. Dickinson ...	10
	William Cliff ...	T. Chadwick ...	8
	Winifredian ...	C. E. Shacklock ...	20
	Yucatan ...	F. Shepherd ...	3
		W. Harrocks ...	
"Lobelia" S.S. Co.	Lobelia ...	F. H. Watson ...	4
Manchester ...	Manchester Corporation	P. J. Heath ...	12
Mediterranean & New York.	Pawnee ...	J. G. Cartwright ...	6
Navigazione Generale Italiana.	Vincenzo Florio ...	— Gheraldo ...	2
Peninsular and Oriental.	Egypt ...	J. R. Lendon ...	14
	Himalaya ...	W. L. Broun, R.N.R. ...	4
	Japan ...	C. L. W. Field ...	5
Petersen, W. ...	Quebec ...	E. P. Martin, R.N.R. ...	
Philadelphia Transatlantic.		H. M. Walker ...	4
	North Point ...	W. E. Robertson ...	13
"Pinta" S.S. Co.	Pinta ...	J. E. Dothie ...	1
Prince ...	Black Prince ...	J. E. Dothie ...	1
	Italian Prince ...	A. B. W. Sheppard, R.N.R. ...	3
	Moorish Prince...	C. B. Anderson ...	2
	Napolitan Prince	W. Barrett ...	3
	Norman Prince...	H. Eagleton, R.N.R. ...	16
	Ocean Prince ...	W. Gill ...	7
	Sicilian Prince ...	R. Kirkwood ...	18
Pyman, Bell & Co.	Eveline ...	W. Hanks ...	7
	Mab ...	H. J. Claridge ...	
Red Star...	Vaderland ...	B. Burgess ...	4
Ritson, T. S. ...	Netherby (Ship) ...	W. Rasmussen ...	5
Ropner ...	Kirkby ...	R. C. Ehoff ...	22
		G. P. Scott ...	1
		O. N. Pettersson ...	5

METEOROLOGICAL REGISTERS received during the year 1904-05  
—continued.

## (5.)—North Atlantic Registers (Form No. 51)—continued.

Line.	Ship	Captain.	No. of Registers.
Rover Shipping Co.	Inchkeith ... ..	F. G. Major ... ..	2
Royal Mail Steam Packet Co.	Atrato ... ..	H. E. Rudge ... ..	12
	Danube .. ...	R. H. Stranger ... ..	10
	La Plata ... ..	L. R. Dickinson ... ..	11
	Magdalena ... ..	F. S. Newton ... ..	14
	Nile ... ..	W. J. Dagnall ... ..	6
	Orinoco ... ..	J. Pope ... ..	9
	Severn ... ..	J. D. Spooner ... ..	4
	Tagus ... ..	H. D. Doughty ... ..	2
	Thames ... ..	W. J. Dagnall ... ..	10
	Trent ... ..	F. W. Powles ... ..	9
	Tyne ... ..	A. C. Farmer ... ..	6
Southern Steam Shipping Co.	South America ... ..	J. Thomas ... ..	2
Taylor & Sander- son S.S. Co.	Coronation ... ..	H. P. Lewis ... ..	1
Toronto Trading Co.	Toronto ... ..	J. Watson ... ..	2
Trechmann ...	Emma ... ..	C. E. Taylor ... ..	9
Ulster S.S. Co. ...	Carrigan Head ... ..	T. Foley ... ..	10
Union-Castle ...	Avondale Castle ... ..	T. Martin ... ..	3
	Braemar Castle... ..	T. Choape, R.N.R. ... ..	8
	Briton ... ..	R. Walls ... ..	10
	Carisbrook Castle ... ..	D. Wallace ... ..	10
	Galeka ... ..	J. W. Creaghe ... ..	6
	Guelph ... ..	J. Tyson... ..	4
	Kildonan Castle ... ..	R. F. Harris ... ..	8
	Pembroke Castle ... ..	T. H. Wilford ... ..	2
United S.S. Co. ...	Alabama ... ..	J. W. Hague, R.N.R. ... ..	7
"Ursula Bright" S.S. Co.	Ursula Bright ... ..	J. Tyson ... ..	2
White Star ...	Afric ... ..	W. Verrall ... ..	2
	Arabic ... ..	R. Götsche ... ..	6
	Armenian ... ..	F. Coode... ..	7
	Baltic .. ...	J. O. Carter, R.N.R. ... ..	10
	Bovic ... ..	B. F. Hayes, R.N.R. ... ..	19
	Canopic ... ..	J. B. Ranson, R.N.R. ... ..	13
		F. B. Howarth, R.N.R. ... ..	

METEOROLOGICAL REGISTERS received during the year 1904-05  
—continued.

(5.)—North Atlantic Registers (Form No. 51)—continued.

Line	Ship.	Captain.	No. of Registers.
White Star—cont.	Cedric ... ..	H. J. Haddock, C.B., R.N.R.	10
	Celtic ... ..	H. St. G. Lindsay, R.N.R.	10
	Cevic ... ..	J. B. Ranson, R.N.R. ...	
	Cretic ... ..	W. H. Clarke ... ..	18
	Cymric ... ..	J. James ... ..	17
	Georgic ... ..	T. P. Thompson ... ..	9
	Germanic ... ..	J. B. Ranson, R.N.R. ...	
	Majestic ... ..	F. R. Clarke, R.N.R. ...	3
	Oceanic ... ..	C. A. Bartlett, R.N.R. ...	12
	Republic ... ..	E. J. Smith, R.N.R. ...	11
	Runic ... ..	B. F. Hayes, R.N.R. ...	
	Teutonic ... ..	J. G. Cameron, R.N.R. ...	17
	Victorian ... ..	J. McAuley ... ..	18
		H. F. David, R.N.R. ...	5
		D. Thomas, R.N.R. ...	
		E. R. McKinstry, R.N.R.	15
		G. J. Caven, R.N.R. ...	10
		D. Thomas ... ..	
		D. Kerr ... ..	
		J. Mathias ... ..	
Wilson & Furness- Leyland.	Cambrian ... ..	C. A. Bartlett, R.N.R. ...	17
		F. Hart, R.N.R. ...	

(6.) International Meteorological Co-operation Logs received  
during the year 1904-05.

(a.) From the ROYAL NAVY (34).

H.M.S.	Commanding Officer.
Amphion ... ..	J. Casement (Captain).
Archer ... ..	J. P. Rolleston (Commander).
Barracouta ... ..	F. E. Travers "
Barrosa ... ..	" "
Basilisk ... ..	A. Dodgson "
Blanche ... ..	H. J. L. Clarke "
Cambrian ... ..	F. Finnis, Ad.C. (Commodore).
Dwarf ... ..	W. N. England (Lieutenant and Commander).
Forte ... ..	R. C. Sparkes (Captain).
	P. Hoskyns, C.M.G., M.V.O. (Captain).
	C. H. Dundas (Captain).
Gibraltar ... ..	A. H. Limpus (Captain).
Icarus ... ..	G. F. S. Knowling (Commander).
Karrakatta ... ..	G. E. Corbett (Lieutenant and Commander).
Lizard ... ..	J. C. Watson "
	J. C. T. Glossop "



METEOROLOGICAL REGISTERS received during the year 1904-05  
—continued.(6.) International Meteorological Co-operation Logs received  
during the year 1904-05—continued.

(a.) From the ROYAL NAVY (34)—continued.

H.M.S.				Commanding Officer.
Magpie...	...	...	...	J. K. Laird (Commander).
Mildura	...	...	...	C. E. Kingsmill (Captain).
Monarch	...	...	...	C. H. Bayly (Captain).
Naiad	...	...	...	A. E. Bethell, C.M.G., The Hon. (Captain).
Nymphe	...	...	...	E. P. E. Jervoise (Commander).
Odin	...	...	...	H. L. D. Pearce
Partridge	...	...	...	A. C. Bruce (Lieutenant and Commander).
Pearl	...	...	...	E. P. Aske (Captain).
Penguin	...	...	...	{ J. W. Combe (Commander).
Phæton...	...	...	...	{ W. Pudsey-Dawson (Commander).
Philomel	...	...	...	E. J. Fleet (Captain).
Phœbe	...	...	...	J. E. Bearcroft, C.B. (Captain).
	...	...	...	{ F. C. B. Addington, The Hon. (Commander).
	...	...	...	{ G. A. Hardinge, The Hon. (Commander).
Pylades	...	...	...	{ H. C. C. Da Costa (Commander).
	...	...	...	{ R. S. Phipps Hornby
Rattler	...	...	...	C. Tibbitts (Lieutenant and Commander).
Ringarooma	...	...	...	F. St. G. Rich (Captain).
Royal Arthur	...	...	...	R. P. F. Purefoy, M.V.O. (Captain).
Terpsichore	...	...	...	C. H. Coke (Captain).
Thistle	...	...	...	E. S. Houseman (Lieutenant and Commander).
Torch	...	...	...	{ N. G. Macalister (Commander).
	...	...	...	{ H. J. O. Millar
Wallaroo	...	...	...	F. C. M. Noel (Captain).
Warspite	...	...	...	J. L. Marx (Captain).

International Meteorological Co-operation Logs received  
during the year 1904-05.

(b.) From the MERCANTILE MARINE (35).

Line.				Ship.	Captain.
Campbell, J. R.	...	...	...	Tinto Hill	H. Docherty.
Devitt & Moore	...	...	...	Macquarie	F. W. Corner, R.N.R.
Evans, J. G.	...	...	...	Alliance	R. H. Potter.
Indra	...	...	...	Indralema	J. Firth.
Montgomery, W.	...	...	...	Ladye Doris	C. G. Wood.
National Antarctic Expedition				Morning	W. Colbeck, R.N.R., F.R.G.S.

METEOROLOGICAL REGISTERS received during the year 1904-05  
—continued.

International Meteorological Co-operation Logs received  
during the year 1904-05—continued.

(b.) *From the MERCANTILE MARINE (35)—continued.*

Line.	Ship.	Captain.
New Zealand Shipping Co. ..	Otarama ...	J. P. Forsdick.
	Paparoa ...	R. Jaggard.
	Rangatira ...	G. Nicole.
	Rimutoka ...	H. E. Greenstreet.
	Ruapehu ...	F. Mayoss, R.N.R.
	Tongariro ...	I. A. Sutcliffe.
	Waimate ...	J. J. Hamon.
	Wakanui ...	— Croucher.
	Whakatane ...	R. C. Clifford.
Nicol, W. ... ..	Craigisla ...	D. Jones.
Nourse J. ... ..	Ems ... ..	W. H. Millichap.
	Erne ... ..	G. T. Dann.
	Rhine ... ..	G. Hesse.
	Rhone ... ..	W. H. Millichap.
Ocean Steamship Co. ... ..	Menelaus ...	W. Towell.
Peninsular & Oriental S.S. Co.	Arcadia ... ..	{ A. C. Loggin. J. C. A. Lyon, R.N.R.
	Britannia ... ..	F. H. Seymour.
	China ... ..	T. S. Angus.
	Himalaya ... ..	W. L. Broun, R.N.R.
	India ... ..	{ C. Gadd. F. W. Vibert, R.N.R.
		{ W. D. G. Worcester.
Royal Mail Steam Packet Co.	Magdalena ...	J. Pope.
Scottish National Antarctic Expedition.	Scotia ... ..	T. Robertson.
Shaw, Saville & Albion Co. ...	Karamea ... ..	G. Burton, R.N.R.
	Mamari ... ..	A. S. Banks.
	Matatua ... ..	W. Burvill Holmes, R.N.R.
	Tokomaru ... ..	J. Maxwell.
Union-Castle ... ..	Goorkha ... ..	F. J. Moseley, R.N.R.
White Star ... ..	Britannic ... ..	B. F. Hayes, R.N.R.
	Gothic ... ..	W. H. Kidley, R.N.R.

(c.) *From LAND STATIONS.*

Country.	Station.	Authority.
Cape of Good Hope ...	Royal Observatory	The Meteorological Commission.
Sydney, N.S.W. ...	The Observatory ...	H. C. Russell, B.A., C.M.G., F.R.S.

## APPENDIX V.

## INSTRUMENTS supplied, &amp;c., to the ROYAL NAVY.

Per Account.	Baro- meters.	Ane- roids.	Thermometers.			Screens.	Hydro- meters.
			Ordinary.	Max.	Min.		
April 1st, 1904, afloat ...	268	809	1,888	491	479	329	70
Issued since ...	144	426	724	175	176	88	—
Returned since ...	412	1235	2,612	666	655	417	70
April 1st, 1905, afloat ...	151	404	553	171	177	59	4
	261	831	2,059	495	478	358	66

## INSTRUMENTS supplied for use at NAVAL STATIONS.

April 1st, 1904, in use ...	88	100	274	46	69	15	17
Issued since ...	2	3	35	1	1	—	—
Returned since ...	90	103	309	47	70	15	17
	2	1	27	1	1	—	—
April 1st, 1905, in use ...	88	102	282	46	69	15	17

## DISPOSITION of INSTRUMENTS on April 1st, 1905.

Afloat in Royal Navy ...	261	831	2,059	495	478	358	66
In use at stations ...	88	102	282	46	69	15	17
In store at M.O. ...	38	109	244	93	88	8	28
„ Chatham ...	27	63	151	53	59	23	12
„ Sheerness ...	9	21	56	20	21	12	6
„ Portsmouth ...	25	46	146	48	57	8	4
„ Devonport ...	26	43	108	39	38	16	2
„ Queenstown ...	4	7	15	4	7	—	—
„ Gibraltar ...	3	6	2	1	2	—	4
„ Malta ...	12	53	53	8	11	—	6
„ Bombay ...	5	5	14	5	5	2	4
„ Bermuda ...	4	8	31	6	6	2	—
„ Cape of Good Hope ...	5	11	32	11	11	3	4
„ Hong Kong ...	25	28	65	28	27	9	5
„ Sydney ...	5	5	18	8	8	2	13
Total April 1st, 1905 ...	537	1,338	3,276	865	887	458	171
Lost, &c., since April 1st, 1904	—	5	165	22	7	10	—
Under repair, April 1st, 1905	25	—	—	—	—	—	—

## APPENDIX VI.

## INSTRUMENTS supplied, &amp;c., to the MERCANTILE MARINE.

Per Account.	Baro- meters.	Thermometers.			Screens.	Hydro- meters.
		Ordinary.	Max.	Min.		
April 1st, 1904, afloat ... ..	146	983	—	—	172	581
Issued since ... ..	88	575	—	—	71	324
	234	1,558	—	—	243	905
Returned since ... ..	51	255	—	—	31	149
April 1st, 1905, afloat ... ..	183	1,303	—	—	212	756

## INSTRUMENTS at STATIONS, viz.: Telegraphic Reporting Stations, Observatories, Fishing Villages, etc.

April 1st, 1904, in use ... ..	333	394	74	81	113	7
Issued since ... ..	9	38	7	9	5	—
	342	432	81	90	118	7
Returned since ... ..	7	13	9	10	2	—
April 1st, 1905, in use ... ..	335*	419	72	80	116	7

## DISPOSITION of INSTRUMENTS on April 1st, 1905.

In merchant ships ... ..	183	1,303	—	—	212	756
„ use at stations ... ..	335*	419	72	80	116	7
„ store at M.O. ... ..	5	30	3	4	10	40
At Liverpool Agency ... ..	6	37	—	—	2	24
„ Glasgow ... ..	6	31	—	—	4	27
„ Dundee ... ..	3	8	—	—	2	6
„ Hull ... ..	4	21	—	—	4	14
„ Cardiff ... ..	2	34	—	—	2	9
„ Southampton ... ..	6	15	—	—	5	20
„ Sunderland ... ..	4	23	—	—	6	13
Total April 1st, 1905 ... ..	554	1,921	75	84	363	916
Lost, &c., since April 1st, 1904 ... ..	2	56	2	1	5	11
Under repair, April 1st, 1905 ... ..	1	—	—	—	—	—

\* Of these barometers, 230 are lent for use of sea-faring communities at fishing villages and ports.



## APPENDIX VII.

REPORT OF INSPECTION OF STATIONS IN CONNEXION  
WITH THE OFFICE IN 1904.

The Inspectors were as follows :—

Observatories and Anemograph Stations.	{	Mr. T. W. Baker and Mr. E. G. Constable, by arrangement with the Director of the National Physical Laboratory, Mr. R. H. Curtis, and Mr. J. A. Curtis.	
Districts 0, 1 and part of 6 ...		Dr. A. Buchan.	
„ 2 and part of 4 ...		Mr. J. A. Curtis.	
„ 3 ... ..		Mr. H. Harries.	
„ 5 ... ..	{	Mr. R. G. K. Lempfert and Mr. W. Marriott.	
„ 7 and part of 6 ...	{	Mr. F. J. Brodie and Mr. W. Marriott.	
„ 8 „ „ 4 ...	{	Mr. R. H. Curtis and Mr. W. Marriott.	
„ 9 and 10 ... ..		Capt. C. Hepworth.	

The following Notes are extracted from the Reports of the Inspectors :—

## GROUP A.—OBSERVATORIES.

*Armagh*, August 17th–18th.—The Robinson anemograph and the Beckley rain-gauge appeared to be satisfactory.

Orientation was satisfactory.

There is again need of a further topping of the many trees surrounding this station; the anemometer is much shut in, especially from, say, S.W. to N.

*Ben Nevis*, August 26th (Report by Dr. Buchan).—Two observers, recently added to the Ben Nevis staff, made the observations and did the deductions expertly and correctly.

*Falmouth*, August 31st.—The self-recording instruments here are apparently well looked after.

Each instrument, with clock, &c., was overhauled and cleaned.

*Stonyhurst*, August 11th.—Each instrument received the usual cleaning and examination.

Since my last visit, a new pair of windmill-governors has been fitted to the direction-fan spindle, and is an improvement.

*Valencia*, August 25th.—It is extremely probable that the velocity records at this station, especially in high and gusty winds, are affected by the low height of the observatory tower, which only just rises above the roof ridges of the house. To give a really good exposure, the tower needs to be raised at least another 15 feet.

## GROUP B.—ADDITIONAL ANEMOGRAPH STATIONS.

*Deerness*, September 28th–29th.—At this station the anemograph was found to be in good working order.

*Dublin, Phoenix Park*.—August 19th–20th.—The anemometer appeared to be working freely. It was dismantled and cleaned.

The clock was much over-oiled.

The question of the time on the curves seems to be due to the mixing up of G.M.T. and L.T. ; the sheets are practically always changed at 10 a.m. G.M.T.

Since my visit in 1902, a rather large building has been erected to the N.E. of the anemometer, and nearer to the instrument than any of the older buildings.

A new plantation has also been laid down, fairly close to the staging, and running from S. to N.

*Fleetwood*, August 12th–13th.—I found the Robinson anemometer generally in good order. The instrument was dismantled, both exterior and interior portions, and all parts cleaned. Orientation satisfactory.

*Holyhead*, August 15th–17th. — Robinson anemograph. The examination and cleaning of this instrument was carried out under difficulties, the weather being stormy.

Generally speaking it was in good order. All parts were cleaned.

In testing the orientation, allowance was made for the error said to exist in the vane. I must confess, however, that I was unable to detect the error, although I fitted up a light and sensitive vane immediately over the other—the wind blowing about 30 miles per hour.

Bridled anemometer. The cord carrying the weights of this instrument had broken on the day preceding my visit.

The instrument was dismantled and cleaned, and a new cord fitted.

Dines pressure-tube anemometer. There is nothing special to remark about this instrument.

Before and after dismantling it, I made a series of comparisons with a 10-inch water-gauge.

Maximum pressure plate (non-oscillating). Mr. Davis did not appear to be satisfied with the working of this instrument, the values of late appearing to be low.

On examining it, I found that one of the thin brass pieces holding the guide-rollers at back of plate was bent, and the roller jammed against the brass slip, so that the plate moved stiffly. The woodwork to which the brass slips are screwed has opened out a little, and there was about  $\frac{1}{30}$  inch difference in width between the centre and the ends of the run.

I reduced this as much as was possible, altered the rollers, and cleaned all parts of the instrument, and it appears now to work more freely.

*Nottingham*, September 15th.—There is a Dines anemometer at this station. It is exposed on the north-eastern gable of an engine-house, with its vane head 46 feet above the ground and 8 feet above the roof.

There is nothing so high in the immediate neighbourhood except the chimney shaft, which is to the south-westward, and so far away as not materially to influence the indications.

The station is in the valley of the Trent, and practically on a level with the river bank.

I advised that a comparison be made between the forces by Beaufort scale, as estimated by Mr. Ings (the telegraphic observer), and the velocities as shown by the curves, and that in any case of difficulty reference should be made to the Office for advice.

The curves are mounted in guard books at the Guildhall, and Mr. Brown, the City Engineer, will be pleased to allow the Office the use of them if occasion arises. The record exists from January 1st, 1904.

*Shields, North*, August 31st–September 1st.—I found this instrument in good order, but in need of the annual over-haul and cleaning. Its position at the bottom of a disused chimney shaft exposes it to much dust.

The work designed to ensure safety in access to the instrument has now been carried out, as arranged with the Tyne Improvement Commissioners.

*Yarmouth*, October 7th–8th.—The anemometer here was found working very well, and is in excellent order, the traces obtained with the new silver helices being very good.

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#### GROUP C<sup>3</sup>.—ADDITIONAL RAIN-RECORDER STATIONS.

*Nottingham*, September 15th.—There is a Halliwell rain-gauge at this station, placed in the enclosure close to the 8-inch gauge used for the telegraphic observations.

The machine is now working well.

The records are mounted in guard books at the Guildhall, and Mr. Brown will be pleased to allow the Office to use the information if desired. The records are available from the beginning of 1904.

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#### GROUP S.—ADDITIONAL SUNSHINE STATIONS.

*Salcombe*, August 1st.—The sunshine recorder has an excellent exposure on the top of the hill above the town. The horizon is perfect and the instrument is well attended to. The results it yields will supply a very satisfactory exponent for the sunshine of the district.

*Scarborough*, September 6th.—The sun recorder was removed on March 30th, 1904, to a new and better position on the top of the tower at the fire station, the ball being 62 feet above the ground.

Except from N.E. to E. by S., where the Castle interferes to a slight extent, the exposure is perfect. The instrument is now in the charge of Mr. Birkbeck, the engineer. Some adjustment was required for latitude. This I made, and then re-cemented the instrument in its place.

The thermometer screen and rain-gauge at this station have also been moved since last inspection. They now stand on a small lawn overlooking the harbour, close to the top of the cliff tramway, and about 38 feet higher than in their old position.

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GROUPS D. AND E.—NORMAL CLIMATOLOGICAL STATIONS\*  
(SECOND ORDER STATIONS of the INTERNATIONAL CLASSIFICATION).

*Ballinacurra*, September 21st.—This station has been established by Mr. H. Bennett in connexion with the experimental farm at Ballinacurra, which is under the auspices of the Irish Department of Agriculture. The equipment is first-class, and the exposure of the instruments excellent. The observations are taken by Mr. John Smith, under the direct supervision of Mr. Bennett, and I found him to be an accurate observer. Mr. H. Hunter, barley expert, writes the monthly sheet for this office, and makes the necessary corrections and reductions. The barometer hangs in the office of the malting house and is well placed, although subject during winter to slight fluctuations in temperature. Thermometer screen, sunshine recorder, and rain-gauge, are suitably situated on a grass terrace adjoining a croquet lawn (on the west side) and a field (on the east).

This promises to be a valuable addition to the climatological stations in Ireland.

*Cheltenham*, September 5th.—There was a little spirit at the top of the tube of the grass minimum. I recommended that the grass minimum be more exposed. The Jordan sunshine recorder was in good adjustment. The Robinson anemometer was not working very satisfactorily. The observer, some time ago, in cleaning the mercury in the cistern of the Fortin barometer let some air get into the tube. The instrument is now satisfactory.

*Crathes*, August 5th.—The instruments are remarkably good, and placed well, and the observations are specially well observed by Mr. Smith and family.

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\* A Normal Climatological Station is one at which readings are taken each day at 9 a.m. and at 9 p.m., local time, and which is provided with the following instruments properly verified and exposed:—Barometer, dry-bulb, wet-bulb, maximum and minimum thermometers, and rain-gauge.



*Dublin Trinity College*, September 17th.—This new station, which is in charge of Prof. Thrift, F.T.C.D., promises to be a very valuable one, and is peculiarly well situated in the Fellows' Garden of the College. The barometer is kept in a large room in the old magnetic observatory in this garden, and the sunshine recorder is placed on the roof of the building. Thermometer screen, solar radiation thermometer, grass minimum thermometer, earth thermometers, and rain-gauge are well situated at some distance to the north of the building on the lawn, this site having been selected by Sir John Moore. Mr. A. R. Moore, his son, is the observer, and is versed in the work and much interested in it. Prof. Thrift's general supervision is another item ensuring efficiency.

*Dunmow, Bigod's Hall*, July 21st.—This is an excellently planned station, being in the midst of the experimental plots of ground in the Countess of Warwick's Agricultural School, the instruments being thoroughly well exposed. The barometer is suspended in a little wooden hut within the meteorological enclosure, but as the interior of the hut becomes very hot on sunny days, I recommended the removal of the instrument to the spacious entrance hall of the house, where it would be subject to comparatively slight changes of temperature, and at the same time be more easily accessible to read at any time. (In its present position, out in the field, it involves a walk of at least 200 yards each way to ascertain what it is doing.) With the exception of a defective grass minimum the instruments are in very good order. It seems probable that the intense drought has been the cause of the sunshine recorder brick pillar sinking slightly (about  $\frac{1}{8}$  inch) to the westward. Mr. Hacking, formerly at Cockle Park, takes great interest in meteorology, and he is ably seconded by Mr. Holloway, who undertakes the work of observation and reduction.

In the training of the pupils, one of the features of the school is the inculcation of the habit of observing natural phenomena. The boys, therefore, are taught to be systematic in recording the various meteorological instruments, noting the wind direction and its force, the forms and movements of clouds, &c., as do the boys on the training ships "Worcester" and "Conway," but they are encouraged to go a step further;—after taking observations, they make a forecast (in writing) of what the present changes will probably lead to in the course of the day.

As it is intended that the boys shall eventually become responsible agriculturists, it is obvious that this training of the habit of close observation in early life cannot fail to be of the greatest value in after years.

*Dunrobin*, August 16th.—The minimum thermometer was found out of order, being  $1^{\circ}4$  too low, with evaporated spirit at the top or in the tube. The instrument has been either inadvertently changed or damaged since last inspected.

The other instruments were in very good order, and the observations continue to be carefully made.

*Glasnevin*, September 16th.—The thermometer screen, solar radiation thermometer, grass minimum thermometer and rain-gauge, formerly in somewhat too close proximity to trees and shrubs, and liable to interference by visitors, are now situated outside the Botanic Gardens proper on new grounds adjoining the Gardens, and immediately to the south of them. A large triangular area, far removed from buildings, trees and shrubs, is fenced in with barbed wire. The arrangement is admirable, and the site excellent. The screen is in good repair, but needs paint. All the instruments are in good order except the barometer, the vernier of which fails to retain its position when set. Both the observer and his assistant are experienced in the work, and are thoroughly efficient.

*Guernsey, Fort Road*, July 14th.—Exposure.—Excellent. Instruments.—Satisfactory, but barometer has not been to Kew since last sent to makers for repairs. Observations.—Excellent.

The station is situated on plateau in centre of island, near its highest point; there are no tall trees near, and the house is distant from the instruments considerably more than twice its height. An almost uninterrupted view of horizon is obtained from anemometer tower; the nearest shrub is about 6 feet below level of cups.

The instruments are all in excellent order, and spare thermometers are available in case of accidents.

*Hull*, September 9th.—Everything was in good order at this station. The thermometer screen and rain-gauge have been moved since last inspection to another site then selected. The removal has resulted in improvement. The new grass minimum read  $1^{\circ}0$  lower than my standard, although I could detect no separated spirit.

Earth thermometers at 1 ft. and 4 ft. are now in use.

The observations are conducted by Mr. Witty, the Parks' Superintendent.

*Lairg*, August 17th.—The station has been greatly improved by the cutting down of trees, and others will be cut down shortly. The observer takes a good deal of interest in the observations, and is a careful observer.

*Laudale*, August 27th.—Since the death of Mr. Fletcher in July, his son, who succeeded him in the management of Laudale, has been in charge of the station, assisted by his sister, Miss D. B. Fletcher.

The instruments were all in excellent order.

*Llandudno*, July 8th.—This station was in good order. On comparing the thermometers it was found that the dry and wet bulbs had both gone up  $0^{\circ}2$ . The sunshine recorder is mounted on an iron column. The spot of light was on the noon line of the card at 12.0 local time. The barometer is mounted in the Sanitary Inspector's office at the Town Hall, but it is reading  $\cdot047$  inch too low.

*Oundle School*, July 16th.—The station is admirably placed, nearly in the centre of the extensive school-field, some little distance outside the village, the instruments being arranged, as shown on the rough plan, in a railed off space of about 9 yards by 6 yards. Distant trees interfere somewhat with the early and late sunshine, but this defect will be remedied when the new observatory tower is built, Mr. Sanderson, the Head Master, promising to have a suitable position arranged for the recorder on the south front of the dome. The barometer is hung in the school laboratory in the village. All the instruments are in excellent order, and Mr. Morris, the school meteorologist, takes great interest in the work of observing, which has to be done out of school hours. He is a careful and reliable observer, and for the Science Society of the school he prepares a daily report, which is posted on the outside of the school wall for the information of the scholars. Here also are exhibited aneroidograms for successive weeks, and photographs of lightning flashes recently taken by Mr. King, one of the masters.

*Poltalloch*, August 30th.—Except the minimum thermometer, which was much out of order, the instruments were well attended to, and carefully and correctly observed.

*Salisbury, Wilton House*, July 12th,—Exposure.—Good. Some small fruit trees on N.E. are rather nearer than twice their height. I moved solar maximum into position in which it would not be in shade at 10 a.m.

I gathered the impression that observations are taken with great care. Temperature and rainfall observations are especially good. Conformity to Beaufort notation would increase value of weather observations.

*Southampton*, July 12th.—Exposure.—Good. Solar maximum at present gets shaded in late afternoon, as shrubs on west side have grown considerably; these are to be reduced in size.

Instruments.—All quite satisfactory. Sphere of sunshine recorder very yellow in colour; I have some doubt as to its sensitiveness. The instrument needed adjustment for level.

Observations.—Most carefully taken.

*Whitby*, September 5th.—This is a long-established station that has, however, but recently come in connexion with the Office.

The outfit of instruments is very good, including a Campbell-Stokes sunshine recorder. The ground on which the outdoor instruments stand is, however, not protected in any way, but is quite open to visitors. I recommend that the authorities be urged to have the space properly enclosed at once, so as to prevent possible tampering with the instruments.

The rain-gauge was too near the edge of the cliff. I selected a better site a few yards distant, and the observer promised to move the instrument at once.

The thermometer screen was too high, and was not firmly fixed. I asked that this might be corrected.

Mr. Newbitt is an experienced and careful observer, and I think the station is a valuable one.



*Wolfelee*, September 6th.—The thermometer screen was ordered to be repaired and repainted; otherwise the instruments were in good order. The observer was recently appointed, and instructions were given generally regarding the reading of the various instruments. He promises to be a careful observer.

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#### GROUP R.—RAINFALL STATIONS.

*Caistor*, September 13th.—The observer has recently changed his residence. The rain-gauge is now exposed in a garden on sloping ground, at about 90 feet greater elevation than in its former position. There are a good many trees around which shelter the instrument to some extent; and to gain a better exposure I placed the gauge with its rim 3 feet 6 inches above the ground. There is still some protection from surrounding objects, but in spite of this in its present position the records will satisfactorily represent the rainfall at Caistor. Mr. Ford takes the observations personally, and manifests considerable interest in the work.

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#### GROUP G.—AUXILIARY CLIMATOLOGICAL STATIONS.

*Arlington Court*, August 2nd.—The present observer has only been in charge since January, but before coming to Arlington he had had experience in taking rainfall observations elsewhere. The instruments were in good order and are apparently carefully read. There are two rain gauges in use, and one gives almost always a higher record than the other, although the same glass is used for the two instruments. The gauges are not far from each other, but the check gauge has, in my opinion, the better exposure, some large trees intervening between the two. I consider the present check gauge amount the more correct, and strongly recommend its acceptance for the future.

*Balruddery*, September 8th.—The instruments were in good order, but are now removed to a more open situation near the centre of the large kitchen garden, in a plot of grass, where the exposure of the thermometers and rain-gauge is good. The observations are made with care and intelligence.

*Barnstaple*, August 2nd.—The Fortin barometer is not all that could be desired, and is hung in a bad light. A match has always to be used to set the instrument, and even so an accurate setting is a very difficult thing to obtain.

*Bawtry, Hesley Hall*, September 10th.—The rain-gauge, owing to the growth of trees and shrubs, is now somewhat sheltered. I asked Mr. Whitaker to move it to another site, which I selected, not far away, but much more open. This he promised to do at once.



*Bristol, Overcourt Park, August 6th.*—The instruments at this station and their exposure are excellent, and the observations appear to be very carefully made by Mr. Dillridge, Mr. Lippincott's head gardener. I heard that another rain-gauge is kept at a station about a mile distant, and at an elevation of 100 feet above the one at the Park, and Mr. Lippincott very kindly promised to send its record each month to the Office.

*Buntingford, July 22nd.*—Being in the centre of an extensive field, away from trees and buildings, the site selected for this station is an excellent one, but the enclosure, 6 yards by 3 yards, is rather small. As it is in contemplation to shift the enclosure to another part of the field, perhaps a larger space and a lower fence can be arranged. Except for the barometer the instrumental equipment is good, and the records in future are likely to be greatly improved. Dr. Melville Smith takes much personal interest in the subject of meteorological observations, and he proposes to add to his equipment an officially approved barometer, a sunshine recorder, and an anemometer.

*Cardiff, August 4th.*—This is a new station under the control of Dr. Walford, the Medical Officer of Health, and the instruments are excellently exposed in the Roath Park about 2 miles to the north-east of the centre of Cardiff. The instruments are good and it is intended to add a grass minimum thermometer and a wind vane to the outfit. Other temperature and rainfall observations are at present being taken by Mr. Pettigrew, the Superintendent of the Parks, at a station about 150 yards distant, and these are used as checks upon the other.

*Coventry, September 16th.*—The mercury in the cistern of the Fortin barometer was corroded, making it difficult to set the zero point accurately. There was 9° of separated spirit in the grass minimum, which I corrected. With these exceptions everything was in good order.

The observations are conducted under the superintendence of Dr. E. Hugh Snell, the Medical Officer of Health, and they are taken by Mr. Gamble, one of his assistants. Mr. Gamble reads correctly and will, I believe, prove a very careful observer. The outfit of instruments includes earth thermometers at 1 foot and 4 feet, and a Negretti and Zambra self-registering rain-gauge.

*Cullompton, August 18th.*—Mr. Turner has a glass shade over the sunshine recorder. Air is permitted to get inside the shade, so there is no steaming on the glass. There is a possibility of a tree in a neighbouring garden to the east-south-east soon intercepting the morning sunshine.

*Felixstowe, July 13th.*—The station occupies a good position near the sea shore on the low ground between Felixstowe and Harwich, and the exposure of the screen and sunshine recorder is very good, but the soil is a loose sand, and the wind drifts the sand about in such quantities that the wet bulb thermometer must frequently be rendered useless. On the occasion of the inspection the muslin above the bulb was stiff with sand and salt, and although the wick was thoroughly saturated up the loose portion

from the water, it was perfectly dry round the neck of the bulb, and the muslin round the bulb was also quite dry. Consequently the dry and wet bulbs read alike. On refitting new muslin and wick there was a fall of several degrees in a few minutes. Mr. Mills will in future change the muslin and wick frequently—probably this should be done weekly. All the instruments in use are excellent and the observer is fully qualified to be in charge of them.

*Leeds*, August 2nd.—The out door instruments are placed on the roof of the museum, which is in the centre of the city. The roof, though large, is not flat, but is broken up with small roofs, skylights, &c., and there are, moreover, higher buildings in the immediate vicinity, so that the circulation of air must be interfered with to some extent.

It is to be regretted that so important a city as Leeds should not have its official meteorological outfit exposed under standard conditions, so that the results of the observations might be directly comparable with those at other places.

*Llangammarch Wells*, August 3rd.—Since the last inspection this station has been entirely remodelled, and it is now quite satisfactory. Dr. W. Black Jones will welcome any suggestions either as to outfit or method which the Office may desire to make.

*Monmouth Grammar School*, August 5th.—Mr. Coates will be glad of any suggestions the Office might like to make for bringing his methods, &c., into line with theirs. The station promises to become a very good and useful one.

*Newport, Mon.*, August 5th.—Maximum and minimum thermometers are exposed in the depôt of the Corporation Waterworks, and should give reliable data respecting the air temperature of the town. The observations, both of temperature and rainfall, are carefully made.

*Newquay*, July 28th.—Dr. Vigurs desires to send observations of temperature and of rainfall to the Office direct, for publication with his returns of sunshine. The instruments are good, as is also their exposure; but building operations are encroaching upon the site, and in the near future another will, no doubt, have to be chosen.

*Portsmouth*, July 19th.—The station has recently been greatly improved by the addition of a Stevenson screen.

*Reading*, July 22nd.—Exposure.—Good. Instruments.—Satisfactory.

Observations.—Some of the older boys act as observers. During the holidays the headmaster, and in his absence the gardener, takes the observations.

*Rugby*, September 17th.—It is very desirable that both screen and rain-gauge should be removed to more open sites.

*Salthurn-by-the-Sea*, September 5th.—This is a new station, the outfit for which has been obtained through the Office, at the expense of Mr. Pearson, a resident in the town. The Urban

District Council has provided the site and fixed the instruments, while Dr. Allan Bennett, and Mr. Pearson will conduct the observations.

The out-door instruments have an excellent exposure on the sea front, 9 feet below the general ground level, and about 80 feet above the sea. A grass slope extends to the upper level, and winding paths lead down to the beach.

The sun recorder will lose a little sunshine in the early morning and late evening in winter, but I estimate that as a maximum this loss can never exceed one hour a day.

The observers are competent, and the station promises to become a very useful and interesting one.

*Shoeburyness*, July 11th.—The equipment is a good one, and the sergeant-major in charge, who takes an intelligent interest in the work, is willing to undertake more complete records on receipt of the necessary forms. The responsible officers are anxious that everything should be well and correctly attended to.

*Totland Bay*, July 18th.—Observations.—Carefully and punctually taken. Careful observations of the direction of motion of clouds are made. By standing under the tower, built on to the front of the house, and sighting the clouds against the tip of the wind vane (61 feet above ground) good observations can be taken.

Wind velocity is determined by means of a Robinson cup-anemometer. Mr. Dover does not estimate the wind force at the hour of taking the daily observations (9 a.m.),—the values given are averages for the past 24 hours.

#### GROUP H.—FISHERY BAROMETER STATIONS.

*Atherfield (Isle of Wight)*, July 17th.—Barometer No. 204.

Circumstances of exposure, &c., are precisely similar to those at Brixton (which see). Instrument is entered in books as belonging to Admiralty.

*Bognor*, July 19th.—The instrument (? No. 115) is in charge of the Pier Master, and it is exhibited at the entrance to the pier. It appears to be in good order. It is set every morning, but no record is kept.

*Boscastle*, July 29th.—The barometer here is placed in a recess in a wall, where it was protected by a glass door, and also by a sliding wooden shutter. The glass door is however broken, and only the shutter remains, and that is also in a dilapidated state. The barometer appeared to be sound, but it is covered with dirt and cobwebs. It is hung a considerable distance back from the quay, very near the centre of the older part of the village.

I was told that about nine fishing boats work from Boscastle, and in summer a few coasting craft use the harbour; three were lying at the quay at the time of my visit.



No storm signals have been exhibited here for a long time past. If the "warnings" are to be continued I would like to suggest that they be sent direct to the Coast Guard, and that the signal be hoisted at the coast guard signal staff, which is in quite as good a position as the other and is always accessible.

I saw (at Newquay) Lieut. Ayscough, the Divisional Officer, and he thought the Coast Guard should accept no responsibility for the barometer unless it was first properly housed. Col. Hawker was from home on the day of my visit, but I gathered from Lieut. Ayscough and others that he wished to be relieved of any further responsibility either for the barometer or storm warnings. I fear there is no likelihood of any local funds being forthcoming for the repair of the box.

*Brixton (Isle of Wight)*, July 17th.—The instrument (M. O. 206) is in charge of the Chief Officer of the coast guard station. It appears to be in good order. It is placed inside the office in a satisfactory position, but it cannot be seen by the public, and no chart of the readings is exhibited, the latter being merely entered in a note-book. The coast guard station is far removed from other houses, so that even if the instrument were placed in a more public position, few people would benefit from it. Occasionally the local fishermen ask the officer on duty whether the barometer is falling or rising.

*Devoran*, July 21st.—The barometer hangs at the head of a staircase leading to the Subscription Reading-room in the village, a considerable distance from the quay, and in a position where it cannot be seen by passers-by in the street, although persons who know where to find it can consult it even if they are not members of the reading-room. It is in charge of Mr. Pascoe, who is a postman and the honorary secretary of the reading-room, and who lives close at hand. The barometer was in good condition.

Devoran was never a fishing place; but some years ago when the mining industry was prosperous it had a large coasting trade, occasionally as many as 40 vessels being at the quays at one time. Now at varying intervals two steamers bring coal for local use, and the rest of the trade is done by a few barges which go down the river to Falmouth; there are absolutely no fishing boats.

Although as I have said, anyone can go to the barometer, it is as a matter of fact only consulted by members of the reading-room, and it is as an adjunct of the room that it now appears to be regarded.

*Falmouth*, July 20th.—This barometer is hung inside the Custom House in a position where it is not readily accessible to the public.

Outside the Custom House another barometer, supplied by the National Lifeboat Institution, is hung; and that is the instrument consulted by watermen and others. The Collector of Customs, in whose charge the B.T. barometer is, described the office instrument as "practically a private instrument; no one outside the Customs staff ever examines it."



The Collector also told me that much interest is shown in the record of the pressure anemometer, which is sent daily from Pendennis, and is put up at about 1 p.m. by the side of the daily weather report. He said that both the anemogram and the report are much examined by pilots, boatmen, and others who are interested in the weather.

*Felixstowe Ferry*, July 13th.—Station barometer M.O. 154 is in charge of Mr. Gray, Chief of the Coast Guard at Felixstowe Ferry, about three miles up the coast from Felixstowe. The instrument is hung in a pump recess inside the first floor entrance to Tower U, but is useless.

It was formerly kept in the Coast Guard boat-house on the beach, but in the storm of March 25th, 1898, the boat-house was swept away, the telescope and other things being lost. The barometer was saved, but the vernier was damaged and, no doubt, some of the mercury lost, as it now stands 0·6 inch too low.

Mr. Gray does not consult the barometer, and no one else ever comes to see it, there being only four pilots and a few lobster fishers in the locality.

I recommend that the barometer be recalled, another not being required.

*Gorey (Jersey)*, July 13th.—The instrument is in charge of Captain Knowles, the Harbour Master, and is placed in a prominent position in the window of his office. It appears to be in good order, but it is exposed to the sun during the afternoon. Readings are taken every morning at about 9 a.m. and plotted on a chart, which is exhibited, together with storm-warning telegrams (if any) in a frame placed next to the barometer. Observations of wind and weather are also entered on this chart. Captain Knowles tells me that the instrument is much appreciated by the local fishermen.

Storm-warning telegrams usually reach Gorey 30 to 50 minutes after the time of issue, but occasionally evening messages are not received until the following morning: they are found to be useful.

*Gorleston*, October 8th.—I found the barometer clean and in good order. It is easily accessible (being fitted in a recess in the wall of the pilot-house on the pier) to the fishermen and general public, and is really much referred to, especially so at the time of the herring fishery, by both the local and Scotch boats.

*Harwich*, July 12.—Fishery barometer, No. 538, B.T. 88, is in charge of Mr. W. G. Anabona, Chief Officer of the Coast Guard. The instrument is in good order, in a large pent-roofed box fixed against the tarred wall in the yard of the Coast Guard building, facing the sun in the early morning. Its indications, without the attached thermometer, are entered in the log daily at 9 a.m., noon, 3 p.m., and midnight. Two panes of glass are let into the face of the case, so that both the height of the barometer and the attached thermometer can be read off.

Many pilots, fishermen, the masters of small craft and of wind-bound vessels frequently come to see what the barometer is doing, so it is evident the instrument supplies a want in the locality.

Mr. Anabona will in future record the attached thermometer in his log.

*Hastar Hospital*, July 19th.—The instrument, M.O. 147, is in charge of the police; it is placed in the porch of the main gate and appeared to be in good order. Readings are taken at 8 a.m., 2 p.m., 8 p.m., and 2 a.m., and are sent to the Office. So far as I was able to ascertain the instrument is not consulted by the public. I was told that the hospital also possesses a self-registering aneroid.

*Hayle*, July 27th.—The barometer is in very good order and is kept in a box set in the wall of the Custom House, where it can be consulted by anyone, and where it is passed by shipping masters and others on their way to and from the Harbour Office. It is in charge of Mr. R. Graham, the Principal Officer of Customs, who sets the index daily, and looks after the instrument very carefully. I was told that the barometer is very much used.

The staff for exhibiting the signal cone is opposite the Custom House, in a very good position for the signal to be seen; and Mr. Graham says the warnings are greatly valued. The staff is not, however, in good repair. After much trouble Mr. Graham got the Harbour Authorities to do something to it recently, and the signals can now be hoisted, but for some time that could not be done, and even now the pole is imperfectly stayed. The telegram is exhibited in the window of the Custom House.

*King's Lynn, Alexandra Dock*, July 15th.—Station barometer N. and Z., M.O., 195, remains in the care of Mr. A. G. Russell, the Dock Manager. Formerly it was suspended at the Dock Head, but in accordance with the Inspector's suggestion in 1888 it was removed to the Dock entrance gate. Here, however, it was found that the constant slamming of the gates disturbed the mercury, and it was thought best to fix it on the side of the Police Office, a few feet away. This proved an unsatisfactory position, as the sun was shining on the instrument most of the day. Then it was shifted to its present position at the entrance to the Dock Master's office, close to the Police Office. Even here it is affected by the sun during some parts of the day, but it is difficult to find a place in the Dock which would not be equally objectionable.

All the mariners and others about the Docks come to see the instrument and take great interest in it, considering it to be very accurate in its indications, except when it changes very rapidly.

*King's Lynn, Custom House*, July 15th.—The fishery barometer at King's Lynn Custom House has only the maker's number, 380, on it, but the official number, M.O. or B.T., given by Mr. Wallace, is 56.

The instrument is in the care of the Collector of Customs, now Mr. W. R. Twitchett, and the vernier is set every morning by the Deputy Collector, but no records are kept. It is suspended in the long room of the Custom House.

Every day it is consulted by many of the sailors and fishermen in port, and both the Collector and his deputy agree in saying that it is greatly appreciated by the class of people for whom it was intended to be of use. Should the question of shifting it again arise the best place would be outside the Custom House, on the wall, between the entrance and the advertisements of official notices, where it would face north out of the sun's rays, and all persons passing to and fro between the town and the harbour could see it—but a glazed case would be necessary to protect it.

*Leigh (Essex)*, July 13th.—Fishery or station barometer M.O. 174 is in the care of Mr. James Collins, Station Officer of the Coast Guard. The instrument, in a windowed case, is suspended on the south wall of the Coast Guard watch room, exposed to the sun's rays all day. On my arrival the attached thermometer was already up to 98°, and the men informed me that the usual height reached daily in sunny weather exceeds 110°. I went with Mr. Collins to see if a better place was available for suspending it where it would be easily accessible to the fishermen of the locality, who, up till now, have hardly seen the barometer, owing to the Coast Guard watch room being in an awkward place to get at, across the railway lines. In the absence of any more substantial and suitable place I selected the north end of what is known as the Oyster Shed, on Bell Wharf, where all the fishermen congregate. Two of the principal men on the wharf promised to obtain the sanction of the owner of the shed and to take measures for having the barometer properly suspended under the supervision of Mr. Collins. The shed is only about 100 yards distant from the watch room. The fishermen who, having business with the Coast Guard, have seen the barometer a few times, express themselves very favourably about it, "as it is always very correct in foretelling the weather, and ought to be down here on the wharf where we can always have a look at it." The instrument is in good condition.

*Margate*, July 21st.—The instrument, No. 619, B.T. No. 92, is exhibited in the porch of the Seaman's Institute in a very satisfactory position. It is in charge of the curator, who sets it every morning, but no record of the readings is kept. It appears to be in good order, and is much consulted.

*Orford Haven*, July 12th.—At Harwich I communicated, by telephone, with Orford Haven Coast Guard, to ascertain the nearest railway station—which is Melton, 9 miles distant. I was told that there has been no barometer at Orford Haven for many years—"it was done away with years ago." This information was confirmed by one of the Harwich Coast Guard men, formerly at Orford Haven, who says that there has not been a barometer at the station for years, and that since its removal the observations were taken at Hollesley Bay Training College.

*Penryn*, July 21st.—The barometer is suspended in a case outside the room used by the Customs Officer, at the head of a short flight of steps. It is well protected from the weather except that the sun shines upon it during the early part of the day, but it was very dusty and dirty.



There are no fishing boats at Penryn and only a few coasters use the place, the number depending chiefly upon the state of the granite trade. The quay-men use the barometer at times, but they do not go afloat, and "most of the coasters have a barometer or aneroid on board."

The Customs Officer comes to Penryn from Falmouth, and he had not arrived when I left Penryn; I had therefore to get my information respecting the barometer from a man in an office at the base of the steps, and from enquiries made on the quay.

*Portscatho*, July 20th.—This instrument was recently moved from its original position to the doorway of the "The Institute," where it is under the care of the honorary secretary, Mr. W. Finlay Hamilton.

The instrument is in good condition. It hangs upon the wall in a good position for being seen, but the sun shines full upon it for some hours near midday.

There is very little fishing done from this place now, and only four men there can be regarded as "fishermen" working at fishing for a living. In summer, several boats are in use for visitors' trips.

I gathered that some opposition had been manifested to the removal of the barometer from the old "Reading Room and Boatmen's Shelter" to the new "Institute"; but in its present site it is well looked after, and is "set" each morning by the caretaker, and it is but a few yards away from where it was.

*Ryde (Isle of Wight)*, July 18th.—The instrument [No. 285 ? 46 ? (no M.O. number)] is placed on the pier-head and appears to be in a satisfactory condition. It is set every morning, but the readings are not recorded, as a record of an aneroid barometer at the other end of the Pier is kept up by the Coast Guard. I also noticed another mercury barometer, exhibited for public use by an optician, close to the pier.

*Shields, North*, September 1st.—This fishery barometer, No. 99, is exposed on the Fish Quay, outside the Quay Master's Office. It is in a wooden case affixed to the wall of the house.

The attached thermometer has been stolen. With the exception of some tiny globules of mercury in the upper part of the tube, the instrument was in good order, but on comparison with my standard it read 0·05 inch too low.

Mr. McKenzie would like a supply of Form No. 15 on which to exhibit the barometer diagram. I promised these should be sent.

I was told that the instrument is constantly being consulted by the fishermen and others, and that it is found to be of great service.

*Shields, South*, September 1st.—This fishery barometer hangs in the inner lobby of the Mercantile Marine Office.

At night no one except those in the house can consult the barometer.



It is a public office, and those persons who know of the existence of the barometer can, during the day, come and consult it. I was informed that the boatmen on the quay (there are practically no *fishermen* there) did know about the instrument, and did consult it from time to time.

The instrument is in good order.

*Sunderland*, September 3rd.—This barometer, No. 148, is in the custody of the Coast Guard. I found it hanging inside the boat-house, and quite inaccessible to ordinary members of the public. I was informed it had been in the same position for upwards of 20 years.

The Coast Guard station is being transferred to Roker, on the other side of the river, and I therefore dismounted the instrument and conveyed it to the new station.

I selected a new site for it where it can be seen by boatmen and others, and Mr. Parkes, the Chief Officer of the Coast Guard at the station, believes that in its new position it will prove of great service to the local men.

Mr. Parkes promised to have a glass-fronted case made to protect the instrument, and I arranged that till this case was ready the barometer should be kept in the watch-house.

*Ventnor*, July 18th.—The instrument, M.O. 118, is in charge of Mr. J. W. Blake, bathing machine and boat proprietor. It is placed on the north side of a specially constructed pedestal on the Marine Parade. Readings are taken every morning and plotted on a chart, which is exhibited together with the Daily Weather Report. The instrument appeared to be in good order.

*Wells, Norfolk*, July 14th.—Fishery barometer, B.T. 82, on the occasion of the previous visit, in 1888, was looked after by Mr. Goddard, a clerk in the employ of Messrs. J. & R. Marriott, merchants.

It appears that on leaving Wells, Mr. Goddard transferred the custody of the barometer to Captain William Temple, the Harbour Master, and about four years ago the latter passed it on to Mr. E. B. Southgate, butcher, Freeman Street, Wells, who has since kept the key of the case in which the instrument is suspended against the outside wall of Messrs. R. & G. Smith's office, facing northward to the quay wall.

It is in good order, is set (not read) every morning by Mr. Southgate, between 9 and 10 o'clock, and on a slip of paper placed inside is noted, as to-day, "Thursday, July 14th, 1904, set at 9.35 a.m."

I saw Captain Temple (who should be regarded as in charge), Mr. Southgate, and some of the sailors about the quay, and they all agreed that the barometer is most highly appreciated by sailors, fishermen and the public, being regarded as one of the "institutions" of Wells. Should Mr. Southgate be late in coming to set it, people are sure to come to remind him.

*Yarmouth (Isle of Wight)*, July 17th.—The instrument, M.O. 231, is in charge of the Harbour Master (not Coast Guard). It is placed in a case on the north wall of the office, where it is protected from sunshine till after 6 p.m. Daily readings are taken at about 10 a.m. (1 p.m. on Sundays), and plotted on a chart, which is exhibited next to the instrument. Observations of weather and wind are also entered on the chart. The instrument appeared in good order, but its reading was rather high—30·43 inches. The reading at M.S.L. (taken from working chart) was probably about 30·18 inches. The instrument is frequently consulted by the local boatmen and also by the owners of yachts. Storm warnings are received at this station; the telegrams are exhibited in a screen placed near the barometer.

### COMPARISON OF INSTRUMENTS.

The following tables give the corrections required to be applied to the readings of the various instruments to make them agree with the Inspector's standards:—

#### BAROMETERS.

#### OBSERVATORIES.

STATION.	Inspector's Standard Corrected.	Reporting Barometer.	Check Barometer.	REMARKS.
ENGLAND AND WALES.				
Falmouth .. .. .	Inches. 29·825	Inches. + '003	Inches. —	Mean of 6 comparisons.
Kew.. .. .	—	—	—	
Oxford .. .. .	—	—	—	
Stonyhurst .. .. .	29·544	+ '005	—	
SCOTLAND.				
Aberdeen .. .. .	—	—	—	Mean of 5 comparisons.
Ben Nevis.. .. .	—	—	—	
Fort William .. .. .	29·697	— '005	—	
Glasgow .. .. .	—	—	—	
IRELAND.				
Armagh .. .. .	29·599	'000	—	Mean of 5 comparisons.
Valencia .. .. .	—	—	—	

## BAROMETERS.

## TELEGRAPHIC REPORTING STATIONS.

STATION.	Inspector's Standard Corrected.	Reporting Barometer.	Check Barometer.	REMARKS	
ENGLAND AND WALES.					
Bath .. .. .	Inches. —	Inches —	Inches. —	No comparison made.	
Clacton-on-Sea .. ..	30.101	- .005	—		
Dungeness .. .. .	30.091	+ .016	+ .021		
Holyhead .. .. .	—	—	—	No comparison made.	
Jersey .. .. .	30.294	+ .002	+ .012		
Liverpool (Bidston) ..	29.667	+ .002	—		
London (Brixton) ..	—	—	—	Not inspected this year.	
Nottingham .. .. .	29.995	+ .001	- .013		
Oxford .. .. .	30.000	- .001	—		
Pembroke .. .. .	—	—	—	Mean of 8 comparisons. } Not inspected this year.	
Portland Bill .. .. .	—	—	—		
Scilly .. .. .	29.820	- .004	.000		
Shields, North .. ..	29.995	+ .003	+ .003		
Skegness .. .. .	29.809	- .009	—		
Spurn Head .. .. .	30.001	+ .005	+ .009		
Yarmouth.. .. .	29.667	- .001	+ .003		
SCOTLAND.					
Aberdeen .. .. .	29.484	- .008	- .011		
Leith .. .. .	29.879	- .005	- .005		
Nairn .. .. .	30.162	- .003	- .003		
Stornoway .. .. .	30.049	- .007	- .003		
Sumburgh Head .. ..	29.755	- .005	- .003		
Wick .. .. .	29.360	.000	- .010		
IRELAND.					
Birr Castle .. .. .	—	—	—	Not inspected this year.	
Blacksod Point .. ..	29.732	+ .004	- .019		
Donaghadee .. .. .	30.096	+ .008	- .004		
Malin Head .. .. .	29.604	+ .002	+ .018		
Roche's Point .. ..	30.234	—	—		
Valencia .. .. .	30.320	+ .007	—		

NORMAL CLIMATOLOGICAL STATIONS (Second Order Stations,  
International Classification).

STATION.	Inspector's Standard Corrected.	Reporting Barometer.	Check Barometer.	REMARKS.
ENGLAND AND WALES.	Inches.	Inches.	Inches.	
Aspatia .. .. .	29.746	+ .003	—	Not tested.
Bettws-y-Coed .. ..	30.033	+ .009	—	
Cardiff .. .. .	—	—	—	
Carlisle .. .. .	29.887	+ .035	—	
Castletown, Isle of Man	30.311	+ .002	—	
Clacton .. .. .	30.101	- .005	—	
Cockle Park .. .. .	29.740	.000	—	
Cronkbourne .. .. .	30.191	+ .007	—	
Dunmow .. .. .	29.816	+ .010	—	
Fulbeck .. .. .	29.817	+ .004	—	
Garforth .. .. .	29.849	+ .012	—	
Geldeston .. .. .	30.175	+ .006	—	
Guernsey .. .. .	29.898	+ .008	—	
Hull .. .. .	30.063	+ .012	—	
Lincoln .. .. .	30.053	- .003	—	
Llandudno .. .. .	—	+ .047	—	
Manchester, Oldham Rd	30.085	.000	—	
Manchester, Whitworth Park.	30.062	+ .008	—	
Monmouth .. .. .	30.025	+ .010	—	Mean of 7 comparisons.
Oundle .. .. .	30.093	- .011	—	
Plymouth .. .. .	29.984	+ .005	—	
Prestwich .. .. .	29.892	- .006	—	
Salisbury .. .. .	29.884	.000	—	
Shrewsbury .. .. .	30.052	- .008	—	
Southampton .. .. .	30.017	- .001	—	
Stokesay .. .. .	29.793	+ .008	—	
Whitby .. .. .	29.768	+ .008	—	
Whitby .. .. .	29.768	+ .008	—	Mean of 2 comparisons.
Whitby .. .. .	29.768	+ .008	—	
SCOTLAND.				
Balruddery .. .. .	29.530	+ .015	—	
Oally .. .. .	29.335	- .011	—	
Cargen .. .. .	29.722	+ .016	—	
Crathes .. .. .	29.746	- .005	—	
Deerness .. .. .	29.830	- .020	—	
Dundee .. .. .	29.950	.000	—	
Dunrobin .. .. .	29.984	+ .002	—	
Fort Augustus .. .. .	29.933	.000	—	
„ William .. .. .	29.697	- .005	—	
Lairg .. .. .	29.436	+ .016	—	
Laudale .. .. .	30.072	.000	+ .012	
Ochtertrey .. .. .	29.393	- .012	—	
Poltalloch .. .. .	29.730	+ .014	—	
Rothsay .. .. .	29.804	- .002	—	
Wolfelee .. .. .	29.288	- .002	—	
IRELAND.				
Ballinacurra .. .. .	—	—	—	Standard bar. broken.
Dublin, Phoenix Park ..	29.927	- .003	—	Mean of 5 comparisons
„ Trinity College ..	—	—	—	} Standard bar. broken.
Glasnevin .. .. .	—	—	—	



## OTHER CLIMATOLOGICAL STATIONS.

STATION.	Inspector's Standard Corrected.	Reporting Barometer.	Check Barometer.	REMARKS.
ENGLAND AND WALES.	Inches.	Inches.	Inches.	
Barnet .. .. .	29·834	- ·022	—	
Barnstaple .. ..	30·236	+ ·102	—	
Buntingford .. ..	29·80	+ ·30	—	Read to hundredths only.
Coventry .. .. .	29·903	+ ·013	—	
Leeds .. .. .	—	—	—	Not compared.
Llangammarch Wells..	29·616	- ·015	—	
Maidenhead .. ..	30·071	+ ·006	—	
Newquay .. .. .	30·017	+ ·020	—	
Nottingham Castle ..	29·869	+ ·005	—	
Portsmouth .. ..	30·139	+ ·018	—	
Preston .. .. .	29·892	+ ·006	—	
Reading .. .. .	29·885	+ ·021	—	
Rugby .. .. .	29·909	+ ·011	—	
Saltburn .. .. .	29·803	+ ·003	—	
Shoeburyness .. ..	30·201	+ ·013	—	Mean of 2 comparisons.
Totland Bay .. ..	30·189	+ ·026	—	
Truro .. .. .	30·050	+ ·020	—	
Ventnor .. .. .	30·175	+ ·014	—	
Worthing .. .. .	30·049	+ ·001	—	
SCOTLAND.—None.				
IRELAND.—None.				

## APPENDIX VIII.

ACCESSIONS TO THE LIBRARY DURING THE YEAR ENDING  
31ST MARCH, 1905, ARRANGED ON THE LINES OF THE  
INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.

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- I.—*METEOROLOGY*; p. 157.  
 II.—*REPORTS . . . OF SCIENTIFIC SOCIETIES WHICH  
INCLUDE METEOROLOGICAL TABLES OR PAPERS*; p. 208.  
 III.—*ASTRONOMY*; p. 210.  
 IV.—*GEOGRAPHY*; p. 211.  
 V.—*MISCELLANEOUS*; p. 214.
- 

NOTE.—To avoid reduplication of entries the following rules have been adhered to as far as possible :—

- (a) A publication has only been included under the sub-heading “**General**” when it could not be classed under any one [or more] of the other sub-headings of the same general heading.
- (b) The heading “**Meteorological Registers**” has been held to include tabular summaries of meteorological observations as well as transcripts of observations.
- (c) Official reports, which are not exclusively or primarily meteorological, but contain meteorological summaries or tables, have been classed in geographical order under the sub-headings 1710-1730 (**Climatology: Agricultural, Phenological, or Hygienic**) or under 1800 (**Meteorological Registers—General**), according to the nature of the Report.
- (d) Periodical issues have been classed under 0020 (**Periodicals**) if they contain miscellaneous articles on meteorological subjects, and under 0020 (**Reports of Meteorological Institutions**) if they contain administrative reports, but year books and other publications consisting of tables of meteorological data chronologically arranged with or without explanatory notes, have been classed under 1800-1820 (**Meteorological Registers**).

Tables of data of meteorological elements, arranged to give a synoptical review of the weather for consecutive days, weeks, months, &c., have been classed under 1830-1840 (**Weather Reports**).

General Discussions of data not classed as Weather Reports are included under 1700-1730 (**Climatology**).

Cross references have been used when a publication is made up of distinct sections belonging to different headings.

- (e) Publications consisting of meteorological data, whether dealing with a single meteorological element or with more than one, have been classed under 1800-1820 (**Meteorological Registers**); those containing *discussions* of data for a single element, *e.g.*, rainfall, under the separate heading, with a cross reference, if necessary, under 1800-1820 (**Meteorological Registers**).

## I.—METEOROLOGY (F),

## INCLUDING TERRESTRIAL MAGNETISM.

0010

## HISTORY. BIOGRAPHY.

\***Hellmann, G[ustav].**—Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus. Herausg. von G. Hellmann. No. 15 (Schlussheft). Denkmäler mittelalterlicher Meteorologie. Mit einer Einleitung und einem Anhang, enthaltend Ergänzungen und Berichtigungen zu früheren Nummern. 4°. Berlin, 1904.

**Hooreman, Fern.**—Le vent dans l'antiquité. See 1300.

**Vallot, Joseph, et son œuvre.**—sm. f°. (*Rev. Illustr., Paris, 1904.*)

## 0020 PERIODICALS, REPORTS OF METEOROLOGICAL INSTITUTIONS, SOCIETIES, CONGRESSES, &amp;c.

(See Note d, p. 156.)

[**Allahabad, Meteorological Office.**]—Administration report of the Meteorological Reporter to Government, United Provinces of Agra and Oudh. 1903-4. sm. f°. Allahabad, 1904.

**Amsterdam, K. Akademie van Wetenschappen.**—Extract from the report made by the Committee of advice for the according of the Buys-Ballot medal. 1a. 8°. (*Reprinted from Proc. of the Meeting of June 27, 1903.*)

**Berlin, Königlich Preussisches Meteorologisches Institut.**—Bericht über die Tätigkeit . . . im Jahre 1903 von W. von Bezold. 1a. 8°. Berlin, 1904.

(**Bombay, Government Observatory.**)—Report on the condition and proceedings of the Government Observatory, Colaba, for the year which ended with the 31st December, 1903. sm. f°. s.l.e.a.

**Budapest, K. Ung. Reichsanstalt für Meteorologie u. Erdmagnetismus.**—Bericht über die Thätigkeit der Kgl. Ung. Reichsanstalt für Meteorologie u. Erdmagnetismus und des Observatoriums in Ó-Gyalla im Jahre 1903. (Deutsche Ausgabe.) 1a. 8°. Budapest, 1904.

**Calcutta, Meteorological Office, Bengal.**—Administration report of the Meteorological Reporter to the Government of Bengal for the years 1902-03, 1903-04. 2 parts. f°. s.l.e.a.

**Calcutta, Meteorological Office, India.**—Indian meteorological memoirs. Vols. 15-17. 3 vols. sm. f°. Calcutta, 1903-5.

(——— ——— ———) Report on the administration of the Meteorological Department of the Government of India in 1903-04. f°. s.l.e.a.

**Cape Town, Meteorological Commission, Cape of Good Hope.**—Report of the Meteorological Commission, 1900-1902. 3 vols. sm. f°. Cape Town, 1901-1903.

NOTE.—Books marked \* have been acquired by purchase; the others are donations from institutions, societies, or authors.

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

**0020** **Carlsruhe, Centralbureau für Meteorologie und Hydrographie.**—Jahresbericht . . . mit den Ergebnissen der meteorologischen Beobachtungen und der Wasserstandsaufzeichnungen am Rhein und an seinen grössern Nebenflüssen für das Jahr 1903. 1a. 4°. Karlsruhe, 1904.

\* **Ciel et Terre.**—Revue populaire d'astronomie, de météorologie, et de physique du globe. 25<sup>e</sup> année; 1904-5. 8°. Bruxelles, s.a.

**Dublin, General Register Office.**—Detailed annual report of the Registrar-General (Ireland). *See* 1730 *dc*.

**Durban, Natal Observatory.**—Report of the Government Astronomer for the year 1903. sm. f°. Pietermaritzburg, 1904.

**Greenwich, Royal Observatory.**—Report of the Astronomer Royal to the Board of Visitors . . . read . . . 1904, June 4. 1a. 4°. s.l.e.a.

**Hamburg, Deutsche Seewarte.**—Annalen der Hydrographie und maritimen Meteorologie. 32. Jahrg., 1904. 1a. 8°. Berlin, s.a.

——— Aus dem Archiv der Deutschen Seewarte. 26. Jahrg., 1903. 1a. 4°. Hamburg, 1903.

——— 26. Jahresbericht über die Tätigkeit der deutschen Seewarte. 1903. Ann. Hydrogr., Berlin, 32, 1904, Beih. 2. 1a. 8°. Hamburg, 1904.

\* **Himmel und Erde.**—Illustrierte naturwissenschaftliche Monatsschrift. Herausgegeben von der Gesellschaft Urania zu Berlin. Redakteur: Dr. P. Schwahn. 16. Jahrg. 1a. 8°. Berlin, 1904.

**International Meteorological Committee.**—Report of the International Meteorological Committee. Southport, 1903. Published by authority of the Meteorological Council. Official No. 164. 1a. 8°. London, 1904.

——— Bericht des Internationalen Meteorologischen Komitees. Versammlung zu Paris, 1900, und zu Southport, 1903. Königl. Preuss. Meteor. Inst. 1a. 8°. Berlin, 1905.

**Johannesburg, Transvaal Meteorological Department.**—Report for the years ending 30th June, 1903, 1904. 2 papers. sm. f°. s.l.e.a. and Pretoria, 1904. (*Transvaal Administr. Rep.*, 1903, 1904, p. 61.)

**Kew Observatory, Richmond, National Physical Laboratory.**—Report. 1903, 1904. 2 vols., 1a. 8°. London, 1904-1905.

——— Report of the Observatory Department for the year 1904. With appendices. 1a. 8°. London, 1905.

\* **Klein, Hermann J.**—Jahrbuch der Astronomie und Geophysik. 14. Jahrg., 1903. 8°. Leipzig, 1904.

**Kodaikānal Observatory.**—Annual Report of the Director, Kodaikānal and Madras Observatories. 1903. sm. f°. s.l.e.a.

[**London, Meteorological Office.**]—Report of the Meteorological Council for the years ending 31st of March, 1903 and 1904 . . . 2 vols., 1a. 8°. London, 1904.

——— **Royal Meteorological Society.**—Quarterly Journal. Vol. 30, 1904. 1a. 8°. London, 1904.

——— **Solar Physics Observatory.**—Report made to the Solar Physics Committee, by Sir Norman Lockyer, upon the work done in the Solar Physics Observatory, South Kensington, from 1st January to 31st December, 1903. 1a. 8°. [London, 1904.]



**Mauritius, Royal Alfred Observatory.**—Annual report of the Director . . . for 1903. sm. f°. Port Louis, 1904. 0020

**Meteorologische Zeitschrift.**—Herausgegeben im Auftrage der K. K. Oesterreichischen Gesellschaft für Meteorologie und der Deutschen Meteorologischen Gesellschaft. 21. Jahrg. (39. Bd. d. Zeitschr. oesterr. Gesellsch. Meteor.) 1904. 1a. 8°. Wien, s.a.

**Montevideo, Observatorio Meteorológico Municipal.**—Anuario meteorológico del Observatorio Municipal del Prado (Montevideo) por Luis Morandi. Años 1-3, 1901-1903. 3 vols. 1a. 8°. Montevideo, 1902-1904.

**Ottawa, Department of Marine and Fisheries.**—Report of the Meteorological Service of Canada, by R. F. Stupart. 1902. 4°. Ottawa, 1903.

**Paris, Bureau Central Météorologique de France.**—Annales . . . publiées par E. Mascart. 1900, 1901, I., Mémoires; II., Observations, [1901 Fasc. 1]; III. Pluies. 6 vols. 1a. 4°. Paris, 1902-3.

—— **Observatoire Municipal, (Observatoire de Montsouris).**—Annales. Tomes 1-3, 1900-1902. 3 vols. 1a. 8°. Paris, 1900-1902.

—— **Société Météorologique de France.**—Annuaire. Tome 52, 1904. 1a. 8°. Paris, s.a.

**Revista Matto Grosso.**—Publicação mensal de sciencias, lettras, artes e variedades. Vol. 1. 1904. sm. f°. Cuyabá, 1904.

Contains daily met. obsns. at Rio de Janeiro and Cuyabá.

**Rhodesia (Southern).**—Report on meteorology for the year ended 31st March, 1903, by the Statist. sm. f°. Salisbury, 1903.

**Rome, Ufficio Centrale Meteorologico e Geodinamico Italiano.**—Annali. Serie ii. Vol. 14, 1892, Parte 3; 20, 1898, Parte 1; 21, 1899, Parte 1; 22, 1900, Parte 2. 4 vols. sm. f°. Roma, 1904.

[**St. Petersburg, Nicolas Central Physical Observatory.**—Monthly meteorological bulletin.] 12, 1904. 1a. 4°. St. Petersburg, 1904.

In the Russian language.

—— ——— Report of the Nicolas Central Physical Observatory for 1902. Presented to the Imp. Acad. Sc., by M. Rikatcheff.] 1a. 4°. St. Petersburg, 1904. (*St. Petersb., Mem. Acad. Imp. Sc., 8° ser., Cl. phys.-math., ser. No. 8.*)

In the Russian language.

**Southport, Fernley Observatory.**—Report and results of observations. See 1800 *de*.

**Symons's Meteorological Magazine.**—Edited by H. R. Mill. Vol. 39, 1904. 8°. London, 1905.

**Tebbutt, John.**—Report of Mr. Tebbutt's Observatory, The Peninsula, Windsor, New South Wales, for the year 1903. 8°. Sydney, 1904.

Discontinued.

**Tokio, Central Meteorological Observatory.**—Bulletin. No. 1. 1a. 4°. Tokio, 1904.

—— **Meteorological Society of Japan.**—Journal. 22nd-23rd years. 1903-1904. 2 vols. 8°. Tokio, 1903-1904.

In the Japanese language.

**Uccle, Observatoire Royal de Belgique.**—Annuaire météorologique. 1904. 18°. Bruxelles, 1904.

- 0020 **Vienna, K. K. Central Anstalt für Meteorologie und Erdmagnetismus.**—Jahrbücher. Jahrg. 1902. Neue Folge, 39. Bd. la. 4°. Wien, 1904.

**Warsaw, Station Centrale Météorologique du Musée de l'Industrie et de l'Agriculture.**—[Rapport.] 1903. la. 8°. Warszawa, 1904. (*Wiad. mat., Warszawa*, 8.)

**Washington, Department of Agriculture, Weather Bureau.**—Monthly weather review and annual summary. Vol. 32, 1904. 4°. Washington, 1905.

——— Report of the Chief of the Weather Bureau, 1902-3. la. 4°. Washington, 1903.

\* **Wetter, Das.**—Monatsschrift für Witterungskunde. Herausgegeben von R. Assmann. 21. Jahrg., 1904. la. 8°. Berlin, 1904.

### 0030 GENERAL TREATISES, TEXT BOOKS, DICTIONARIES, BIBLIOGRAPHIES.

**Bilt (de), K. Nederlandsch Meteorologisch Instituut.**—Lijst van uitgaven. (Liste de publications.) 1850-1 Mei, 1904. la. 8°. Utrecht, 1904.

**Bucharest, Institutul Meteorologic al Romaniei.**—Bibliografia și notițe meteorologice de St. C. Hepites. 1901-1903. 3 vols. sm. f°. București, 1902-4. (*București, Bul. lunar obs. meteor. România*, 10-12, 1901-1903.)

**Budapest, K. Ung. Reichsanstalt für Meteorologie und Erdmagnetismus.**—Verzeichniss der für die Bibliothek . . . im Jahre 1902. la. 8°. Budapest, 1902.

Title in Hungarian language also.

**Hamburg, Deutsche Seewarte.**—V. Nachtrag zum Katalog der Bibliothek der Deutschen Seewarte zu Hamburg. 1903. la. 8°. Hamburg, 1904.

**Hellmann, G[ustav].**—Contribution to the bibliography of meteorology and terrestrial magnetism in the 15th, 16th, and 17th centuries. 4°. Washington, 1894. (Reprinted from Washington, Rep. Chicago Meteor. Congr., 1893, Aug., p. 352.)

\* **London, Royal Society.**—International catalogue of scientific literature. F. Meteorology. Second annual issue. 8°. London, 1904.

**O'Gyalla, Königl. Ung. Meteorologisches und Magnetisches Observatorium.**—Bibliothek . . . Liste des Zuwachses 1903. 1. Suppl. zum Namen- und Sachregister. la. 8°. Budapest, 1904.

### 0040 ADDRESSES, LECTURES, AND MAGAZINE ARTICLES.

**Curtis, Richard Henry.** Water-vapour. See 1000.

[**Leyst, E[rnst].**—Present problems relating to the study of atmospheric electricity. Address to the Annual Meeting of the Imp. Soc. of Nat. of Moscow, Oct. 3, 1903.] la. 8°. [*Moscow, Proc. Imp. Soc. Nat.*, 1903.]

In the Russian language.

**Polis, P[eter Hermann Johann].**—Die klimatischen Verhältnisse in der Rheinprovinz. See 1700 *de*.

**Rotch, A[bbott] Lawrence.**—Sounding the ocean of air. See 0400.

0060 INSTITUTIONS, MUSEUMS, COLLECTIONS, ECONOMICS.

**Bauer, L[ouis] A.**—Department of international research in terrestrial magnetism of the Carnegie Institution. 1a. 8°. (Terr. Mag., Washington, D.C., 9, 1904, p. 1.)

**Havana, Colegio de Belen de la Compañia de Jesus.**—Album conmemorativo del quincuagesimo aniversario de la fundacion en la Habana del Colegio de Belen de la Compañia de Jesus. 1a. 8°. Habana, 1904.

**\*Meteorological Grant Committee.**—Report of the Committee appointed to inquire into the administration, by the Meteorological Council, of the existing parliamentary grant. Vol. 1, Report; vol. 2, Evidence and appendices. (Cd. 2123, 2124.) 2 vols. sm. f°. London, 1904.

**Tokio, Central Meteorological Observatory.**—The organization of meteorological service in Japan. 8°. Tokio, 1904.

METHODS OF OBSERVATION AND COMPUTATION.

0110 INSTRUCTIONS FOR OBSERVERS.

**\*Tyas, R.**—A companion to the weather glass, . . . with blank forms and diagrams, . . . sm. 8°. London, s.a.

**Vienna, K. K. Zentralanstalt für Meteorologie und Geodynamik.**—Jelinek's Anleitung zur Ausführung meteorologischer Beobachtungen nebst einer Sammlung von Hilfstafeln. 5. umgearbeitete Auflage. Teil 1. 1a. 8°. Wien, 1905.

**Washington, Hydrographic Office.**—Instructions to the voluntary meteorological observers of the U.S. Hydrographic Office. By James Page. 1a. 8°. Washington, 1904.

0120 TABLES FOR REDUCTIONS.

**Pernter, J[osef] M[aria].**—Jelineks Psychrometer-Tafeln, erweitert und vermehrt von J. Hann. Neu herausgegeben und mit Hygrometer-Tafeln versehen von J. M. Pernter. 5. erweiterte Aufl. 1a. 4°. Leipzig, 1903.

0130 COMPUTATION OF MEAN RESULTS.

**Sutton, J[ohn] R[ichard].**—The determination of mean results from observations made at second-order stations on the table-land of South Africa. 1a. 8°. (*Rep. S. African Assoc., advanc. Sc.*, 1, 1903.)

OBSERVATORIES AND INSTRUMENTS.

0200 GENERAL.

**London, Royal Meteorological Society.**—Exhibition of meteorological instruments, 14th to 17th March, 1905. 1a. 8°. Edinburgh, [1905].

0210 OBSERVATORIES—CONSTRUCTION AND EQUIPMENT.

**Polis, P[eter Hermann Johann].**—Besichtigung des meteorologischen Observatoriums [in Aachen]. sm. f°. Sheet. (*Deutsch. Med.-Zeitung, Berlin*, 1904.)

- 0210 **Havana, Observatorio del Colegio de Belen.**—Apuntes historicos acerca del Observatorio del Colegio de Belen, Habana, por el P. M. Gutiérrez-Lanza. 1a. 8°. Habana, 1904. (*Album Commem. 50° Aniv. de la fundación en la Habana del Colegio de Belén.*)

Vallot, Joseph, et son œuvre. See 0010.

## 0220 SELF-RECORDING APPARATUS.

**Fergusson, S. P.**—Kites and instruments employed in the exploration of the air at Blue Hill Observatory, 1897-1902. See 0360.

**Strachan, Richard.**—On solar intensity recorders. 1a. 8°. (*Horol. Journ., London*, 46, 1904, p. 76.)

——— On self-recording rain-gauges. 3 parts. 1a. 8° (*Horol. Journ., London*, 47, 1904, pp. 35, 52; 47, 1905, p. 61.)

## 0240 ANEROIDS.

**Rosenthal, Elmar.**—Über die elastische Nachwirkung bei Aneroid-Barographen. sm. f°. (*St. Pétersbourg, Bull. Acad. Imp. Sc., 5<sup>e</sup> sér.*, 19, 1903, p. 115; *Berichtigung*, 20, 1904, p. 113.)

## 0250 THERMOMETERS.

**Strachan, Richard.**—On solar thermometers. 1a. 8°. (*Horol. Journ., London*, 46, 1903, p. 45.)

——— On terrestrial thermometers. 1a. 8°. (*Horol. Journ., London*, 46, 1904, p. 90.)

——— On earth thermometers. 1a. 8°. (*Horol. Journ., London*, 46, 1904, p. 105.)

## 0300 RAIN GAUGES.

**Strachan, Richard.**—On rain-gauges. Parts 1-5. 5 parts. 1a. 8°. (*Horol. Journ., London*, 46, 1904, pp. 126, 140, 155; 47, 1904, pp. 8 and 20.)

## 0310 ANEMOMETERS.

**Marvin, C. F.**—Anemometer tests. 1a. 4°. (*Washington, D.C., U.S. Dep. Agric., Mon. Weath. Rev.*, 28, 1900, p. 58.)

**Zahm, A. F.**—The measurement of air velocity and pressure in aërodynamic experiments and the balloon anemometer. 1a. 8°. (*Aéronaut. Journ., London*, 8, 1904, p. 74.)

## 0320 ACTINOMETERS.

**Strachan, Richard.**—On solar intensity instruments. 1a. 8°. (*Horol. Journ., London*, 46, 1904, p. 62.)

## 0330 SUNSHINE RECORDERS.

**Strachan, Richard.**—On sunshine recorders. 1a. 8°. (*Horol. Journ., London*, 46, 1903, p. 35.)



0360

## KITES.

**Fergusson, S. P.**—Kites and instruments employed in the exploration of the air at Blue Hill Observatory, 1897–1902. Cambridge, 1904. la. 4°. (*Cambridge Mass., Ann. Obs. Harvard Coll.*, 43, part 3, app. D., p. 215.)

**Cambridge (Mass.), Astronomical Observatory of Harvard College.**—Annals. Vol. 43, part 3. See 1820 *gg*.

## PHYSICS OF ATMOSPHERE.

0400

## GENERAL.

**Berlin, Königlich Preussisches Meteorologisches Institut.**—Ergebnisse der Arbeiten am aeronautischen Observatorium, 1. Oktober 1901 bis 31. Dezember 1902. Von R. Assmann und A. Berson. la. 4°. Berlin, 1904.

**Cambridge (Mass.), Astronomical Observatory of Harvard College.**—Annals. Vol. 43, part 3 . . . . With appendices containing observations with kites 1897–1902. See 1820 *gg*.

**Dines, W[illiam] H[enry].**—Observations by means of kites at Crinan in the summer of 1903. la. 8°. (*London, Quart. Journ. R. Meteor. Soc.*, 30, 1904, p. 155.)

**Harding, Charles.**—Scientific balloon ascents. la. 8°. (*Aéronaut. Journ.*, London, 8, 1904, p. 69.)

**Hergesell, H[ugo].**—Rapport sur les travaux de la commission internationale pour l'aérostation scientifique. la. 8°. (*Rapp. Com. météor. internat., Réunion de Southport*, 1903.)

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*de* **British Islands.**

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*See 1800 de.*

**Greenwich, Royal Observatory.**—*Results of the magnetical and meteorological observations.* *See 1800 de.*

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**Kew Observatory, Richmond, National Physical Laboratory.**—*Report.* *See 0020.*

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*dg* **Spain and Portugal.**

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**Lisbon, Observatorio do Infante D. Luiz.**—*Annaes.* *See 1820 dg.*

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*eb* **China.**

**Hong-Kong, Observatory.**—*Observations.* *See 1800 eb.*

*eg* **Malay Peninsula, and Philippines.**

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*hh* **Brazil.**

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London, Admiralty, Hydrographic Department.—Baltic Pilot, Part i., formerly published as the Danish Pilot. Originally compiled by the late Vice-Adm. Zahrtmann. 4th edition. la. 8°. London, 1904.

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*mb* **Indian Ocean, S. of Equator.**

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90 **NAVIGATION, MEASUREMENTS OF TIME AND POSITION.**

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Knowledge and Illustrated Scientific News.—Vol. I. 1904. la. 4° London, s.a.

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\* Nature, La. Revue des sciences et de leurs applications aux arts et à l'industrie. Journal hebdomadaire illustré. 32<sup>e</sup> année, 1903-4. 1<sup>re</sup> et 2<sup>e</sup> Semestres. 2 vols. sm. f°. Paris, s.a.

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"Daily Mail" Year Book for 1905.—Fifth year of issue. Edited by Percy L. Parker. sm. 8°. London, [1905].



# APPENDIX IX.

## LIST of INSTITUTIONS and PERSONS receiving PUBLICATIONS issued by the COUNCIL.

OBSERVERS contributing returns printed in one of the periodical publications receive a copy of the publication.

The *Daily Weather Report* is sent to seaports and to a few places in London for exhibition.

The *Annual Report* is sent to all observers at land stations in connexion with the Office who express a wish to receive it. It is also sent to certain Professors at British Universities and Colleges, and to Agricultural Colleges.

Periodical or occasional publications are sent to the institutions and persons named in the following list, generally speaking, in exchange for publications received.

### UNITED KINGDOM.

Public Offices :		Admiralty :	
Edinburgh	Board of Fisheries.	Dartmouth	H.M.S. "Britannia."
	*Royal Scottish Museum.	Greenwich	*Royal Naval College.
London ...	*Royal Observatory.	London ...	*Royal Observatory, Hydrographer. Librarian.
	Army Medical Department.	Portsmouth	Royal Naval College.
	Board of Agriculture (Dr. Somerville).	R.N.R.	H.M.S. "Briton" (In- verness).
	*Board of Education, Secondary Branch.	Drill Ships	" "Clyde" (Aber- deen).
	— Solar Physics Ob- servatory.		" "Daedalus " (Bristol).
	Board of Trade.		" "Durham " (Leith).
	— Superintendents of the M.M.O. at various seaports.		" "Eagle" (Liver- pool).
	— Consultative Branch.		" "President " (W. I. Dock).
	— Fisheries and Harbour Department.		" "Unicorn " (Dundee).
	— Marine Depart- ment (Capt. Chal- mers).		
	— Standard Weights and Measures De- partment.		
	Chinese Maritime Cus- toms.		
	General Post Office.		
	*Imperial Institute.		
	Registrar General.		
	Trinity House.		

\* Receive all publications (Daily Weather Report not necessarily included).



LIST OF INSTITUTIONS, &c., receiving PUBLICATIONS—*cont.*

BRITISH COLONIES AND DEPENDENCIES— <i>cont.</i>		EUROPE— <i>cont.</i>	
<i>Australasia—cont.</i>		<i>AUSTRIA-HUNGARY—cont.</i>	
Sydney ...	*Observatory. Royal Society of New South Wales.	Prague ...	Hydrographic Office. *Observatory. Royal Society of Sciences.
Wellington ...	*Colonial Museum.	Trieste ...	Observatory.
Windsor ...	Observatory.	Vienna ...	Austrian Meteorological Society. Central Hydrographical Bureau. *Central Meteorological Office. *Hann, Hofrath Dr. J. Ministry of Agriculture.
<i>Canada.</i>			
Montreal ...	*McGill University.		
Toronto ..	*Meteorological Office.		
<i>Falkland Islands.</i>			
Cape Pembroke	Lighthouse Keeper.		
<i>India and Eastern Asia.</i>		<i>BELGIUM.</i>	
Allahabad ...	Meteorological Reporter.	Brussels (Uccle)	*Observatory. Meteorological Service.
Bangalore ...	Meteorological Department.	Ostend ...	Navigation School.
Bombay ...	*Observatory.		
Calcutta ...	*Meteorological Reporter. Surveyor General.		<i>BULGARIA.</i>
Dehra Dun ...	Trigonometrical Survey.	Sofia ...	Central Meteorological Station.
Hong Kong ...	*Observatory.		
Kodaikanal ...	Observatory.		<i>DENMARK.</i>
Simla ...	Meteorological Reporter.	Copenhagen ...	Hydrographic Office. International Council for the Study of the Sea. *Meteorological Institute. *Society of Sciences.
Singapore ...	Principal Civil Medical Officer.		
<i>Mediterranean.</i>			
Malta ...	Observatory.		
<i>South Africa.</i>		<i>FRANCE.</i>	
Bloemfontein.	Grey College. *Observatory.	Bordeaux ...	Society of Oceanography of the Gulf of Gascony.
Cape Town ...	Meteorological Commission. Natal Observatory.	Lyons ...	Observatory.
Durban ...	Transvaal Meteorological Department.	Marseilles ...	Meteorological Commission.
Johannesburg		Paris ...	*Central Meteorological Office. *Hydrographic Office. Hydrometric Service. *Institute of France. *Meteorological Society.
<i>Indian Ocean.</i>		Perpignan ...	Meteorological Commission.
Mauritius ...	*Meteorological Society.	Puy-de-Dôme.	Observatory.
<i>EUROPE.</i>			
<i>AUSTRIA-HUNGARY.</i>		<i>GERMANY.</i>	
Cracow ...	Observatory.	Aachen ...	Meteorological Station.
Fiume ...	Nautical Academy.	Berlin ...	Hydrographic Office. *Meteorological Institute.
Innsbrück ...	Observatory.		
O'Gyalla ...	Observatory.		
Pesth... ..	*Central Meteorological Institute.		
Pola ... ..	*Hydrographic Office.		

\* Receive all publications (Daily Weather Report not necessarily included).

LIST OF INSTITUTIONS, &c., receiving PUBLICATIONS—*cont.*

GERMANY— <i>continued.</i>		NORWAY.	
Bremen ...	Meteorological Observ- atory.	Christiania ...	*Meteorological Insti- tute.
Carlsruhe ...	Central Meteorological Office.	PORTUGAL.	
Dresden ...	*Meteorological Insti- tute.	Coimbra ...	Observatory.
Frankfort ...	Physical Society.	Lisbon ...	Observatory.
Gotha ...	M. Justus Perthes' Geo- graphical Institute.	Azores.	
Greifswald ...	Geographical Society.	Ponta Delgada	Observatory.
Halle... ...	Leopold-Carolin Academy.	ROUMANIA.	
Hamburg ...	*Deutsche Seewarte. Schück, Capt. A.	Bucharest ...	Meteorological Insti- tute.
Kiel ... ...	Commission for the Exploration of the German Ocean.	RUSSIA.	
Leipzig ...	*University Library.	Dorpat ...	Observatory.
Magdeburg ...	Observatory.	Helsingfors ...	Society of Sciences.
Munich ...	*Central Meteorological Office.	Kazan ...	Observatory.
Neustadt ...	Observatory.	Moscow ...	Observatory.
Neustadt an der Haardt.	Forest Academy.	Nicolaieff ...	Hydrographic Office.
Potsdam ...	Winkl. Geh. Rath Dr. G. von Neumayer.	Odessa ...	Observatory.
Strassburg ...	*Observatory.	Pavlovsk ...	Observatory.
Stuttgart ...	Meteorological Agri- cultural Service.	St. Petersburg	*Central Physical Ob- servatory.
Wilhelms- haven.	Central Meteorological Office.		Hydrographic Depart- ment.
	Observatory.		Wocikof, A.
GREECE.		Tiflis ...	*Observatory.
Athens ...	Observatory.	Warsaw ...	Meteorological Bureau.
ITALY.		SERVIA.	
Catania ...	Meteorological Obser- vatory.	Belgrade ...	Central Observatory.
Florence ...	*Observatory.	SPAIN.	
Milan ...	Observatory.	Guardia ...	Observatory.
Moncalieri ...	*Observatory.	Madrid ...	Central Meteorological Institute.
Naples ...	*Observatory.		*Observatory.
Palermo ...	Observatory.		Observatory, Chamar- tin de la Rosa.
Pesaro ...	Observatory.	Malaga ...	Society of Sciences.
Riposto ...	Observatory.	San Fernando	*Observatory.
Rome ...	Central Meteorological Office.	Vilafranca del Panades.	Observatory.
Turin ...	Vatican Observatory.	SWEDEN.	
Venice ...	*Observatory.	Stockholm ...	*Central Meteorological Institute.
NETHERLANDS.			Nautical Meteoro- logical Bureau.
Amsterdam ...	*Geographical Society. Meteorological Insti- tute.	Upsala ...	Royal Academy.
De Bilt, Utrecht.	*Royal Meteorological Institute.		Meteorological Obser- vatory.

\* Receive all publications (Daily Weather Report not necessarily included)



LIST OF INSTITUTIONS, &c., receiving PUBLICATIONS—*cont.*

SWITZERLAND.		AMERICA— <i>continued.</i>	
Berne ...	Hydrometrical Bureau.	Oaxaca ...	*Central Park Obser- vatory.
Geneva ...	Geographical Society.	Philadelphia ..	*State Library.
Mont Blanc ...	Observatory.		Observatory.
Neuchâtel ...	Observatory.		*American Philoso- phical Society.
Zürich ...	Central Meteorological Office.		*Franklin Institute.
AFRICA.		Porto Alegre..	Azambuja, Sr. G. A. de
Algiers ...	Meteorological Service.	Porto Rico ...	Engineer in Chief.
Cairo ...	Sanitary Department.	Quito... ..	Observatory.
	Survey Department.	Rio Janeiro ...	Meteorological Depart- ment, Ministry of Marine.
AMERICA.			Observatory.
Buenos Aires..	Mons. Lasagna Obser- vatory.	Saltillo ...	Observatory.
Cambridge, Mass.	*Harvard College Ob- servatory.	San Luis ..	Observatory.
Cordoba ...	Meteorological Office.	Potosi.	
	*National Academy.	San Salvador	Observatory.
Costa Rica ...	Meteorological Insti- tute.	Valparaiso ...	*Meteorological Service.
Guatemala ...	Central Laboratory.	Washington...	Chief Signal Officer.
Havana ...	*Observatory.		Department of Agri- culture.
	Central Meteorological Station.		Hydrographic Office.
Mexico ...	"Antonio Alzate" Scientific Society.		*Naval Observatory.
	Central Meteorological Observatory.		*Smithsonian Institu- tion.
Monte Video...	Meteorological Society.		*Surgeon General's Office.
	Observatory, Villa Colon.		*Weather Bureau.
New York ...	American Geographical Society.	ASIA.	
		Batavia ...	*Observatory.
		Beyrout ...	Lee Observatory.
		Irkutsk ...	Observatory.
		Manila ...	Meteorological Obser- vatory.
		Tokio ...	*Imperial Meteorolo- gical Observatory.
		Zi-ka-wei ...	Observatory.

\* Receive all publications (Daily Weather Report not necessarily included).

## APPENDIX X.

## ACCOUNT of RECEIPTS and PAYMENTS for the year ending 31st March, 1905:—

RECEIPTS.			PAYMENTS.		
	£	s. d.		£	s. d.
Balance from year 1903-1904 .. .. .	—	1,489 12 7	ADMINISTRATION:		
Parliamentary vote ..	—	15,300 0 0	Council .. .. .	839 5 0	
Repayment of expenses charged under—			Secretary .. .. .	825 0 0	
(1.) Incidental expenses .. ..	26 5 11		Salaries and wages ..	1,086 17 6	
(2.) Observatories ..	38 8 6		Rent, fuel, and lighting	723 13 1	
(3.) Special Researches	29 5 0		Incidental and contingent expenses ..	445 12 0	
(4.) Antarctic Meteorology .. ..	100 0 0		Furniture, fittings, &c. ..	153 9 3	
		193 19 5	Expenses incidental to International Meteorological Congress ..	29 0 8	3,902 17 6
SUPPLY OF INFORMATION:			SPECIAL RESEARCHES:		
Weather Forecasts, Reports, &c. .. ..	541 18 0		Salaries and other charges .. .. .	—	886 19 5
Telegrams sent abroad .. ..	599 2 9	1,141 0 9	LAND METEOROLOGY:		
			Observatories and stations, including remuneration of observers..	2,165 9 9	
SUPPLY OF INSTRUMENTS, &c.:			Salaries:— Discussion and reduction of observations, &c. .. ..	1,951 0 0	4,116 9 9
Repayment of cost of M.O. instruments purchased by observers..	198 18 9		WEATHER INFORMATION AND FORECASTS:		
Repayment of cost of other commissions ..	331 12 8	530 11 5	Telegraphic reports and storm warnings, remuneration of observers, &c. .. ..	2,584 18 9	
			Salaries: — Preparation and issue of reports and forecasts .. ..	1,341 1 2	3,925 19 11
CHARGES FOR COMMISSION:			INSPECTIONS:		
On supply of instruments, &c. .. ..	—	28 11 9	Salaries and travelling expenses .. .. .	—	432 2 6
SUPERANNUATION ACCOUNT:			OCEAN METEOROLOGY:		
Annuities .. .. .	285 6 4		Salaries:— Discussion and reduction of observations .. .. .	1,398 10 6	
Interest on Investment	46 6 5	331 12 9	Expenses incidental to the supply of instruments:—		
			Proportion of salaries for care and issue of instruments ..	170 0 0	
			Royal Navy .. .. .	562 1 11	
			Mercantile Marine and Stations ..	605 15 6	2,736 7 11
			ANTARCTIC METEOROLOGY:—		
			Salaries and other charges .. .. .	—	148 1 4
			MISCELLANEOUS COMMISSIONS executed for Colonial and Foreign Institutions, &c. ..	—	277 2 5
			SUPERANNUATION:		
			Pensions and Allowances Invested .. .. .	829 3 2	
				750 0 0	1,579 3 2
			BALANCE:		
			Cash at Bank .. ..	957 9 3	
			“ at Office .. ..	52 15 6	1,010 4 9
		£19,015 8 8			£19,015 8 8

NOTE.—On March 31st the amount of 2½ per cent. Annuities held by the Council for the provision of Superannuation Annuities was £2,156 4s. 1d.

# INDEX.

## A.

	PAGE
Accessions to the Library ... ..	31, 74, 156
Account of receipts and payments for 1904-1905 ... ..	...32, 220
Acknowledgments of assistance received ... ..	14-16, 18
Admiralty, supply and stock of instruments for the ... ..	19, 133
— — of Daily Weather Reports for Coast Guard Stations ... ..	21
— — of Forecasts to H.M. Ships ... ..	22
— — of Hydrographic Notices, &c., to the ... ..	19, 64
Aeronautics, Fourth International Conference on Scientific ... ..	6
Agencies at ports for supply of instruments to ships ... ..	75
Agricultural and Sanitary purposes, statistics for ... ..	70
Anemograph stations, number and list of ... ..	26, 27, 63, 72, 91
— at St. Helena, discussion of the records of the ... ..	32
Anemometer comparisons at Holyhead continued ... ..	32
Antarctic Expeditions, grant for ... ..	6
— —, tabulation of observations in connexion with ... ..	6, 19, 32
Auxiliary climatological stations ... ..	...26, 28, 63, 73, 95-97
Azores, daily telegrams from the ... ..	65

## B.

Balloon ascents, collection of cloud observations in connexion with ... ..	7
Balloons and Kites, observations of the upper air by means of ... ..	7
Barograph stations, list of additional ... ..	... 26, 63, 91, 92
Barometers, determination of Index errors of Marine ... ..	8
—, Fishery, supply of, conditions, &c. ... ..	9, 10, 20, 26, 76
—, reduction of readings to sea level ... ..	7
Barometric pressure, charts of ... ..	8
Beaufort's wind scale in relation to velocity equivalents ... ..	... 11, 32
Ben Nevis Observatories, closing of ... ..	9
— — Observations supplied for International Aeronautical Investiga- tion ... ..	29
Board of Agriculture, and Fishery Barometers ... ..	10
— — and Technical Instruction for Ireland, and Fishery barometers ... ..	10
Borneo, East :—Establishment of station at Sanga Sanga ... ..	14
British Isles, climatology of ... ..	... 11, 26
British Rainfall Organisation, rainfall observations supplied to ... ..	29

## C.

Captains who have sent in "excellent" logs, list of ... ..	...18, 110
Charts :—Daily charts of pressure over the Atlantic ... ..	8, 19
Climatological stations ( <i>see</i> "Normal" and "Auxiliary" climatological stations).	

	PAGE
Climatology ... ..	26, 29
Cloud observations in connexion with balloon ascents, collection of ...	7
Colonial and Foreign stations, publication of observations received from ...	13, 63
— — — supply of instruments gratuitously to voluntary observers	20, 64
Conspicuous meteorological occurrences in 1904 ... ..	33
Constitution of the office ... ..	5
Contents ... ..	2
Continental stations from which reports are received daily, list of ...	100
Co-ordination of Meteorological Observations in British Dominions beyond the Seas ... ..	13
Correspondence and Accounts Branch, work of ... ..	17, 32
Council, changes in the ... ..	5
—, list of ... ..	3
Crops and weather ... ..	12
Crown Agents, supply of instruments through the ... ..	12, 20
Cyprus, establishment of Stations and discussion of observations ..	64

**D.**

Daily Weather Report, method of utilising the information received for the	21
— — —, publication and distribution of ... ..	21, 66
— — —, exhibition of ... ..	22, 66
— — —, subscriptions to ... ..	66
Devonport, forecasts supplied to Commander-in-Chief at ... ..	22
Dines, W. H., kite experiments off West Coast of Scotland and Coasts of Ireland ... ..	7
Directors, list of ... ..	3
Divisions of the Office and work of each Branch ... ..	16, 17
Documents received from Foreign and Colonial land stations, list of	29, 74, 102-104
— — — from ships, list of ... ..	111-132

**E.**

East Borneo, observations received from ... ..	14
Educational ... ..	14
Eliot, Sir J., K.C.I.E., appointed on the Council ... ..	6
"Excellent" observers, list of ... ..	18, 110
Executive officers ... ..	6
Expenditure for 1904-1905 ... ..	32, 220

**F.**

Field, Capt. A. Mostyn, R.N. (Hydrographer) succeeded to the Council ...	6
Finance ... ..	32, 220
Fishery barometer stations, classification, number, and list of ... ..	26, 76
— barometers, supply of, and conditions ... ..	9, 20
— —, transference of supervision to Board of Agriculture ... ..	10
— —, transference of supervision to the Board of Agriculture and Technical Instruction for Ireland ... ..	10



	PAGE
Forecast and Storm Warning Branch, work of ... ..	16, 20, 65
— — — — — Districts ... ..	67
— — — — — —, examination of the meteorology of the ...	11
Forecasts of weather, checking of ... ..	23, 42
— — —, inquiries at the Office and by telegraph ... ..	23
— — —, preparation of, arrangements for issue, exhibition of, and charges for... ..	22, 68
— — —, for the years 1895-1904, success in the ... ..	23, 24
— — —, summary of results of comparison of, for the year 1904-1905 ... ..	23, 42
— — —, supply of, to H.M. ships ... ..	22
— — — — — the Press ... ..	21, 22, 23, 66, 72
— — —, where exhibited ... ..	22
Foreign and Colonial stations, observations received from ...	13, 29, 74, 102-104
Foreign telegraphic stations, list of ... ..	100

## G.

Gales of the British Islands, not warned for, in 1904 ... ..	41
German observations, exchange of, in connexion with the Antarctic Expeditions ... ..	6
— Government, observations of upper air by means of balloons and kites ...	7

## H.

Harvest forecasts, distribution of... ..	22, 68, 100
Hergesell, Dr., Ben Nevis observations supplied to ... ..	29
Holyhead, continuation of anemometer comparisons at ... ..	32
Hourly Readings and Means, publication of ... ..	30, 31
Hydrographic Notices supplied to the Admiralty ... ..	19
Hydrograph Station ... ..	26, 92

## I.

Indian Ocean, preparation of Pilot charts of the ... ..	13
— — — discussion of meteorological data of the ... ..	19
Information to the public, supply of, and charges ... ..	65, 73
Inquiries, number and classification of, and information supplied in reply to ... ..	30, 67
Inspection of stations ... ..	28
— — —, reports of ... ..	135-155
Instruments, notes on ... ..	11
— — —, stock of ... ..	133, 134
— — —, supply of, and conditions ... ..	9, 19, 20, 64, 75, 77
— — —, to Colonial Meteorological organisations ... ..	20
International Co-operation :—	
Antarctic Expeditions... ..	6
Cloud observations ... ..	7
Determination of the Index Error of ships' barometers... ..	8
Upper Air, Investigations of the ... ..	6

	PAGE
International Cloud Atlas, re-publication of ... ..	8
— Conference at Innsbruck ... ..	7
— Meteorological Committee, observations of the upper air by means of kites and balloons... ..	7
Irish Lights Office, loan of log books for checking storm warnings ...	15

## K.

Kite experiments off the West Coast of Scotland and Coasts of Ireland ...	7
---	---

## L.

Library, contents of, and arrangements for referring to books, &c. ...	17, 31
—, accessions to ... ..	31, 74, 156
Lloyd's, supply of records of weather from various signal stations ...	15
Logs received from the Admiralty ... ..	17
— — — — — Mercantile Marine ... ..	17, 111-132
London, new station established for ... ..	8, 21

## M.

Magnetic observations at Valencia Observatory continued ... ..	14
Marine Branch, work of ... ..	16-20
— observations, collection and discussion of ... ..	10, 18, 74
Mercantile Marine, supply and stock of instruments for the... ..	19, 75, 134
— — — — — Associations, acknowledgment of co-operation of ... ..	15
Mersey Docks and Harbour Board, loan of log-books for checking storm warnings, &c. ... ..	15
Meteorological Committee ... ..	48
— Council ... ..	55
— Office, account of the work of the, for past 50 years ... ..	43
Mill, Dr. H. R., rainfall observations supplied to ... ..	29
Miscellaneous investigations:—	
Detailed examination of the meteorology of the forecasts districts ...	11
Investigation of the "trajectories" of the air during the progress of barometric changes ... ..	10
Notes upon Instruments ... ..	11
Wind measurements, Beaufort's scale and wind velocities ... ..	11, 32

## N.

National Antarctic Expedition, discussion of land observations ...	6, 19, 32
Newspapers, supply of meteorological data to ... ..	21, 22, 23, 66, 68, 72
Normal climatological stations, classification and list of ... ..	26, 27, 29, 73, 93, 95
— — — — —, publication of returns from ... ..	29

## O.

	PAGE
Observatories, classification of, arrangements with, and list of	... 26, 63, 72, 91
—, publication of observations from	... 31, 72
Observatory Branch, work of	... 17, 31
Observers, acknowledgments of assistance rendered by	... 14-16, 18
— at the Stations of the several Orders, list of	... 91-101
Occurrences, conspicuous meteorological, in 1904	... 33
Ocean Island, Observations received from	... 14
— Meteorology	... 13, 17
Office, Administration of the	... 6
—, Staff	... 6, 16, 64
—, establishment and objects of the, 1854-1904	... 43
Obituary...	... 16, 18

## P.

Pilot Charts (Monthly), of the North Atlantic and Mediterranean, publication of, &c.	... 18, 64, 74
— — —, Indian Ocean (proposed)	... 10
— — —, for the North Atlantic and North Pacific	... 18
— — — (Quarterly), of the North Sea and Baltic	... 19
— — —, South Atlantic and South Pacific (proposed)	... 19
Pluviograph Stations, list of additional	... 26, 92
Post Offices, exhibition of forecasts at	... 68
Publications of the Office, preparation of	... 10, 11, 17, 31, 65, 70, 74
— — —, list of	... 59, 105
— — —, supplied to various Institutions, applications for, &c.	... 30, 215
Presentations...	... 14, 18, 75, 215
Press, Supply of forecasts to the	... 21, 22, 23, 66, 68, 72

## R.

Railway stations, sale of Daily Weather Report at	... 22, 66
Rainfall observations	... 29
— Stations...	... 26, 97-99
Receipts and payments for 1904-1905	... 32, 220
Registers received from ships, list of	... 111-132
Registrar-General for England, preparation of meteorological reports for	... 29
— — for Ireland, information supplied to	... 29
Royal Navy, supply and stock of instruments for the	... 19, 133
Routes, and number of ships observing for Office	... 17
Repulse Bay, Davis Straits, observations received from	... 14

## S.

	PAGE
Sanitary and Agricultural purposes, statistics for ... ..	70
Scottish Meteorological Society, loan of log-books for checking storm warnings ... ..	15
— —, discontinuance of grant towards maintenance of Ben Nevis Observatories ... ..	9
Seasons in the British Isles since 1878 ... ..	11
Sea temperature charts ... ..	19
— — observations ... ..	26, 28
— — stations, classification, number, and list of ... ..	26, 28, 101
Second Order Stations ... ..	26, 28, 63
Ships, supply of instruments to ... ..	19, 75
— list of documents received from ... ..	111-132
— observing for the Office, lines of route and number of ... ..	17
Simpson, G. C. ... ..	6, 11
Southampton Island (Hudson's Bay), Station at ... ..	20
Stations in the British Islands, classification of ... ..	26, 78
— —, list of ... ..	80-101
— —, reports of inspections of ... ..	21, 28, 135-155
— Foreign and Colonial, observations from ... ..	29, 74
— — —, list of ... ..	102-104
Statistics and Library Branch, work of ... ..	17, 26
Steamship Companies, acknowledgment of co-operation of ... ..	15
St. Helena, report upon anemograph records at ... ..	13, 32
Storm warnings, arrangements for, and the number and list of stations supplied with ... ..	16, 24, 68
— —, checking of, 1904 ... ..	40
— —, obstacles to the transmission of ... ..	25
— —, results of comparison of, for 1904 and previous years ... ..	25, 40
— — — —, 1874-1903, in decades ... ..	25
Sunshine stations, classification and list of ... ..	26, 27, 63, 73, 93
Statement of provisions for the supply of information to the public	65, 73, 74

## T.

Tables for reduction of Barometer readings ... ..	7
Telegraphic information, preparation and supply of ... ..	65
— reporting stations, publication of observations from ... ..	21, 65
— — —, classification and list of ... ..	21, 26, 63, 99, 100
Temperature (accumulated) ... ..	71
Thermograph stations, number and list of additional ... ..	26, 73, 92
Thermometers, notes upon ... ..	11
Trinity House, The Corporation of, loan of log-books for checking storm warnings ... ..	15

## U.

Upper air, observations of, by means of balloons and kites ... ..	6
---	---



## V.

	PAGE
Valencia Observatory, magnetic observations continued at ... ..	14
Volunteer observers, acknowledgments of assistance rendered by ... ..	14

## W.

Weather during 1904, statement of the conspicuous features of the ... ..	33
— and crops ... ..	12
— Forecasts, <i>see</i> "Forecasts of weather."	
— information displayed in front of the Office ... ..	22, 66
— telegraphy and forecasts ... ..	16, 20, 65
Weekly Weather Report, particulars of appendices and supplements to ... ..	70
— — —, publication and distribution of ... ..	29, 30, 70
Wharton, Rear Admiral Sir W. J. L., R.N., retirement of, from Council ... ..	6
Wind Charts of the South Atlantic ... ..	10, 30
— velocities and Beaufort scale, as to revision of table for, &c. ... ..	11, 32
Wireless telegraphy ... ..	8

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