

Confidential.

R E P O R T

OF THE

METEOROLOGICAL COUNCIL,

For the Year ending 31st of March, 1901,

TO THE

PRESIDENT AND COUNCIL

OF THE

ROYAL SOCIETY.



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(REPORT OF METEOROLOGICAL COUNCIL 1900-1901.)

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



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For details of Information Received. — See Appendix II.

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# THE METEOROLOGICAL COUNCIL,

1900-1901.

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Lieutenant-General SIR RICHARD STRACHEY, R.E., G.C.S.I.,  
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., D.Sc., F.R.S.

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

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

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ROYAL SOCIETY.

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In common with all Her subjects, the Council have shared in the profound sorrow at the death of Her late Majesty Queen Victoria, and in the loyal and dutiful sympathy expressed to His Majesty the King and the Royal Family in their bereavement.

The Council recall especially the occasions of the Queen's journeys across the sea, and particularly the memorable and gracious journey to Ireland in April, 1900.

On these occasions the Meteorological Office was called upon for special service in the supply of information to the Royal Yacht. With the knowledge of the Queen's interest in their work the memory of this service will always be cherished.

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**Constitution  
of the  
Council.**

The appointment reported last year of Mr. W. N. Shaw, a member of the Council, to fill the office of Secretary on the retirement of Mr. R. H. Scott, necessitated some provision for making up the statutory number of members of the Association, which was incorporated under the Companies Acts in 1891 with the name of the Meteorological Council (Report, 1891, p. 25). From the constitution of the Council it became necessary that the question should be referred to the President and Council of the Royal Society, who appointed a Committee to consider whether any changes in the constitution and duties of the Meteorological Council were desirable, and invited the Council to nominate two of its members to act on the Committee with those nominated by the Royal Society.

As a result of these deliberations, the President and Council of the Royal Society decided that the Meteorological Council should consist of not less than seven and not more than ten members, of whom a limited number—four in the first instance, in addition to the Hydrographer to the Admiralty—should be designated Directors; that the control of the business of the Council should be vested in the Directors for the time being, who should receive remuneration for their services.

Upon being informed of this decision of the Royal Society, the Council at once took steps to give legal effect to it, and, in consultation with Mr. A. B. Kempe, Treasurer of the Society, drafted and carried out the necessary alterations in the Articles of Association, and thereupon reported the completion of the arrangements to the Royal Society.

The Council were subsequently informed by letter, dated March 26th, 1901, that the President and Council of the Royal Society had appointed the existing members of the Council (with the exception of Mr. F. Galton, who had expressed a wish to retire), in addition to the Hydrographer to the Admiralty, to be Directors, with Sir R. Strachey as Chairman; and, further, that they had appointed as additional members of the Council The Earl of Rosse, K.P., and Mr. J. Y. Buchanan for five years; Mr. W. H. Dines, President of the Royal Meteorological Society, Professor Arthur Schuster, and Mr. R. H. Scott for three years.

The Directors formally took over the control of the business of the Council at a meeting held on April 10th, 1901.

The correspondence referring to the reconstitution of the Council is printed in Appendix I., p. 36, together with the modified Articles of Association.

**Retirement of  
Mr. F. Galton.**

The retirement of Mr. F. Galton brings to a close a long tenure of office, which has been characterised throughout by the activity and energy devoted to the discharge of its duties. Mr. Galton was a member of the original Meteorological Committee appointed in 1866, and became a member of the Council after the revision of the arrangements in 1876. His work for the Office was especially noteworthy on account of his wide knowledge of meteorological instruments and his ingenuity in devising means for improving them, as well as for representing graphically the results obtained with them.

The care which he devoted to the selection of suitable phraseology has done good service to the science of meteorology. The term "anticyclone" originally suggested by him has passed into the current language of the subject.

Mr. Galton was Chairman of the Committee of Kew Observatory from 1889 until the Observatory was taken over as a department of the National Physical Laboratory at the end of 1899. His tenure of this position, with respect to the principal Observatory in connexion with the Office, was very advantageous, and enabled the Council to develop the satisfactory systems of examination of automatic records and of inspection of instruments, which are characteristic of the British Meteorological Service.

Mr. Galton retires on account of advancing age, and he carries with him in his retirement the cordial appreciation of his work by his colleagues on the Council.

At the request of the Hydrographer, the Council undertook the arrangements for supplying the meteorological instruments required by the Admiralty for the use of the National Antarctic Expedition. The instruments are for the most part only slightly modified forms of those in use at meteorological stations in this country or on board British ships, but the sunshine recorders required considerable modification because they had to be designed to register sunshine throughout the twenty-four hours during a considerable part of the year. After consultation with Sir G. G. Stokes, two instruments have been constructed which can be used for registration during the twenty-four hours, or for a shorter period, and at the same time a special form of card has been constructed to receive the record.

National  
Antarctic  
Expedition.

The Council have also undertaken the arrangements for supplying additional apparatus for experimental meteorological work, at the request of the Committee of the Expedition.

The cost of the instruments supplied to the Expedition which do not form part of the usual equipment for meteorological observations on board His Majesty's ships, is borne by the Admiralty, or by the Committee of the Expedition.

In compliance with a request from the Committee of the Expedition, the Council have made special arrangements for transcribing from meteorological logs in their possession all the meteorological data for the region between latitude 50° S. and 60° S. and from longitude 120° E. eastward to 130° W. A contribution to the cost of this work will be made by the Committee to cover the special incidental expenses.

At the request of the Royal Society the Council have undertaken the tabulation and preparation for the press of the meteorological observations by Mr. Bernacchi and others on board the ship "Southern Cross" and at Cape Adare, the land station of the Antarctic Expedition recently sent out by Sir G. Newnes. Incidentally, this work has been of great service to the Council in enabling them to form an opinion upon the working of various instruments, and, in particular, of the barograph, thermograph, and sunshine recorder, which formed part of the equipment of

Observations  
on board the  
"Southern  
Cross" and at  
Cape Adare.



the "Southern Cross" Expedition. They have been enabled to make use of this information in arranging for the supply of instruments to the National Antarctic Expedition.

Forecasts of  
fog for the  
London  
district.

In the autumn of last year the Council received a number of applications from the officials of electric lighting companies and others for a special service of forecasts of fog for London and the neighbourhood during the winter months. The Council fully recognise the desirability and the importance of such a service, but they are of opinion that to carry it out effectively a much more detailed knowledge of the special meteorological conditions of the several districts of London would be required than that which is now available. They have not the means of obtaining the necessary information from the various districts, and the funds at their disposal are not more than sufficient to enable the Office to deal generally with the meteorology of the British Isles and neighbouring seas and of the oceans traversed by British ships; moreover, they have no staff at their disposal by whom the special investigation of the meteorological conditions of any particular district can be undertaken.

Such local investigations seemed to the Council to fall to the duty of the local authorities, and the Council have accordingly addressed a letter to the County Council of London suggesting the lines upon which an effective investigation might be conducted. The Council have reason to believe that the subject has been under the consideration of a committee, but they have not yet received the reply of the County Council to the suggestion.

In the meantime they have been called upon to supply one of the local authorities of the London district with daily forecasts having special reference to the occurrence of fogs.

International  
Committee.

By direction of the Council, the Secretary attended the open Congress of Meteorologists at Paris in September, 1900, and the meetings of the International Committee, of which he was elected a member, in succession to Mr. R. H. Scott. The subject of most practical international importance brought before the Committee was the question of international arrangements for the acceleration of weather telegrams from the observing stations to the central offices of the various countries, and the establishment of uniform hours of observation. In this matter Great Britain occupies a very special position on account of the geographical situation of the islands with reference to the approach of weather changes, a large proportion of which are from the west.

Observations  
at 7 a.m.

The matter is regarded by the Continental weather offices as of such importance that, as already reported (Report for 1899-1900, p. 6), the Deutsche Seewarte requested the Council to make special arrangements for daily observations at 7 a.m., with a special service of telegrams reporting the observations to Hamburg. The request was followed up by a similar one from Holland, and this service has been in operation since May last. The Council have now before them an application from the Seewarte for the extension of the arrangement to other stations and the discontinuance of the 8 a.m. service to Germany.

In connexion with these matters, the Council have had under consideration the advantages that might result from changing the

hour of observation at the British stations from 8 a.m. to 7 a.m., the common hour of observation on the Continent. They are of opinion that if the change were carried out with the effective co-operation of the Post Office the service of weather telegrams could be made much more prompt and efficient in this country and for the whole of Western Europe, and the weather reports could be brought out in time to catch the mid-day mails and reach a much larger number of persons in the British Isles on the day of issue than at present.

There are, however, associated with the matter questions of additional expense and re-organisation, and the Council have not yet seen their way to take any active step in the matter.

At the request of the late Professor G. F. Fitzgerald the Council have sanctioned an arrangement for regular magnetic observations at the observatory at Valencia (Cahirciveen). The cost of the observations is defrayed from a fund controlled by the Earl of Rosse.

Magnetic  
observations  
at Valencia.

In order to make the information as to the facilities which the Office affords to the public more accessible, the Council have had a memorandum prepared in which those facilities are briefly explained. The memorandum is reprinted in Appendix II. to this Report, and copies can be obtained upon application to the Secretary.

Supply of  
information  
to the Public

In the discharge of the duties entrusted to them the Council have to rely largely upon the help of volunteer observers at sea and on land, and they desire to record their recognition of the assistance thus afforded them, and their appreciation of the care and skill that have been devoted to securing accurate and regular records.

Acknow-  
ledgments.

They have on this occasion specially to acknowledge their indebtedness to the Portuguese Government for the continuation of the daily telegrams from the Azores; to Mr. T. G. Benn, of Newton Reigny, Penrith, who furnished, at his own expense, a daily telegraphic report of observations at 8 a.m. from October 1st, 1900, till March 31st, 1901, and thus supplied valuable information for the North-Western district of England, which is not fully represented in the Daily Weather Chart: Mr. Benn also checked the daily forecasts for the North-Western district; to the Corporation of Bath who, through their Medical Officer, Dr. W. H. Symons, has sent a similar daily telegram since January 18th; to Mr. Glyde, of Tavistock, for occasional telegrams reporting observations of cirrus cloud; to the local authorities of Clacton-on-Sea, Hastings, Eastbourne, Brighton, Worthing, Llandudno, Rhyl, and Southport, who send telegraphic information of sunshine; to Mr. A. Cresswell, of the Birmingham and Midland Institute, Mr. Mainland, of the Gillibrand Meteorological Observatory at Darwen, and Professor Schuster, of Manchester, who send daily reports of evening observations by post, and thus enable the Council to supplement the telegraphic reports with useful information as to the state of the weather at inland stations on the previous day.

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**Administration.**

The administration of the Office is conducted by the Secretary, under the direction of the Council, with the assistance of the Marine Superintendent and a staff of 39 clerks and attendants.

At the close of last year, Mr. R. Strachan was granted an annuity, under the new scheme of Superannuation, after long and meritorious service. He was transferred from the Board of Trade at the establishment of the Office, was for many years in charge of the Instruments' Department, and contributed several useful memoirs on the Meteorology of the Arctic and Antarctic regions, compiled from the records of the various expeditions that have been sent to those regions.

**Summary of the work of the Office.**

The work of the Office may be briefly summarised under the following heads:—

I. 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.

The issue of meteorological instruments for use on board the ships of the Royal Navy, and for observers belonging to the Merchant Service, with which is associated the supply of instruments to the Telegraphic Reporting Stations, &c.

II. WEATHER TELEGRAPHY.—The collection of observations transmitted by telegraph, three times in each day, from selected stations in the British Isles (chiefly on the coasts), and on the Continent of Europe, the preparation of a Daily Report embodying the observations, and of forecasts of weather based upon them, and the issue of warnings to ports on the coasts of the United Kingdom whenever there are indications of the approach of severe storms.

III. CLIMATOLOGY.—The collection of information of various kinds from observatories and other land stations in the British Isles, and from a few stations in British possessions or in Foreign countries, with the view of extending the accurate knowledge of the meteorological conditions obtaining in the various districts in which the observations are made, and of the changes to which they are subject.

IV. LIBRARY.—For the collection and preservation of weather maps and other publications issued by the Colonies and Dependencies of the British Empire, and by Foreign Countries, so that they may be available for consultation by those requiring information as to the weather in various parts of the globe.

V. MISCELLANEOUS INVESTIGATIONS.

VI. PUBLICATIONS.

VII.—FINANCE.

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All the branches of the Office are utilised for the preparation of replies to inquiries on questions connected with the weather, which are made from time to time by public bodies or by private persons.



Details of the work of the Office during the past year are given below under the headings which have been enumerated.

## PART I.

## OCEAN METEOROLOGY.

*Collection of Information.*—The Office has continued the systematic collection of data with respect to the meteorology of the ocean, and for this purpose complete outfits of meteorological instruments have been supplied to selected officers of merchant ships who were willing to make observations at sea. Collection of Information.

The instruments supplied are :—

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

His Majesty's ships also are supplied with instruments, which, however, differ slightly from those lent to the Mercantile Marine. The Council continues to receive valuable observations from the officers of the Royal Navy.

In order to facilitate the supply of instruments to the Mercantile Marine, agencies are established at Cardiff, Dundee, Glasgow, Greenock, Hull, Liverpool, and Southampton. A list of the agents is given in Appendix II., p. 53. Agents.

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. Notices to captains as to the supply of instruments are frequently distributed from the Office.

The number of merchant ships supplied with instruments and log books during the year has been 83. Taking into account the ships which had instruments in their possession at the beginning of the year, the approximate number of ships of the merchant service employing instruments belonging to the Office for observations during the year was 169. Supply of instruments to ships.

Appendix III. (p. 68) contains a list of the observers who have, during the past year, contributed logs classed as "excellent." The Council take this opportunity of expressing their best thanks to those who have thus assisted them. 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.
Holmes, W. B.     ...     ...     ...     ...	S.S. "Matatua."
Martyr, J. W. C.     ...     ...     ...     ...	S.S. "Montrose."
Mitchell, J.     ...     ...     ...     ...	S.S. "Prome."
Woolfall, A.     ...     ...     ...     ...	S.S. "Amasis,"

**Death of  
observers.**

The Council have to note with great regret the death of five of their old observers. Capt. Peter Murdoch died at Valparaiso in November, 1900. He had for many years been an observer for the Office, and had kept 22 meteorological logs, of which 20 were classed as excellent. Capt. W. Martin, R.N.R., died at the Cape in January, 1901. Capt. H. W. Dyke, ship "Rathdown," had kept several excellent logs for the Office. His vessel disappeared with all hands between Japan and Oregon. Capt. W. H. Smith, R.N.R., had kept 22 meteorological logs, of which 18 were excellent. Capt. Gilbert Shaw had kept 29 logs for the Office.

**Logs  
received.**

The meteorological logs received during the year numbered 120, of which 103 were either "excellent" or "very good."

A list of the logs received is given in Appendix IV. (p. 69).

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

North Atlantic ... ..	29	Eastern, via Suez Canal...	14
Mediterranean ... ..	4	Far Eastern, via Cape of	
South America (East Coast)	8	Good Hope ... ..	15
" " (West " )	3	Far Eastern, via Suez	
South Africa ... ..	10	Canal ... ..	18
Eastern, via Cape of Good		Pacific ... ..	37
Hope ... ..	1	Polar ... ..	1

**Recognition  
of "excellent"  
observers.**

As a mark of recognition of valuable co-operation, the Council present various publications of the Office (*see* Appendix XIV., p. 148) to observers who return well-kept logs.

The Council desire to note specially that they have continued to receive, through the Ocean Steamship Company of Liverpool, a considerable number of logs, principally relating to voyages to and from the China Seas via Suez.

**Observations  
from the  
Pacific  
Ocean.**

*Observations from the Pacific Ocean.*—The arrangements described in the Report for 1898, p. 8, and also in the Report for 1900, p. 10, for the supply of instruments from His Majesty's Dockyards at Sydney and at Hong Kong to the Commanders of the Canadian-Pacific Railway Company's Steamers, and Canadian-Australian Steamship Company's Steamers have been in operation. The observations contained in these logs are of special importance in regard to the material which they afford for the gradual improvement of the Current Charts for the Pacific Ocean issued by the Office.

**Observations  
of Drift Ice  
in Northern  
Seas.**

On behalf of the Danish Meteorological Institute, which has undertaken a work having for its object the collection of information in regard to the state of the ice in the waters East and West of Greenland and elsewhere, within the limits of Arctic navigation, between the months of March and August inclusive, the Office has secured the co-operation of several Captains voyaging to the Arctic.

**Use of the  
information  
collected.**

The information contained in the meteorological logs is chiefly used in the preparation of statistical results for different oceans, which are issued as separate publications either by H.M. Stationery Office or by the Hydrographic Department of the Admiralty.

In the past year the *Charts illustrating the Weather of the North Atlantic Ocean in the Winter of 1898-99* have been published by the Stationery Office, and the work on the *Wind Charts of The East and West Coastal Regions of South America* for the Hydrographic Department has been nearly completed. Considerable progress has been made with the work on the Meteorology of the South Atlantic. Publications.

During the year the Council have made arrangements for the preparation and issue of a series of Monthly Pilot Charts of the North Atlantic and Mediterranean to commence with April, 1901. The statistical information which is contained on the charts is largely derived from previous publications of the Office, but the Council have also to acknowledge their obligation to the publications of the United States Weather Bureau and the Deutsche Seewarte for supplementary information of interest and importance to seamen. The charts are to be sold by the agents for the sale of Stationery Office publications at 6d. for a single copy, and the Board of Trade have kindly made arrangements whereby captains and officers of the Mercantile Marine can obtain copies at the Mercantile Marine Offices of a large number of ports. Pilot charts of the North Atlantic and Mediterranean.

By the issue of these charts the Council desire to make the information collected in the Office for many years more generally accessible. They hope also to add to the charts each month the most recent information as to the position of ice in the North Atlantic and other matters of interest to seamen. They have accordingly solicited the co-operation of the various Steamship Companies and Mercantile Marine Associations, and have received promises of assistance from the following: White Star; Cunard; American; Dominion; Johnston; Allan; Elder Dempster; Norfolk and North American; Messrs. Scrutton, Sons & Co.; Liverpool Steamship Owners' Association; Liverpool Shipowners' Association; Mercantile Marine Service Association; Merchant Service Guild; and London Shipmasters' Society.

*Climatological Information for the Admiralty.*—Statistics as to the climates of foreign ports are from time to time required by the Admiralty for use in various publications; information has been supplied bearing upon the climatic conditions of the shores of the Red Sea and gulf of Aden; meteorological results for Ascension, St. Helena and Tristan d'Acunha; also for various places in the Bay of Bengal. Information supplied for the Admiralty.

Various hydrographic notices are extracted from the meteorological logs and forwarded to the Admiralty. Among those sent during the year were notes by Captain G. Mitchell, S.S. "California"; Captain J. S. D. Phillips, S.S. "Warrimoo"; Captain W. D. G. Worcester, R.N.R., S.S. "India"; Captain W. Anderson, Barque "Loch Katrine"; Captain T. R. Evans, Barque "Conway Castle."

Data have been obtained, and forwarded to Sir Norman Lockyer, bearing upon the distribution of cloud over the Atlantic and over Asia and the neighbouring seas during the solar eclipses of January 22nd, 1898, and May 28th, 1900.



## SUPPLY AND STOCK OF INSTRUMENTS.

## Supply of instruments to Royal Navy.

The total number of instruments supplied to the Royal Navy during the year ended March 31st is 1,082. Particulars of these instruments are given in Appendix V. (p. 78) which includes a statement of the stock of instruments for this purpose standing on the books on March 31st, 1901, and of their distribution.

## Supply of instruments to Mercantile Marine, &amp;c.

Appendix VI. (p. 79) gives similar information with regard to other instruments belonging to the Office which have been supplied to the Mercantile Marine, to Observatories, to Telegraphic Stations, or which remain in store.

Instruments are occasionally lent to observers in unfrequented parts of the world when the Council have reason to believe that the observations will be taken with due care, and the observers undertake to send copies of their observations to the Office.

## Instruments for New Guinea.

In May, 1900, the Council received an application from the Acting Government Secretary, British New Guinea, for six sets of instruments for stations in New Guinea. Some years ago a similar request for three sets had been complied with, but no return of observations had been made. The Council recognize the importance of observations in that region, and after some correspondence with the Agent-General for Queensland, they were assured that the returns would be regularly made, and the six sets of instruments were accordingly supplied.

## Instruments for Sabang Bay.

Instruments have also been supplied for use at a new signal station established by Lloyd's at Pulo Wai, Sabang Bay, upon similar conditions.

## Fishery Barometers.

*Fishery Barometers.*—Barometers are lent by the Office to fishing villages and other places on the coast for the benefit of sailors and fishermen. There are 226 stations of this kind, of which 67 are in England, 7 in Wales, 64 in Ireland, 83 in Scotland, 4 in the Isle of Man, and 1 in Jersey. A list of the stations is given in Appendix II., p. 53.

During the past year barometers have been supplied to Inniscree Island, on the recommendation of the Coastguard Authorities; to Kyle of Lochalsh, on the application of Mr. J. G. Weir, M.P.; to Ullapool, on the application of the Fishery Board for Scotland, to replace one supplied in 1892 and maliciously damaged under such circumstances that no blame could be attached to those in whose care the instrument was placed; to Glenarm, on the application of the Chief Officer of the Coastguard; and to Marvaig, on the application of the Fishery Board for Scotland.

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.

## PART II.

## WEATHER TELEGRAPHY AND FORECASTS.

## Daily weather Reports.

A report 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 is issued by the

Office at 11 a.m. each day except Sundays and Bank Holidays, together with forecasts of the probable weather over the United Kingdom for the period ending at noon on the following day. A second report referring to the weather at 6 p.m., with forecasts for the following civil day, is issued each evening for the morning editions of the daily papers.

For the purposes of these reports the arrangements made for daily observations at 25 stations in the British Isles, at 8 a.m. and 6 p.m., to be reported by telegram to the Office, have been continued. Telegraphic messages are also received from 18 stations on the Continent. Messages are sent from a selection of the stations immediately after the 6 p.m. observations, and all send full reports after the morning observations, a certain number also report 2 p.m. observations. The hours of observation on the Continent do not in all cases correspond with those of the British stations.

Telegraphic  
reporting  
stations.

The Telegraphic Reporting Stations in the British Isles are those marked with the letter "T" in the list given in Appendix II. (p. 56), and the same Appendix contains at p. 61 a list of the Foreign Stations which send daily telegrams to the Office.

In addition to the stations which belong to the regular service of the Office the Council have had the advantage of daily telegraphic reports from the Azores (through the courtesy of the Portuguese Government), from Newton Reigny, Penrith, and from Bath (see p. 9).

*Inspection of the Telegraphic Reporting Stations.*—The stations in the United Kingdom are regularly inspected. The Reports of the Inspectors for the past year have shown 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 was last given in Appendix X. of the Report for 1891. The Report has appeared regularly during the year.

The Daily  
Weather  
Report.

From August 1st, 1900, some modifications have been introduced into the form of the Report. The morning and evening observations of the Telegraphic Reporting Stations appear on the first page as usual, but the two charts on the second page, representing the morning distribution of pressure, wind and sea, and of temperature and weather respectively, are supplemented by three smaller charts. One represents the barometric distribution over the whole of Europe at 8 a.m. of the preceding day in order that the general atmospheric changes may be more readily traced. Another represents mean morning isotherms for the British Isles for periods of one or two months, so that the distribution of temperature for the day may be easily compared with the normal distribution for the season as estimated for a period of twenty five or thirty years. The third represents the distribution of mean maximum or minimum temperature estimated in a similar manner. These charts may be varied from time to time to represent other statistical results of interest,

The forecasts on the third page are drawn up in the same way as before, but the synopsis of the "Situation at 8 a.m." and the statement of the probable changes in the system now prevalent have been remodelled so as to give a more effective idea of existing conditions and the changes indicated thereby.

There are also changes on the fourth page of the Report. Instead of "General Remarks on the Weather over Europe" there is a table giving the latest information in the possession of the Office as to maximum and minimum temperature, rainfall, and weather at selected stations on the Continent and elsewhere which are beyond the area represented by the telegraphic reports. This has been introduced to meet a suggestion of Sir W. Harcourt that the Report should give the latest information in the possession of the Office that might be useful to travellers on the Continent and elsewhere. The selection of the stations is accordingly determined by the current interests of travellers, and is varied from time to time according to the information available.

The information as to the weather in the British Islands is 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 which have proved a useful addition to the telegraphic reports of the first page.

For convenience of reference a small supplemental table gives the Greenwich time of sunrise, noon, and sunset for four selected stations in the British Isles, so that the variation in the duration of daylight and the standard times of local noon for any locality may be ascertained.

**Distribution  
of Daily  
Weather  
Reports.**

Hitherto the issue of the reports has been confined to certain public offices and institutions, and to annual or quarterly subscribers. The distribution has been by hand or by book-post. The area within which delivery can be effected on the day of issue is necessarily very limited. About 250 copies are distributed without charge to newspapers, for public exhibition at seaports, to Government Offices and public institutions, to correspondents of the Office, and to foreign meteorological institutions. The issue to subscribers has amounted to about 170 copies, and in the course of the past year the Council have made provisional arrangements 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, at the Meteorological Office and at the railway bookstalls of 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. It is hoped that the facilities afforded by the new arrangement may bring the information which the reports contain within the reach of some of those interested in the subject who live outside the present limits of delivery on the day of issue. If the provisional arrangement should make it apparent that there is any public demand for the accommodation, efforts will be made to continue and extend it.

**Display of  
information  
in front of  
the Office.**

*Display at the Meteorological Office in London of Information as to the Weather on British Coasts.*—At 9.30 a.m. and 3 p.m. every week day the substance of the reports received by telegraph, as to



he state of the weather and of the sea at the following stations :  
 Yarmouth, Dover (Dungeness), Portland Bill, Scilly, Holyhead,  
 and Valencia Island, is conspicuously displayed on the balcony of  
 the Office, at 63, Victoria Street, S.W. At the same hours charts  
 are suspended in the portico of the street door, which exhibit the  
 latest information from all our coasts, and the latest forecasts and  
 storm warnings that have been issued.

*Weather Forecasts.*—In addition to their publication in the Daily Weather Report various means are adopted for the distribution of the forecasts drawn up in the Office of which the following is a summary for the past year.

Weather  
Forecasts.

*11 a.m. Forecasts.*—These forecasts are based upon the 8 a.m. observations, and are drawn up at 11 a.m. for the 24 hours ending at noon on the following day. Copies are called for by messengers from newspapers or news agencies, and printed copies are delivered to subscribers and distributed for exhibition as follows : in the City, at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's, Cornhill, and Messrs. de la Rue & Co.'s, Bunhill Row; in the West End, in the Libraries of the House of Lords and the House of Commons; at Messrs. Elliott's, St. Martin's Lane; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; and at the Office, 63, Victoria Street.

At the request of the Admiralty forecasts for the S.W. of England and the Bay of Biscay are regularly supplied to the Commander-in-Chief, Devonport, and other forecasts for separate districts are sent by telegraph to certain provincial newspapers.

*3.30 p.m. Harvest Forecasts.*—During the summer months (June to September inclusive) a special service of forecasts is arranged for the benefit of agriculturists and others. The forecasts are based upon special telegraphic reports of observations taken at 2 p.m. at a selected number of Reporting Stations, and refer to the 24 hours from midnight of the day of issue. The forecasts are sent by telegraph to those who express a wish to receive them regularly, and who defray the cost of the telegrams. The number of recipients of these forecasts for various periods in the summer of 1900 was 129. It showed a remarkable increase over the number of applications in 1899, which only reached 20.

*8 p.m. Forecasts.*—These are based upon the 6 p.m. observations and are distributed with the evening report to the representatives of newspapers and news agencies for insertion in the morning papers. The number of copies so distributed has not been materially changed in the course of the year.

Forecasts are also sent by the Office in reply to inquiries by post or by telegram received between the hours of 8.30 a.m. and 8 p.m. The revised arrangements referred to last year for the supply of weather information by telegraph, whereby the charge was reduced from 1s. to 6d., in addition to the cost of the inquiry and reply telegrams, came into force on August 1st. A circular announcing the change was, through the courtesy of the Postmaster General, exhibited at the Postal Telegraph Offices. In consequence the number of telegraphic inquiries has increased in the year from 90 to 256. There were also 86 personal inquiries

Telegraph  
inquiries :  
forecasts.



for forecasts during the year, and a very large number of inquiries on the part of representatives of the press for special information upon any unusual occurrence in connexion with the weather.

Transcripts  
of  
observations.

The Council have from time to time received applications for special transcripts of a selection of the observations made for the Office. It has long been the practice to supply specially drawn maps for the "Times," and for some time past special transcripts of the observations have been furnished to the "Daily Mail," and until December, 1900, to the "Express." During the past year a similar transcript has been furnished by telegram to the "Liverpool Journal of Commerce." The Liverpool Underwriters' Association has for many years past received a daily telegram from the Office of observations at a number of coast stations. The "Daily Telegraph" has been supplied with special observations made at Valencia at 10 p.m. each night. For these services a charge has been made.

Within the past year the United States Weather Bureau has requested the Council to make arrangements for sending a daily message by cable reporting the 8 a.m. observations at a number of British and European stations. Arrangements have been made accordingly and have been in operation since December 18th, 1900.

Results of  
Forecasts.

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 VII., p. 80. The complete success, partial success, partial failure, and complete failure of the forecast is estimated according to definite rules which are designed to eliminate bias as far as possible.

It will here suffice to state that partial success means that the Forecast was correct for more than half the elements dealt with at the places of observation situated in the district in question, and a similar 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, 1900-1901.

Districts.	Per-centages.				
	Complete Success.	Partial Success.	Partial Failure.	Complete Failure.	Sum of Successes, Complete and Partial.
SCOTLAND, N. ...	58	26	11	5	84
" E. ...	56	27	12	5	83
ENGLAND, N.E. ...	60	28	10	2	88
" E. ...	56	28	13	3	84
MIDLAND COUNTIES...	58	27	12	3	85
ENGLAND, S. ...	58	30	10	2	88
SCOTLAND, W. ...	59	25	10	6	84
ENGLAND, N.W. ...	55	28	12	5	83
" S.W. ...	57	29	10	4	86
IRELAND, N. ...	56	27	11	6	83
" S. ...	55	25	13	7	80
Summary ...	57	27	11	5	84

In order to test the success of the Forecasts of the year in comparison with those of previous ones, the following table has been drawn up. It shows for each year of the decade 1891–1900 the percentages of complete and partial success of the Forecast issued at 8.30 p.m. It will be noticed that the highest degree of complete success was obtained in 1893 and 1900, and that the number of complete successes was above the average for the whole decade.

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.
1891 ... ..	50	30	80
1892 ... ..	46	33	79
1893 ... ..	59	25	84
1894 ... ..	56	27	83
1895 ... ..	55	25	80
1896 ... ..	54	27	81
1897 ... ..	55	26	81
1898 ... ..	55	28	83
1899 ... ..	55	27	82
1900 ... ..	57	27	84
Average ... ..	54.2	27.5	81.7

The forecasts for the N.W. district of England issued during six weeks of the current year have been independently checked by Mr. T. G. Benn of Newton Reigny, who brought out a much larger percentage of successes (total and partial) than that shown by the checking made in the Office.

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

Storm  
Warnings

A list of the stations is given in Appendix II., p. 45. At the end of March, 1900, there were 233, of which 124 were in England and Wales, 70 in Scotland, 32 in Ireland, 4 in the Isle of Man, and 3 in the Channel Islands.

The Council regret that very few of the stations have any provision for exhibiting warning signals after dark, so that a telegram sent in the winter months on account of observations received in the afternoon or evening remains in many cases unheeded until after daylight on the following morning. This unsatisfactory state of things arises from the fact that the Council are only able to supply the signal cone. The provision of accessories and of the lamps and oil necessary for signalling at night is left to the locality.

A comparison has been made in the Office between the warnings issued during the year and the subsequent weather actually



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A comparison has been made in the Office between the warnings issued during the year and the subsequent weather actually

experienced, in accordance with the method indicated in the Report for 1888-9, Appendix VII., p. 64.

The Council have again to acknowledge their obligations to Trinity House, the Irish Lights Office, the Scottish Meteorological Society, and the Mersey Docks and Harbour Board, for the loan of the log books of Lightships and Lighthouses for the purpose of this comparison.

The results of the comparison are exhibited in the following table:—

### STORM WARNING CHECKING.

COMPARISON between the WARNINGS and the subsequent WEATHER in 1900.

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. ...	46	33	10	3	—	—	—	Mar. 12.
" E. ...	37	17	19	1	—	—	—	Apr. 15.
" N.W. ...	44	27	14	3	—	—	—	Nov. 10.
" W. ...	44	18	19	6	—	1	—	—
Ireland, S.W. ...	49	32	15	2	—	—	—	June 24.
" N.W. ...	53	38	10	3	—	2	—	June 24,
								Nov. 8.
								Nov. 10.
								Nov. 13-14.
								Jan. 18
Irish Sea ...	43	38	3	1	1	—	—	(part),
								Aug. 3.
								Oct. 26.
St. George's Channel	34	23	7	1	—	3	—	—
Bristol Channel ...	37	30	7	—	—	—	—	—
England, S.W. ...	36	26	7	2	—	1	—	Dec. 27.
" S. ...	24	13	7	4	—	—	—	—
" S.E. ...	23	15	5	3	—	—	—	—
" E. ...	18	11	3	3	—	1	—	Feb. 14,
								Aug. 3,
								Oct. 26.
" N.E. ...	24	18	6	—	—	—	—	Apr. 13,
								Apr. 15,
								Aug. 3,
								Oct. 26.
Totals ...	512	339	132	32	1	8	—	
Percentages...	—	66.2	25.8	6.3	0.2	1.5	—	

NOTES ON GALES EXPERIENCED in 1900, for which no WARNING had been issued.

*January 18th.*—EASTERN SHORES OF IRISH SEA. A N.W. gale.

The Western shores of the sea were duly warned, but gale proved more general than was anticipated.

*February 14th.*—ENGLAND, E. An Easterly gale.

Our S. and S.E. coasts were duly warned, but gale extended further than was expected.

*March 12th.*—SCOTLAND, E. A N. to N.W. gale.

Due to a secondary depression, not indicated even at 8 a.m. on 12th. In the evening it was too late.

*April 13th.*—ENGLAND, N.E. and E. A W. gale.

All our Western coasts had been warned, but the gale extended further than was expected, owing to a secondary depression, not indicated beforehand.

*April 15th.*—SCOTLAND, E., and ENGLAND, N.E. A S.W. gale.

Similar to next above.

*June 24th.*—IRELAND, S.W. and N.W. A N.W. gale.

The appearance at 8 a.m. was not threatening, but wind proved stronger than was anticipated.

*August 3rd.*—Eastern half of IRISH SEA, ENGLAND, N.E. and E. A N. to N.E. gale.

Many coasts were warned on evening of 2nd, but the disturbance was larger than was anticipated.

*October 26th.*—IRISH SEA, ENGLAND, N.E. and E. A N.W. gale.

The depression which caused this gale originated and was developed over the N. of England on 25th-26th. The gale was accompanied by unusually heavy rains (three inches and more). The weather was certainly rainy and unsettled, but there was no indication that such a storm was probable.

*November 8th.*—IRELAND, N.W. A W. to N.W. gale.

There was no indication of the approach of this gale on the evening of the 7th, and at 8 a.m. on the 8th it was too late to warn.

*November 10th.*—SCOTLAND, N.W., and IRELAND, N.W. A W. gale.

Felt at extreme outlying stations only—due to a secondary disturbance of which no indication was given at 6 p.m. 9th.

*November 13th and 14th.*—SCOTLAND, N.W., and IRELAND, N.W.

This gale was felt at outlying stations only, and was accompanied by a very sudden increase of pressure over the Atlantic, in the rear of a previous shallow low-pressure system.

*December 27th.*—ENGLAND, S.W. A W. gale.

England S. and S.E. were duly warned, but the advent of this depression was very sudden, and there were no indications of its approach.



Comparison  
of results for  
100 with  
previous  
years.

The following table contains a statement of the amount of success of storm warnings in the decade 1891-1900 :—

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
		p.c.	p.c.	p.c.	p.c.
1891	522	62.3	24.5	86.8	7.5
1892	488	59.4	31.2	90.6	6.8
1893	480	60.8	28.6	89.4	7.1
1894	502	68.5	23.5	92.0	6.0
1895	523	63.3	26.4	89.7	8.0
1896	467	67.7	23.8	91.5	2.9
1897	596	60.1	31.7	91.8	4.5
1898	581	59.8	27.5	87.3	4.5
1899	504	59.3	31.9	91.2	4.8
1900	512	66.2	25.8	92.0	6.3

The Council have again to acknowledge the courtesy of Lloyd's in forwarding observations from a number of their signal stations.

### PART III.

#### CLIMATOLOGY.

##### I.—BRITISH ISLES.

The Council do not attempt to deal completely with the details of the climatology of the British Isles, but they receive returns of various kinds from stations in all parts of the kingdom. Some of these returns are from the stations which are supported by the Office, but the greater number are furnished by volunteer observers. A complete alphabetical table of the stations which furnished returns in the year ended on March 31, 1901, is given in Appendix II., p. 56. The nature of the information supplied is indicated by the letters in the sixth column of the table, which are explained on p. 55. To facilitate reference the same letters are used in the enumeration of the different classes of stations which is given here, although the lettering is not consecutive.

Classification  
of Stations.

For the purposes of classification meteorological stations are, by International agreement, divided into three orders as follows :—

Stations of  
the First  
Order.

I. *Stations of the First Order* are observatories which furnish continuous records of the barometric pressure and the temperatures of the dry-bulb and wet-bulb, as well as continuous records of rainfall, wind, and bright sunshine, with frequent eye observations of the weather and of the kind and amount of cloud.

At the observatories connected with the Office the registration of the barometer and the wet-bulb and dry-bulb thermometers is photographic, according to the system established by the Meteorological Committee in 1868. The wind registration is by

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At the observatories connected with the Office the registration of the barometer and the wet-bulb and dry-bulb thermometers is photographic, according to the system established by the Meteorological Committee in 1868. The wind registration is by



the Kew pattern Robinson anemograph, with 9-in. cups and 2-ft. arms. The rain records are by Beckley's float rain gauge, and the records of sunshine by the Campbell-Stokes sunshine recorder.

In addition to the observatories which are completely equipped, self-recording instruments of various kinds have been installed at other stations, and their records are forwarded to the Office. The whole number of stations provided with self-recording instruments may accordingly be subdivided as follows :—

- A. *Fully equipped Observatories.*
- B. *Anemograph Stations*, at which continuous records of wind are obtained.
- C. *Barograph Stations*, which supply records of pressure derived from self-recording aneroid barometers.
- S. *Sunshine Stations.*

II. *Stations of the Second Order.*—This name is limited to stations which supply normal climatological data—viz., observations of pressure, of the dry-bulb and wet-bulb thermometers, the direction and force of the wind, the amount and kind of cloud, and the state of the weather taken twice daily at properly correlated hours; together with measurements of rainfall, maximum and minimum temperature, taken once daily at the appropriate hours. The selected hours of observation for the British Isles are 9 a.m. and 9 p.m. *local time*, and stations at which the observations comply in all respects with this specification may be called Normal Climatological Stations. They are indicated in the table of Appendix II. by the letter D.

Stations of  
the Second  
Order.

At many of the stations of the Second Order in this country sunshine records are added, but though eminently desirable they are not included in the International specification.

Observations of “grass minimum” and “solar maximum” thermometers are sometimes added to the returns of normal stations.

III. *Stations of the Third Order.*—All other stations which furnish climatological data not so complete as those of normal stations, or data derived from observations at other than the normal hours, are classed as Third Order Stations. This class technically includes the Telegraphic Reporting Stations, because the hours of observation at these stations are 8 a.m. and 6 p.m. *Greenwich time*, instead of 9 a.m. and 9 p.m. *local time*; and there is a difference of practice as regards the time of reading the maximum and minimum thermometers, although the instruments used are the same, and the amount of information is quite as full as that from normal stations. The stations included in this class may be subdivided into the following groups :—

Stations of  
the Third  
Order.

- T. *Telegraphic Reporting Stations*, giving observations at 8 a.m. and 6 p.m. (Greenwich mean time); some also at 2 p.m.

- G. Other *Climatological Stations*, with the same equipment as a normal station, but giving readings once a day only, or at hours differing from 9 a.m. or 9 p.m.
- F. *Weekly Weather Report Stations*, supplying weekly returns of observations of rainfall and of the maxima and minima of temperature taken at 9 a.m. daily.
- R. *Rainfall Stations*, which supply monthly returns of daily observations of rainfall, with remarks on the weather.

Sea temperature stations.

IV. *Sea Temperature Stations (W.)*, at which observations of the temperature of the sea and of the air are taken twice daily.

First order stations.  
Observatories.

A. STATIONS OF THE FIRST ORDER: OBSERVATORIES.—The Council has continued to maintain the observatory at Valencia (Cahirciveen), and has also continued its contributions to the maintenance of the meteorological observatories at Kew, Falmouth, Aberdeen, and Fort William,\* at which the self-recording instruments, installed by the Council, are under the management of the National Physical Laboratory, the Royal Cornwall Polytechnic Society, the University of Aberdeen, and the Scottish Meteorological Society respectively. From the observatories complete records of the meteorological elements, together with the appropriate tabulations and eye observations, have been, with one exception, regularly received. The returns from Fort William have fallen into arrear owing to the indisposition of the staff, but the arrears are (May, 1901) being rapidly made up. The arrangement with the observatories at Glasgow and Stonyhurst, under which copies of the traces of the self-recording instruments are supplied to the Office, have been likewise continued.

The Council has also made a contribution to the Scottish Meteorological Society towards the cost of the hourly observations at the summit of Ben Nevis.

Ben Nevis observatories.

No change has been made in any of the arrangements for the first order stations during the year. Three years ago the Council were informed (*see* Report 1899, p. 22) that the observatories at Ben Nevis would be discontinued for lack of funds, and accordingly they gave the notice agreed upon to terminate the arrangement under which they made a grant towards the maintenance of these observatories. The notice expires in October, 1901. The Scottish Meteorological Society, however, through private benefactions, have found themselves enabled to continue the observatories, and have requested the Council to continue the grants for another year. The matter is still (June, 1901) under the consideration of the Council.

As already mentioned, the letters in column 6 of the table in Appendix II. indicate the nature of the information received by the Office from the several stations. In many cases more elaborate observations are taken, although they are not reported to the Office. For example, the Radcliffe Observatory at Oxford and the Observatory of the Mersey Docks and Harbour Board at Bidston are fully equipped observatories of the First Order. The

\* The observatory at Fort William has no Anemograph, the site being unsuitable for satisfactory observations of wind.

Fernley Observatory of the Corporation of Southport, the Gillibrand Observatory of the Corporation of Darwen, the Observatory of the Birmingham and Midland Institute at Edgbaston, the Observatory of the late Sir Cuthbert Peek, Bart., at Rousdon, and the Meteorological establishments at St. Helen's and at Plymouth, possess many valuable self-recording instruments.

**B. ANEMOGRAPHIC STATIONS.**—In the autumn of last year the Council learned that the Robinson Anemometer on Kingstown Pier, belonging to the Irish Board of Works, was still maintained in operation. They accordingly applied to the Board of Works for copies of the records. The Board very courteously agreed to send the original sheets, and from the beginning of the present year the records have been received monthly. The records for the past twenty-one years have also been sent to the Office, and are preserved with those from 1856 to 1879 for the same station which had previously been received. In other respects the Anemographic stations remain unchanged. Anemometers are still maintained by the Office (in addition to those at the stations of the first order) at Armagh,\* Deerness (Orkney), Fleetwood, Holyhead, Shields, Yarmouth, and Scilly. At Phoenix Park, Dublin, the Council's Anemometer is in charge of the staff of the Ordnance Survey, who send up the records; and the Council also receive the records from the Duke of Northumberland's Anemometer at Alnwick. The Anemometers are of the standard Robinson pattern, except at Scilly and Phoenix Park, where they are of smaller size. At Kew, Holyhead, and Scilly Dines' pressure tube instruments are also maintained for the purpose of comparison, and at Holyhead a pressure plate instrument and a bridled Robinson Anemometer are kept at work for experimental purposes.

Anemographic stations

**C. BAROGRAPHIC STATIONS.**—A number of the Telegraphic Stations are supplied by the Council with self-recording aneroid barometers for use in reporting, and in addition the Council receive every week the traces from a number of barographs belonging to private observers. During the past year these have been increased by barograms from Chatsworth, which have been forwarded by the Duke of Devonshire, who sends also weekly thermograph curves. The other stations from which barograms have been received are Fulbeck (Rev. V. F. Willson); Kilkenny (the Marquis of Ormonde); the Athenæum Club; Penbedw (Mr. H. W. Buddicom); Waterford (the Harbour Authorities); Forgandenny, Perth (Mr. C. L. Wood); Hampstead (Mr. H. R. Beeton); Rochford, Tenbury (Rev. J. Tomson.)

Barographic stations.

**S. SUNSHINE STATIONS.**—Complete returns of the original cards for the year have been received from 58 stations. The returns from Edinburgh, Bournemouth and York were discontinued in the course of the year, the two latter stations temporarily, and returns from Kingstown (Dr. Power) were commenced; a second Station was also established at Sheffield by the Corporation for the purpose of ascertaining the local variation in the amount

Sunshine stations.

\* The observatory at Armagh is also provided with a Beckley's self-recording rain gauge, the records of which are regularly sent to the Office.



of bright sunshine, and the returns from Scarborough, which had been discontinued since October, 1899, have been recommenced.

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 14 other stations for insertion in the Weekly Weather Report. Of these, six were derived from the records of the Jordan recorder, which depends upon the exposure of sensitive paper to the sun's light, and the others from Campbell-Stokes' instruments.

The distribution of the Sunshine Stations on the 31st March was as follows :—

SUNSHINE STATIONS (82) AT MARCH 31, 1901.

Stations.	No.	Stations.	No.
Scotland, N. ... ..	6	England, N.E. ... ..	6
.. E. ... ..	4	.. N.W. and N. Wales	13
.. W. ... ..	2	.. Midland Counties	8
Ireland, N. ... ..	2	.. E. ... ..	9
.. S. ... ..	4	.. S. ... ..	16
Channel Islands ... ..	3	.. S.W. and S. Wales	9

Additional  
stations  
desired.

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

For the purpose of uniformity in the returns, they deem it desirable that the observations should be made with the Campbell-Stokes instrument, and they are in consultation with the National Physical Laboratory with a view to drawing up a standard specification of the instrument that shall lead to strict comparability of the records.

*D. Stations of the Second Order.*—These stations, as well as many of the sunshine stations, and all the stations enumerated under F, G, and R, are maintained by private persons or local authorities or institutions, who provide their own outfit of instruments. Returns for 1900 were received from 80 stations. The returns are of two kinds: first, detailed daily records of pressure, temperature and other data on a Form which is known as the International Form A; and secondly, monthly summaries of the daily observations for the year on the International Form B. All the observers, numbering 45, who send their reports directly to the Office make their returns monthly on the first Form. In addition to these returns the Council have arranged with the Royal Meteorological Society and the Scottish Meteorological Society to forward to the Office returns already prepared for publication, some on Form A and others on Form B. These are incorporated with the returns which are received directly and prepared for publication in the Office. The returns which have been forwarded to the Office under this arrangement are 4 on Form A and 12 on Form B from the Royal Meteoro-

logical Society, and 3 on Form A and 16 on Form B from the Scottish Meteorological Society. The stations from which they have been received are marked *M.* and *S.* respectively in the list of stations in Appendix II.

The stations of the Second Order for 1900 were distributed as follows :—

Stations.	No.	Stations.	No.
Scotland, N. ... ..	7	England, N.E. ... ..	10
" E. ... ..	8	" N.W. and N. Wales	8
" W. ... ..	9	" Midland Counties	12
Ireland, N. ... ..	4	" E. ... ..	6
" S. ... ..	5	" S. ... ..	6
Channel Islands ... ..	0	" S.W. and S. Wales	5

The Council have to regret the discontinuance during the year of the return of observations from the following stations : Chester (the Rev. J. C. Mitchell, B.D.), Currygrane, Edgeworthstown, Co. Longford (Mr. J. M. Wilson, M.A.), Edinburgh (Mr. R. C. Mossman, F.R.S.E.), Ladylaw (Mr. T. Wilson), Londonderry (Mr. J. Conroy), Rochester (Mr. W. H. Tingey, B.A.), and Tenby (Mr. R. J. Truscott for the Corporation). Mr. J. Conroy has been a valued correspondent of the Office for very many years, and though unable on account of advancing age to carry on the observations twice daily, he still contributes a return of daily observations for the Weekly Weather Report. The Tenby Corporation still supply sunshine records for the same publication.

On the other hand the Council are glad to report that normal returns of observations have been commenced from the Owens College Observatory, Whitworth Park, Manchester, which is in the charge of Professor A. Schuster, F.R.S.; and from the Gillibrand Observatory of the Darwen Corporation, which is in the charge of Mr. G. Mainland; and also that Mr. J. Smith Hill, B.A., Principal of the Agricultural College at Aspatria, near Carlisle, has established a normal station at that College, from which returns have been received since February.

*T. Telegraphic Reporting Stations.*—These have been already referred to in Part II. The observations from these stations for each month are repeated at the end of the month on a special form of return, from which the telegraphic reports can be corrected, if necessary, before being used for statistical purposes.

*G. Other Climatological Stations.*—A return of daily observations at 9 a.m. at Machrihanish by Mr. J. Franklin Adams commenced from April, 1900, and a similar return from a station in the People's Park at Kingstown has been set on foot by Dr. J. B. Power, the Medical Officer of Health.

The Council, however, regret that the excellent returns from Cooper's Hill of observations at 9 a.m. and 3 p.m., which have been forwarded for many years by Professor H. McLeod, F.R.S., were discontinued at the close of the year.

*F. Weekly Weather Report Stations.*—Weekly returns for the Weekly Weather Report (*see* p. 33) are received from several Normal Climatological Stations as the letters in Column 6 of the Table of Stations will show. By the arrangement which has already been referred to the returns for 10 stations are forwarded weekly by the Royal Meteorological Society, and for 7 by the Scottish Meteorological Society.

A number of changes have taken place in the stations belonging to this group in the course of the year. Observations at Colley Weston by Miss Tasker replace those at Ketton Hall, which were supplied by the late Mr. Fred Coventry. Those at Swarraton (by Rev. W. L. W. Eyre, M.A.) are forwarded by the Royal Meteorological Society in place of observations previously received through the Society from Cranley, in the same district. Archdeacon Wynne, of Killarney, who has found himself obliged to discontinue his observations, has transferred his instruments to Dr. E. W. Griffin, the Medical Officer of the District Lunatic Asylum, and thus the returns from that station are continued with but little change of position, and with the intermission of only a few weeks. The Rev. V. F. Willson, who has maintained for some years a normal station at Fulbeck (Lincolnshire), is now sending a weekly return as well, and Messrs. John Summers & Sons have commenced a weekly return from Hawarden Bridge, Chester.

The telegraphic reports from Bath (*see* p. 9) furnish an additional set of returns for the weekly report.

*R. Rainfall Stations.*—There have also been a considerable number of changes in these stations. Returns from Burford, Dolmelynllyn, Market Rasen, Barvin, Tixover Hall, and Quin have ceased, and others have been commenced at Hastings (St. Helen's Crescent), Mareham le Fen, New Church (Mon.), Newton Hall, and Rauceby (Lincolnshire); while Mr. G. E. Elland's observations, which formerly came from Wealdstone, are now made for Watford.

Sea  
Temperature  
Stations.

*W. Sea Temperature Stations.*—Daily observations of the temperature of the sea-surface have been taken since 1879 at a number of stations. The observations for the three years 1879–1882 were used in the preparation of the “Meteorological Atlas,” published in 1883.

The stations from which returns were received during the past year comprised 16 English and 3 Irish Light Vessels, 4 Coast-guard Stations in England, 12 in Scotland, and 12 in Ireland, together with stations at Holyhead, St. Ann's Head, and Scilly. Twelve of these stations are situated on the Atlantic seaboard, 10 in the Irish Sea and North Channel, 2 in St. George's Channel, 3 in the Bristol Channel, 7 in the English Channel, and 16 in the North Sea.

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 are regularly inspected, while the others are visited as opportunity offers. The stations of Class II., 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. The rest of the stations are visited from time to time by the Inspectors of the Office. During the past year Dr. Buchan visited the Scottish Stations, Mr. W. N. Shaw, Secretary, took charge of the inspection of the stations in Ireland and the North West of England, and North Wales. The other parts of England and Wales were visited by Mr. F. Gaster, Mr. R. H. Curtis, Mr. J. A. Curtis and Mr. F. J. Brodie. The inspection of the principal observatories and of some of the anemographic stations was carried out by Messrs. T. W. Baker and E. G. Constable, of Kew Observatory. In the list of stations given in Appendix II., p. 56, the year when each station was last visited by an Inspector from the Office, is indicated by the figures in the seventh column.

Extracts from the reports of the Inspectors upon the self-recording instruments are given in Appendix IX., p. 89. A report on the instruments maintained by the Council at the Kew Observatory, in the charge of the National Physical Laboratory, is also given, together with some notes on the work of the Ben Nevis Observatories, forwarded by Sir A. Mitchell in reply to a request from the Council.

The whole list of stations sending returns to the Office during the year 1900-1901 may be summarised as follows :—

Number and Description.						Class.	Nature of the Information received. (See p. 55).
8	Observatories	...	...	...	...	I.	A.
16	Anemograph stations	...	...	...	...	—	B.
17	Barograph stations	...	...	...	...	—	C.
82	Sunshine stations	...	...	...	...	—	S.
80	Second Order stations	...	...	...	...	II.	D.
28	Telegraphic stations	...	...	...	...	III.	T.
102	Weekly Weather Report stations	...	...	...	...	III.	F.
	Climatological stations	...	...	...	...	III.	G.
	Rainfall stations	...	...	...	...	III.	R.
50	Sea Temperature stations	...	...	...	...	—	W.

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 Part VI., p. 33, are examined, checked and prepared for the press; the information is also utilised in other ways.

Use of the information from climatological stations.

Weekly results of the Temperature and Rainfall Observations are prepared and regularly supplied to the Registrar-General for Ireland from 10 of the Irish stations for use in his "Weekly Return of Births and Deaths," while a full table of Monthly and Quarterly results from seven stations is prepared in the Office, and supplied to him at the beginning of each quarter for publication in his "Quarterly Return of Marriages, Births, and Deaths."

Reports supplied to Registrar-General for Ireland.



**Rainfall observations.** Copies of observations at twenty-four Rainfall Stations have also been sent for the use of the British Rainfall Organisation to Dr. H. R. Mill and Mr. Sowerby Wallis, who have succeeded the late Mr. G. J. Symons in the management of that Organisation.

**Ben Nevis observations.** A transcript of Ben Nevis observations has been sent to Dr. Hergesell at his request in connexion with the International Aeronautical Investigation.

**Miscellaneous inquiries.** The information is also used to furnish replies to inquiries. During the year upwards of sixty requests for statistical information of more or less extensive character have been dealt with. Some of these have been required for use in scientific inquiries, but the greater number have been from firms of Solicitors and have reference to disputed claims for damages and other legal actions and ask principally for statistics of winds and fogs.

Among the inquiries of the former kind which have been dealt with during the past year may be mentioned the following :—

From the Royal Commission on Salmon Fisheries and from Dr. D. Noel Paton as to the Rainfall over England and Wales in the 10 years 1881–1890 :

From the Irish Department of Agriculture as to ground frosts reported at Irish Stations in the ten years from 1890 for use in an inquiry concerning flax cultivation ;

From the Marine Biological Association, Plymouth (through Mr. Walter Garstang), as to the mean monthly temperatures of the sea to the West of the British Isles, and as to the average temperature of the British Isles for each quarter from 1854.

#### FOREIGN AND COLONIAL STATIONS.

A list of documents received from Foreign and Colonial Stations in the course of the year is given in Appendix II., p. 65.

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. Six are in the Bahamas, of which five send in lighthouse registers. Three are in the West Indies. Ten are on the West Coast of Africa. Three are on the Mediterranean Coast. Two are in Central or South America. One in the Falkland Islands, one at Teneriffe, and one in Madagascar.

The returns from distant stations have been largely used for the compilation of meteorological information for the Admiralty. (*See* p. 13).

**Uganda observations.** Observations chiefly relating to the Lake Levels and Rainfall of several stations on the Victoria Nyanza have been received from the Foreign Office and copies will be supplied to the Royal Geographical Society and Mr. E. Ravenstein for publication.

## PART IV.

## 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. Each work, immediately on receipt, is entered on a card under the author's name, and is subsequently entered in a classified catalogue under the subject to which it refers. The Library consists at present of about 16,000 volumes and pamphlets.

Appendix XI., p. 117, gives a list of the additions to the Library during the year. These amounted to 450 books and pamphlets.

The series of daily weather maps, which already included weather charts for Japan in the far East, for the United States and for Mexico in the Western and for New South Wales in the Southern Hemisphere, has been amplified by the receipt of charts from the Meteorological Services of Canada, Saxony, Denmark and Holland. The most important additions to the library acquired by purchase have been the daily synoptic charts of the North Atlantic and adjacent countries, for the year from December 1894 to November 1895, prepared by the German and Danish Meteorological Authorities jointly, and three important volumes giving an account of Scientific Balloon Voyages from Berlin prepared by Dr. Assmann and Dr. Berson for the Berlin Aeronautical Society.

Among the presents to the Library is included a magnificent Climatological Atlas of the Russian Empire, the publication of which constitutes the memorial of the 50th anniversary of the opening of Nicholas Central Physical Observatory at St. Petersburg. A History of the Observatory accompanied the Atlas. A Climatological Album of Roumania has also been received from Professor S. C. Hepites.

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, and in particular Mr. F. W. Harmer, for meteorological information in connexion with a paper on the Meteorology of the glacial epochs for the Geological Society, and Sir Norman Lockyer, K.C.B., in connexion with his researches upon the periodicity of rainfall in Equatorial and Southern latitudes.

## PART V.

## MISCELLANEOUS INVESTIGATIONS.

*Atmospheric Electricity.*—In continuation of the inquiry into the records of the Electrograph at Kew, Mr. C. T. R. Wilson, F.R.S., has contributed to the Royal Society a paper on the "Ionization of Atmospheric Air" which has been published in the Proceedings of Atmospheric Electricity.

the Society (Proc. Roy. Soc., Vol. 68, p. 151). This paper concludes the inquiry for the present. Mr. Wilson summarises the results of the investigation in a report sent to the Council at the end of January, which is printed in Appendix X., p. 114.

Seasonal  
variation of  
temperature.

With the assistance of Mr. R. Waley Cohen, B.A., the Secretary has initiated an inquiry into the seasonal variation of the temperature of the air of the British Isles, as shown by the daily means for 25 years, computed in the Office from the hourly readings of temperature at four of the Observatories connected with the Office. The inquiry is directed towards tracing the connexion between certain peculiarities disclosed by the harmonic analysis of the curves of seasonal variation of temperature and the occurrence of winds from different points of the compass and the temperatures associated therewith. The results will be embodied in a paper in due course.

Atlantic  
weather,  
1898-9.

The investigation of the circumstances associated with the exceptional winter weather of 1898-99, an account of which appeared as an introduction to the publication of daily Charts illustrating that period, proved to be of considerable interest and importance. It was accordingly thought desirable that Captain Campbell Hepworth, Marine Superintendent, who drew up the introduction, should read a paper on the subject before the British Association at Bradford. An abstract of the paper appears in the Report of the Association.

Miscella-  
neous.

Mr. R. H. Curtis, who has charge of the sunshine records sent to the Office, and has given a great amount of attention to the subject, read a paper on an improved sunshine recorder before the Royal Meteorological Society. The recorders sent out from the Office since the introduction of this improvement have been arranged in the manner described in that paper.

The comparison of anemometers at Holyhead has been continued.

The reduction and tabulation for the Royal Society of the observations of the Southern Cross Antarctic Expedition have already been referred to, as likewise the preparation of data books from the logs of ships south of latitude 40° S. for the use of the Antarctic Expedition.

The Council have thought it desirable to draw up a brief statement of the conspicuous features of the weather during the year 1900 for the purposes of future reference, and this is printed in Appendix VIII.

Among the incidents is included the thunderstorm which broke over London in the afternoon of July 27. This storm moved northward from the Bay of Biscay, contrary to the anticipation of the Office, and in consequence the Official forecast failed, and attention was called to the fact by a letter in the *Times*. A diagram has been prepared showing all the continuous records that could be collected from various self-recording instruments, and the diagram is reproduced on p. 81.

International  
co-operation  
for Balloon  
Research.

In connexion with the balloon ascents, arranged by international agreement, Prof. Hergesell, of Strassburg, Chairman of the International Sub-committee for Aeronautics, requested the co-operation



of the Council in the collection of cloud observations for the day preceding and the day following, as well as for the day of each ascent. The following observatories expressed their willingness to co-operate in this matter : Greenwich, Kew, Oxford, Glasgow, Rousdon, Valencia, Falmouth, Liverpool, Stonyhurst and Aberdeen. They forward to the Office observations of clouds for the three appropriate days of each month, for transmission to Prof. Hergesell, who undertakes the necessary arrangements for collating the results.

The Council have given permission to Mr. F. J. Brodie to use unpublished data belonging to the Office for the compilation of a paper on the Gales of the British Islands, for presentation to the Royal Meteorological Society.

## PART VI.

### PUBLICATIONS.

The Daily Weather Report, embodying the reports obtained from the Telegraphic Reporting Stations and some additional information, as indicated on pp. 9 and 15, has been regularly issued. Daily  
Weather  
Report.

The number of subscribers has been about 170.

Supplements shewing the mean monthly values for 25 years of the several elements at the Reporting Stations have been issued, and the means for thirty years have been prepared. The latter for the first six months of the year have been issued.

Applications for free copies of this and other publications from the University of Birmingham and from the Edinburgh Museum of Science and Art have been granted

The Weekly Weather Report is based upon the observations furnished by the Telegraphic Reporting Stations, supplemented by those from a number of Third Order Stations, which are classified under the heading F of p. 55, and it includes, also, others from a number of additional Sunshine Stations. It is issued every Thursday, and gives a summary of the weather, in the week ending on the previous Saturday, for agricultural and sanitary purposes. Statistics as to the mean temperature, rainfall and sunshine for the week are given, and these are compared with the average values for a number of years. Statistics of "accumulated temperature" are also given. A brief explanation of the mode of compilation of these statistics is given in Appendix II, p. 48. Weekly  
Weather  
Report.

Each week's report contains, also, three weather maps, and a weather summary, which enable the reader to follow the changes of weather over the whole of Europe for each day, and its relation to barometric changes. The weekly reports have been regularly issued.

The Monthly Supplements have also been continued in the same form as hitherto, and contain monthly summaries in a form similar to the monthly summaries for Stations of the Second Order, together with charts of the distribution of pressure and wind, temperature, rainfall, and the paths of cyclonic depressions. Monthly,  
Quarterly,  
and Annual  
Supplements

Quinquennial  
Supplement.

The usual annual and quarterly summaries (*see* p. 49) have been issued and the quinquennial statistical summaries have been prepared and issued as supplements to the Volume for 1900.

First Order  
Stations.

*Observatories of the First Order.*—After careful examination of the curves traced by the instruments, and of the measurements of the curves made at the observatories, the readings for each hour are tabulated, and from them a volume is prepared giving the means of the readings for the several hours, of barometric pressure, temperature, wind, rainfall, and sunshine, for each consecutive group of five days, for the months, and for the year.

The form adopted for the presentation of these observations has been varied from time to time. For some years the curves themselves were reproduced. From 1874 to 1886 the hourly readings at the several observatories were published; but from 1887 the plan now in use, of giving the five-day means, was adopted, while in the volume for 1895, at the suggestion of the International Conference at Paris, the hourly readings at Kew and Valencia were included in addition, and this was continued in the volume for 1897 prepared in the current year.

Means of the meteorological elements for each hour of the day over a long period of years are also occasionally prepared; and the harmonic components are calculated for the curve representing the diurnal variation of pressure and temperature for the hourly means thus obtained for the several months over which the observations extend.

Second  
Order  
Stations.

*Second Order 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 "*Observations at Stations of the Second Order*," of which twenty-three volumes have been issued, the last being that for 1897.

The volume for 1897 is, as regards the "A" list, the same as that for 1896, but from the "B" list two stations disappear, namely, Arley Cottage, Co. Cavan, and Killarney, while five stations are added, namely, Lairg, Sutherlandshire, Manchester (City), Edgbaston, Lowestoft, and Rede Court, Rochester, a net addition therefore of three stations.

## Pilot Charts.

*Publications on Marine Meteorology.*—The issue of Monthly Pilot Charts for the North Atlantic and Mediterranean (*see* p. 13) commenced with the issue, shortly after the middle of March, of the number for April.

Winter of  
1898-9.

*Occasional Publications.*—The charts illustrating the weather in the North Atlantic in the winter of 1898-9, with an introduction describing the meteorological conditions on the Eastern and Western shores of the ocean during the period, were published in March, 1901.

A complete list of the publications which have been issued by the Office is given in Appendix XIV., p. 148, and in Appendix XIII., p. 142, 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.

In the autumn the Council issued the English version of the *Report of Proceedings of the St. Petersburg Meeting of the International Committee* in 1899. The most conspicuous feature of the publication is a long report by M. Violle upon the measurement of solar radiation; meteorological work with kites and balloons receives its share of attention, and nearly all subjects of recent meteorological investigation are touched upon.

Report of  
International  
Committee.

## PART VII.

## FINANCE.

Appendix XII., p. 141, shows the receipts and payments during the year ending 31st March 1901. The amount voted by Parliament was 15,300*l.*, as in the previous year, and the miscellaneous receipts amounted to £1,277 5*s.* 2*d.* In addition to these amounts the sum of £80 was received from the Government Grant Committee for the continuation of Mr. Wilson's researches on atmospheric electricity.

The following abstract of expenditure shows the true net charge against the Parliamentary grants of this and the preceding year, together with the increase or decrease in 1900-1, as compared with the previous year :—

NET EXPENDITURE.	1899-1900.	1900-1.	Increase.	Decrease.
GENERAL ADMINISTRATION :				
<i>Payment of Council and Secretary ...</i>	£ s. d. 1,721 7 2	£ s. d. 1,545 11 0	£ s. d. —	£ s. d. 175 16 2
<i>Office ...</i>	909 13 6	912 9 0	2 15 6	—
<i>Rent, Fuel, and Lighting</i>	726 11 7	736 5 2	9 13 7	—
<i>Alterations to premises and contingencies ...</i>	262 14 0	331 16 1	69 2 1	—
<i>Expenses incidental to International Meteorological Congress ...</i>	3 5 0	26 5 11	23 0 11	—
SPECIAL RESEARCHES ...	900 5 4	803 14 3	—	96 11 1
LAND METEOROLOGY ...	3,298 4 8	3,399 7 4	101 2 8	—
WEATHER INFORMATION ...	3,477 12 10	3,488 10 7	10 17 9	—
INSPECTIONS ...	434 11 4	401 10 2	—	33 1 2
OCEAN METEOROLOGY ...	2,276 4 3	1,916 19 10	—	359 4 5
SUPERANNUATION ...	177 6 8	2,082 0 0	1,904 13 4	—
Total ...	£ 14,187 16 4	15,644 9 4	2,121 5 10	664 12 10

NOTES.—The increase under "Superannuation" is due to the retirement of the late Secretary and the purchase of an annuity on the life of a retiring clerk. The sum of £1,599 17*s.* 11*d.* was paid to the Post Office during the year 1900-1 on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires, &c.

Chairman.



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NET EXPENDITURE.	1899-1900.	1900-1.	Increase.	Decrease.
GENERAL ADMINISTRATION:				
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Payment of Council and Secretary ... ..	1,721 7 2	1,545 11 0	—	175 16 2
Office ... ..	909 13 6	912 9 0	2 15 6	—
Rent, Fuel, and Lighting	726 11 7	736 5 2	9 13 7	—
Alterations to premises and contingencies ...	262 14 0	331 16 1	69 2 1	—
Expenses incidental to International Meteorological Congress ...	3 5 0	26 5 11	23 0 11	—
SPECIAL RESEARCHES ...	900 5 4	803 14 3	—	96 11 1
LAND METEOROLOGY ...	3,298 4 8	3,399 7 4	101 2 8	—
WEATHER INFORMATION ...	3,477 12 10	3,488 10 7	10 17 9	—
INSPECTIONS ...	434 11 4	401 10 2	—	33 1 2
OCEAN METEOROLOGY ...	2,276 4 3	1,916 19 10	—	359 4 5
SUPERANNUATION ...	177 6 8	2,682 0 0	1,904 13 4	—
Total ... ..	14,187 16 4	15,644 9 4	2,121 5 10	664 12 10

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Chairman.

## APPENDIX.

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### APPENDIX I.

#### CONSTITUTION OF COUNCIL.

**From the ROYAL SOCIETY to the METEOROLOGICAL COUNCIL.**

The Royal Society,  
Burlington House, W.,  
February 19th, 1900.

DEAR SIR RICHARD,

WE are directed by the President and Council of the Royal Society to inform you that your letter of February 14th has been considered by them.

The President and Council note that you state that the additional member of the Meteorological Council is required only to complete the legal number of members of the Corporation, and that an addition to their number is not desired for other reasons by the members of the Meteorological Council. Further, the President and Council are informed that the legal obligation to appoint a seventh member of the Corporation is not operative for six months from the time at which the number of members falls below seven. They are, therefore, of opinion that it will be best to defer appointing the additional member until they have had an opportunity of discussing further with the Meteorological Council what is the best course to be pursued.

To attain this end it was resolved to appoint a Committee, consisting of the officers, two members to be nominated by the Meteorological Council, the Astronomer Royal, Professor Schuster, Professor J. J. Thomson, Mr. G. J. Symons, and Mr. W. N. Shaw (if not nominated by the Meteorological Council), to consider whether any changes in the constitution and duties of the Meteorological Council are desirable.

We are, therefore, to ask that the Meteorological Council will be good enough to nominate two members of the Committee at an early date, in order that the Committee may meet as soon as possible.

We are, &c.,

M. FOSTER,  
ARTHUR W. RÜCKER,  
Secretaries, R.S.

Lient.-General Sir R. Strachey, G.C.S.I., F.R.S.,  
Chairman of the Meteorological Council,

From the ROYAL SOCIETY to the METEOROLOGICAL COUNCIL.

The Royal Society,  
3rd November, 1900.

DEAR SIR,

I AM directed to forward for the information of the Meteorological Council the enclosed copy of a scheme for the reconstitution of the Meteorological Council, which has been approved by the President and Council of the Royal Society; and to say that the President and Council are prepared, upon being called upon to do so, to appoint persons to form the Meteorological Council in accordance with Section II. of the scheme under reference.

I am, &c.

ROBERT HARRISON,

The Secretary to the  
Meteorological Council.

Assist. Sec., Royal Society.

I.

In place of Articles 4, 5, 6, 7, and 8 of the present Articles of Association of the Meteorological Council the following shall be substituted :—

4. *Admission of Members.*—The Association shall consist of the Meteorological Council—a body of seven or more persons, not exceeding ten in all, of whom one is the Hydrographer of the Admiralty for the time being, and the others are nominated by the President and Council of the Royal Society.

5. *Management of the Association.*—The business of the Association shall be managed by a body of Directors, of whom the Hydrographer to the Admiralty shall be one. The President and Council of the Royal Society shall from time to time appoint as many other members of the Association as they may think fit, and for such periods as they may think fit, to be such Directors.

6. *Nomination of Chairman.*—The Chairman shall be one of the Directors, and shall be appointed from time to time by the President and Council of the Royal Society.

7. *Appointment of Secretary.*—The Secretary shall be appointed from time to time by the Directors, and may be one of the Directors.

8. *Meetings, Proceedings, &c.*—A General Meeting of the Association shall be held at least once in each year, in accordance with Section 49 of the Companies Act of 1862. The Meetings of the Directors shall be held as the Directors shall appoint, and their proceedings shall be regularly recorded and printed. The Association shall submit, yearly, a Report of its Proceedings to the Royal Society for presentation to Parliament.



## II.

The President and Council of the Royal Society shall approve the proposed alteration of the Articles, and shall, in accordance therewith, appoint seven or more persons, not exceeding ten in all, to form the Meteorological Council, and shall, in the first instance, appoint four members of the Association, and four only, besides the Hydrographer to the Admiralty, to be Directors, and shall appoint one of the Directors to be Chairman; and shall resolve that the number of Directors shall not be subsequently changed without consultation with the Meteorological Council. If the Meteorological Council object to any proposed change, no such change shall be effected without the approval of the Treasury.

## III.

The Directors shall receive a remuneration for their services, but the total sum allotted yearly for this purpose shall not exceed £1,000, the amount authorised by the Treasury. The apportionment of this sum shall be regulated by a Resolution of a General Meeting of the Association, subject to the approval of the President and Council of the Royal Society. Provided always that (1) the yearly sum allotted to the Chairman shall not exceed £300; (2) the yearly sum allotted to any other Director shall not exceed £125 with the addition of travelling expenses; (3) the Hydrographer to the Admiralty shall be remunerated by a yearly payment proportionate to the number of his attendances at the Meetings of the Directors.

## ARTICLES OF ASSOCIATION.

(Passed at an Extraordinary General Meeting of the Meteorological Council, held on November 21st, 1900; confirmed, December 19th, 1900. Registered, 21st December, 1900).

(1.) For the purposes of registration the number of the Members of the Association is declared not to exceed ten.

(2.) These Articles shall be construed with reference to the provisions of the Companies' Act, 1862, and the Companies' Act, 1867, and terms used in these Articles shall be taken as having the same respective meanings as they have when used in these Acts.

(3.) The Association is established under the authority of the Lords Commissioners of the Treasury, for the purposes expressed in the Memorandum of Association.

(4.) *Admission of Members.*—The Association shall consist of the Meteorological Council—a body of seven or more persons, not exceeding ten in all, of whom one is the Hydrographer to the Admiralty for the time being, and the others are nominated by the President and Council of the Royal Society.

(5.) *Management of the Association.*—The business of the Association shall be managed by a body of Directors, of whom the Hydrographer to the Admiralty shall be one. The President and Council of the Royal Society shall from time to time appoint as many other Members of the Association as they may think fit, and for such periods as they may think fit, to be such Directors.

(6.) *Nomination of Chairman.*—The Chairman shall be one of the Directors, and shall be appointed from time to time by the President and Council of the Royal Society.

(7.) *Appointment of Secretary.*—The Secretary shall be appointed from time to time by the Directors, and may be one of the Directors.

(8.) *Meetings, Proceedings, &c.*—A General Meeting of the Association shall be held at least once in each year, in accordance with Section 49 of the Companies' Act of 1862. The meetings of the Directors shall be held as the Directors shall appoint, and their proceedings shall be regularly recorded and printed. The Association shall submit, yearly, a report of its proceedings to the Royal Society for presentation to Parliament.

(9.) *Accounts, Audit.*—The Annual Estimates shall be submitted for approval to the Treasury, and the accounts, after examination by two members of the Association, shall be sent to the Treasury for audit.

(10.) A notice may be served by the Association upon any Member, either personally or by sending it through the post as a prepaid letter, addressed to such Member, at his registered place of abode. Any notice, if served by post, shall be deemed to have been served at the time when the letter containing the same would be delivered in the ordinary course of the post, and in proving such service it shall be sufficient to prove that the letter containing the notice was properly addressed and put into the Post Office.

(11.) *Temporary Provision.*—Until the appointment of Directors by the Royal Society under the provisions of Article 5 shall have been made, the business of the Association shall continue to be managed by the Members of the Meteorological Council as heretofore constituted.

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From the ROYAL SOCIETY to the METEOROLOGICAL COUNCIL.

The Royal Society,

March 26th, 1901.

SIR,

I AM directed to make known to you the following decisions of the President and Council of the Royal Society in regard to the Meteorological Council and Association.

The President and Council accept the resignation of Mr. Francis Galton as a member of Council, and, in doing so, wish to record their appreciation of his long and valuable services.

They nominate Sir Richard Strachey, Professor G. H. Darwin, Dr. Buchan, and Mr. Shaw to be, with the Hydrographer to the Admiralty, the Directors. They further nominate General Sir Richard Strachey as Chairman.

They have come to the conclusion that it will be desirable to appoint five other persons to bring up the number of members of the Association to ten, and for that purpose nominate as members the Earl of Rosse, Mr. J. Y. Buchanan, for a period of five years, and Mr. Dines, Professor Schuster, and Dr. R. H. Scott, for a period of three years.

They take it for granted that these additional five members will not be often required to attend meetings of the Council; possibly one or two meetings a year, in addition to the statutory annual meeting, will be all that is desirable. And they are of opinion that these gentlemen should not receive any honorarium for their attendance. Indeed, they have reason to believe that their acceptance of a honorarium would present legal difficulties.

I am, &c.,

M. FOSTER,

Secretary, R.S.

The Secretary,

The Meteorological Council.

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## APPENDIX II.

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

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

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#### COUNCIL.

##### *Directors :*

Lieutenant-General Sir Richard Strachey, R.E., G.C.S.I., 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., D.Sc., F.R.S.  
Rear-Admiral Sir William J. L. Wharton, K.C.B., F.R.S., Hydro-  
grapher to the Admiralty.  
Mr. William Napier Shaw, M.A., 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., Pres. Roy. Met. Soc.  
Professor Arthur Schuster, Ph.D., F.R.S., F.R.A.S.  
Mr. Robert Henry Scott, M.A., D.Sc., F.R.S.

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The Meteorological Office was established in the year 1867 under the control of a Committee appointed by the Royal Society, at the instance of the Board of Trade, the Admiralty, and the Treasury, to take over the duties of the Meteorological Department of the Board of Trade, which had been established in 1854.

The Office was accordingly charged with the duty of collecting meteorological reports by telegraph from stations in the British Isles and their immediate neighbourhood, with a view to the issue of storm warnings and forecasts of weather; of collecting for public use statistics about the weather from land stations in the British Isles and elsewhere, as well as from ships of the Royal Navy and the Merchant Service: and of promoting the practical applications of the science of meteorology by special researches.

A parliamentary grant was assigned for the maintenance of the Office. Changes have been made from time to time in the arrangements, and the control is now vested in a body of Directors appointed by the Royal Society.

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.

#### A. TELEGRAPHIC INFORMATION.

##### *Daily Weather Reports, Forecasts and Storm Warnings.*

Daily  
information  
received.

Between 8.30 a.m. and 10 a.m. telegraphic messages are received daily, reporting meteorological observations at 25 stations (*see* list of stations, p. 55) in the British Isles, chiefly on the coast, and at 29 stations 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.

These reports are supplemented by telegraphic reports from the Azores, through the courtesy of the Portuguese Government, 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.

The Daily Weather Report may be obtained on payment at the Meteorological Office of a subscription (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 at Messrs. W. H. Smith & Son's railway bookstalls at the following terminus stations :—Victoria, Charing Cross, King's Cross, St. Pancras, Euston.

Subscribers for the Daily Weather Report receive monthly lists of "Corrections and Additions," and occasional supplements giving statistical meteorological results for the stations sending daily telegraphic reports.

Special advance copies of the descriptive remarks on the state of the weather and the forecasts, based upon the morning or evening observations, are prepared at 11 a.m. and 7.30 p.m. respectively, and are supplied gratis to the representative of any newspaper or press agency calling for them at the Office at the hours named.

Reports for the Press.

As far as practicable the Council 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 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.

Forecasts.

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.

Forecasts for separate districts, and other extracts from the daily Reports.



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



Inquiries by  
telegraph.

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.

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.

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 additional charge of 3*d.* per telegram for a forecast for a single district, and 6*d.* for two or more districts.

Harvest  
forecasts.

The Council have made arrangements for a special service of afternoon reports during the season of the Hay and Corn Harvests (June 1st to September 30th), whereby they are enabled to issue a special series of forecasts daily (Sundays excepted) at 3.30 p.m. The forecasts for any district are supplied by telegraph to agriculturalists 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 Council, 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.

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 undertake to supply the lanterns. In all cases the local authorities must undertake the charges incidental to the hoisting of the signal, such as flagstaff and gear, oil, &c., and also as to the keeping of the apparatus in repair, painting, &c.

The following is a list of the stations to which storm-warning telegrams are sent :—

NORTHERN.	WESTERN.	SOUTHERN.	EASTERN.
SCOTLAND, N.E.	IRELAND, S.W.	ENGLAND, S.W.	ENGLAND, N.E.
Lerwick.	Tuskar L.H.	The Lizard.	Berwick-on-
Scalloway.	New Ross.	Falmouth.	Tweed.
Dunrossness.	Dunmore East.	Pendennis.	Cullercoats.
Sumburgh Hd. L.H.	Dungarvan.	Mevagissey.	Tynemouth.
Noup Head L.H.	Minehead L.H.	Mount Batten.	South Shields.
Stromness.	Youghal.	Plymouth.	Souter Point L.H.
Kirkwall.	Queenstown.	Devonport.	Sunderland.
Cantick Head L.H.	Cork.	Prawle Point.	Hartlepool.
Holborn Head.	Passage.	Teignmouth.	Middlesborough
Dunnet Head.	Kinsale.	Exmouth.	Redcar.
Wick.	Do. (Old Head).		Whitby.
Tarbet Ness L.H.	Galley Head L.H.		Filey.
Avoch.	Castletownshend.		Flamborough Hd.
Inverness.	Fastnet Rock L.H.		Bridlington.
Nairn.	Brow Head.		Hull.
Burghead.	Tralee.		Goole.
Lossiemouth.	Limerick.		Grimsby.
Buckie.	Loophead L.H.		Boston.
Port Knockie.	Galway.		
Cullen.			
Portsoy.	IRELAND, N.W.		
Banff.	Killybegs L.H.		
Fraserburgh.	Tory Island L.H.		
Peterhead.	Lough Swilly L.H.		
Aberdeen.	Rathmullan.		
Girdleness L.H.	Malin Head.		
	Portrush.		
	Port Ballintrae.		
	Ballycastle.		

[Continued.]

LIST OF STORM-WARNING STATIONS—*continued.*

NORTHERN.	WESTERN.	SOUTHERN.	EASTERN.
SCOTLAND, E.	IRISH SEA.	ENGLAND, S.	ENGLAND, E.
Stonehaven.	Belfast.	Guernsey.	Sutton Bridge.
Montrose.	Donaghadee.	St. Helier's	Lynn.
Scurdy Ness L.H.	Burr Point.	(Jersey).	Sheringham
Broughty Ferry.	Howth.	Gorey	Cromer.
Dundee.	Kingstown.	Portland L.H.	Great Yarmouth.
St. Andrews.	Pt. of Ayre (I. of M.)	Weymouth.	Southwold.
Anstruther.	Ramsey	Anvil Point L.H.	Orford Ness L.H.
Pittenweem.	Douglas	Poole.	Ipswich.
Buckhaven.	Castletown	Hurst Castle L.H.	Harwich.
Methil.	Silloth.	Southampton.	Gulfleet L.H.
Wemyss, West.	Maryport.	Hamble.	
Burntisland.	Workington.	Yarmouth.	
Grangemouth.	Whitehaven.	Cowes.	
Bo'ness.	Barrow.	Ryde.	
Granton.	Walney I. L.H.	St. Catherine's Pt.	
Newhaven.	Merecambe.	Portsmouth.	
Leith.	Fleetwood.	Littlehampton.	
Fisherrow.	Blackpool.	Brighton.	
Dunbar.	Lytham.	Newhaven.	
Cockburnspath.	Southport.		
St. Abb's Head.	Formby.		
Eyemouth.	Liverpool.		
	Runcorn.		
	Hoylake.		
	New Brighton.		
	Connah's Quay.	ENGLAND, S.E.	
SCOTLAND, N.W.	Penmaenmawr.	Beachy Head.	
Fair Isle L.H.	Port Penrhyn.	Eastbourne.	
C. Wrath L.H.	Point Lynas L.H.	Hastings.	
Stourhead L.H.	Skerries L.H.	Rye.	
Port of Ness.	Holyhead.	Sandgate.	
Stornoway.	South Stack L.H.	Folkestone.	
Island Glass L.H.	Caernarvon.	Dover.	
Portnaguairan.	Port Dinorwic.	Deal.	
	ST. GEORGE'S	Ramsgate.	
	CHANNEL.	Margate.	
	Aberystwyth.	Faversham.	
	Milford.	Sheerness.	
		Chatham.	
		Greenhithe.	
SCOTLAND, W.	BRISTOL CHANNEL.		
Glasgow.	Small's L.H.		
Greenock.	Caldy L.H.		
Rothsay.	Pembrey.		
Lamlash.	Llanelly.		
Carradale.	Swansea.		
Campbelton.	Briton Ferry.		
Mull of Cantire L.H.	Porthcawl.		
Rhuvaal L.H.	Nash L.H.		
Rhinn of Islay L.H.	Penarth.		
Ardrossan.	Cardiff		
Girvan.	(Bute Dock).		
Ballantrae.	Do. (Barry Dock).		
Cairn Ryan.	Newport.		
Corsewall Point	Weston-super-Mare.		
L.H.	Burnham.		
Mull of Galloway	Bridgewater.		
L.H.	Lundy Island.		
	Ilfracombe.		
	Bull Point L.H.		
	Barnstaple.		
	Appledore.		

*Continued*



LIST OF STORM-WARNING STATIONS—*continued*.

NORTHERN.	WESTERN.	SOUTHERN.	EASTERN.
	BRISTOL CHANNEL <i>—cont.</i> Hartland Pt. L.H. Boscastle. Port Isaac. Newquay. Hayle. Godrevy L.H. St. Ives. St. Sennen. Newlyn, West. Penzance. Scilly.		

## B. INFORMATION RECEIVED WEEKLY.

METEOROLOGICAL STATISTICS FOR AGRICULTURAL AND  
SANITARY PURPOSES.WEEKLY WEATHER REPORT, WITH MONTHLY AND ANNUAL  
APPENDICES.

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. 42), so that the area represented is much larger than that covered by the Daily Weather Report.

For the statistical summaries, the information from the 25 telegraphic reporting stations in the British Isles is supplemented by weekly returns of daily observations of maximum and minimum temperature and rainfall supplied by volunteer observers from 37 other stations, marked F in the list on pp. 56 to 61, and by a number of observations of duration of bright sunshine at stations marked S in the list, which brings up the number of stations making sunshine returns to 68. 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.

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.

The following are the rules for computing, from the observed maxima and minima, the accumulated temperature above or below 42° F. for a weekly period :—

1. Obtain the mean temperature, from the means of the seven observed maxima and minima, suitably corrected for non-periodic changes of temperature.

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

Conditions of Temperature.	To obtain the daily Accumulated Temperature.	
	Above 42° F.	Below 42° F.
If the minimum is <i>above</i> 42° F., or <i>equal</i> to 42° F.	Subtract 42° F. from the mean.	There is none.
If the minimum is <i>below</i> 42° F., but the mean for the day is <i>above</i> 42° F.	From the difference between the mean for the day and the minimum deduct the accumulated temperature below 42° F., calculated as stated in the next column.	The required quantity is the excess of 42° F. over the minimum, multiplied by the coefficient 0·4.
If the mean for the day is <i>below</i> 42° F., but the maximum is <i>above</i> 42° F.	The required quantity is the excess of the maximum over 42° F., multiplied by the coefficient 0·4.	From the difference between the mean for the day and the minimum deduct the accumulated temperature above 42° F., calculated as stated in the preceding column.
If the maximum is <i>below</i> 42° F., or <i>equal</i> to 42° F.	There is none.	Subtract the mean from 42° F.

In each of the above cases the result will be the average *daily* value, and must be multiplied by 7 in order to obtain the value for the whole week.

The coefficient varies with the duration of the period, and also with the base temperature.

The coefficient given in the second and third rules of the preceding table is for a weekly period, and for the base temperature  $42^{\circ}$  F. The following are its values for other base temperatures :— for  $32^{\circ}$  F., 0.4 ; for  $52^{\circ}$  F., 0.33 ; for  $62^{\circ}$  F., 0.25.\*

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

I. *A Monthly Supplement* giving (1) a climatological summary of the observations at the Telegraphic Reporting Stations; (2) a summary of maximum and minimum temperature, rainfall, and sunshine at the additional stations which furnish weekly returns. In the case of instrumental observations a comparison with the average is included in each of these summaries. (3) Four maps showing the average distribution of barometer and wind, the movements of barometric depressions, the distribution of mean temperature, and the distribution of rainfall.

II. *Appendix I.* Containing, (1) a quarterly and annual summary of rainfall and mean temperature of each district compared with the corresponding quarter or the whole year for each of the past ten 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 ;

(3) Monthly totals of rainfall, accumulated temperature and sunshine, together with progressive totals for each month of the quarter.

III. *Appendix II.* Weekly and progressive totals of rainy days, rainfall, accumulated temperature, and duration of sunshine with percentage of possible amount for the whole year for the several districts.

IV. *Appendix III.* Appears every fifth year and gives the weekly and progressive values of the different elements in each five years and for the whole period since 1881.

V. *Appendix IV.* 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.

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

Advance  
copy for the  
use of  
newspapers.

The Report is published every Thursday afternoon by the Publishers to the Stationery Office, Messrs. Eyre & Spottiswoode, East Harding Street, 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.

\* A full explanation of the principles on which these rules are based will be found in Appendix II. to the Quarterly Weather Report for 1878.



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

The Council maintains a fully equipped meteorological Observatory at Valencia (Cahirciveen), Co. Kerry, Ireland. They have also established instruments and subsidised the observatories at Kew, Falmouth, Aberdeen, and those at the foot and the summit of Ben Nevis. They receive in return curves and hourly tabulations of pressure, dry bulb temperature, wet bulb temperature, rainfall, direction and velocity of the wind, together with sunshine records from the five observatories first named, and copies of the hourly readings from the summit of Ben Nevis.

An annual volume embodying the results of the observations at the five Observatories is published in the usual way. That for 1897 has recently been issued, price 37s. 6d.

In return for an annual grant they also receive 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, Kingstown, Holyhead, North Shields, Scilly and Yarmouth.

Sunshine records are received from 64 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.

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.		Temperature.		Humidity.†	Wind.	Cloud.	Weather.	Rain.	Temp.	Extra Observations.	
Attached Thermometer		Uncorrected.		Corrected and reduced to 32° Fahr. at mean sea level.							
Dry bulb.		As read.		Corrected.							
Wet bulb.											
Dry bulb.											
Wet bulb.											
Dew point.											
Elastic Force of Aqueous Vapour.											
Percentage.											
Direction.											
Force 10-12.											
Amount at 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.											

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

An annual volume embodying the results of these observations is published ; that for 1897 has recently been issued, price 22s.

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 weekly readings of sea temperature.

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Barometer.	Temperature.		Humidity.†	Wind.	Cloud.	Weather.	Rain.	Temp.	Extra Observations.							
Attached Thermometer	Uncorrected.		Elastic Force of Aqueous Vapour 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.	Duration of Bright Sunshine.	Weather Symbols.	Remarks.
	Dry bulb.	As read.														
	Wet bulb.	Corrected.														
	Dry bulb.															
	Wet bulb.															
	Dew point.															

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

An annual volume embodying the results of these observations is published ; that for 1897 has recently been issued, price 22s.

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 weekly readings of sea temperature.



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, and are shown upon pp. 56 to 61.

Extracts from the returns thus collected, whether published in the manner described or in manuscript, are supplied to any person upon making written application to the Secretary, 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. The information 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 of the Council is required to attend in court to prove the statements contained in the extracts supplied.

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

Periodical returns are received by the Council from the stations in different British Colonies and dependencies, or in foreign countries, as follows :—Antigua, Bahamas (six stations), Barbados, Beyrout, Falkland Islands, Cape Spartel, Colon, Cyprus (six stations), Fort Rae,\* British Guiana, Gibraltar, Gold Coast (eight stations), Lagos, Madagascar, Port Natal,\* St. Helena (three stations), Sierra Leone, Sombrero, Teneriffe.

A list of the documents received from these stations is given on pp. 65 to 67.

Extracts from these returns are supplied upon the same terms as those from the returns of British Stations.

#### E.—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 His Majesty's ships, 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 can be obtained on application to the Office.

Commencing with April of the current year (1901), a series of Pilot Charts of the North Atlantic and Mediterranean is 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 6d. each. Copies can also be obtained from the Publishers to the Stationery Office at the price of 5s. for an annual series of 12 charts, or 6d. for each chart, in addition to the cost of transmission.

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\* Observations from these Stations are exceptional.



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.

#### F.—THE LIBRARY.

In return for copies of publications issued by the Council the Office receives the weather reports and other publications of the official meteorological organisations of the world and of many private organisations.

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.

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

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

- (1.) To the Ships of the Royal Navy.
- (2.) To the Captains of Merchant vessels who undertake to keep a Meteorological log during their voyage and forward it to the Office.
- (3.) To the Telegraphic Reporting Stations in the British Isles.
- (4.) To the First Class Observatories in connexion with the Office, and
- (5.) To a few Coast Stations in less frequented parts of the world where observations are deemed to be specially desirable.

The Council are prepared to supply, at a cost of 5 per cent. in addition to their contract prices and the cost of carriage, trustworthy instruments 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 Council 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.

A book of "Instructions in the use of Meteorological Instruments" has been prepared in the Office, and is sold by Messrs. Eyre and Spottiswoode, East Harding Street, E.C., and the other agents for the sale of Stationery Office publications, price 2s. 6d. A new edition of this publication is now being prepared.

The supply of instruments to His Majesty's ships is conducted through the Admiralty. The officers of the Mercantile Marine are supplied either directly from the Office or through the following agents :—

Cardiff—T. L. Ainsley, Bute Dock.  
 Dundee—Captain John McGlashan, 33, Dock Street.  
 Glasgow—Messrs. D. McGregor & Co., 37 & 38, Clyde Place.  
 Greenock—Messrs. D. McGregor & Co., 32, Brymner Street.  
 Hull—Messrs. Castle & Co., Commercial Road.  
 Liverpool—Messrs. D. McGregor & Co., 39, South Castle Street.  
 Southampton—Captain D. Forbes, 169, High Street.

For the supply of instruments on commission for observers, or for Distant Coast Stations, application should be made to the Office.

#### FISHERY BAROMETERS.

The Council have been in the habit of supplying 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 for 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 PLACES supplied with FISHERY BAROMETERS.

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

*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, Findon, 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, West Hartlepool, Staithes, Scarborough, Filey, Flamborough, Bridlington Quay, Withernsea, Hull, Lynn (2), Wells, Gorleston, Lowestoft, Orford Haven, Felixstowe, 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, Budleigh Salterton,

Exmouth, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscatho, Penryn, Durgan, Porthallow, Falmouth, Coverack, Newlyn (2), Mousehole, Penberth, Porth Guarra.

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

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

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

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

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

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

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

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

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

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

*Hebrides.*—Stornoway, Portnaguran, Obb, Valtos, Carloway, Ness, Berneray, Marvaig.



**LIST of STATIONS in the BRITISH ISLANDS from which INFORMATION has been received at the METEOROLOGICAL OFFICE during the Year ended March 31st, 1901.**

The Stations marked “S” are in connexion with the Scottish Meteorological Society, and those marked “M” are in connexion with 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 sixth column, as follows:—

- A.—Continuous records of pressure, temperature, wind, sunshine, and rain, with eye observations of the amount, form, and motion of the clouds, and notes on the weather. (Observatories.)
- B.—Continuous record of the direction and velocity (or force) of the wind. (Anemographic Stations.)
- C.—Continuous record of pressure. (Barographic Stations.)
- D.—Monthly sheets, containing the regular observations at 9 a.m. and 9 p.m. each day, local time, of pressure, temperature (dry bulb and wet bulb), wind, cloud, and weather, with the daily maximum and minimum of temperature, the daily rainfall, and general remarks on the weather. (Second Order Stations.)
- E.—Monthly means and summaries of observations taken at 9 a.m. and 9 p.m. each day as above. (Second Order Stations.)
- F.—The 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.”
- G.—Observations of the same kind as at Second Order Stations, but either—(a) less full, (b) taken only once daily, (c) taken at hours other than 9 a.m. and 9 p.m. (Third Order Stations.)
- R.—Monthly sheets containing the daily observations of the amount of rainfall, with remarks on the weather. (Third Order Stations.)
- S.—Continuous record of bright sunshine. (Sunshine Stations.)
- T.—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.” (Telegraphic Stations.)
- W.—Daily observations of the temperature of the sea water. (Sea Temperature Stations.)

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Year of last Inspec- tion.
Aberdeen Observatory ..	57 10	2 6 W.	40	Prof. G. Niven, F.R.S.	A. T. C.	99
" Cove Bay ..	57 9	2 5 "	—	Coastguard ..	W.	—
Aberdovey ..	52 33	4 4 "	—	John Edwards ..	S.	—
Adaro ..	52 33	8 47 "	—	W. Bowles ..	R.	—
Alnwick Castle ..	55 25	1 43 "	210	Humphry Wiliams, for the Duke of Northum- berland.	B. F.	00
Ampleforth ..	54 12	1 5 "	349	Rev. J. B. McLaughlin, B.A., O.S.B.	D.	00
Ardross Castle, N.B. ..	57 45	4 21 "	449	W. Minty ..	R.	—
Arlington Court (Barnstaple) ..	51 8	3 58 "	613	Lady Chichester ..	F.	99
Armagh Observatory ..	54 21	6 39 "	196	J. L. E. Dreyer, Ph.D.	B.D.F.S.	00
Arran, North, Galway ..	53 6	9 30 "	—	Coastguard ..	G. W.	—
Aspatia ..	54 46	3 21 "	250	J. Smith Hill, B.Sc.	D.	—
Aspley Guise, Beds. ..	52 1	0 38 "	410	E. E. Dymond ..	S.	—
Aysgarth, Yorks ..	54 18	1 58 "	646	Rev. F. W. Stow, M.A.	D.	99
Bahama Bank Lightship ..	54 20	4 13 "	—	Light-keepers ..	W.	—
Ballantrae, Ayrshire ..	55 6	5 0 "	—	Coastguard ..	W.	—
Ballydonegan, Co. Cork ..	51 38	10 3 "	—	" ..	W.	—
Ballyglass, Co. Mayo ..	54 17	9 52 "	—	" ..	W.	—
Baltimore, Co. Cork ..	51 38	9 22 "	—	" ..	G.	90
Bath ..	51 23	2 21 "	—	W. H. Symons, M.D., for the Corporation.	T.S.	—
Belfast, Queen's College ..	54 35	5 56 "	81	John Wylie ..	D.	00
Belvoir Castle (Grantham) ..	52 54	0 47 "	259	W. H. Divers, for the Duke of Rutland.	D.	00
<b>5</b> Ben Nevis ..	56 48	5 0 "	4,405	A. Rankin, for Directors Ben Nevis Observatory.	A. E.	—
<b>M</b> Bennington, Herts. ..	51 54	0 5 "	407	Rev. J. D. Parker, LL.D.	E.	00
<b>M</b> Berkhamsted ..	51 46	0 34 "	400	E. Mawley, F.R. Met. Soc.	E.	00
Bettws-y-Coed ..	53 6	3 48 "	628	Col. Wynne Finch ..	R.	—
Bexhill ..	50 51	0 28 E.	—	A. J. Brook ..	R.	—
Bidston Observatory (Liver- pool).	53 24	3 4 W.	188	W. E. Plummer, F.R.A.S.	D. T.	99
Birr Castle (Parsonstown) ..	53 6	7 55 "	175	J. L. Roe and T. Colvin, for the Earl of Rosse.	D. S. T.	00
<b>M</b> Blackpool ..	53 48	3 3 "	62	A. J. Anderson, M.A., M.B., for the Corporation.	F. S.	00
Blackscod Point, Co. Mayo ..	54 6	10 4 "	37	A. Marshall ..	W. T.	00
Bognor ..	50 47	0 40 "	—	H. C. L. Morris, M.D., for the Corporation.	S.	—
" ..	50 47	0 40 "	—	A. G. Thompson ..	G.	—
<b>B</b> Bolton ..	53 35	2 37 "	389	W. W. Madley, for the Corporation.	G.	—
Bournemouth ..	50 43	1 53 "	—	C. Dales, for Town Council	S.	00
<b>5</b> Braemar ..	57 0	3 24 "	1,111	J. Aitken, J.P.	D. F. S.	00
Bramley, Surrey ..	51 11	0 33 "	148	J. Bartlett, M.A.	D.	00
Bray, Co. Wicklow ..	53 12	6 6 "	—	Coastguard ..	G.	—
Brighton ..	50 49	0 8 "	65	A. Newsholme, M.D., for the Corporation.	S.	96
Broadstairs ..	51 21	1 26 E.	—	L. A. Skinner, for the Dis- trict Council.	S.	—
Burnmouth (Ayton, Berwick) ..	55 51	2 4 W.	—	Coastguard ..	W.	—
Burntisland ..	56 4	3 14 "	—	" ..	W.	—
<b>M</b> Buxton ..	53 14	1 54 "	987	W. Pilkington ..	E.	99
Caernarvon Bay Lightship ..	53 6	4 45 "	—	Light-keepers ..	W.	—
Cambridge ..	52 13	0 6 E.	83	Miss A. Walker, for Sir Robt. Ball, F.R.S.	S. D.	98
Cardigan Bay Lightship ..	52 25	5 1 W.	—	Light-keepers ..	W.	—
<b>S</b> Cargen ..	55 2	3 37 "	72	A. Peacock ..	E.	96
Carrigallen, Co. Lestrim ..	53 58	7 38 "	350?	Mrs. J. Godley and Miss Morrow.	R.	—
Chatham ..	51 23	0 32 E.	136	The Instructor in Survey- ing.	G.	99
Chatsworth ..	53 14	1 37 W.	—	The Duke of Devonshire, K.G.	C.G.	—
<b>M</b> Cheadle ..	52 58	1 57 "	646	J. C. Phillips ..	E. F.	99
<b>M</b> Cheltenham ..	51 54	2 3 "	184	R. Tyrer, B.A.	E.	98
Chester (Hawarden Bridge) ..	53 12	3 1 "	—	F. B. Summers ..	F.	—
Churchill, Oxon ..	51 56	1 34 "	509	Giles Edmonds ..	R.	96

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Year of last Inspec- tion.
<b>Churchstoke</b> .. .. .	52 31	3 5 W.	538	P. Wright, F.C.S.	D. F. S.	98
<b>Cirencester</b> .. .. .	51 43	1 57 "	446	Prof. G. T. Locke, M.A.	F. S.	00
<b>Clacton-on-Sea</b> .. .. .	51 48	1 9 E.	—	A. W. Shadick, for the Town Council.	T.S.	—
<b>Cleggan, Co. Galway</b> .. .. .	53 33	10 8 W.	—	Coastguard .. .. .	W.	—
<b>Clifton</b> .. .. .	51 27	2 37 "	230	D. Rintoul, M.A.	F.	90
<b>Colly Weston</b> .. .. .	52 37	0 31 "	280	Miss A. Tasker .. .. .	F.	00
<b>Colwyn Bay</b> .. .. .	53 17	3 43 "	—	R. E. Lord, M.D., B.Sc.	S.	97
<b>Coningbeg Lightship</b> .. .. .	52 2	6 40 "	—	Light-keepers .. .. .	W.	—
<b>Cooper's Hill (Egham)</b> .. .. .	51 26	0 34 "	279	Prof. H. McLeod, F.R.S.	G.	98
<b>Cranleigh</b> .. .. .	51 8	0 29 "	232	Rev. G. C. Allen .. .. .	F.	—
<b>Cromarty</b> .. .. .	57 41	4 0 "	—	Coastguard .. .. .	W.	—
<b>Cronkbourne (Douglas)</b> .. .. .	54 10	4 29 "	137	A. W. Moore, M.A.	D. F. S.	99
<b>Crookhaven</b> .. .. .	51 28	9 43 "	—	Coastguard .. .. .	G.	90
<b>Crosshaven</b> .. .. .	51 48	8 18 "	—	" .. .. .	G.	90
<b>Cuckfield, Sussex</b> .. .. .	51 1	0 9 "	389	John Howe .. .. .	R.	97
<b>Cullompton</b> .. .. .	50 51	3 23 "	202	T. Turner, J.P.	F. S.	00
<b>Darwen, Lancashire</b> .. .. .	53 41	2 28 "	710	G. Mainland, for the Cor- poration.	S.	00
<b>Deerness, Orkney Islands</b> .. .. .	58 56	2 45 "	169	M. Spence .. .. .	B. D. S.	00
<b>Disserth (Llandrindod)</b> .. .. .	52 13	3 24 "	711	Rev. J. Le Herbert .. .. .	R.	00
<b>Donaghadee</b> .. .. .	54 38	5 32 "	40	J. Conolly .. .. .	T.	00
<b>Doneraile, Co. Cork</b> .. .. .	52 13	8 34 "	266	Capt. J. W. Evans, J.P.	R.	—
<b>Dover</b> .. .. .	51 7	1 18 E.	198	H. E. Stilgoe, C.E.	R.	98
<b>Dublin, Botanic Gardens</b> .. .. .	53 23	6 16 W.	67	F. W. Moore, M.R.I.A.	D.	00
" <b>City</b> .. .. .	53 20	6 15 "	47	Sir J. W. Moore, M.D.	D. F.	00
" <b>Phoenix Park</b> .. .. .	53 22	6 21 "	155	Major Haynes, R.E.	B. D. S.	00
<b>Dundee</b> .. .. .	56 28	2 56 "	160	J. Carnochan .. .. .	D. S.	00
<b>Dungeness</b> .. .. .	50 55	0 58 E.	26	W. H. Taylor .. .. .	T.	00
<b>Dunrobin Castle</b> .. .. .	57 59	3 56 W.	12	D. Melville, for the Duke of Sutherland.	D.	00
<b>Durham</b> .. .. .	54 46	1 35 "	336	Prof. R. A. Sampson, M.A.	D. F. S.	00
<b>Dursley, Glos.</b> .. .. .	51 41	2 21 "	250	R. W. Pinney .. .. .	R.	96
<b>Eastbourne</b> .. .. .	50 46	0 17 E.	39	R. Sheward, for the Corpo- ration.	D. S.	00
<b>East Goodwin Lightship</b> .. .. .	51 13	1 36 "	—	Light-keepers .. .. .	W.	—
<b>East Dereham</b> .. .. .	52 41	0 57 "	158	G. H. H. Cooper .. .. .	R.	—
<b>Edgbaston (Birmingham)</b> .. .. .	52 28	1 56 W.	534	Alf. Cresswell .. .. .	D. F. S.	00
<b>Edinburgh</b> .. .. .	55 57	3 12 "	253	R. C. Mossman, F.R.S.E.	D. S.	00
<b>English and Welsh Grounds Lightship.</b> .. .. .	51 27	3 0 "	—	Light-keepers .. .. .	W.	—
<b>Ennis, Co. Clare</b> .. .. .	52 51	8 59 "	38	Miss A. L. Scott .. .. .	R.	—
<b>Ennistymon, Co. Clare</b> .. .. .	52 57	9 17 "	131	Rev. C. W. McDowell, M.A.	R.	—
<b>Falmouth</b> .. .. .	50 9	5 4 "	167	E. Kitto .. .. .	A. F.	00
<b>Felixstowe</b> .. .. .	51 58	1 22 E.	76	Rev. J. G. Munday, M.A.	F. S.	00
<b>Fleetwood</b> .. .. .	53 56	3 1 W.	—	M. S. Gaultier .. .. .	B.	00
<b>Forgandenny, Perth</b> .. .. .	56 21	3 29 "	175	C. L. Wood .. .. .	C.	—
<b>Forest Row, Sussex</b> .. .. .	51 7	0 2 E.	619	Rt. Hon. J. Bryce, D.C.L., M.P.	R.	—
<b>Fort Augustus</b> .. .. .	57 8	4 40 W.	68	Rev. C. von Dieckhoff .. .. .	E. F. S.	99
<b>Fort William</b> .. .. .	56 49	5 7 "	31	A. Rankin, for Directors, Ben Nevis Observatory.	A. F.	00
<b>Foynes, Co. Limerick</b> .. .. .	52 37	9 7 "	108	W. H. Ward, for Lord Monteagle.	F.	95
<b>Fulbeck, Lincolnshire</b> .. .. .	53 3	0 37 "	185	Rev. V. F. Willson, M.A.	C. D.	00
<b>Galdeston (Beccles)</b> .. .. .	52 28	1 31 E.	37	E. T. Dowson .. .. .	D. F. S.	99
<b>Glasgow</b> .. .. .	55 53	4 18 W.	180	Prof. L. Becker, Ph.D.	A. D. F.	00
<b>Glenarm</b> .. .. .	51 58	5 56 "	—	Coastguard .. .. .	G.	—
<b>Glencarron</b> .. .. .	57 30	5 14 "	489	D. D. Munro .. .. .	E. F.	00
<b>Glenlee</b> .. .. .	55 5	4 12 "	203	W. Melville .. .. .	E. F.	96
<b>Gordon Castle</b> .. .. .	57 37	3 5 "	101	C. Webster, for the Duke of Richmond and Gordon, K.G.	E.	00
<b>Gorleston (Gt. Yarmouth)</b> .. .. .	52 35	1 43 E.	—	J. G. Bammant .. .. .	G.	—
<b>Haslar Hospital</b> .. .. .	50 47	1 7 W.	—	C. Seaman .. .. .	G.	—



Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Year of last Inspec- tion.
Hastings, St. Helen's Cres.	50 51	0 34 E.	149?	Rev. H. H. Breton, M.A. ..	R.	00
" Waterworks ..	50 51	0 34 "	—	— Farnham, for the Cor- poration.	S.	00
Hesley Hall (Bawtry) ..	53 27	1 4 W.	85	B. I. Whitaker, J.P. ..	F.	99
Hereford ..	52 5	2 45 "	281	Rev. T. B. Harrington ..	F.	98
Hidecote (Campden), Glos. ..	52 5	1 46 "	524	Major W. Wright, R.A. ..	R.	97
Hillington ..	52 48	0 33 E.	88	Rev. H. F. B. Frookes, M.A.	D. F. S.	98
Hollesley Bay, Suffolk ..	52 3	1 27 "	38	Prof. C. G. Freer Thon- ger, F.R.S.	D. S.	98
Holyhead, Harbour Office. ..	53 18	4 39 W.	57	F. M. Cotton, C.E. ..	B. W.	00
" Sailors' Home ..	53 18	4 39 "	48	T. Chope ..	T.	00
Hoylake, Cheshire ..	53 23	3 12 "	—	L. G. Dashper ..	S.	—
Hurdlestown (Broadford), Co. Clare.	52 48	8 38 "	157	Lieut.-Col. W. O. Bentley, R.A.	R.	—
Kearsney Abbey (Dover) ..	51 8	1 17 E.	100?	C. W. Curtis ..	R.	96
" Chilton Farm ..	51 8	1 17 "	135	H. E. Stilgoe, C.E. ..	R.	—
Ketton Vicarage ..	52 38	0 32 W.	109	Rev. A. Swire ..	R.	99
Kew Observatory ..	51 28	0 19 "	18	C. Chree, D.Sc., F.R.S. ..	A.	00
Kilredane, Co. Clare ..	52 35	9 47 "	—	Coastguard ..	W.	—
Kilkenny ..	52 39	7 14 "	212	H. Carlton, for the Marquis of Ormonde.	C. F.	98
Killarney ..	52 4	9 30 "	174	E. H. Griffin, M.D. ..	G. F.	—
Killiney, Co. Dublin ..	53 16	6 7 "	249	R. O'Brien Furlong, C.B.	R.	95
Kingstown ..	53 17	6 8 "	—	H.M. Office of Works ..	B.	00
" ..	53 17	6 8 "	—	J. B. Power, for the Dist. Council.	G. S.	00
Kirkwall ..	58 59	2 57 "	—	Coastguard ..	W.	—
Kish Bank Lightship ..	53 19	5 55 "	—	Light-keepers ..	W.	—
Lahinch, Co. Clare ..	52 55	9 21 "	52	Miss I. F. K. Bowes ..	R.	99
Lairg ..	58 1	4 22 "	335	Rev. D. Macrae ..	E. F.	00
Lamlash, Isle of Arran ..	55 32	5 8 "	—	Coastguard ..	G. W.	—
Laudale, Argyleshire ..	56 41	5 41 "	14	A. Fletcher, for T. H. G. Newton, M.A.	D. F.	98
Lednathie ..	56 45	3 7 "	719	W. Morrison, for P. Stor- month Darling.	E.	00
Leith ..	55 58	3 10 "	19	T. Richardson ..	T.	00
Leman and Ower Lightship	53 8	2 2 E.	—	Light-keepers ..	W.	—
Lerwick ..	60 9	1 8 W.	—	Coastguard ..	W.	—
Limerick ..	52 39	8 36 "	—	A. W. Shaw ..	R.	95
Liscannor, Co. Clare ..	52 56	9 23 "	—	Coastguard ..	W.	—
Lissan, Co. Tyrone ..	54 41	6 45 "	300	—	E.	98
Littlestone-on-Sea ..	50 59	0 59 E.	—	W. Walsh, for H. T. Tubbs	G. S.	00
Llandinam, Montgomery ..	52 29	3 26 W.	509	John Owens ..	R.	—
Llandoverly ..	51 59	3 48 "	217	J. Watkins ..	F.	00
Llandudno ..	53 21	3 50 "	72	Wm. Little, for Town Council.	E. F. S.	99
London, Brixton ..	51 27	0 8 "	77	F. Gaster ..	T.	—
" City ..	51 31	0 5 "	80	Messrs. De La Rue ..	S.	—
" Hampstead ..	51 34	0 10 "	—	H. R. Beeton ..	C.	—
" Pall Mall ..	51 30	0 7 "	—	Athenæum Club ..	C.	—
" Westminster ..	51 30	0 8 "	76	The Staff of the Met. Office	C. G.	—
" Westminster Training College.	51 30	0 8 "	—	H. A. Reatchlous, M.A. ..	S.	—
Londonderry ..	55 0	7 19 "	87	J. Conroy ..	F.	00
Loughborough ..	52 47	1 12 "	146	W. Berridge ..	T.	98
Lowestoft ..	52 29	1 44 E.	—	C. J. Heppell ..	G.	—
Lowestoft ..	52 29	1 44 "	84	J. E. O'Connor, M.B., for the Corporation.	E. S.	99
Lytham ..	53 44	2 58 W.	21	J. C. Fisher, M.A., M.B., for the Corporation.	D. S.	00
Machrihanish ..	55 25	5 45 "	16	J. Franklin Adams ..	G.	95
Maidenhead ..	51 30	0 43 "	99	G. H. Palmer ..	G.	99
Malin Head, Co. Donegal ..	55 23	7 24 "	230	A. Cox ..	T. C.	00
Mallananny ..	53 55	9 40 "	119	Miss M. Kilsby ..	R.	—
Manchester, Oldham Rd. ..	53 29	2 13 "	190	J. Niven, M.A., M.B., for the Corporation.	D.	00
" Whitworth Park	53 28	2 14 "	125	Prof. Schuster, F.R.S., D.Sc.	D.	00
Marchmont ..	55 44	2 25 "	498	J. A. Wood ..	E. F. S.	98
Marcham-le-Fen ..	53 8	0 5 "	33	Mrs. G. L. Kime ..	R.	—

Station	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Year of last Inspec- tion.
<b>M</b> Margate .. .. .	51 24	1 24 E.	83	J. Stokes, J.P. . . . .	S.	00
Markree Castle, Co. Sligo ..	54 11	8 27 W.	122	F. W. Henkel, B.A., for Col. Cooper.	D. F. S.	00
Minard, Co. Kerry .. ..	52 7	10 8 "	—	Coastguard .. .. .	W.	—
Morpeth .. .. .	55 13	1 41 "	324	W. H. Hogg .. .. .	D. S.	00
Mount Callan (Inagh), Co. Clare.	52 53	9 16 "	479	Lt.-Col. Tottenham ..	R.	98
<b>N</b> Nairn .. .. .	57 36	3 52 "	32	Miss Penny .. .. .	T.	00
Newarp Lightship .. ..	52 45	1 53 E.	—	Light-keepers .. ..	W.	—
Newcastle, Co. Wicklow ..	53 5	6 6 W.	256	B. H. Steede, M.D. ..	D.	00
Newcastle-on-Tyne .. ..	54 54	1 36 "	152	N. H. Martin, F.C.S. ..	G. S.	99
Newchurch .. .. .	51 41	2 48 "	—	C. Cullum .. .. .	R.	—
Newmarket-on-Fergus ..	52 46	8 53 "	—	W. W. Fitzgerald ..	R.	98
Newport, Monmouth .. ..	51 35	3 0 "	—	C. Cullum .. .. .	R.	00
Newton Hall .. .. .	54 57	1 54 "	524	Rev. J. Seymour St. John	R.	—
Newquay, Cornwall .. ..	50 25	5 4 "	250?	A. Hardwick, M.D., for the Town Council.	S.	00
<b>N</b> Newton Reigny (Penrith) ..	50 25	5 5 "	—	Coastguard .. .. .	W.	—
Northallerton .. .. .	51 41	2 48 "	579	T. G. Benn .. .. .	T. S.	00
North-West Lightship ..	51 20	1 26 "	129	W. Stead, C.E. .. ..	R.	95
<b>N</b> Norwood .. .. .	53 31	3 31 "	—	Light-keepers .. ..	W.	—
.. .. .	51 26	0 6 "	220	W. Marriott .. .. .	E.	—
<b>O</b> Ochtertyre .. .. .	56 23	3 53 "	329	G. Croucher, for Sir P. K. Murray, Lt.	E. F.	99
Omagh (Edenfel) .. ..	54 36	7 19 "	300	Col. Buchanan, C.B. ..	F.	00
Oswaldkirk, Yorkshire ..	54 12	1 3 "	510	R. Thompson .. .. .	S.	96
Outer Dowsing Lightship ..	53 27	1 5 E.	—	Light-keepers .. ..	W.	—
Owers Lightship .. .. .	50 39	0 41 W.	—	" .. .. .	W.	—
Oxford .. .. .	51 46	1 16 "	208	A. A. Rambaut, M.A. ..	T. S.	00
<b>P</b> Pant-y-reos .. .. .	51 38	3 4 "	449	C. Cullum .. .. .	R.	00
Parkstone, Dorset .. ..	50 43	1 56 "	197	R. H. Barnes, B.A. ..	D.	00
Penbedw (Mold) .. .. .	53 12	3 11 "	650	H. W. Buddicom .. ..	C.	—
Pennant Bay (Aberdour) ..	57 40	2 16 "	—	Coastguard .. .. .	W.	—
Pennington .. .. .	50 46	1 35 "	—	Miss H. Fullerton ..	R.	—
Penrhyn Quarry .. .. .	53 10	4 6 "	—	H. P. Meares .. .. .	R.	—
Peper Harow .. .. .	51 11	0 40 "	199	John Warner .. .. .	R.	—
<b>P</b> Pinmore (Girvan) .. ..	55 12	4 49 "	187	P. Donald, for Capt. Hamil- ton.	E.	99
<b>P</b> Plymouth, The Hoe .. ..	50 22	4 8 "	116	H. Victor Prigg, C.E., for the Corporation.	D. F. S.	00
<b>P</b> Poltalloch .. .. .	56 8	5 30 "	132	D. S. Melville, for Lord Malcolm.	E.	00
Portland Bill .. .. .	50 32	2 27 "	177	O. Smith .. .. .	T.	00
Portrush .. .. .	55 13	6 40 "	—	Coastguard .. .. .	W.	—
Port Talbot .. .. .	51 34	3 45 "	—	R. Milner, for Miss Talbot	S.	00
Prestwich (Manchester) ..	53 32	2 17 "	320	T. R. H. Clunn, M.D. ..	D. F. S.	99
<b>R</b> Ranceby Hall .. .. .	53 0	0 29 "	125	General M. Willson ..	G.	—
Recess, Co. Galway .. ..	53 28	9 44 "	90	A. A. Smith .. .. .	R.	—
Rhyl .. .. .	53 19	3 29 "	—	A. A. Goodall, for Dist. Council.	S.	—
<b>R</b> Ridgmont .. .. .	52 1	0 36 "	291	H. M. Freear .. .. .	D.	98
Ridlington .. .. .	52 37	0 45 "	522	W. W. Wortley .. ..	R.	—
Roche's Point, Co. Cork ..	51 47	8 15 "	42	W. Kennedy .. .. .	T.	00
Rochford (Tenbury) .. ..	52 18	2 36 "	316	Rev. John Tomson ..	C. R.	96
<b>R</b> Rosewell .. .. .	55 51	3 7 "	690	R. B. Mitchell, M.D. ..	E.	99
Rothamsted .. .. .	51 48	0 22 "	368	Sir J. H. Gilbert and T. Wilson.	F. G. S.	99
<b>R</b> Rothesay .. .. .	55 50	5 4 "	115	J. Kay .. .. .	E.	00
<b>R</b> Rounton, Yorkshire .. ..	54 24	1 18 "	242	Sir I. L. Bell, Bart., F.R.S.	E.	99
<b>R</b> Rousdon, Devon .. .. .	50 43	3 0 "	515	The late Sir C. E. Peck, Bart., M.A. .. .. .	E.	00
<b>R</b> Roxborough, Co. Limerick	52 35	8 36 "	111	A. W. Shaw .. .. .	R.	95
Royal Sovereign Lightship	50 43	0 27 E.	—	Light-keepers .. ..	W.	—
Rugby .. .. .	52 22	1 15 W.	379	St. J. B. Wynne Willson, M.A.	G.	98
<b>S</b> St. Ann's Head, Pembroke	51 41	5 30 "	150	G. H. Dunsford .. ..	T. S. W.	00
St. Aubin's, Jersey .. ..	49 12	2 11 "	25	J. Fisher .. .. .	T.	00



Station	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Year of last Inspec- tion.
<b>M</b> Margate .. .. .	51 24	1 24 E.	83	J. Stokes, J.P. . . . .	S.	00
Markree Castle, Co. Sligo ..	54 11	8 27 W.	122	F. W. Henkel, B.A., for Col. Cooper.	D. F. S.	00
Minard, Co. Kerry .. ..	52 7	10 8 "	—	Coastguard .. .. .	W.	—
Morpeth .. .. .	55 13	1 41 "	324	W. H. Hogg .. .. .	D. S.	00
Mount Callan (Inagh), Co. Clare.	52 53	9 16 "	479	Lt.-Col. Tottenham ..	R.	98
Nairn .. .. .	57 36	3 52 "	82	Miss Penny .. .. .	T.	00
Newarp Lightship .. ..	52 45	1 53 E.	—	Light-keepers .. ..	W.	—
Newcastle, Co. Wicklow ..	53 5	6 6 W.	256	B. H. Steede, M.D. . .	D.	00
Newcastle-on-Tyne .. ..	54 59	1 36 "	152	N. H. Martin, F.C.S. .	G. S.	99
Newchurch .. .. .	51 41	2 48 "	—	C. Cullum .. .. .	R.	—
Newmarket-on-Fergus ..	52 46	8 53 "	—	W. W. FitzGerald ..	R.	98
Newport, Monmouth .. ..	51 35	3 0 "	—	C. Cullum .. .. .	R.	00
Newton Hall .. .. .	54 57	1 54 "	524	Rev. J. Seymour St. John	R.	—
Newquay, Cornwall .. ..	50 25	5 4 "	250?	A. Hardwick, M.D., for the Town Council.	S.	00
Newton Reigny (Penrith) ..	51 41	2 43 "	579	Coastguard .. .. .	W.	—
Northallerton .. .. .	54 20	1 26 "	129	T. G. Benn .. .. .	T. S.	00
North-West Lightship ..	53 31	3 31 "	—	W. Stead, C.E. .. ..	R.	95
<b>N</b> Norwood .. .. .	51 26	0 6 "	220	Light-keepers .. ..	W.	—
				W. Marriott .. .. .	E.	—
<b>S</b> Ochtertyre .. .. .	56 23	3 53 "	329	G. Croucher, for Sir P. K. Murray, Bt.	E. F.	99
Omagh (Edenfel) .. ..	54 36	7 19 "	300	Col. Buchanan, C.B. . .	F.	00
Oswaldkirk, Yorkshire ..	54 12	1 3 "	510	R. Thompson .. .. .	S.	96
Outer Dowsing Lightship ..	53 27	1 5 E.	—	Light-keepers .. ..	W.	—
Owers Lightship .. .. .	50 39	0 41 W.	—		W.	—
Oxford .. .. .	51 46	1 16 "	208	A. A. Rambaut, M.A. .	T. S.	00
Pant-y-reos .. .. .	51 38	3 4 "	449	C. Cullum .. .. .	R.	00
Parkstone, Dorset .. ..	50 43	1 56 "	197	R. H. Barnes, B.A. . .	D.	00
Penbedw (Mold) .. .. .	53 12	3 11 "	650	H. W. Buddicom .. ..	C.	—
Pennant Bay (Aberdour) ..	57 40	2 16 "	—	Coastguard .. .. .	W.	—
Pennington .. .. .	50 46	1 35 "	—	Miss H. Fullerton ..	R.	—
Penrhyn Quarry .. .. .	53 10	4 6 "	—	H. P. Meares .. .. .	R.	—
Peper Harow .. .. .	51 11	0 40 "	199	John Warner .. .. .	R.	—
<b>P</b> Pinmore (Girvan) .. ..	55 12	4 49 "	187	P. Donald, for Capt. Hamil- ton.	E.	99
Plymouth, The Hoe .. ..	50 22	4 8 "	116	H. Victor Prigg, C.E., for the Corporation.	D. F. S.	00
<b>P</b> Poltalloch .. .. .	56 8	5 30 "	132	D. S. Melville, for Lord Malcolm.	E.	00
Portland Bill .. .. .	50 32	2 27 "	177	C. Smith .. .. .	T.	00
Portrush .. .. .	55 13	6 40 "	—	Coastguard .. .. .	W.	—
Port Talbot .. .. .	51 34	3 45 "	—	R. Milner, for Miss Talbot	S.	00
Prestwich (Manchester) ..	53 32	2 17 "	320	T. R. H. Clunn, M.D. .	D. F. S.	99
Rauceby Hall .. .. .	53 0	0 29 "	125	General M. Willson ..	G.	—
Recess, Co. Galway .. ..	53 28	9 44 "	90	A. A. Smith .. .. .	R.	—
Rhyl .. .. .	53 19	3 29 "	—	A. A. Goodall, for Dist. Council.	S.	—
Ridgmont .. .. .	52 1	0 36 "	291	H. M. Freear .. .. .	D.	98
Ridlington .. .. .	52 37	0 45 "	522	W. W. Wortley .. ..	R.	—
Roche's Point, Co. Cork ..	51 47	8 15 "	42	W. Kennedy .. .. .	T.	00
Rochford (Tenbury) .. ..	52 18	2 36 "	316	Rev. John Tomson ..	C. R.	96
<b>R</b> Rosewell .. .. .	55 51	3 7 "	690	R. B. Mitchell, M.D. .	E.	99
Rothamsted .. .. .	51 48	0 22 "	368	Sir J. H. Gilbert and T. Willson.	F. G. S.	99
<b>R</b> Rothesay .. .. .	55 50	5 4 "	115	J. Kay .. .. .	E.	00
<b>R</b> Rounton, Yorkshire .. ..	54 24	1 18 "	242	Sir I. L. Bell, Bart., F.R.S.	E.	99
<b>R</b> Rousdon, Devon .. .. .	50 43	3 0 "	515	The late Sir C. E. Peek, Bart., M.A. . . . .	E.	00
Roxborough, Co. Limerick ..	52 35	8 36 "	111	A. W. Shaw .. .. .	R.	95
Royal Sovereign Lightship ..	50 43	0 27 E.	—	Light-keepers .. ..	W.	—
Rugby .. .. .	52 22	1 15 W.	379	St. J. B. Wynne Willson, M.A.	G.	98
St. Ann's Head, Pembroke ..	51 41	5 30 "	150	G. H. Dunsford .. ..	T. S. W.	06
St. Aubin's, Jersey .. ..	49 12	2 11 "	25	J. Fisher .. .. .	T.	06



Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied.	Year of last Inspec- tion.
St. David's, Pembrokeshire	51 53	5 16 W.	215	W. P. Probert, LL.D.	D.	00
St. Helen's, Lancashire	53 28	2 45 "	151	F. Drew Harris, M.D., for the Corporation.	G.	00
St. Heliers, Jersey	49 11	2 6 "	—	Signal Officer, Fort Regent	S.	00
St. Leonard's	50 51	0 33 E.	178	H. Colborne, M.R.C.S., for the Corporation.	D. F.	00
" West Marina	50 51	0 32 "	—	T. Elmdridge, for the Corpo- ration.	G.	00
St. Peter Port, Guernsey	49 32	2 32 W.	222	F. E. Carey, M.D.	S.	00
Salcombe, Devon	50 14	3 46 "	—	Coastguard	W.	—
Sandgate, Kent	51 4	1 9 E.	56	A. Robert Bowles, C.E.	R.	99
at Scarborough	54 18	0 24 W.	210	W. W. Larkin, for the Cor- poration.	D. F. S.	00
Scarborough	54 17	0 23 "	—	Coastguard	W.	—
Schull	51 32	9 32 "	—	"	G.	90
Scilly Islands, St. Mary's	49 56	6 18 "	65	A. Hicks	B. S. T. W. C.	00
Seafeld, Co. Clare	52 48	9 30 "	—	Coastguard	W.	—
Seaham Harbour	54 50	1 19 "	148	G. H. Aird	D.	00
Seven Stones Lightship	50 4	6 5 "	—	Light-keepers	W.	—
at Shaftesbury	51 1	2 12 "	722	Miss L. H. Harris	F.	00
Shambles Lightship	50 31	2 20 "	—	Light-keepers	W.	—
Sheffield, Weston Park	53 23	1 29 "	429	E. Howarth, F.R.A.S.	D. S.	99
" Attercliffe	53 24	1 25 "	—	J. Robertson, M.D., B.Sc., for the Corporation.	S.	—
Sheephaven (Dunfanaghy)	55 11	7 58 "	—	Coastguard	W.	—
Shields, North	55 0	1 27 "	99	W. B. Clark	T.	00
Shields, North, High Light- house.	55 0	1 27 "	—	T. Robson	B.	00
Shipwash Lightship	52 2	1 33 E.	—	Light-keepers	W.	—
Skipton	53 58	2 9 W.	567	W. Farrer	G.	99
Solway Lightship	54 48	3 32 "	—	Light-keepers	W.	—
Southampton	50 55	1 24 "	78	J. T. Cook, for Dir. Gen. of Ordnance Survey.	D. F. S.	00
Southport	53 39	2 59 "	37	J. Baxendell, for the Cor- poration.	S.	97
South Rock Lightship	54 25	5 22 "	—	Light-keepers	W.	—
Spiddal, Co. Galway	53 15	9 17 "	—	Coastguard	G.	90
Spurn Head	53 34	0 7 E.	26	A. S. Badcock	T.	00
Spurn Lightship	53 34	0 13 "	—	Light-keepers	W.	—
Stokesay (Craven Arms)	52 26	2 52 W.	370	Rev. W. La Touche, M.A.	D.	00
Stonyhurst College	53 51	2 28 "	375	Rev. W. Sidgreaves	A. D. F.	00
Stornoway	58 11	6 22 "	29	J. Mackenzie	T. S. C.	00
"	58 11	6 22 "	—	Coastguard	W.	—
Stranraer	54 54	5 2 "	—	"	G.	—
Strathpeffer Spa, N.B.	57 37	4 28 "	253	J. Tregelles Fox, M.D.	D. S.	99
Sumburgh Head (Shetlands)	59 51	1 17 "	126	Rev. W. Brand	T. C.	98
Sunderland	54 54	1 23 "	—	Coastguard	W.	—
at Swarraton	51 8	1 11 "	—	Rev. W. L. W. Eyre, M.A.	F.	00
Symbister, Shetlands	60 14	1 25 "	—	J. S. Nicolson	G.	—
System, Leicester	52 43	1 5 "	178	S. K. Daniels	R.	96
Tadby, Lincolnshire	53 24	0 16 "	251	Rev. S. Lewin, B.A.	D.	00
Tadlin, Co. Donegal	54 38	8 39 "	—	Coastguard	W.	—
Temple Bruer, Lincolnshire	53 4	0 30 "	—	Miss G. Morley	R.	99
Tenby	51 41	4 42 "	79	R. J. Truscott, for the Cor- poration.	S.	00
Thurcaston (Leicester)	52 42	1 10 "	253	Rev. T. A. Preston, M.A.	S.	96
Torquay	50 28	3 31 "	286	A. Chandler, for the Cor- poration.	S.	00
Totland Bay, Isle of Wight	50 41	1 33 "	84	J. Dover, M.A.	G.	00
Union Hall, Co. Cork	51 33	9 8 "	—	Coastguard	G.	90
Uzen (Montrose)	56 40	2 28 "	—	Coastguard	W.	—
Valencia Observatory, Ca- hirciveen.	51 56	10 15 "	30	J. E. Cullum	A. T. C.	00
" Island, Glanleam	51 56	10 20 "	—	Miss E. FitzGerald	R.	—
" Knightstown	51 55	10 20 "	—	Coastguard	G.	—
Ventnor	50 36	1 13 "	80	Miss M. Gibson	S.	97

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Infor- mation supplied	Year of last Inspe- tion.
Wakefield .. .. .	53 41	1 30 W.	96	A. Clyde .. .. .	E.	99
Waterford .. .. .	52 16	7 7 "	—	Harbour Authorities .. .. .	C.	—
Watergate (Emsworth) .. .. .	50 56	0 55 "	236	W. M. Christy .. .. .	R. S.	99
Watford .. .. .	51 39	0 34 "	253 2	G. E. Elland .. .. .	R.	—
Wealdstone .. .. .	51 37	0 20 "	179	G. E. Elland .. .. .	R.	—
Wessington Court (Wool- hope) .. .. .	52 1	2 35 "	—	S. Lomas, for Miss L. Grafton.	D.	00
Westbourne, Sussex .. .. .	50 52	0 55 "	30	Rev. L. B. Birkett .. .. .	S.	99
Westray, Orkney .. .. .	59 17	3 0 "	—	Capt. J. Hewison .. .. .	G.	—
Whitechurch, Devon .. .. .	50 32	4 6 "	533	E. E. Glyde .. .. .	E.	98
Wick .. .. .	58 27	3 6 "	80	J. Sinclair .. .. .	T.	00
Wolfelee .. .. .	58 27	3 6 "	—	Coastguard .. .. .	W.	—
Woolacombe, Devon .. .. .	51 23	2 39 "	587	W. Gordon .. .. .	B.	98
Worsop .. .. .	51 10	4 12 "	59	E. Henshall, C.E. .. .. .	D.	98
Worthing .. .. .	53 22	1 5 "	56	H. Mellish .. .. .	S.	96
Yarmouth .. .. .	50 49	0 22 "	38	C. Kelly, M.D., for the Cor- poration.	S.	99
Yarmouth, Norfolk .. .. .	52 37	1 43 E.	10	G. T. Watson .. .. .	B. T. C.	00
Yarmouth, Isle of Wight .. .. .	50 42	1 29 W.	—	Coastguard .. .. .	G.	—
Ynis-y-bro (Newport) .. .. .	51 33	3 3 "	115	C. Cullum .. .. .	R.	00
York, The Museum .. .. .	53 57	1 5 "	56	H. M. Platnauer, B.Sc. .. .. .	D.	98
" Bootham .. .. .	53 57	1 5 "	105	A. G. Pichard .. .. .	S.	96

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

Station.	Authority	Station.	Authority.
Haparanda .. .. .	Meteorological Office, Stock- holm.	†The Helder .. .. .	Bureau Central Météorologique, Paris.
Hernösand .. .. .		Brussels .. .. .	
*Stockholm .. .. .		Cape Gris Nez .. .. .	
Wisby .. .. .		†Brest (St. Mathieu) .. .. .	
Karlstad .. .. .	Meteorological Institute, Christiania.	Lorient (Île de Groix) .. .. .	Cent. Met. Inst. of Germany.
Bodo .. .. .		*†Roche fort (Île d'Aix) .. .. .	
*Christiansund .. .. .		†Biarritz .. .. .	
*†Skudesnaes .. .. .		†Paris .. .. .	
Færder .. .. .	Meteorological Institute, Copenhagen.	Belfort .. .. .	Observatory, Lisbon.
†The Scaw .. .. .		Lyons .. .. .	
Fanø .. .. .		Nice .. .. .	
Cuxhaven .. .. .		Perpignan .. .. .	
	Deutsche See- warte, Ham- burg.	Berlin .. .. .	Observatory, Lisbon.
		Frankfort .. .. .	
		Munich .. .. .	
		Corunna .. .. .	
		Lisbon .. .. .	
		Azores (P. Delgada) .. .. .	

*Note*—The stations marked with an asterisk (\*) report also at 2h. p.m., and those with dagger (†) at 6h. p.m.; Lisbon reports at 4h. p.m. instead of 6h. p.m.  
The Helder does not send reports at 6 p.m. on Sundays.

## LIST OF BRITISH STATIONS ARRANGED UNDER COUNTIES.

County.	Station.	County.	Station.
England :—		England—cont.	
Bedford... ..	Aspley Guise.	Kent ... ..	Kearsney.
	Ridgmont.		Littlestone-on-Sea.
Berkshire ... ..	Maidenhead.		Margate.
Buckingham ... ..	—		Sandgate.
Cambridge ... ..	Cambridge.	Lancashire ... ..	Blackpool.
Cheshire ... ..	Bidston.		Bolton.
	Chester, Ha- warden Bridge.		Darwen.
	Hoylake.		Fleetwood.
Cornwall ... ..	Falmouth.		Lytham.
	Newquay.		Manchester.
	Scilly.		Do. Whitworth Park.
Cumberland ... ..	Aspatria.		Prestwich.
	Newton Reigny.		St. Helens.
Derby ... ..	Buxton.		Southport.
	Chatsworth.		Stonyhurst.
Devon ... ..	Arlington.	Leicester ... ..	Belvoir Castle.
	Cullompton.		Loughborough.
	Plymouth.		Syston.
	Rousdon.		Thurcaston.
	Salcombe.	Lincoln ... ..	Fulbeck.
	Torquay.		Mareham-le-Fen.
	Whitchurch.		Rauceby.
	Woolacombe.		Tealby.
Dorset ... ..	Parkstone.		Temple Bruer.
	Portland Bill.	Middlesex ... ..	London :
	Shaftesbury.		City.
Durham ... ..	Durham.		Hampstead.
	Seaham.		Pall Mall.
	Sunderland.		Westminster.
Essex ... ..	Clacton-on-Sea.		Wealdstone.
Gloucester ... ..	Cheltenham.	Monmouth ... ..	Newchurch.
	Cirencester.		Newport.
	Clifton.		Pant-y-reos.
	Dursley.		Ynis-y-bro.
	Hidecote.	Norfolk... ..	East Dereham.
Hampshire} ... ..	Bournemouth.		Geldeston.
	Haslar.		Hillington.
	Pennington.		Yarmouth.
	Southampton.	Northampton ... ..	Colly Weston.
	Swarraton.	Northumberland	Alnwick Castle.
	Totland Bay.		Morpeth.
	Ventnor.		Newcastle-on- Tyne.
	Yarmouth.		Newton Hall.
Hereford ... ..	Hereford.		North Shields.
	Wessington Court.	Nottingham ... ..	Hesley Hall.
Hertford ... ..	Bennington.		Worksop.
	Berkhamsted.	Oxford ... ..	Churchill.
	Rothamsted.		Oxford.
	Watford.	Rutland ... ..	Ketton.
Huntingdon ... ..	—		Ridlington.
Kent ... ..	Broadstairs.	Shropshire ... ..	Stokesay.
	Chatham.	Somerset ... ..	—
	Dover.	Stafford... ..	Cheadle.
	Dungeness.		



County.	Station.	County.	Station.
England— <i>cont.</i>		Wales— <i>cont.</i>	
Suffolk ...	Felixstowe. Gorleston. Hollesley Bay. Lowestoft.	Merioneth ...	Aberdovey.
Surrey ...	Bramley. Brixton. Cooper's Hill. Cranleigh. Kew. Norwood. Peper Harow.	Montgomery ...	Churchstoke. Llandinam.
Sussex ...	Bexhill. Bognor. Brighton. Cuckfield. Eastbourne. Forest Row. Hastings. Do. Water-works. St. Leonards. Do. West Marina. Watgate Park. Westbourne. Worthing.	Pembroke ...	St. Ann's Head. St. David's. Tenby.
Warwick ...	Edgbaston. Rugby.	Radnor ...	Disserth.
Westmoreland ...	—	Islands :—	
Wiltshire ...	—	Isle of Man ...	Cronkbourne.
Worcester ...	Rochford.	Jersey ...	St. Aubin's. St. Heliers.
Yorkshire ..	Ampleforth. Aysgarth. Northallerton. Oswaldkirk. Rounton. Scarborough. Sheffield. Do. Attercliffe. Skipton. Spurn Head. Wakefield. York.	Guernsey ...	St. Peter Port.
Wales :—		Scotland :—	
Anglesey ...	Holyhead.	Aberdeen ...	Aberdeen. Braemar. Pennant Bay.
Brecknock ...	—	Argyll ...	Laudale. Machrihanish. Poltalloch.
Cardigan ...	—	Ayr ...	Ballantrae. Pinnore.
Carmarthen ...	Llandovery.	Banff ...	Gordon Castle.
Carnarvon ...	Llandudno. Penrhyn Quarry. Bettws-y-Coed.	Berwick ...	Burnmouth. Marchmont.
Denbigh ...	Colwyn Bay.	Bate ...	Lamlash. Rothesay.
Flint ...	Penbedw. Rhyl.	Caithness ...	Wick.
Glamorgan ...	Port Talbot.	Clackmannan ...	—
		Cromarty ...	Cromarty. Strathpeffer Spa.
		Dumbarton ...	—
		Dumfries ...	—
		Edinburgh ...	Edinburgh. Leith. Rosewell.
		Elgin ...	—
		Fife ...	Burntisland.
		Forfar ...	Dundee. Lednathie. Uzon.
		Haddington ...	—
		Inverness ...	Ben Nevis. Fort Augustus. Fort William.
		Kincardine ...	Cove Bay.
		Kinross ...	—
		Kirkcudbright ...	Cargen. Glenlee.
		Lanark ...	Glasgow.
		Linlithgow ...	—
		Nairn ...	Nairn.
		Orkney ...	Deerness. Kirkwall. Westray.

County.	Station.	County.	Station.
Scotland— <i>cont.</i>		Ireland— <i>cont.</i>	
Peebles ...	—	Donegal ...	Teelin.
Perth ...	Forgardenny Ochertyre.	Down ...	Donaghadee.
Renfrew ...	—	Dublin ...	Dublin (City). Do. (Mountjoy Barracks.)
Ross ...	Ardross Castle. Glencarron. Storraway.		Glasnevin. Killiney. Kingstown.
Roxburgh ...	Wolfelee.	Fermanagh ...	—
Selkirk ..	—	Galway ...	Arran. Cleggan. Recess. Spiddal.
Shetlands ...	Lerwick. Sumburgh Head. Symbister.	Kerry ...	Killarney Minard. Valencia. Do. Glanleam. Do. Knightstown.
Stirling...	—		
Sutherland ...	Dunrobin Castle. Lairg.	Kildare ...	—
Wigton ...	Stranraer.	Kilkenny ...	Kilkenny.
Ireland :—		King's Co. ...	Birr Castle.
Antrim ...	Belfast. Glenarm. Portrush.	Leitrim ...	Carrigallen.
Armagh ...	Armagh.	Limerick ...	Adare. Foynes. Limerick. Roxborough.
Carlow ...	—	Londonderry ...	Londonderry.
Cavan ...	—	Longford ...	—
Clare ..	Ennis. Ennistymon. Hurdlestown. Kilcredane. Lahinch. Liscanor. Mount Callan. Newmarket-on- Fergus. Seafield.	Louth ...	—
Cork ...	Baltimore. Crookhaven. Crosshaven. Doneraile. Roches Point. Schull. Union Hall.	Mayo ...	Ballyglass. Blacksod Point. Mallaranny.
Donegal ...	Malin Head. Sheep Haven.	Meath ...	—
		Monaghan ...	—
		Queen's Co. ...	—
		Roscommon ...	—
		Sligo ...	Markree Castle.
		Tipperary ...	—
		Tyrone ..	Lissan. Omagh.
		Waterford ..	Waterford.
		Westmeath ...	—
		Wexford ...	—
		Wicklow ...	Bray. Newcastle.

## LIST OF DOCUMENTS received from FOREIGN AND COLONIAL LAND STATIONS during the year ending March 31st, 1901.

Place.	Observer.	Nature of Observations.
Antigua ... ..	K. McDonald...	Observations twice daily, 1900, March to June.
Bahamas (Abaco) ... ..	Lightkeepers...	Lighthouse Register, 1900, January to December.
" (Cay Lobos) ... ..	" ... ..	" " " " " "
" (Cay Sal) ... ..	" ... ..	" " " " " "
" (Inagua) ... ..	" ... ..	" " " " " "
" (Nassau) ... ..	J. A. Kerr and R. W. D. Albany ...	Observations once daily, 1900, February to December; 1901, January, February.
" (Watling Island) ... ..	Lightkeeper ... ..	Lighthouse Register, 1900, January to December.
Barbados ... ..	J. R. Bovell ... ..	Monthly Summary of Observations twice daily, 1900, March to December; 1901, January, February.
Beyrout (Lee Observatory) ... ..	R. S. Dugan ... ..	Observations twice daily, 1900, March to December; 1901, January, February.
Cape Pembroke (Falkland Islands) ... ..	G. K. Brown, Lightkeeper... ..	Lighthouse Register, 1900 January to December.
Cape Spatol (Tangier) ... ..	E. C. Hathaway, Lloyd's Signal-man.	Observations twice daily, 1900, March to December; 1901, January, February.
Colon, Isthmus of Panama ... ..	Rev. S. P. Hendrick ... ..	Observations twice daily, 1900, February to December; 1901, January.
Cyprus (Famagusta) ... ..	G. Eliades ... ..	Observations twice daily, 1900, January to December.
" (Kyrenia) ... ..	P. Michaelides ... ..	" " " " " "
" (Larnaca) ... ..	V. E. Feneck and P. Nicopoulos ...	" " " " " "
" (Limassol) ... ..	Luigi Borand and M. Theodorides ...	" " " " " "
" (Nicosia) ... ..	P. Nicopoulos and V. E. Feneck ...	" " " " " "
" (Papho) ... ..	E. A. Malliotis and M. Enotiades ...	" " " " " "
Fort Rae ... ..	Captain H. P. Dawson, R.A. ...	Hourly observations from 1 September, 1882, to 31 August, 1883.



LIST OF DOCUMENTS received from FOREIGN AND COLONIAL LAND STATIONS during the year ending March 31st, 1901.  
—continued.

Place.	Observer.	Nature of Observations.
George Town (British Guiana)...	Robert Ward ...	Observations twice daily, 1900, March to September.
" " " ...	" " " ...	Daily record of sunshine, 1900, February to December; 1901, January, February.
Gibraltar ...	Sergeant J. Power and Staff Sergeant W. Tuson, Med. Staff Corps.	Observations twice daily, 1900, March to December; 1901, January, February.
Gold Coast (Abari) ...	Assistant Colonial Surgeons ...	Observations twice daily, 1900, January to December; 1901, January.
" " (Accra) ...	" " " ...	" " " " " " " "
" " (Adida) ...	" " " ...	" " " " " " " "
" " (Axini) ...	" " " ...	" " " " " " " "
" " (Cape Coast Castle) ...	" " " ...	" " " " " " " "
" " (Gonabaga) ...	" " " ...	" " " " " " " "
" " (Kumasi) ...	" " " ...	" " " " " " " "
" " (Kwitta) ...	" " " ...	" " " " " " " "
Lagos ...	T. B. Wright... ...	" " " " " " " "
Mojunga, Madagascar ...	Stratton C. Knott ...	" " " " " " " "
Port Natal... ...	D. I. Nolan ...	Barometer diagrams, 26 December, 1886, to 10 September, 1887.



## APPENDIX III.

LIST of CAPTAINS and OFFICERS who have sent in Logs classed as "Excellent" during the year ending March 31, 1901. 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 or Officer.	Number of "Ex- cellent" Logs.	Ship.
Angus, T. S. ... ..	23	S.S. China.
Bertie, J. L. ... ..	4	S.S. European.
Clarke, W. H. ... ..	5	S.S. Tauric.
Crewe, E. ... ..	8	S.S. Victoria.
Crowley, C. ... ..	13	Verajean.
Dawson, W. P., R.N. ... ..	6	H.M.S. Waterwitch.
De la Garde, P., R.N. (Assist- ant Paymaster).	6	H.M.S. Waterwitch.
Duguid, W. ... ..	4	S.S. Prome.
Dupen, P. P. ... ..	16	S.S. Jebba.
Holmes, W. B. ... ..	1	S.S. Matatua.
James, E. Gates, R.N.R. ...	3	Lynton.
Livett, H. W. ... ..	2	S.S. Ormuz.
McAllister, W. ... ..	3	S.S. Clan Ferguson.
Nartyr, J. W. C. ... ..	1	S.S. Montrose.
Millican, J. W. ... ..	19	S.S. Loughrigg Holme.
Milner, W. H. ... ..	33	S.S. Tagus.
Mitchell, J. ... ..	2	S.S. Prome.
Mullan, F. C. ... ..	7	S.S. Reynolds.
Scott, G. P., F.R.Met.Soc. ...	18	Buckingham.
Simpson, A. ... ..	31	S.S. Moravian.
Squares De Carteret, W. G. ...	10	S.S. Minia.
Woolfall, A. ... ..	1	S.S. Amasis.



## APPENDIX IV.

## LIST of METEOROLOGICAL LOGS and DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Voyage.	Year.	Officers who have assisted in keeping the meteorological Log.
Adams, William	S.S. Diana	Davis Straits	1900	Alexander Connor, 2nd Officer.
Anderson, Wm.	Barque Loch Katrine	Adelaide and Melbourne	1900-1901	R. C. Nicholl, A. R. Worthington,
Angus, T. S.	S.S. China	Bombay, via Suez	1900	B. Elliot, 3rd, 4th, and 5th Officers.
"	"	"	1900	R. Kemp, R. Nicholl, G. Martell, 2nd, 4th, and 5th Officers.
"	"	Sydney, via Suez	1900	P. C. Headlam, Supernumerary 2nd Officer, F. Hallam, 3rd Officer, A. R. Worthington, 4th Officer.
"	"	"	1900-1901	W. Milman, A. K. Worthington, B. Elliot, 3rd, 4th, and 5th Officers.
Archibald, Rupert, R.N.R.	R.M.S. Empress of China.	Hong Kong and Vancouver	1900	John G. Sutherland, R.N.R., A. O. Cooper, R.N.R., W. Jones and J. Bowman.
"	"	"	1900-1901	W. Jones, A. O. Cooper, R.N.R., W. B. Wilkinson, R.N.R., and F. Davison.
Barker, D. W., R.N.R.	Training Ship Worcester.	Off Greenhithe	1900	Cadets.
Bertie, J. L.	S.S. European	New Orleans	1900	J. Williams, H. G. Hay, T. Williams, 2nd, 3rd, and 4th Officers.
"	"	New York	1900	W. J. Brysson, A. W. Melling, and H. G. Hay.
"	"	"	1900	do.
"	"	New Orleans	1900	do.
Chamberlin, W.	Ship Poseidon	Honolulu, Portland (Oregon)	1900	

LIST of METEOROLOGICAL LOGS and DOCUMENTS received from SHIPS—*continued.*

Captain's Name.	Ship.	Voyage.	Year.	Officers who have assisted in keeping the Meteorological Log.
Clarke, W. H. ...	S.S. Tauric ...	New York ...	1900	R. Learmouth, 2nd Officer, V. W. Hickson, R.N.R., 2nd Officer, W. McColl, 3rd Officer, M. B. Wilson, 3rd Officer, R. Hume and G. Houlgrave, 4th Officers.
" " ...	" ...	" ...	1900-1901	V. W. Hickson, R.N.R., 2nd Officer, M. B. Wilson, J. L. Jones, H. C. Rowlands, 3rd Officers, G. Houlgrave, P. C. Laight, 4th Officers
Combe, Commander J. W., R.N.	H.M.S. Penguin ...	Australian Station ...	1899-1900	Sub-Lieut. J. D. Nares, assisted by G. Hutchinson, H. Britcher, J. Spicer, and W. Chisholm, Quartermasters.
Constantine, T. ...	R.M.S. Nile ...	East Coast of South America	1900	W. Rossclunis, 5th Officer.
Corner, F. W., R.N.R. ...	Ship Macquarie ...	Sydney ...	1899-1900	J. G. Macdonald, Chief Officer.
Cox, S. G. ...	S.S. Rotherfield ...	Galveston ...	1898-99	W. J. Ingram.
Crewe, Edward ...	R.M.S. Victoria ...	Sydney, via Suez ...	1900	E. C. Roberts, R.N.R., Chief Officer. C. G. Smith, R.N.R., 2nd Officer, C. E. Hudson, R.N.R., Supernumerary 2nd Officer, C. W. Clift, R.N.R., 3rd Officer, H. H. Manning, R.N.R., 4th Officer, and J. H. Langley, 5th Officer.
" " ...	" ...	" ...	1900	E. C. Roberts, R.N.R., Chief Officer, C. G. Smith, R.N.R., 2nd Officer, W. F. Cossey, Supernumerary 2nd Officer, C. W. Clift, R.N.R., 3rd Officer, H. H. Manning, R.N.R., 4th Officer, C. H. Druce, 5th Officer.
" " ...	" ...	" ...	1900-1901	E. C. Roberts, Chief Officer, C. G. Smith, R.N.R., 2nd Officer, W. F. Cossey, Supernumerary 2nd Officer, H. H. Manning, 3rd Officer, S. C. Swaby, 4th Officer, C. H. Druce, 5th Officer.

Crowley, C. ...	...	Ship Verajan	...	Newcastle (N.S.W.), Portland (Oregon), and Cape Town.	1899-1900	W. C. Jackson, B. Westray, 1st and 2nd Mates.
Cust, Commander H. E. P., R.N.	...	H.M.S. Rambler	...	Table Bay and Newcastle (N.S.W.)	1900	do.
	...		...	Simon's Bay ...	1900	Lieut. H. J. G. Lawrence, R.N.
Davies, Herbert	...	R.M.S. Don	...	West Indies ...	1899-1900	J. Gair, 3rd Officer.
"	...	"	...	Colon ...	1900	F. A. Bilton, F. S. Hannon, G. G. Gib- bard, 3rd, 4th, and 5th Officers.
"	...	R.M.S. Orinoco	...	West Indies ...	1900	Do.
Dawson, W. P., R.N.	...	H.M.S. Waterwitch	...	Samsa, China Sea ...	1899	Philip de la Garde, Assistant Paymaster, and J. R. Bowering, A. King, P.O.'s 1st class, G. Britton, F. J. Canaway, P.O.'s 2nd class.
Dickinson, L. R.	...	R.M.S. Danube	...	East Coast of South America	1899-1900	H. N. Lewis, 3rd Officer, C. N. Young, 4th Officer, S. W. Farmer and W. D. McFarlane, 5th Officers.
"	...	"	...	"	1900	W. D. McFarlane, 5th Officer.
Docherty, Hugh	...	Barque Tinto Hill	...	San Francisco, Iquique, and Dunkirk	1899-1901	— Allen, Alex. Hall, 2nd Officers.
Duguid, Wm	...	S.S. Prome	...	Rangoon, via Suez ...	1900	George Guthrie and Ralph Taylor, 2nd and 3rd Officers.
"	...	"	...	"	1900	S. E. Speakman and L. C. Bakewell, 1st and 2nd Officers.
Dupen, P. P.	...	S.S. Jebba	...	West Coast of Africa	1900	Do.
"	...	"	...	"	1900	do.
"	...	"	...	"	1900-1901	Do.
Evans, T. R.	...	Barque Conway Castle	...	Honolulu, Callao, and Taltal	1899-1901	
French, A. A. L.	...	S.S. Lumen	...	Philadelphia...	1900	F. A. White, 1st Mate.
Gifford, H. C.	...	S.S. Amber	...	Gibraltar	1900	G. C. Hogg, D. P. Morrell, E. G. Enright, 1st, 2nd, and 3rd Officers.



## LIST of METEOROLOGICAL LOGS and DOCUMENTS received from SHIPS—continued.

Captain's Name.	Ship.	Voyage.	Year.	Officers who have assisted in keeping the Meteorological Log.
Gifford, H. C. ...	S.S. Amber ...	West Coast of Africa, Lisbon, and Gibraltar	1900	G. Hogg, Chief Officer, D. P. Morrell, 2nd Officer, W. Mist, 3rd Officer, and E. G. Enright, Extra 3rd Officer.
Glegg, Robert ...	S.S. Macduff ...	China and Japan, via Suez...	1899-1900	James Elliot, C. E. L. Gumley, George Ansted, 1st, 2nd, and 3rd Officers.
Griffin, E. J., R.N.R. ...	R.M.S. Briton ...	Cape Town ...	1899-1900	F. G. Robinson, G. Hamilton, and P. Durkin, 3rd, 4th, and 5th Officers.
" " " ...	" " " ...	" " " ...	1900-1901	
Hay, C. W. ...	R.M.S. Aorangi ...	Brisbane, Honolulu, and Vancouver	1899-1900	A. H. Reed and R. Bailey, 3rd and 4th Officers.
" " " ...	" " " ...	" " " ...	1900	Wm. Bishop, 3rd Officer.
" " " ...	R.M.S. Warimoo ...	Sydney, Brisbane, Suva, Honolulu, and Victoria (E.C.)	1899	G. M. Hammon, A. H. Reed, and W. Ellis, 2nd, 3rd, and 4th Officers.
Hemming, F. A. ...	R.M.S. Miowera ...	Sydney, Vancouver, via Wellington. Honolulu, and Brisbane.	1898-1900	Messrs. Sydney Pearson, 3rd Officer, W. Ellis, Macfarlane, Newbery, and H. Young.
" " " ...	" " " ...	Vancouver, Honolulu, Suva, and Sydney	1899	Willoughby Ellis, 3rd Officer.
" " " ...	" " " ...	Brisbane, Victoria (B.C.), via Honolulu...	1900	H. C. Hamand, W. Macfarlane, R. Bailey, and A. W. Newbery.
Hepworth, M. W. Campbell, R.N.R. ...	R.M.S. Aorangi ...	Sydney, Brisbane, Suva, Honolulu, and Vancouver.	1899	S. Phillips, R. M. Reader, F. J. Bayldon, and R. Bailey, 1st, 2nd, 3rd, and 4th Officers.
Holmes, W. B. ...	S.S. Matatua ...	Wellington, via Cape Good Hope, and Monte Video, via Cape Horn.	1900-1901	R. J. Cross, A. C. Allingham, 2nd and 3rd Officers.
James, E. G., R.N.R. ...	Ship Lynton ...	San Francisco ...	1899-1900	A. Donaldson, Chief Officer, and G. H. Goldsbrough, Midshipman.
Kempson, C. H. ...	R.M.S. Ionic ...	Cape Town, Wellington, Rio Janeiro ...	1899-1900	Messrs. Wm. Jones & Lewis.

Livett, H. W. ...	R.M.S. Ormuz ...	Sydney, via Suez ...	1900	P. N. Layton, H. R. Lesslie, J. Hills, A. V. Cowell, 1st, 2nd, 3rd, and 4th Officers.
Lockyer, H. R. C. ...	S.S. Heliope... ..	Monte Video ...	1900-1901	J. Duncan, L. Page. — Kelly, 1st, 2nd, and 3rd Officers.
McAllister, Duncan ...	S.S. Bharu ...	Batoum, Calcutta, via Suez ...	1899-1900	Thomas Richmond, 2nd Officer.
" " ...	" " ...	" " " " ...	1900	James Lyall, Thomas Richmond, and L. McDonald, 1st, 2nd, and 3rd Officers.
" Wm. ...	S.S. Clan Ferguson ...	Madras, via Suez ...	1900	C. Joel Higgins, 2nd Officer.
MacCormac, A. R. C. ...	Ship Alcinous ...	Sydney and Astoria (Oregon) ...	1899-1900	James MacVicar, Mate.
McKay, H., R.N.R. ...	R.M.S. Lucania ...	New York ...	1900	E. H. Pratt and E. G. Giggie, Extra 2nd Officers.
Marshall, O. P., R.N.R. ...	R.M.S. Empress of India.	Hong Kong and Vancouver ...	1900	W. Davison, 2nd Officer. J. H. Carter, 4th Officer.
Martin, T. C. ...	Barque Loch Tay ...	Adelaide ...	1899-1900	G. Calcutt, 2nd Officer.
Martyr, J. W. C. ...	S.S. Montauk ...	Quebec and Las Palmas ...	1900	Thomas E. Musgrave.
" " ...	S.S. Montrose ...	Cape Town ...	1900-1901	F. W. Whitton, R.N.R.
Miller, A. T., R.N. ...	Training Ship Conway ...	Off Birkenhead ...	1900	Cadets.
Millican, J. W. ...	S.S. Loughbrigg Holme ...	Quebec, Vera Cruz, Galveston, Pictou, and Nova Scotia.	1899-1900	
Milner, W. H. ...	S.S. Tagus ...	Cape Town ...	1900	L. J. K. H. Tinney, 4th Officer.
Mitchell, George ...	S.S. California ...	Mediterranean Ports and New York ...	1900	John Samuel.
Mitchell, James ...	S.S. Prome ...	Rangoon, via Suez ...	1900	
" " ...	" " ...	" " " " ...	1900	R. Taylor, H. Lyon, John Reid, 1st, 2nd, and 3rd Officers.
Monro, Lieut. and Commander C. E., R.N. ...	H.M.S. Dart ...	Australian Stations... ..	1900	Surgeon A. O. Bolardt, assisted by E. Brasington, C. Lloyd, C. Ball, and N. Smith, Petty Officers.
Mortimer, S. ...	R.M.S. Aorangi ...	Brisbane, Honolulu, and Victoria (B.C.) ...	1899-1900	A. H. Reed and R. Bailey, 3rd and 4th Officers.
Moseley, F. J., R.N.R. ...	S.S. Goorkha ...	Cape Town ...	1900	I. Grogan, I. Attwood, R.N.R., I. Haywood, S. C. Rogers, 1st, 2nd, 3rd, and 4th Officers.

LIST OF METEOROLOGICAL LOGS AND DOCUMENTS received from SHIPS—*continued*.

Captain's Name.	Ship.	Voyage.	Year.	Officers who have assisted in keeping the Meteorological Log.
Mullan, F. C., F.R.G.S.	S.S. Reynolds	Batoum, Colombo, and Batavia ... ..	1900	W. H. Davies, T. Harrison, and E. Hall.
" " "	"	Java, Algiers, via Suez, Philadelphia, and Marseilles.	1900	Do.
" " "	"	Marseilles, Black Sea Ports, and Hamburg.	1900	Do.
Nasbet, J. R., R.N.R.	S.S. Sabine Rickmers	China Sea ... ..	1899-1900	T. Powell, A. Dransfield, 1st and 2nd Officers.
Newton, F. S.	R.M.S. Don	West Indies ... ..	1900	C. N. Young, E. Clarke, and L. W. Morant, 3rd, 4th, and 5th Officers.
Nicholson, C., R.N.R.	R.M.S. Ormuz	Sydney, via Suez ... ..	1900	P. N. Layton, R.N.R., H. R. Leslie, W. de M. Baynham, R.N.R., A. V. Cowell, R.N.R., 1st, 2nd, 3rd, and 4th Officers.
Noal, R. J.	S.S. Helopes...	Cape Town and Buenos Aires ... ..	1900	
"	"	Monte Video and Buenos Aires ... ..	1900	
Parker, W. J.	Barque Kinclune	East London and Otago ... ..	1899-1900	Edward Foley, 2nd Officer.
Pattman, R.	Ship Loch Torridon...	Adelaide ... ..	1899-1900	A. Evans, L. C. Taylor, Malcolm J. Comyn, 1st, 2nd, and 3rd Officers.
Phillips, J. D. S.	R.M.S. Aorangi	Brisbane, Honolulu, and Victoria (B.C.)	1899-1900	A. H. Reed and R. Bailey, 3rd and 4th Officers.
"	R.M.S. Warrimoo	Brisbane, Honolulu, and Vancouver ...	1900	G. M. Hammon, F. Bayldon, S. Payes Davy, E. C. Mason, 1st, 2nd, 3rd, and 4th Officers.
Potter, R. H.	Barque Alliance	Cape Town, Newcastle (N.S.W.), and Valparaiso.	1899-1900	R. O. Harris, Reginald Turnbull, 1st and 2nd Officers.
Pybus, H., R.N.R.	R.M.S. Empress of Japan.	Victoria (B.C.) and Hong Kong ... ..	1900	J. G. Sutherland.



Reeves, I.	...	S.S. Australia	...	Sydney, via Suez	...	...	1900	S. A. Davidson, R.N.R., E. G. H. Brady, R.N.R., L. R. Gardiner, R.N.R.
"	...	"	...	"	...	...	1900	E. G. H. Brady, R.N.R., Supernumerary 2nd Officer, L. R. Gardiner, R.N.R., 3rd Officer, E. Downes, R.N.R., 4th Officer.
"	...	"	...	"	...	...	1900-1901	L. A. Davidson, R.N.R., 2nd Officer, D. Stratton, Supernumerary 2nd Officer, L. R. Gardiner, R.N.R., 3rd Officer.
Reynolds, R., R.N.R.	...	R.M.S. Norman	...	Cape Town	...	...	1899	C. E. Stuart, R.N.R., — Marklew, T. A. Jones, D. E. Easton, 1st, 2nd, 3rd, and 4th Officers.
Roberts, Robert	...	S.S. Cabenda	...	West Coast of Africa	...	...	1899-1900	Messrs. J. E. P. Matthews, Tinney, Farmer, and Owen.
Rogers, B. H.	...	S.S. Othello	...	Bombay, via Suez, New York	...	...	1897-1900	C. L. Coxwell and G. A. Mackenzie.
Budge, Horace	...	R.M.S. Atrato	...	West Indies	...	...	1900-1901	
"	...	R.M.S. Para	...	"	...	...	1900	
Schleman, Henry	...	S.S. Sophocles	...	Melbourne, via Cape Town	...	...	1900-1901	A. Thomson, H. Clark and R. Harrison, 1st, 2nd, and 3rd Officers.
Scott, G. P.	...	Ship Buckingham	...	Calcutta	...	...	1900	W. Calvert, George Gibbons, 1st and 2nd Officers.
Seymour, F. H.	...	S.S. Britannia	...	Sydney, via Suez	...	...	1900	M. E. Dunstan, Supernumerary 2nd Officer, B. B. Hetherington, 3rd Officer, G. Lake, 4th Officer, H. R. Rhodes, 5th Officer.
"	...	"	...	"	...	...	1900	B. B. Hetherington, Supernumerary 3rd Officer, G. Lake, 4th Officer, and J. E. Adams, 5th Officer.
"	...	"	...	"	...	...	1900	M. E. Dunstan, Supernumerary 2nd Officer, H. D. Bennett, 3rd Officer, G. Lake, 4th Officer, H. R. Rhodes, 5th Officer.
Simpson, Alexander	...	S.S. Moravian	...	Melbourne, via Cape Town	...	...	1899-1900	H. W. Schleman, Chief Officer, J. A. Elrick, 2nd Officer, and D. M. Ross, Supernumerary 2nd Officer.

LIST of METEOROLOGICAL LOGS and DOCUMENTS received from SHIPS—*continued.*

Captain's Name.	Ship.	Voyage.	Year.	Officers who have assisted in keeping the Meteorological Log.
Simpson, Alexander ...	S.S. Moravian	Melbourne, Sydney, via Cape	1900	H. W. Schleman, Chief Officer, J. A. Elrick, 2nd Officer, and D. M. Ross, Supernumerary 2nd Officer.
Simpson, C. H., R.N. ...	H.M.S. Egeria	Vancouver	1900	Sub-Lieutenant J. S. Harris, R.N.
"	"	"	1900	Do.
Squares de Carteret, W. G.	S.S. Minia	Halifax	1899-1900	James Adams, Chief Officer, E. Hewardine, Nav. Officer, L. E. Jeffries, 2nd Officer, H. Lee, 3rd Officer.
Tamplyn, L. H.	S.S. El Dorado	Chinese Ports	1900	J. M. Smith and P. Callan, 1st and 2nd Officers.
"	"	China Sea	1900	George Milner, F. Large, and F. Hereford.
Tod, J. C.	Barque Shakespeare...	Natal, Newcastle (N.S.W.), Iquique, Mauritius, and Sydney.	1898-1900	
Trenaman, R. W.	S.S. Romney	Monte Video	1900	A. Gittins.
"	"	Monte Video and Galveston	1900	C. Longbottom, 2nd Officer.
Turner, A.C., R.N.R.	S.S. Britannia	Bombay, via Suez	1900	R. A. Browne, 2nd Officer.
"	"	"	1900	Do.
"	"	"	1900	Do.
Tyson, John	R.M.S. Moor	Cape Town	1900	G. R. P. Thwaites, W. M. Betts, H. B. Rake, P. A. Cockburn, 1st, 2nd, 3rd, and 4th Officers.
"	"	"	1900	W. Morton Betts, John Kerbey, W. Haywood, P. A. Cockburn, 1st, 2nd, 3rd, and 4th Officers.
Walker, H., R.N.R.	R.M.S. Campania	New York	1899-1900	— Hankinson, 2nd Officer, — Affolter, Ex. 2nd Officer, — Dyke, 3rd Officer, — Brown, 4th Officer.
Wilson, John, R.N.R.	S.S. Anchoria	"	1900	John Duncan, 3rd Officer.





Wood, G. H. B. ...	...	Barque Lutterworth	New Zealand	...	...	...	1899-1900	J. Renton and W. Starr, 1st and 2nd Officers.
Woodward, E. A. ...	...	Barque Cumbrian	Sydney (N.S.W.), Peru, and Dunkirk	...	...	...	1899-1900	J. A. Rae and S. Spearpoint, 1st and 2nd Officers.
Woolfall, Alfred	...	S.S. Amasis	Quebec and Alexandria	...	...	...	1900-1901	A. H. James, Chief Officer, C. W. Burleigh, 2nd Officer, E. M. Hussey-Cooper, 3rd Officer, A. D. Williamson, Supernumerary 3rd Officer, H. T. Williams, 4th Officer, H. A. Smith, 5th Officer.
Worcester, W. D. G., R.N.R.	...	S.S. India	Sydney, via Suez	...	...	...	1900	G. C. Holloway, A. H. James, C. W. Burleigh, E. M. H. Cooper, H. Williams, and A. Cameron.
"	...	"	"	...	...	...	1900	A. H. James, R.N.R., Chief Officer, S. P. Berridge, 2nd Officer, A. D. Williamson, Supernumerary 2nd Officer, H. T. Williams, 3rd Officer, and C. W. Cartwright, 5th Officer.
"	...	"	"	...	...	...	1900-1901	

## APPENDIX V.

## INSTRUMENTS supplied to the Royal Navy.

Per Account.		Baro- meters.	Ane- roids.	Thermometers.				Hydro- meters.
				Ordinary.	Max.	Min.	Screens.	
April 1st, 1900, afloat	...	239	674	1,400	427	418	238	57
Issued since	...	119	249	498	108	108	40	—
Returned since	...	358	923	1,898	535	526	278	57
	...	97	176	435	87	83	16	—
April 1st, 1901, afloat	...	261	747	1,463	448	443	262	57

## INSTRUMENTS supplied for use at Naval Stations.

April 1st, 1900, in use	...	75	83	249	33	55	10	11
Issued since	...	3	2	37	1	1	—	6
Returned since	...	78	85	286	34	56	10	17
	...	3	1	27	1	—	—	3
April 1st, 1901, in use	...	75	84	259	33	56	10	14

## DISPOSITION of ADMIRALTY INSTRUMENTS on April 1st, 1900.

Afloat in Royal Navy	...	261	747	1,463	448	443	262	57
In use at stations	...	75	84	259	33	56	10	14
In store at M.O.	...	51	100	73	70	65	44	45
" Chatham	...	6	16	70	28	27	11	12
" Sheerness	...	5	18	38	14	14	11	6
" Portsmouth	...	17	38	118	41	46	19	4
" Devonport	...	17	36	130	45	47	20	2
" Queenstown	...	2	4	3	3	4	—	—
" Gibraltar	...	2	—	9	3	3	—	4
" Malta	...	11	16	41	12	8	1	6
" Bombay	...	4	4	6	5	4	2	4
" Halifax	...	4	4	19	4	1	2	8
" Bermuda	...	3	7	9	4	5	2	—
" Jamaica	...	3	4	13	—	1	1	3
" Cape of Good Hope	...	2	2	20	5	2	2	4
" Trincomalee	...	4	5	21	5	6	1	4
" Hong Kong	...	9	11	18	15	14	9	18
" Coquimbo	...	2	3	20	3	4	1	—
" Sydney	...	2	—	—	4	6	2	16
" Esquimalt	...	5	9	20	2	3	2	4
Total April 1st, 1901	...	485	1,108	2,350	744	759	402	211
Lost, &c., since April 1st, 1900	...	—	2	212	14	19	11	8
Under repair, April 1st, 1901	...	26	—	—	3	—	—	—

## APPENDIX VI.

## INSTRUMENTS supplied to the Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.				Hydro- meters.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1900, afloat ...	103	—	653	—	—	98	363
Issued since ... ..	40	—	219	—	—	25	131
Returned since ... ..	143	—	872	—	—	123	494
	39	—	202	—	—	17	115
April 1st, 1901, afloat ...	104	—	670	—	—	106	379

## INSTRUMENTS at Stations, viz., Telegraphic Reporting Stations, Observatories, Fishing Villages, &amp;c.

April 1st, 1900, in use ...	313	1	283	59	66	56	10
Issued since ... ..	19	—	49	8	13	1	—
Returned since ... ..	332	1	332	67	79	57	10
	16	—	11	4	8	—	3
April 1st, 1901, in use ...	316*	1	321	63	71	57	7

## DISPOSITION of INSTRUMENTS on April 1st, 1901.

In merchant ships ... ..	104	—	670	—	—	106	379
„ use at stations ... ..	316	1	321	63	71	57	7
„ store at M.O. ... ..	32	3	98	13	8	25	88
At Liverpool Agency ... ..	7	—	57	—	—	7	25
„ Glasgow ... ..	10	—	40	—	—	5	14
„ Dundee ... ..	5	—	20	—	—	3	20
„ Hull ... ..	3	—	16	—	—	3	10
„ Cardiff ... ..	8	—	31	—	—	4	31
„ Southampton „ ... ..	4	—	17	—	—	3	19
Total, April 1st, 1901 ...	489	4	1,270	76	79	213	593
Lost, &c., since April 1st, 1900	2	—	50	1	3	7	19
Under repair, April 1st, 1901	2	—	6	—	—	—	—

\* Of these barometers, 226 are lent for use of seafaring communities at fishing villages and ports.





## APPENDIX VII.

REPORT ON THE COMPARISON OF THE FORECAST ISSUED AT 8h. 30m. p.m., WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 months April 1900 to March 1901. 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," but the results of the 8.30 p.m. Forecasts only are here published.

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

The Summary for the various districts is given at page 18.

Months.		Percentages.				Months.		Percentages.			
		Wind.	Weather.	Average.	a + b.			Wind.	Weather.	Average.	a + b.
April	a	40	57	49	77	November	a	40	64	52	84
	b	27	30	28			b	37	26	32	
	c	26	9	18			c	16	6	11	
	d	7	4	5			d	7	4	5	
May	a	61	66	64	86	December	a	36	67	52	85
	b	22	23	22			b	43	23	33	
	c	12	8	10			c	14	8	11	
	d	5	3	4			d	7	2	4	
June	a	57	65	61	86	January	a	52	59	56	80
	b	27	23	25			b	26	23	24	
	c	14	10	12			c	14	12	13	
	d	2	2	2			d	8	6	7	
July	a	50	56	53	83	February	a	54	65	60	86
	b	32	28	30			b	27	26	26	
	c	11	10	11			c	16	7	12	
	d	7	6	6			d	3	2	2	
August	a	54	65	60	85	March	a	54	69	62	88
	b	27	23	25			b	28	24	26	
	c	12	6	9			c	15	5	10	
	d	7	6	6			d	3	2	2	
September	a	54	68	61	85	The entire year	a	50	64	57	84
	b	22	25	24			b	29	25	27	
	c	16	5	10			c	15	7	11	
	d	8	2	5			d	6	4	5	
October	a	48	69	59	86						
	b	27	28	27							
	c	15	2	9							
	d	10	1	5							

## APPENDIX VIII.

### CONSPICUOUS METEOROLOGICAL OCCURRENCES IN 1900.

The following were the more striking features in the weather of 1900, noticed in connexion with the issue of daily and weekly reports.

1. *Gales.*—These were unusually frequent, but with a few exceptions they were of little severity. The most important storms were :—

(a.) From South and South-East on February 15th ; severe in the North and East, and accompanied by heavy snow-storms.

(b.) A Westerly (South-West to North-West) gale on December 20th and 21st ; severe in the West and North.

(c.) A Westerly gale on December 28th ; severe in the West and South. On this occasion a mean hourly velocity of 75 miles (nominal\*) or more was registered at four of the Anemometer Stations.

The Westerly to Northerly gale which prevailed on the English and Irish Coasts on August 3rd was of unusual strength for the summer-time.

The records of the Anemographic Stations in connexion with the Office have furnished instances in which an average velocity of 44 miles per hour for one hour was reached or exceeded during the year, as given in the following Table. An average velocity of 44 miles per hour is assumed to be equivalent to the estimated force, 9 of Beaufort's Scale.† The average velocity for the hour is taken from the records of the Robinson anemograph or the Dines anemograph at the stations from which the records are quoted ; the maximum rate in a gust is from Dines instruments which are installed at Holyhead and Scilly.

The exposure of the several anemometers is not uniform and, in some cases, not so good as could be wished.

The effect upon the record caused by an imperfect exposure of an anemometer may be either to unduly increase or decrease it, according to circumstances.‡

The absence of any record of high winds at a station must in some cases be attributed to the peculiarity of exposure rather than to the entire failure of high winds in the locality.

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\* See Note on p. 83.

† See Quarterly Journal, Royal Meteorological Society, Vol. xxiii., p. 41.

‡ See Annual Report of the Office for 1897-98, p. 23.



NOTES on GALES for which a MEAN ACTUAL VELOCITY of not less than 44 MILES (60 miles nominal)\* per hour was REGISTERED on the SELF-RECORDING ANEMOMETERS.

Date.	Station.	Duration of Severe Gale. 44 miles per hour, or above.	Wind Direction.	Maximum.		Remarks.
				Hourly Velocity.	Rate in a gust.	
Jan. 9	Deerness...	11.30 a.m. to 0.30 p.m. ...	W.	44	—	In each of these instances the centre of the disturbance followed a north-easterly course, at some distance to the northward of the British Isles, and the gales only became severe locally.
" 18	Fleetwood	2.30 a.m. to 3.30 a.m. ...	W.	44	—	
" 22, 23	Deerness...	10.30 p.m. to 0.30 a.m. ...	W.S.W. to W.	44	—	
" 24	Scilly ...	11.30 a.m. to 1.30 p.m. ...	W.N.W.	47	60	A very squally gale. The depression appears to have become developed over England and to have travelled south-eastwards to the continent. These two were the only stations at which the force of a strong gale was registered.
" 27, 28	Scilly ...	11.30 a.m. to 2.30 p.m., 27th, and 8 a.m. to 7 p.m., 28th ...	W.N.W.	47	75	
	Yarmouth	7.30 to 8.30 p.m., 28th ...	N.W. to N.E. N.E.	61 42	83 —	
Feb. 13, 14	Scilly ...	5.30 p.m. to 10.30 p.m. ...	N.N.E. to N.N.W.	49	66	The centre of this depression passed up the Channel during the night; at 8 a.m., 14th, it lay over Belgium. During the early hours of the 16th, some severe squalls were experienced at Scilly, in one of which a rate of 71 miles per hour was registered by the pressure-tube anemometer. The depression was a deep one, and travelled across the north of Ireland and past the west coast of Scotland.
	Yarmouth	11.30 p.m. to 2.30 a.m. ...	E.N.E.	44	—	
" 15, 16	Scilly ...	2.30 a.m. to 4.30 a.m., 15th ...	S.E. ly	45	61	
	Yarmouth	3.30 p.m. to 8.30 p.m., 15th ...	S.E.	48	—	
	Deerness...	2.30 p.m., 15th, to 8.30 a.m., 16th ...	E.S.E.	64	—	
	Aberdeen	6.30 p.m., 15th, to 2.30 a.m., 16th ...	S.E.	45	—	



Feb. 20	Scilly ...	Between 5 & 6 a.m., & from 7 a.m. to 9 a.m.	W.N.W.	46	58	Although the barometer was very low, the gradients were not steep, and the force of a strong gale was reached only at the mouth of the Channel.
Mar. 12	Deerness...	1.30 p.m. to 4.30 p.m.	W.	45	—	In both these instances the depression centres passed well to the northward of Great Britain. At Scilly on the afternoon of this day some severe squalls from west were recorded, in one of which a rate of 57 miles per hour was reached. The depression followed an erratic course, first to the south-eastward, and then recurving went to the northward, and later to the south-westward, disappearing finally off the mouth of the Channel.
" 15, 16	Deerness...	11.30 p.m. to 2.30 a.m.	N.N.W.	45	—	
" 18	Kingstown	4.30 p.m. to 5.30 p.m.	E.S.E.	45	—	
Apr. 11	Valencia...	1.30 p.m. to 3.30 p.m.	W.S.W.	46	—	The strong wind here was due to the formation of a well-marked secondary depression over the north-west of England.
" 13	Fleetwood	6.30 a.m. to 11.30 a.m.	W.S.W. to W.N.W.	48	—	At Holyhead a mean velocity of 44 miles per hour was reached during brief intervals from 4 a.m. to 7 a.m., the maximum rate being 63 miles per hour. The centre of the disturbance was then off the north-east of Scotland.
June 25	Scilly ...	3.30 a.m. to 6.30 a.m.	W.	46	56	Due to a small but well marked depression which travelled across England in a south-easterly direction during the night.

\* The nominal value is that derived from a standard Robinson anemometer by the use of the Factor 3. In the data given in these notes, the factors which give, as nearly as can be ascertained, the true velocities have been employed in each case.

Date.	Station.	Duration of Severe Gale, 44 miles per hour or above.	Wind Direction.	Maximum.		Remarks.
				Hourly Velocity.	Rate in a gust.	
July 6	Fleetwood	2.30 p.m. to 3.30 p.m. ...	W.N.W.	45	—	The gradients became locally steep, owing to the co-existence of a depression over the North Sea, and an anti cyclone to the south-west of England. At Kingstown, at 5.45 p.m., the wind backed suddenly from S. to N.E. At Holyhead, at 9.30 a.m., it veered as quickly from S.S.W. to N.N.W., and at a few minutes before 10 a.m. the force rose abruptly from a calm to a strong gale. At 8 a.m. the centre of the Irish Sea, travelling eastwards. At Scilly the wind veered quickly from S.W. to W., with an increase of force from a "fresh" to a "strong" gale. At Holyhead, at 3 p.m., it veered suddenly from E. to S., and at 6 p.m. almost as quickly from S. to N.W., the force increasing very rapidly from a light breeze to a strong gale. At Kingstown the wind <i>backed</i> from E. to N.W. The depression seems to have followed a very similar track to the last.
Aug. 3	Kingstown Holyhead	6.30 a.m. to 7.30 a.m. ... 10 a.m. to noon ...	N.E. N.N.W.	45 46	— 62	
" 6	Scilly Holyhead	0.45 p.m. to 4.30 p.m. ... 6.40 p.m. to 9.0 p.m. ...	W. N.W.	51 45	71 58	
Nov. 6	Scilly	2.30 p.m. to midnight ...	N.W.	54	71	At Holyhead between midnight and 1 a.m., 7th, the wind increased from a calm to a fresh gale from N.W.

Dec. 5	Scilly ...	4.30 p.m. to 6.30 p.m.	...	W.	47	62	<p>The centre of the depression first travelled south-eastwards from Ireland to the Cornish and Devon coasts, and then north-eastwards across central England.</p> <p>At Scilly and at Holyhead the wind was very gusty, and at the former station some of the squalls lasted several minutes. The gale was caused by a deep depression which travelled in a north-easterly direction outside our western coasts.</p> <p>This was the most severe gale of the year, the force of the wind in the gusts at Scilly being the highest registered there for some years. The depression advanced quickly during the night along an easterly track across central Ireland and the northern counties of England. On our eastern coasts the force of the wind was not so great.</p>
" 15	Deerness	5.30 p.m. to 7.30 p.m.	...	W.	45	—	
" 20, 21	Valencia	4.30 p.m. to 6.30 p.m.	20th	S.W.	49	—	
	Scilly ...	10.15 a.m. to 10.45 a.m.	20th	S.S.W.	44	62	
	Kingstown	0.30 p.m. to 1.30 p.m.	20th	N.N.W.	47	—	
	Holyhead	5 p.m. to 5 a.m.	21st	S.W.ly.	44	64	
	Shields ...	9.30 p.m., 20th. to 1.30 a.m., 21st	...	S.W.	46	—	
	Deerness	8.30 a.m. to 11.30 a.m.	21st	N.W.	49	—	
" 27, 28	Valencia	11.30 a.m., 27th. to 9.30 a.m., 28th	28th	S.S.E. to S. & W.N.W.	59	—	
	Scilly ...	9.30 p.m., 27th. to 0.30 p.m., 28th	28th	S.W. to W. & W.N.W.	62	90	
	Kingstown	9.30 a.m. to 3.30 p.m.	28th	N.E.	55	—	
	Holyhead	9.45 a.m. to 6.45 p.m.	28th	W.N.W.	57	75	
	Fleetwood	11.30 a.m. to 9.30 p.m.	28th	N.W.	64	—	

2 *Heavy Rains*.—The heaviest *summer* rains, accompanied in most instances by thunderstorms, occurred on—

- (a.) July 12th in the North of England and was especially heavy in the West Riding of Yorkshire (at one station in Ilkley there was as much as 5·4 ins.)
- (b.) July 20th in Eastern and Central England. In Northampton and the vicinity a severe hailstorm occurred on this day.
- (c.) July 27th and 28th in Ireland, and especially in the South.

The heaviest *winter* rains were recorded between October 26th, 27th and on December 30th.

In the former case they occurred during the formation of a deep secondary depression over the north of England on October 26th, the disturbance afterwards moving away across the Southern part of the North Sea. The heaviest falls occurred over the counties of Durham and Northumberland, the amount for the 24 hours ending with the morning of October 27th, being over three inches in many places lying between Berwick and Durham, and as much as 3·7 inches at Alnwick Castle and Newcastle-on-Tyne.

This depression was so limited in area during its formation that the daily maps did not adequately represent it. The telegram from Shields on the following morning announcing a rainfall of over three inches in the 24 hours was supposed at first to be a telegraphic error.

The heavy rains of December 30th occurred during the advance along the South of England of a small secondary depression of growing intensity. More than two inches fell at many places in the Western and South Midland counties of England, and more than three inches in a narrow strip of country extending from Bristol and Chepstow to Coventry. The changes which took place during the development of this secondary are very strikingly represented in the records of the Falmouth Observatory which are reproduced in Plate I.

Repeated heavy rains occurred in the West of Scotland during the week ending December 15th, the total amount at Fort William being as much as 8·5 inches, or 92 per cent. of the average for the whole of December.

3.—*Snowstorms*.—The only snowstorms worthy of note occurred in February and on the following dates :—

February 2nd—In the South and East of England.

February 8th to 10th—Over the entire Kingdom.

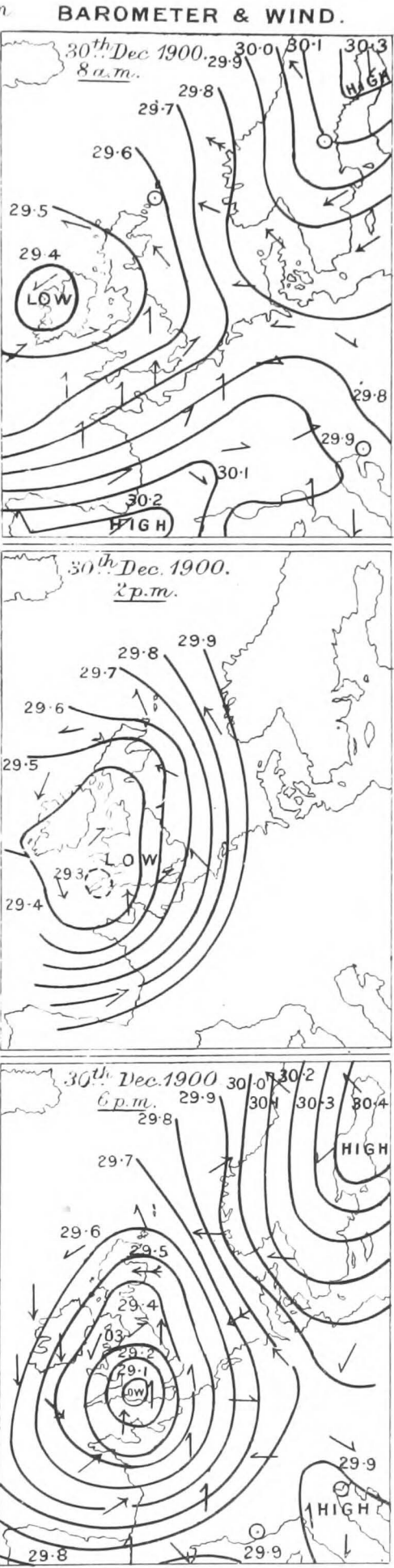
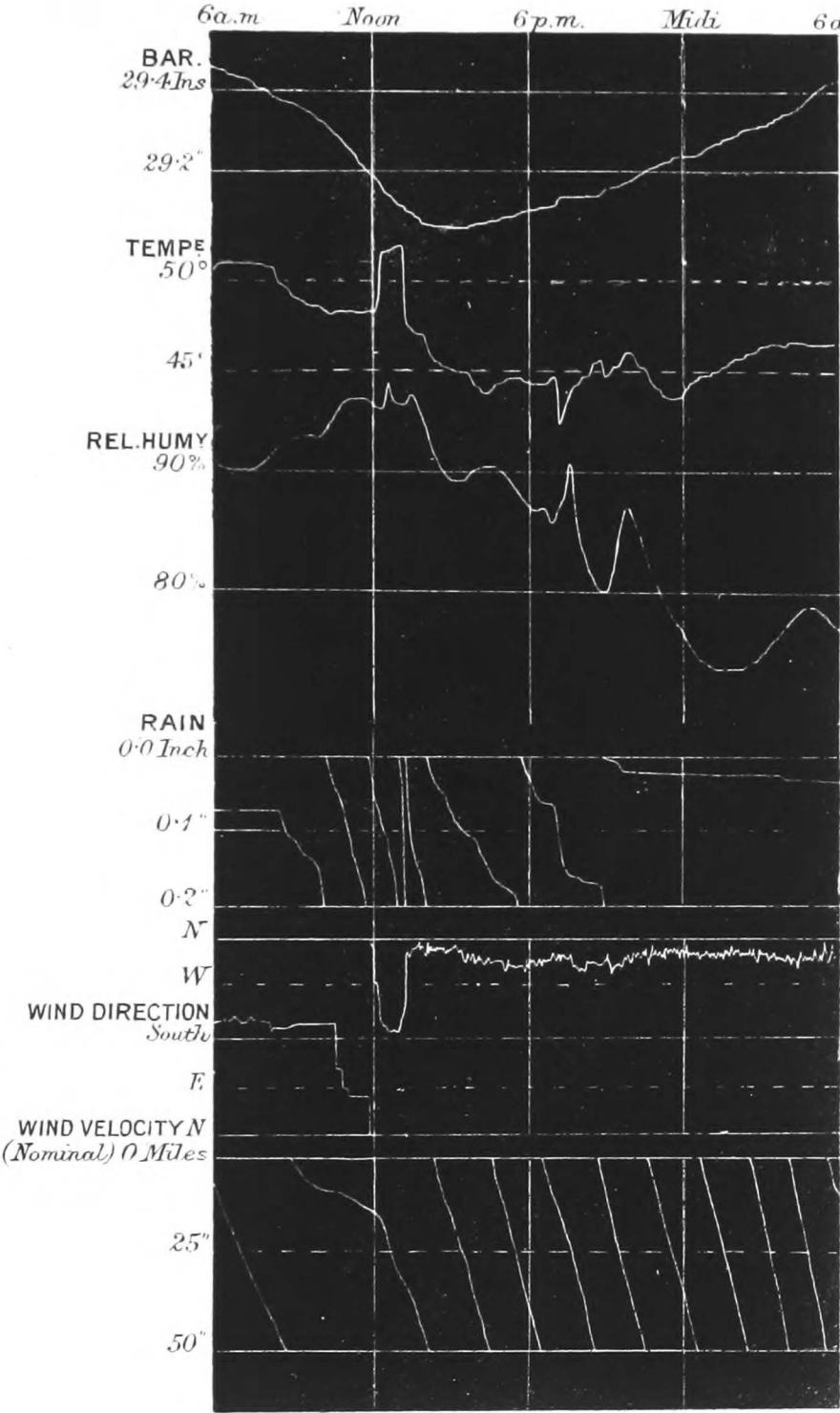
February 13—In all the more Southern Districts.

February 15th—Over the entire northern half of the Kingdom (a very heavy fall accompanied by a violent South-East gale and causing much damage to the telegraph wires.)



Plate I.

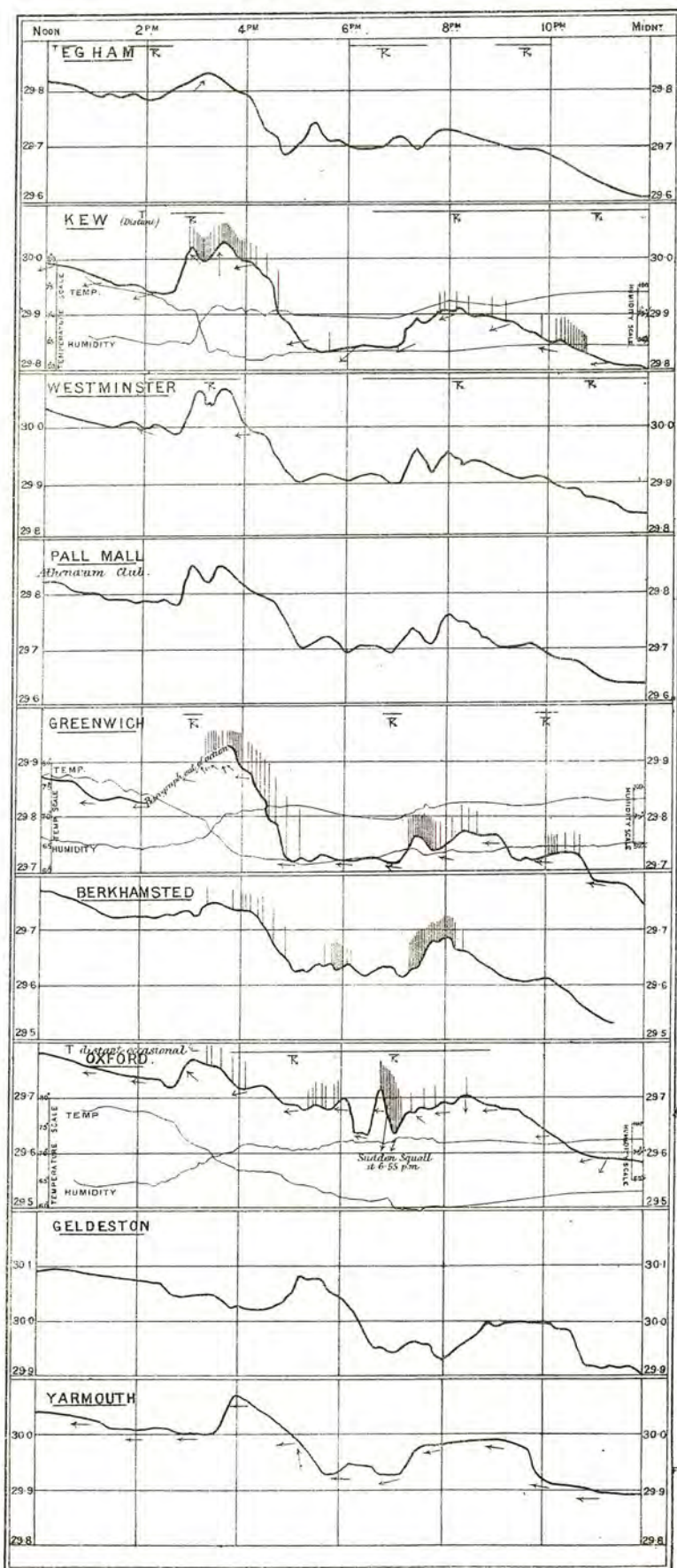
FALMOUTH OBSERVATORY RECORDS.  
Decr 30<sup>th</sup>-31<sup>st</sup> 1900.



*Diagrams illustrating the development of a Gale in the English Channel from a small secondary depression in the Atlantic and the accompanying changes in the Meteorological Elements at Falmouth Observatory.*

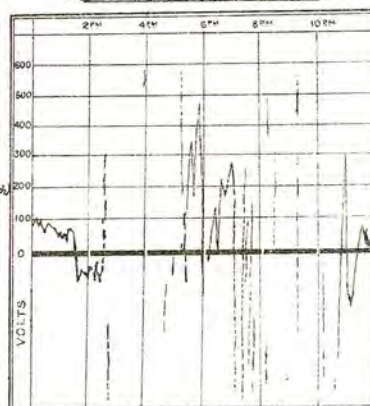


# RECORDS OF THE THUNDERSTORM OF JULY 27<sup>TH</sup> 1900.



## KEW ELECTROGRAM.

JULY 27<sup>TH</sup> 1900. NOON TO MIDNIGHT



PRESSURE.

PRESSURE.

RAINFALL  
(In hundredths of an inch.)  
FORCE AND DIRECTION  
OF WIND  
TEMPERATURE  
AND  
HUMIDITY.

PRESSURE  
AND  
WIND

PRESSURE.

PRESSURE.

RAINFALL  
(In hundredths of an inch.)  
FORCE AND DIRECTION  
OF WIND.  
TEMPERATURE  
AND  
HUMIDITY

PRESSURE

AND  
RAINFALL  
(In hundredths of an inch.)

PRESSURE.

RAINFALL  
(In hundredths of an inch.)  
FORCE AND DIRECTION  
OF WIND  
TEMPERATURE,  
AND  
HUMIDITY.

PRESSURE.  
(Time scale  
uncertain.)

PRESSURE

FORCE AND DIRECTION  
OF WIND.

JULY, 27<sup>TH</sup> 1900. 2 PM



JULY, 27<sup>TH</sup> 1900. 6 PM



## EXPLANATION OF DIAGRAM

**PRESSURE** Shown by the thick line. The readings are uncorrected for height, and, except at Kew, Greenwich and Oxford are from Aneroidographs, without special means of checking the time scale.

**TEMPERATURE and PERCENTAGE HUMIDITY** are shown by fine lines.

**RAINFALL** For each quarter of an hour short vertical lines are drawn to the barometer curve, one for every hundredth of an inch that fell in that interval. Rainfall is only given for stations which have a self recording rain gauge. The rainfall at the other stations is either not measured, or only the measurements for 24 hours are available. The duration of the thunderstorm, or thunderstorms, is shown by the horizontal lines at the top of the several diagrams.

**WIND** The direction is shown by Arrows flying with the wind. The lengths of arrows show the velocity on the scale of 100 miles per hour (nominal) to one half inch.





4. *Thunderstorms*.—These were unusually frequent, and were accompanied in many instances by exceedingly heavy falls of rain and hail. The heaviest and most general storms occurred on the following dates:—

July 12th, 16th and 20th.—In many parts of England.

July 27th and 28th.—In many parts both of England and Ireland.

August 2nd and 3rd.—At several of our Northern Stations.

August 5th and 6th.—In the North and North-West.

August 21st and 22nd—Chiefly in the West and North.

The thunderstorms of July 27th were accompanied in the Central and South-Eastern parts of England by barometrical changes of an unusually sudden character. The storms passed unexpectedly over England from the Bay of Biscay and falsified the forecasts of the Office. The records of a number of observations are reported in Plate II.

5. *Droughts*.—Very few actual Droughts were reported. The longest periods of dry weather occurred—

(a.) In *March* and over Eastern and Central England. At Oxford no rain fell between the 1st and 14th, while at Spurn Head there was only 0·03 inch between the 5th and 24th (20 days). In other parts of the Kingdom the earlier half of the month was dry, but a decided change occurred about the middle of the period.

(b.) In *April* in the Eastern and Southern parts of the Kingdom generally. At Spurn Head there was only 0·03 inch between April 17th and May 2nd, while at Jersey there was none between April 16th and 29th. At our North-Western and Northern Stations, the weather at the time was changeable, but the daily amounts of rain were mostly small.

(c.) In *July* and in the South of England. In London there was only 0·01 inch of rain between the 4th and 26th, while at Dungeness there was none between the 3rd and 26th. In other districts the weather was rather unsettled, with local thunder-rains of considerable weight.

(d.) In *September*.—This was the most general drought of the year, the earlier half of the month being very dry at all but our extreme Western and Northern Stations. At many places in the Central and Southern parts of England scarcely any rain fell between the 2nd and 24th, and at Oxford there was none at all between the 2nd and 25th. After the middle of the month rain set in in the West and North, and in the concluding week it became general.

6. *Temperature*.—The highest temperature occurred at various times between July 19th and 25th, when the thermometer rose to between 85° and 90° in many parts of England, to 92° in London

and at Hillington, and to  $95^{\circ}$  at Cambridge. In London and at Cambridge readings of  $90^{\circ}$  or more were recorded on four distinct days—a very unusual occurrence. In Ireland and Scotland the highest temperatures were registered, as a rule, on August 15th, when the thermometer rose to  $80^{\circ}$  and upwards in many places, and to  $86^{\circ}$  at Londonderry.

The *lowest* temperatures occurred between February 8th and 13th, when the thermometer fell below  $15^{\circ}$  at many Inland Stations in England and Ireland, and below  $10^{\circ}$  in many parts of Scotland. The lowest readings reported were :—(1) In England and Wales,  $8^{\circ}$  at Newton Reigny (Penrith) and  $10^{\circ}$  at Loughborough, Rothamsted and Llandovery ; (2) In Scotland,  $-3^{\circ}$  at Braemar,  $1^{\circ}$  at Lairg and  $5^{\circ}$  at Fort Augustus ; (3) In Ireland,  $10^{\circ}$  at Kilkenny Castle and  $12^{\circ}$  at Killarney.

In the two other winter months, January and December, there was a striking absence of severe frost.

## APPENDIX IX.

## REPORTS OF INSPECTIONS OF STATIONS WITH SELF-RECORDING INSTRUMENTS, 1900.

## A.—OBSERVATORIES. (First Order Stations of the International Classification.)

*Falmouth*, October 12th-15th.—The instruments at this observatory were all in excellent order and the photography was very good.

The anemometer was taken down and cleaned, the different bearings afterwards being lubricated with fresh sperm oil.

The cups and stays were quite sound, but two blades of the fans were found loose, these were resoldered and made secure. The clock and recorder received due attention, and after remounting the instrument the orientation was tested and found correct. Next, the barograph and thermograph were examined and cleaned as usual, the dots shifted from the summer to the winter position, and the thermometers tested (*see* p. 113).

I had the rain gauge clock taken to pieces and cleaned, and then took rubbings of both the self-recording and spare funnels.

T. W. B.

*Oxford, Radcliffe Observatory*, August 29th-30th.—The self-recording meteorological instruments here were, as usual, in first class order. The barograph and thermograph were performing satisfactorily, and the photographic curves were very good.

The Robinson anemometer was dismounted, and the old oil—which was rather dirty—was removed and new sperm added. All parts were cleaned, and the orientation was tested and found correct.

The Beckley rain gauge was examined as usual. The thermometers in the thermograph and the Stevenson screens were compared with Kew Standard, No. 720 (*see* p. 113).

E. G. C.

*Stonyhurst*, August 10th-11th.—The self-recording meteorological instruments at this observatory appeared to be working in a satisfactory manner.

The anemometer was dismounted and cleaned. The lubricant—sperm and paraffin—was fluid, but dirty, and had dried up in the cup on the head of the velocity shaft.

I think it would be well if the Office could send a supply of their sperm oil for use here. The blades of the windmill governors are beginning to wear away.



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I think it would be well if the Office could send a supply of their sperm oil for use here. The blades of the windmill governors are beginning to wear away.



The fusee spring clock driving the cylinder required attention, oiling, &c., which was done. Orientation was good. Both barograph and thermograph were cleaned, and a stouter wining cord was fitted to the clock barrel of latter instrument, the one in use being rather slight.

Lenses and condensers were examined, and the barometer tube cleaned.

The photographic traces of the dry bulb zero line were somewhat faint and too fine. I corrected this, and gave some suggestions for the improvement of the curves, but I am afraid that the irregular gas pressure will always cause variations in the intensity of the traces. The clock of the Beckley rain gauge, No. 3, was cleaned, and a new clock-line fitted, and a new pen and supply of ink was furnished for this instrument.

The thermometers were compared with the Kew Standard thermometer, No. 720, at 57° F., and the corrections required are given in the table (p. 113).

E. G. C.

#### SCOTLAND.

*Aberdeen*, October 2nd-4th.—All the instruments at this observatory were working very satisfactorily, with the exception of the barograph clock. Owing to the wear of the pallets of the escapement, the beat had become very weak and the arc of vibration of the pendulum extremely small so that there was danger of its stopping.

The clock was put in the hands of a local watch maker, who altered the position of the pallets by means of a brass washer and rebushed some of the pinion holes, which greatly improved its action. Professor Niven stated that the thermograph clock had been similarly treated in the early part of the year.

I cleaned the lenses and other parts of both barograph and thermograph, after which the standard thermometers were tested (*see* p. 113).

The anemograph was in excellent order, the bearings of all parts being well oiled and in good condition. After cleaning and replenishing the bearings with fresh sperm oil the orientation was examined and found correct.

On examining the rain gauge I found the clock in such capital order that it did not require any special cleaning. Rubbings of both the self-recording and spare gauges were obtained in the usual way.

T. W. B.

*Fort William*, September 22nd-24th.—The dry thermograph tube was broken on July 15th, and Mr. Rankin reported that he had fitted up the spare tube on the 18th and both were run as dry bulbs, but shortly after Dr. Buchan's visit on August 16th the new tube was made a wet bulb as well as the Standard thermometer, No. 671.

My attention was called to the photographic sheets, which were a good deal discoloured by stray light, and also to the traces which were liable to overlap owing to a difference in the range of the scales of the two thermograph tubes. I took down the new tube and reblacked the stem to block out the stray light. After performing this operation we decided to run the new tube as a dry bulb, and also the Standard thermometer, No. 671, was again made a dry bulb. A new scale will have to be constructed for the new thermometer as soon as a sufficient number of eye-observations have been taken.

The zero lines were changed from the summer to the winter position, and the various thermometers were tested (*see* p. 113).

I took the barograph clock to pieces and cleaned it as well as the other parts of the instrument; also the rain gauge clock was cleaned and a new line fitted to the weight.

The pipe leading from the funnel to the receiver was found cracked, a new piece of piping was substituted, and afterwards rubbings were taken of both the self-recording and spare funnels.

T. W. B.

*Glasgow*, September 19th-21st.—Professor Becker drew my attention to the unsafe condition of the metal frame which supports the thermograph tubes as well as the dry and wet Standard thermometers. This was discovered shortly before my visit, and had been temporarily secured by means of strong wire. I had all the thermometers dismounted, and on examining the supporting frame found that the principal brass tube had split throughout its entire length and in one place was cracked transversely, indeed the brass had become quite rotten.

A new brass tube was fitted to the frame and all parts were made quite sound before the thermometers were remounted.

The zero values were changed from the summer to the winter position and the various thermometers tested (*see* p. 113). Afterwards the usual cleaning of the clock and other parts of the thermograph was duly performed.

The barograph was also examined and cleaned, and the sun recorder was found in correct adjustment. I had the anemometer dismounted and cleaned all parts, the bearings being lubricated with fresh sperm oil as supplied by the office. The orientation was tested and the sheet containing the result was sent in with this report.

On examining the rain gauge it was discovered that the bottom of the Stonyhurst discharger had become unsoldered and in consequence was rendered useless. This I got repaired and left the instrument working quite satisfactorily. The clock was oiled and a rubbing taken of the funnel.

T. W. B.

## IRELAND.

*Valencia, Co. Kerry, August 21st-23rd.* The weather at the time of my visit to this observatory was rather rough and unsettled, but I managed to dismount the anemometer. The sperm oil in the direction-roller sink was rather thick and dirty, and had "caked" on the rollers. All parts were soaked in paraffin, cleaned, and fresh sperm added. The cups, stays, fans, &c., are in a satisfactory condition, and the exterior portion of the instrument has been recently painted. The fusee spring clock driving the cylinder required cleaning and oiling, which was done, and the pencils, &c., received attention. Orientation was good.

The barograph and thermograph were working in a satisfactory manner, and the photographic curves were good; but as it was doubtful if the clock cords would last much longer, I fitted new lines and cleaned both clocks, also the lenses and condensers. The Beckly rain gauge, No. 8, was dismounted and cleaned. A new pen and supply of ink was furnished to Mr. Cullum, as well as a new pen for the "Richard" barograph.

The corrections to the thermometers are given in the table (p. 113).

E. G. C.

## B.—ANEMOGRAPH STATIONS.

## ENGLAND AND WALES.

*Alnwick Castle, October 6th.*—The anemometer was going satisfactorily, and is regularly attended to and oiled by the resident mechanic.

The exposed parts of the instrument were examined and all the bearings found to be well lubricated with sperm oil. I also attended to the recorder and clock, and tested the orientation; the sheet containing the result was forwarded with this report. From an inspection of the curves the tracings sent in to the office appear to be carefully made, excepting that in the original sheets the pencil marks slightly overlap the printed scale both top and bottom, but this is not shown in the tracings.

T. W. B.

*Fleetwood, August 13th-14th.*—The exterior portion of the Robinson anemograph at this station has not been taken down since 1898, and considering this, the instrument was in very fair order. It was taken down, examined, and cleaned. The sperm oil in the direction-roller sink was fluid, but very dirty, and there was no oil in the cup on velocity shaft, but the head of the screw plug for the feeding hole was quite burred off, and the shaft had not been oiled for some little time. I had this remedied and a new slot cut.



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The endless worm on the direction-fan spindle is much worn, causing considerable side-shake, and both of the lower "lignum vitae" steps are cracked. The direction is inclined to be a trifle sluggish.

The clock, pencils, &c., were cleaned and oiled. I found that the plate and nut holding the direction mitre wheel was loose, and could be lifted up; this was put right.

The orientation was satisfactory.

E. G. C.

*Ho'yhead*, September 25th.—I visited the instruments with Mr. Cotton, and gave instructions for some small repairs and for repainting the notice board. There seemed to be too much play in the collar of the Robinson anemometer. Mr. Cotton will apply to the Board of Trade for the painting of the stage which was erected at the expense of the Board.

W. N. S.

*Plymouth*, September 3rd.—This anemometer had not been dismounted since it was first set up, and Mr. Prigg asked me to examine it.

I was informed that the records of this instrument, as well as those of the other self-recording instruments at the station, would willingly be placed at the service of the Office should it at any time desire them.

R. H. C.

*Scilly*, August 28th.—Both the Robinson and the pressure-tube anemometers were dismounted and thoroughly cleaned. The former was in good order, except that the parts which are not readily accessible required cleaning, but there were nowhere any signs of undue wear.

The pressure-tube was working well, but I found that some of the soldered joints were becoming corroded, although as yet the evil has not progressed very far.

Both instruments needed repainting. When restarted after cleaning they both worked very satisfactorily.

R. H. C.

*Shields, North*, October 8th-9th.—Here the recorder and clock greatly needed cleaning, as the dust and dirt which was shaken down upon the instrument during the gale in June last had got into the clutches of the pencils as well as the wheels gearing into the clock. The shafting really passes down a disused chimney, and in order to protect the recording apparatus from any débris, two boards were fitted up when the instrument was first erected, but evidently one of them had got displaced and so allowed the dust to come through on to the instrument. I pointed this out to Captain Robson, who is a comparatively new observer, and had the board replaced in position in his presence.

The endless worm on the direction-fan spindle is much worn, causing considerable side-shake, and both of the lower "lignum vitæ" steps are cracked. The direction is inclined to be a trifle sluggish.

The clock, pencils, &c., were cleaned and oiled. I found that the plate and nut holding the direction mitre wheel was loose, and could be lifted up; this was put right.

The orientation was satisfactory.

E. G. C.

*Holyhead*, September 25th.—I visited the instruments with Mr. Cotton, and gave instructions for some small repairs and for repainting the notice board. There seemed to be too much play in the collar of the Robinson anemometer. Mr. Cotton will apply to the Board of Trade for the painting of the stage which was erected at the expense of the Board.

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*Shields, North*, October 8th-9th.—Here the recorder and clock greatly needed cleaning, as the dust and dirt which was shaken down upon the instrument during the gale in June last had got into the clutches of the pencils as well as the wheels gearing into the clock. The shafting really passes down a disused chimney, and in order to protect the recording apparatus from any débris, two boards were fitted up when the instrument was first erected, but evidently one of them had got displaced and so allowed the dust to come through on to the instrument. I pointed this out to Captain Robson, who is a comparatively new observer, and had the board replaced in position in his presence.

The external parts of the anemometer were dismantled and cleaned and all bearings supplied with fresh sperm oil, after which the orientation was examined and found correct.

Some little difficulty was experienced in getting the clock into proper beat and it stopped during the night. The next day further attention was given to it, and on the following morning Captain Robson informed me that it had gone all right.

T. W. B.

*Yarmouth, August 27th-28th.*—The examination and cleaning of the anemometer here was carried out under difficult conditions, the wind blowing about 40 miles an hour, but with assistance I was able to dismount and overhaul it. The instrument was in good order and well lubricated, and the oil was in a most satisfactory state, both as regards colour and fluidity.

All parts were cleaned, and lubricated with fresh sperm.

The orientation was good.

The support of the stand to which attention was drawn in my last report has been temporarily repaired, and as the heart of the wood seems sound it may stand for some time longer.

I devoted considerable time to the improvement of the velocity pencil markings, and I think that the traces now will be decidedly better, and also mark to the printed scale, but as I have before reported it is an old type of recorder and difficult to do much with.

E. G. C.

#### SCOTLAND.

*Deerness, September 27th-28th.*—At the time of my visit the weather turned out very wet and stormy, and in consequence I was unable to entirely dismount the external parts of the anemometer. The cups, however, were taken off and the velocity shaft, which had broken down in the Spring, was found to have been carefully and neatly repaired by the local smith. The direction shafting was slightly rubbing against the woodwork inside the hut, this was cut away so as to leave the shaft quite free.

The action of the velocity pencil is not very satisfactory, and the trace is bent backwards at the end of each revolution of the pencil, thus showing that the spiral is not true.

Mr. Spence also reports that the trace at times is serrated. On a previous inspection the screw thread of the spindle supporting the pencil was accidentally broken, and the nut is only held by a couple of threads. Should the traces become worse I would suggest that the recording portion of the instrument, including the cylinder, but not the clock, be sent to Mr. Munro for repair.

T. W. B.



## IRELAND.

*Armagh*, August 15th-16th.—The Robinson anemometer at this observatory is apparently regularly looked after and lubricated. It was taken down and all parts cleaned. The oil was in excellent order, clean and fluid; it was replaced with fresh sperm. There is nothing special to note, the instrument—generally speaking—being in good condition, although the fan-spindle worm is beginning to wear away.

The clock, recording pencils, &c., were cleaned and oiled. The velocity pencil rises at times above the plane of the paper in calms, but this cannot be corrected with the present spiral.

The orientation was good.

The rain gauge clock required attention.

E. G. C.

*Dublin, Phoenix Park*, August 16th-17th.—The anemometer here I found was well lubricated but wanted cleaning. It was all dismantled and overhauled.

The oil in the plunger or brake box was in a fairly satisfactory state, but that in the ball bearings for the direction plate was dirty and rather viscid. Fresh sperm was used for both, and all was left clean and in good order.

The clock seems to have been a little erratic of late—it certainly wanted cleaning; this was done and the pendulum-bob was slightly raised.

The orientation was satisfactory.

Greenwich mean time is now used here.

Corporal Blackmore has charge of the meteorological instruments, and seems to take considerable interest in them.

E. G. C.

## C.—SUNSHINE STATIONS.

## ENGLAND AND WALES.

*Blackpool*, October 20th.—The observer, Mr. H. Smith, of the Public Health Office, showed me the instrument and gave me all necessary information. It appears to be somewhat out of adjustment both for level and azimuth, and the lens seems rather deficient in burning power. Instructions should be sent for readjusting it.

W. N. S.

*Bournemouth*, September 13th.—The arrangements respecting observations here are in a transition state, and for the present no returns will be sent to us. The position of the recorder is unsatisfactory owing to trees.

R. H. C.



*Cirencester*, September 14th.—I found the recorder clean, in good focus, and firmly clamped in its place, which is on top of a wooden stand. The adjustment was not quite correct, and I altered it as far as I could without removing the clamping irons, which I deemed it unwise to attempt. I found the card correctly set in its place, and I think the instrument is carefully attended to.

J. A. C.

*Cullompton*, August 18th.—The sunshine recorder was in good adjustment. I called attention to a tree on the east-north-east, and also to one on the west-north-west, which required their tops to be cut off.

W. M.

*Cullompton*, September 5th.—The station has not been seen for the office before. The instrument is well placed, but growing trees to the west are likely to interfere presently with the record. The observations are most carefully made, and the station excellently represents the sunshine of the district.

R. H. C.

*Eastbourne*, November 14th.—This instrument is admirably placed, and I found it clean and in very good order. The card, however, was not in its right place by about fifteen minutes in time.

J. A. C.

*Guernsey*, September 10th.—The record is from a Jordan photographic recorder well placed on the roof of the house and on the highest part of St. Peter Port. The instrument was loose, and required to be made fast to prevent its getting out of adjustment. Dr. Carey expressed his willingness to send other climatological observations if desired to do so.

R. H. C.

*Hastings*, November 13th.—The recorder now stands on the top of a tower built for it on the house of Mr. Farnham, the Water Manager, where it has a very excellent exposure. The adjustment is very good, and the instrument is very carefully attended to.

The station possesses a second recorder, which is in position, but not in use.

It is the custom at this station to tabulate the sunshine for each hour of the day, and these hourly tabulations are, I was informed, at the service of the Office should they at any time be asked for.

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J. A. C.

*Jersey, St. Heliers, September 7th-8th.*—A new recorder has recently been sent to this station, and it had not been accurately placed in position. The post on which it stands was strengthened and the adjustment then made good. The attention of the observer was called to some recent irregularities in returning the cards to the Office. I also inquired as to whether the amount of sunshine could be telegraphed to the Meteorological Office daily, and arranged with the Harbour Master as to the steps to be taken for the purpose.

R. H. C.

*Littlestone-on-Sea, November 12th.*—The recorder is admirably exposed on the top of a water tower which stands close to the sea front. With a possible exception, due to a turret which rises 3 feet above the recorder on the opposite side of the tower, the exposure is perfect.

I found the instrument standing on a stone slab, unfixed, and without any marks to indicate its correct position. The sphere, too, was not central in the bowl. With some little trouble I corrected this latter defect, and then, after carefully adjusting the instrument, I securely bedded it in Portland cement. I instructed the observer to keep a careful watch on the record as the winter solstice approached, and if he found the turret referred to above to interfere with the record to report the fact at once. The instrument was clean and the card properly in position.

J. A. C.

*Margate, November 13th.*—The instrument here is one of the "Universal" pattern, and it was badly out of adjustment. The exposure of the recorder leaves nothing to be desired.

R. H. C.

*Newton Reigny, October 18th.*—The recorder has a good exposure. Newton Reigny is two miles W.N.W. of Penrith; it is on the eastern slopes of the mass of the Cumbrian hills.

W. N. S.

*Newquay, August 31st-September 1st.*—The stand here was much decayed, and the recorder quite loose and not in proper adjustment. As there was some doubt whether the present observer could continue the observations, I tried to find another site for the instrument, but unsuccessfully. Eventually Mr. Pearce promised to make arrangements for the observations being continued at the present site, which has a perfect exposure, and I therefore repaired the stand and readjusted the instrument. I found considerable alteration of the pedestal was necessary to get the ball central in the bowl. Mr. Pearce will endeavour to get the observations taken over by the Town Council.

R. H. C.



*Pembroke, St. Ann's Head*, September 21st.—The recorder stands on a wooden post 5 feet 3 inches high, over grass, on the Head, which is 150 feet above the sea. From E.N.E. to W.N.W. through south the exposure is perfect, and to N.E. and N.W. there is nothing subtending an angle greater than about  $3^{\circ}$ . The instrument was clean, in good adjustment, and is, I believe, carefully attended to. It stands near the thermometer screen and about 200 yards from the light-house.

J. A. C.

*Port Talbot, Margam Park*, September 18th.—The recorder stands on a wooden post on the Castle Terrace where it has a very good exposure, the trees, of which there are many in the park, interfere but very slightly if at all with its indications. I found the small pedestal on which the ball rests was quite loose, and with considerable play, I accordingly dismounted the instrument, and succeeded in fixing the pedestal so that the ball was central in the bowl. I then replaced the instrument in exactly its old position on the wooden post. I think it likely the post will warp somewhat with changes of weather. The instrument appears to be very carefully attended to.

J. A. C.

*Rousdon*, August 20th.—The ball of the sunshine recorder was not quite in the centre of the frame. The ball weighed 3 lbs. Sir Cuthbert Peek has two other balls, one of which weighs 2 lbs.  $15\frac{1}{2}$  ozs. and the other 3 lbs. 1 oz. One is also slightly larger than the other, and denser in colour.

W. M.

*Scarborough*, September 7th.—I recommended that the recorder be moved to a new position where when put on a post it will have a very fair exposure, as the only obstructions, viz., houses on the east and south east make an angle of  $5^{\circ}$  or  $6^{\circ}$ .

W. M.

*Southampton*, September 15th.—The only point that called for remark in connexion with this recorder was that the yellowish tint of the lens appeared to me to be deeper than when I last saw it, an opinion which was shared by the observer. The glass was, however, perfectly clear and transparent, and yielded an excellent trace.

R. H. C.

*Tenby*, September 18th.—The recorder is placed on a wooden stand on the top of a tower 27 feet above the ground, and nearly 100 feet above the sea, with an exposure that may be termed perfect, except for a flag staff that may sometimes cut off a little sunshine. The instrument was out of adjustment for time, and slightly for latitude also. I dismounted it, therefore, and re-set it, so that the sun's image came exactly in the right



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place. I expect, however, the stand will warp with changes of weather. The cards, both for past months and for the future, will be sent to the Office if desired, the Office in that case supplying the blank cards as usual. The observer promised to send up the weekly returns more promptly in future.

J. A. C.

*Torquay*, September 4th.—This instrument had not previously been seen on behalf of the Office. Its site is excellent, and the instrument now in use is a very good one. It is, however, proposed to remove the recorder to a more convenient, although in other respects less satisfactory, site on the pier. The present observer is Mr. F. March, M.P.S., and he appears to have taken up the work very zealously.

R. H. C.

#### IRELAND.

*Markree Castle*, October 9th.—The sunshine recorder is not perfectly exposed, but the site is the best available; the instrument requires fixing. The trace was not running quite parallel to the edges of the card, probably on account of the instrument not being quite level. Mr. Henkel will see to the adjustment of the instrument.

W. N. S.

#### REPORT UPON THE METEOROLOGICAL INSTRUMENTS AT THE NATIONAL PHYSICAL LABORATORY.

The National Physical Laboratory,  
December 21st, 1900.

DEAR SIR,

I HAVE pleasure in enclosing with this a report on the meteorological observations at the National Physical Laboratory (Kew Observatory), which Dr. Chree, Superintendent of the Observatory Department of the laboratory, has drawn up at my request.

I am, &c.,  
R. T. GLAZEBROOK,  
Director.

The Secretary,  
Meteorological Office.

The National Physical Laboratory,  
December 20th, 1900.

DEAR MR. SHAW,

IN accordance with your letter M.O. 1662, I asked Mr. Constable to make any notes that occurred to him, and enclose what he has written. I have also some remarks to add from myself.

*Thermograph*.—The frequent additions of water that appear necessary to the wet bulb thermograph do not appear to me altogether satisfactory. On almost every occasion the watering



causes a slight dislocation of the trace and implies a discontinuity in the physical condition of the instrument. When the temperature is below or in the immediate neighbourhood of  $32^{\circ}$  the behaviour of the wet bulb is decidedly not ideal. This is, of course, a comparatively rare occurrence in most years in this climate. If the Meteorological Office have no definite information as to the relative advantages and disadvantages of the hair hygrometers, which seem pretty commonly used in some foreign countries, it seems a question for examination. Another question that seems to have received much attention abroad is that of the artificial ventilation of thermometers. Assmann's arrangements seem in pretty common use.

*Black Bulb Thermometers in vacuo.*—We have had a good deal of trouble on this head, but I think it is not a subject that the Meteorological Office takes up. Mr. Hicks is making some black bulb thermometers of a new kind which we expect to have an opportunity of examining.

*Sunshine Recorder.*—The Office has been informed before that the time scale of our instrument is not absolutely correct at all seasons of the year. From our experience here we have reason to think that if the different sunshine recorders in use in this country were set up in one place there would be some startling discrepancies. There are differences in the glass and in its back focal length, as well as in the distance between the glass and the cards. Usually the surface of the card comes within the back focal distance, and in consequence, during strong sunshine, the width of the burned strip is sometimes distinctly too large. This tends, of course, to exaggerate the duration of strong sunshine, especially when there are frequent interludes of sunshine and shadow. In faint sunshine, on misty days, there are somewhat conspicuous differences between instruments; in some cases there is no visible record when in other cases it is quite distinct. Those concerned in the development of health resorts are not the most likely persons to appreciate the importance of uniformity in sunshine recorders. If the Meteorological Office saw its way to specify an exact standard there should be a distinct advantage in accuracy.

*Barograph.*—The Office is aware that the compensation for temperature is not absolutely correct. This introduces, of course, variation into the "residual" correction. During 1900 the working standard barometer—with which the absolute measurements are taken—has been on the whole somewhat dirty. As notified in the "tabulations," it was recently found necessary to clean the instrument, and as the first attempt was unsuccessful the operation had to be repeated. On these grounds the conditions under which barometer readings have been taken have been more variable and less satisfactory than usual. There have been, however, a good many comparisons of the working standard with the large standards, and it is hoped that no serious uncertainties have been introduced.

*Anemometers.*—During the past year, as repeatedly mentioned to the Office, the behaviour of the Dines' anemometer in light



winds has been unsatisfactory. The last attempts to reduce the friction of the vane have certainly improved the action, but even at its best the instrument is seemingly less satisfactory in light winds than the Robinson, which in its turn is not satisfactory when a constant factor and uniform friction correction is assumed. The more I see of the Dines the stronger is my impression that it is not a proper type of instrument for giving mean velocities or the integral of mean velocity. It seems an absolute waste of the record to regard it as intended for the drawing by hand of a continuous curve through the parts of the sheet where there is most ink. If the instrument is sufficiently dead beat, and the length, section, &c., of the connecting tubes are practically immaterial, then the proper use to make of the trace—supposing the time scale open enough—is to minutely examine the special features of the storms. Such an examination should throw light on the existence of quasi wave motion, and by inter-comparison of traces from different stations might enable the persistence of gusts, their rate of transmission, &c., to be investigated. I do not know whether any one (say Professor K. Pearson) has carefully thought what exactly it is one gets by drawing a freehand curve through a Dines' trace, whether it is a mean velocity or the square root of a mean square. In the case of the Robinson it is certainly not an arithmetic mean velocity that is got from the trace unless the wind be steady. According to the theory which I gave in the *Phil. Mag.* (Vol. 40, 1895, pp. 63-90), when there are large and frequent oscillations in the wind velocity, the Robinson, besides smoothing down the oscillations, exaggerates the mean velocity. A similar theory has since been advanced by Rateau for air meters, and his experiments seem in the case of these instruments in good accord with the theory. I am aware that comparisons made at various stations between Dines and Robinson records, the former treated in the way described above, show very fair uniformity in the ratios of the total monthly runs given by the two instruments. Monthly runs, however, or even those for much shorter periods, comprise a great variety of conditions, and a complete comparison of the two instruments would involve a separation of the records according to wind steadiness as well as velocity.

On the question of the "factor" we know, of course, *a priori* that there is no such thing as a constant factor, and before finally deciding on any change it might be well to consider whether the application of a constant factor is the best that can be done with reasonable regard to labour involved. The application of a constant friction correction at low velocities, irrespective of the peculiarities of particular instruments or the state of the lubricant, is certainly open to criticism. For various reasons, which will be sufficiently understood from remarks made above, the question of the factor should be settled by *direct* experiments with a *Robinson* apparatus of the standard size; and it is much to be desired that the effects of variation in the experimental conditions—answering as nearly as may be to the normal gusty character of wind—should be ascertained. A "factor" based on rotation experiments, in each of which uniform velocity is aimed at, may not be the

best to apply to an anemometer working under normal conditions. It is also, I think, open to doubt how far motion in a circle influences the record through centrifugal force effects. The question of anemometer exposure—as well as height above the ground—to which Mr. Curtis has frequently called attention—is also of great importance. In a much sheltered station reducing the factor from 3 to, say, 2.25 would certainly be a step in the wrong direction so far as concerns the deduction of the true wind velocity at a given height above level ground free from trees or buildings. Unless the exposure is really good, it might be best to have various factors according to the wind direction, these being determined by special experiments made with an auxiliary anemometer at the nearest available open space. In comparing small anemometers here we find it expedient to disregard records in south winds, the dome interfering slightly with anemometers placed on the existing staging (though not, we hope, with our standard Robinson itself).

*Atmospheric Electricity.*—In the summer some experiments were made as to the relative goodness of insulation afforded by the Mascart insulators employed here and by blocks of solid paraffin and sulphur. When quite fresh and free from dust the paraffin and sulphur—which gave almost identical results—insulated very decidedly better than the Mascart's. After, however, several weeks' use this superiority had very much diminished; but it was thought that if an arrangement were devised protecting the sulphur or paraffin from dust, one or other might probably be a distinct improvement on the Mascart's. At Lyons, Le Cadet describes the use of sulphur pillars—replaced at intervals—as a great improvement on the insulators previously tried, and the present acting Director of Batavia Observatory spoke warmly of stearine pillars replaced monthly. It is desirable that the insulation should be as nearly uniform as our variable climate permits, otherwise there are difficulties in the interpretation of the records from the water dropper. We cannot at present claim to have reached the standard of uniformity that is desirable. Partly as a check on the insulation, eye observations with a portable electrometer have been made as regularly as circumstances allowed on a pillar in the garden.

During the experiments with the paraffin and sulphur insulators some of the results suggested, if they did not absolutely prove, that when the thermometer apparatus in the same room was heated to near the boiling point the insulation fell off. Vapour—whether steam or products of combustion—is *a priori* a probable cause of defective insulation. The Director has, however, decided to put up a partition across the room, so that in the near future this probable source of disturbance will be removed or much reduced.

In some of his recent work Lord Kelvin found that a water dropper generated electricity to some extent, but expressed the opinion that with an instrument working, like ours, in the

open air this defect is wholly negligible. It may, however, be doubted whether in very calm weather such is absolutely the case.

*Rain Gauge.*—Besides the pen referred to by Mr. Constable, trial was made both on the rain gauge and on the Dines anemometer of a Dittmar pen obtained from the Cambridge Instrument Company, but the results were not satisfactory in either case.

When inspecting the electrograph curves casually alongside of the rain cards, at times when negative potential has existed, I have been struck by the fact that the scale of the rain gauge cards seems rather contracted for this kind of work. When a sudden change of potential arises it would be interesting to know whether there has been any corresponding irregularity in the rainfall. Again with a very light rainfall the change of ordinate in the rain curve is so microscopic, taking the thickness of the line into account, that sometimes one is in doubt whether negative potential has or has not been accompanied by rain.

*Earth Thermometry.*—Nothing has been done in this direction here since a report was made on the electrical resistance thermometers kept underground for a year.

CHARLES CHREE.

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#### NOTES BY MR. CONSTABLE.

The self-recording instruments as a whole are working well, and considering the length of time they have been in use, they show but little signs of wear, the most pronounced wearing being naturally in the pallets and escape wheel of the driving clocks.

There are a few small details which could be improved upon.

1. *Anemometer.*—The records on the metallic sheets as at present used are very indistinct indeed in damp weather, and the substitution of silver for present brass helices would largely overcome this, or failing this change, then the metallic surface of the paper should be better than it is now.

The question of the continued employment of the factor 3 wants discussion, and it seems a pity to go on indefinitely producing curves and records which are known to be erroneous.

2. *Photographic sheets.*—A reduction in the annual cost of the photographic paper could be obtained by discontinuing the use of the "second" or duplicate curves on the barograph and thermograph.

Personally, I think these duplicate curves are now unnecessary, as a total failure with the present gelatino-bromide sheets



is practically unknown, and the "second" sheets have been dropped at Oxford and Valencia.

3. Rain gauge.—The Willesden sheets now used for this instrument have proved to be an improvement, where care has been taken with them, but the pens are rather too liable to sudden death if jammed or knocked, and we are trying to improve upon this by the use of a silver barrel pen which is stouter and more rigid and has very little of the ink exposed.

The Beekley rain gauge is now looked upon as the M.O. standard, but its present make, &c., can be decidedly improved upon.

In practical use it has the following faults:—

1. The scale, both as to rainfall and time, is much too contracted.

2. The rate of emptying is not fast enough.

3. Also the float-receiver should be made to hold more than at present before discharging, say 0·3 or 0·4 inch. This would reduce considerably the number of emptyings for a given fall, and in conjunction with an improvement in No. 2 would be decidedly better, as with the present arrangement there is always a doubt in *very* heavy rains—such as accompany thunderstorms, &c.—as to whether the falling rain is not escaping as the water empties out.

A rectangular lamp, say same length as inside of iron cover, with a small circular wick should be provided for use in snowstorms, &c. The evaporation, caused by warming the bottom of receiver and pipe, could be neglected, bearing in mind the ordinary conditions prevailing with snow measurements.

E. G. C.

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NOTES on the WORK of the BEN NEVIS OBSERVATORIES,  
forwarded by Sir A. MITCHELL, Honorary Secretary of the  
Scottish Meteorological Society.

Scottish Meteorological Society,

122, George Street, Edinburgh,

17th June, 1901.

With reference to the two concluding paragraphs of your letter of 7th March, I beg to say that the work done at the two Observatories has been exactly the same during all the years of their existence. A copy of all the observations made at the High Level Station up to 31st May of this year has been transmitted to your Council, and also a copy of all observations made at the Low Level Station up to 30th June, 1900. The causes of this difference are known to you. I enclose for your information the two last reports on the work of the Observatories,

which were made to the British Association for the Advancement of Science,\* and also a copy of those parts of the two last reports to the Scottish Meteorological Society which bear on the subject. As you are probably aware, the whole of the observations made simultaneously at the High and Low Level Observatories over a period of 11 years—that is, a sun spot period—are now being put into type. More than half of the first volume is already printed off. The cost will be about £1,000, and the Royal Societies of London and Edinburgh have undertaken to meet this charge. The whole work of the period of 11 years, which will be completed at the end of this year, is at the same time being studied in various directions by Dr. Buchan and Mr. Omond, with the aid of skilled assistants whom the Directors have been enabled to employ. It is intended to print the results of this research with the observations, and the Directors hope that they will disclose a practical utility of the work in its influence on weather forecasting, and a scientific utility in the general study of the phenomena of weather.

It is, perhaps, desirable to say that some of the results of the study to which I have referred will be given in the first volume which, as stated, is already in an advanced state of preparation. In like manner, some of the results of this study will be given in the succeeding volumes. A final contribution, dealing with the whole period, will appear in the last volume.

I am, &c.,

ARTHUR MITCHELL.

EXTRACT FROM REPORTS TO THE GENERAL MEETING OF THE  
SCOTTISH METEOROLOGICAL SOCIETY.

31st July, 1899.

The health of the observers at the Ben Nevis Observatories has continued good; and the laborious work of making the hourly observations, by night as well as by day, has been carried on uninterruptedly as heretofore. The Directors again record special thanks to Mr. John S. Begg for a month's volunteer services at the High Level Observatory in June last, thus affording a month's much needed relief to one of the staff.

Arrangements are being again made for the resumption of the observations at the Intermediate Station on Ben Nevis, at a height of 2,200 feet, during the coming holiday season.

Observations have been received from Dr. Paterson, Medical Missionary, the Society's corresponding member at Hebron in Palestine. These observations are from February, 1896, to March, 1899, and a discussion of these valuable records will appear in the forthcoming *Journal*.

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\* These reports are printed in the B.A. Reports, Dover, 1899, and Bradford, 1900.

Arrangements have been made for the publication, during the next three years, in the *Transactions* of the Royal Society of Edinburgh, of the observations made at the two Observatories from 1888 to 1901, the time to which it has been proposed to continue the observations. These observations will fill three large quarto volumes, the cost of publishing which will be a little over £1,000. The Royal Society of London have agreed to give £500, being half of the whole expenditure, the balance being met by the Royal Society of Edinburgh.

Meanwhile the printing is being proceeded with, and a few of the early sheets are submitted to the meeting.

No time is lost in pressing forward the preparation for publication of the next issue of the Society's *Journal*, for the two years 1897-98. It will be in the hands of Members some time before Christmas.

Much time continues to be given to the discussion of the hourly observations of the two Observatories. The work of reducing and entering the observations of the two Observatories for every day, side by side, so as to present a direct and easy comparison of the two, is far advanced, being carried down to the close of 1897. The number of daily sheets thus finished is 2,710, and as each sheet contains twenty-two columns, the laboriousness of the work will be in some degree understood.

As explained in previous Reports, the rainfall, fog, thunder, lightning, halos, aurora, and other phenomena observed at 120 places on each day are entered on a map of Scotland for that day. The whole of these maps are now completed down to December, 1898; the number of these maps amount to 2,922. A beginning has been made to enter on the 2,922 maps the gales and storms that have been noted at the lighthouses round the Scottish coast, care being taken to mark the hour of commencement of each storm, so that a comparison may be made with the outburst of the storms and the forecasts issued by the Meteorological Office in London.

Based on the observations of the two Observatories thus presented and charted, various inquiries are afoot by the Secretary and Mr. Omond, both of a scientific and practical character.

19th March, 1900.

The observations at the Intermediate Station on Ben Nevis were undertaken by Mr. D. W. Wilton. These important observations, made in the summers of 1897, 1898, and 1899, are being discussed under the superintendence of Mr. Omond.

The next number of the Society's *Journal* is nearly all in type, and will be distributed to Members early in April. Thereafter, the publication of the second half of Vol. VI. of the *Journal* will be pushed forward, and it is expected that the part will be ready for distribution in the autumn. A good deal has been done in preparing for the press No. XVII. of the *Journal*, containing, among other matters, the Meteorology of Scotland for 1899.



Part of the time of the staff is taken up in revising the proof sheets of the hourly observations of the Ben Nevis Observatories now in the press. It need scarcely be added that the revision of the work, which will fill three large quarto volumes, is peculiarly heavy. The work of reduction and entering on daily sheets the hourly observations of the two Observatories is practically brought down to date. The daily maps of rainfall, fog, storms, and other weather phenomena are completed to December, 1899: and for several months, there are already entered on the same maps the details for storms, forecasts, and storm warnings, with which are compared the hourly observations at the Ben Nevis Observatories, with the view of arriving at some definite knowledge of the relations existing among the phenomena observed and the Meteorology of Scotland, particular attention being in the first place given to the relations between the double set of observations made at Ben Nevis, and the forecasts or warnings issued of storms, rain, fog, and the other weather phenomena.

For several months Mr. Omond has had under discussion all hourly temperatures observed at Fort William and the top of the mountain, showing a difference between the two temperatures distinctly less than the usual difference, together with all cases where the temperature at the top exceeded the temperature at Fort William at the time. It will thus be recognised that this work is largely an inquiry into the anti-cyclone, and its connections with the cyclone and weather changes accompanying their changing relations. Mr. Omond gives an account of this work to the meeting of to-day.

34, Drummond Place, Edinburgh,  
17th June, 1901.

DEAR MR. SHAW,

Since writing my letter to you of this date I have received a letter from Lord McLaren, the President of the Directors of the Ben Nevis Observatories, in which he states (as he had before stated to me by word of mouth) "that one of the objects in view in continuing the double series of observations for a period of eleven years, was to test the correspondence of variations of temperature with the prevalence of sun spots, a problem of great interest to astronomers and physicists; and that in the opinion of our Committee, as this is the year of minimum sun spots, it is desirable to continue the observations for another year in order to see whether there will be a change of sign in the variations of temperature corresponding to the change of sign in the variations of solar activity."

I think that you will be pleased to have Lord McLaren's view on this subject, and I beg you to be good enough to communicate it to your Council.

Believe me, &c.,

ARTHUR MITCHELL.

## COMPARISON OF INSTRUMENTS.

The following tables give the corrections required to be applied to the readings of the instruments at the stations visited by the Inspectors to make them agree with the Inspectors' standards :—

## BAROMETERS.

## TELEGRAPHIC REPORTING STATIONS.

STATIONS.	Inspector's Standard Corrected.	Reporting Barometer.	Check Barometer	REMARKS.
ENGLAND AND WALES.	Inches.	Inches	Inches	
Dungeness .. ..	29.740	+ .006	+ .020	
Holyhead .. ..	—	—	—	
Jersey .. ..	30.140	+ .005	+ .008	
Liverpool (Bidston) ..	—	—	—	Not visited.
London (Brixton) ..	29.526	- .003	—	
London Meteorological Office	29.790	+ .004	—	
Loughborough .. ..	—	—	—	Not visited
Oxford .. ..	—	—	—	
Pembroke (St. Ann's Head).	30.231	+ .013	+ .013	
Portland Bill .. ..	30.413	+ .001	+ .004	
Scilly .. ..	30.377	- .001	- .002	
Shields .. ..	—	—	—	
Spurn Head .. ..	30.172	+ .008	—	
Yarmouth.. ..	—	—	—	
SCOTLAND.				
Aberdeen .. ..	29.625	.000	+ .003	
Leith .. ..	29.747	- .001	+ .002	
Nairn .. ..	30.050	.000	+ .003	
Stornoway .. ..	30.064	+ .002	+ .020	Vernier of check baro- meter out of order.
Sumburgh Head ..	—	—	—	Not visited.
Wick .. ..	30.326	+ .002	+ .009	Both barometers now hang together.

## BAROMETERS.

NORMAL CLIMATOLOGICAL STATIONS (Second Order Station,  
International Classification).

STATION.	Inspector's Standard Corrected.	Reporting Barometer.	Check Barometer.	REMARKS.
ENGLAND AND WALES.	Inches.	Inches.	Inches.	
Ampleforth .. ..	29.446	- .004	—	A very good Fortin.
Belvoir Castle .. ..	29.852	+ .002	—	
Bramley .. .. .	29.216	+ .004	—	
Chester .. .. .	29.979	+ .005	—	
Eastbourne .. ..	29.724	+ .006	—	
Edgbaston .. ..	—	—	—	
Fulbeck .. .. .	29.946	- .002	—	
Morpeth .. .. .	29.581	+ .003	—	
Parkstone .. .. .	30.332	- .003	- .002	
Plymouth .. .. .	30.406	- .001	—	
St. David's.. ..	30.189	+ .007	—	
St. Leonards .. ..	29.693	+ .003	—	
Seaham .. .. .	29.492	- .006	—	
Southampton .. ..	30.183	+ .017	—	
Stokesay .. .. .	29.470	+ .002	—	
Stonyhurst .. ..	—	—	—	
Tealby .. .. .	29.791	+ .009	—	
Tenby .. .. .	30.209	- .018	—	
Wessington Court ..	29.771	- .004	—	
SCOTLAND.				
Braemar .. .. .	28.375	+ .003	—	
Dundee .. .. .	29.612	+ .002	—	
Dunrobin .. .. .	30.277	- .001	—	
Edinburgh .. ..	29.426	- .004	—	
Fort William .. ..	30.137	- .008	—	
Glencarron .. ..	29.666	+ .016	—	
Gordon Castle .. ..	29.812	+ .004	—	
Lairg .. .. .	30.000	+ .020	—	
Lednathie .. .. .	29.104	+ .002	—	
Poltalloch .. ..	29.910	+ .028	—	
Rothsay .. .. .	29.606	- .003	—	



BAROMETERS.  
OTHER CLIMATOLOGICAL STATIONS.

STATIONS.	Inspector's Standard Corrected.	Reporting Barometer.	Check Barometer.	REMARKS.
ENGLAND AND WALES.	Inches.	Inches.	Inches.	
Littlestone .. ..	29.777	- .005	—	
Totland Bay .. ..	30.245	+ .009	—	

THERMOMETERS.  
TELEGRAPHIC REPORTING STATIONS.

STATIONS.	Inspector's Standard Corrected.	Dry Bulb.	Wet Bulb.	Maxi- mum.	Mini- mum.	Grass Min.	Spare.	REMARKS.
ENGLAND AND WALES.	°	°	°	°	°	°	°	
Dungeness .. ..	51.1	-0.1	-0.1	0.0	0.0	—	-0.2	
Holyhead .. ..	58.7	-0.5	-0.3	+0.6	+0.1	—	-0.3	
Jersey .. ..	62.0	-0.7	+0.1	-0.7	+0.1	—	-1.0	Scale of dry bulb defective. Not visited.
Liverpool (Bids- ton).	—	—	—	—	—	—	—	
London (Brixton)	54.0	-0.1	+0.1	0.0	0.0	-0.1	—	
London M.O. ..	62.0	0.0	-0.1	+0.1	0.0	—	—	
Loughborough ..	—	—	—	—	—	—	—	Not visited.
Oxford .. ..	59.0	-0.3	-0.3	-0.4	+0.1	+0.4	—	
Pembroke (St. Ann's Head).	63.8	-0.1	+0.2	0.0	+0.1	—	-0.1	Scale of wet bulb almost illegible.
Portland Bill ..	61.0	0.0	+0.1	0.0	+0.9	—	0.0	The spirit column in the minimum was broken.
Scilly .. ..	63.4	-0.6	-0.4	-0.4	-0.1	—	0.0	
Shields .. ..	57.0	0.0	-0.3	-0.1	+0.7	—	—	
Spurn Head ..	58.0	-0.3	-0.2	0.0	0.0	—	0.0	
Yarmouth .. ..	61.5	-0.1	-0.2	-0.3	+0.5	—	-0.8	
SCOTLAND.								
Aberdeen .. ..	58.7	-0.1	-0.1	-0.1	-0.1	—	—	
Leith .. ..	55.9	-0.1	-0.2	0.0	+0.4	—	-0.2	
Nairn .. ..	60.4	-0.7	-0.7	0.0	+0.1	—	-0.1	
Stornoway ..	61.3	-0.1	-0.1	+0.2	+0.1	—	-0.1	
Sumburgh Head	—	—	—	—	—	—	—	Not visited.
Wick .. ..	59.9	-0.5	-0.5	0.0	+0.1	—	—	
IRELAND.								
Blacksod Point ..	48.9	-0.2	-0.2	+0.1	+1.0	—	-0.3	
Donaghadee ..	49.7	-0.3	-0.4	0.0	+0.5	—	0.0	
Malin Head ..	50.7	-0.3	-0.2	+0.1	-1.0	—	—	
Parsonstown ..	58.6	-0.5	-0.2	-0.4	+0.1	—	—	
Roche's Point ..	51.1	-0.7	-0.4	+0.1	+0.3	—	-0.4	
Valencia .. ..	51.3	-0.6	-0.5	-0.5	-0.1	—	+0.3	

BAROMETERS.  
OTHER CLIMATOLOGICAL STATIONS.

STATIONS.	Inspector's Standard Corrected.	Reporting Barometer.	Check Barometer.	REMARKS.
ENGLAND AND WALES.	Inches.	Inches.	Inches.‡	
Littlestone .. ..	29.777	- .005	—	
Totland Bay .. ..	30.245	+ .009	—	

THERMOMETERS.  
TELEGRAPHIC REPORTING STATIONS.

STATIONS.	Inspector's Standard Corrected.	Dry Bulb.	Wet Bulb.	Maxi- mum.	Mini- mum.	Glass Min.	Spare.	REMARKS.
ENGLAND AND WALES.	°	°	°	°	°	°	°	
Dungeness ..	51.1	-0.1	-0.1	0.0	0.0	—	-0.2	
Holyhead ..	58.7	-0.5	-0.3	+0.6	+0.1	—	-0.3	
Jersey .. ..	62.0	-0.7	+0.1	-0.7	+0.1	—	-1.0	Scale of dry bulb defective. Not visited.
Liverpool (Bids- ton).	—	—	—	—	—	—	—	
London (Brixton)	54.0	-0.1	+0.1	0.0	0.0	-0.1	—	
London M.O. ..	62.0	0.0	-0.1	+0.1	0.0	—	—	
Loughborough ..	—	—	—	—	—	—	—	Not visited.
Oxford .. ..	59.0	-0.3	-0.3	-0.4	+0.1	+0.4	—	
Pembroke (St. Ann's Head).	63.9	-0.1	+0.2	0.0	+0.1	—	-0.1	Scale of wet bulb almost illegible.
Portland Bill ..	61.0	0.0	+0.1	0.0	+0.9	—	0.0	The spirit column in the minimum was broken.
Scilly .. ..	63.4	-0.6	-0.4	-0.4	-0.1	—	0.0	
Shields .. ..	57.0	0.0	-0.3	-0.1	+0.7	—	—	
Spurn Head ..	58.0	-0.3	-0.2	0.0	0.0	—	0.0	
Yarmouth.. ..	61.5	-0.1	-0.2	-0.3	+0.5	—	-0.6	
SCOTLAND.								
Aberdeen .. ..	58.7	-0.1	-0.1	-0.1	-0.1	—	—	
Leith .. ..	55.9	-0.1	-0.2	0.0	+0.4	—	-0.2	
Nairn .. ..	60.4	-0.7	-0.7	0.0	+0.1	—	-0.1	
Stornoway ..	61.3	-0.1	-0.1	+0.2	+0.1	—	-0.1	
Sumburgh Head	—	—	—	—	—	—	—	Not visited.
Wick .. ..	59.9	-0.5	-0.5	0.0	+0.1	—	—	
IRELAND.								
Blacksod Point ..	49.9	-0.2	-0.2	+0.1	+1.0	—	-0.3	
Donaghadee ..	49.7	-0.3	-0.4	0.0	+0.5	—	0.0	
Malin Head ..	50.7	-0.3	-0.2	+0.1	-1.0	—	—	
Parsonstown ..	56.6	-0.5	-0.2	-0.4	+0.1	—	—	
Roebe's Point ..	54.1	-0.7	-0.4	+0.1	+0.3	—	-0.4	
Valencia .. ..	54.3	-0.6	-0.5	-0.5	-0.1	—	+0.3	





THERMOMETERS—*continued.*NORMAL CLIMATOLOGICAL STATIONS—*continued.*

STATIONS.	Inspector's Standard Corrected.	Dry Bulb.	Wet Bulb.	Maxi- mum.	Mini- mum.	Gross Min.	Spare.	REMARKS.
SCOTLAND— <i>cont.</i>	°	°	°	°	°	°	°	
Lednathie .. ..	55.0	-0.2	-0.2	-0.2	+0.3	—	—	
Poltalloch .. ..	59.0	0.0	0.0	0.0	+0.3	—	—	
Rothsay .. ..	56.8	0.0	0.0	+0.2	+0.3	—	—	
IRELAND.								
Armagh .. ..	63.5	-0.4	-0.4	0.0	0.0	—	—	
Belfast .. ..	50.1	0.0	0.0	+1.0	+0.2	—	—	
Markree Castle ..	53.7	-0.2	-0.3	-0.4	+0.2	+0.2	—	
Parsonstown ..	56.7	-0.5	-0.2	+0.1	-0.2	—	—	

## THERMOMETERS.

## OTHER CLIMATOLOGICAL STATIONS.

STATIONS.	Inspector's Standard Corrected.	Dry Bulb.	Wet Bulb.	Max.	Min.	Gross Min.	Spare.	REMARKS.
ENGLAND AND WALES.	°	°	°	°	°	°	°	
Alnwick Castle	50.0	-0.2	-0.2	-0.2	+0.4	—	—	
Cirencester ..	64.4	0.0	0.0	+0.1	0.0	+0.4	—	
Clifton .. ..	58.0	-0.6	-0.2	-0.4	0.0	—	—	
Cullompton ..	62.1	-0.1	-0.4	0.0	+0.3	+0.5	—	
Felixstowe ..	52.0	0.0	0.0	+0.3	-0.2	—	—	
Littlestone ..	47.8	+0.2	+0.1	+0.2	+0.6	+0.9	—	
Llandovery ..	63.0	—	—	-0.7	+1.2	—	—	
St. Helen's ..	50.6	-0.1	-0.1	-0.2	+0.2	+0.5	—	
St. Leonard's ..	51.3	-0.5	-0.7	-0.2	-0.1	—	—	
Shaftesbury ..	61.5	0.0	0.0	-0.2	0.0	—	—	
Swarraton ..	57.7	0.0	-0.1	-0.6	-0.2	—	—	
Totland Bay ..	62.0	-0.2	+0.3	-0.2	+1.2	—	—	
SCOTLAND.								
None.								Could not de- tect any spirit at top of tube of minimum.
IRELAND.								
Edenfel .. ..	50.7	—	—	+0.2	-0.3	—	-0.7	
Kingstown ..	—	—	—	—	—	—	—	
Newcastle ..	56.7	-0.5	-0.6	-0.1	-0.3	—	—	

## THERMOMETERS.

## OBSERVATORIES.

STATIONS.	Inspector's Standard Corrected.	Dry Bulb.	Wet Bulb.	Max.	Min.	Grass Min.	Spare.	REMARKS.
ENGLAND AND WALES.	o	o	o	o	o	o	o	
Falmouth ..	55.0	-0.6	-0.1	-0.5	+0.1	—	—	
Oxford .. ..	59.0	-0.3	-0.3	-0.4	+0.1	+0.4	—	
Stonyhurst ..	57.0	-0.1	-0.3	-0.1	+0.4	+0.4	—	
SCOTLAND.								
Aberdeen ..	51.0	-0.1	-0.0	0.0	+0.3	—	—	
Fort William ..	57.0	0.0	-0.2	0.0	-0.1	—	—	
Glasgow .. ..	57.0	0.0	0.0	0.0	+0.1	—	—	
IRELAND.								
Valencia .. ..	54.3	-0.6	-0.5	-0.5	-0.1	—	+0.3	

## APPENDIX X.

## REPORT ON INVESTIGATIONS IN ATMOSPHERIC ELECTRICITY.

The principal results of the investigations are contained in two papers, the first "On the Comparative Efficiency as condensation nuclei of positively and negatively charged Ions," already published (*Phil. Trans. A*, 1903, pp. 289-308), the second "On the Ionisation of Atmospheric Air," sent with this report. A preliminary note, containing a statement of some of the results of the experiments which are described at length in the latter paper, was read before the Cambridge Philosophical Society on November 26th, 1900. (Many of the results were arrived at independently by Geitel in a paper published almost simultaneously in the *Physikalische Zeitschrift*.)

In these two papers experiments are described proving that water condenses much more readily on negatively than on positively charged "ions," and that such ions are continually being produced in atmospheric air even in the dark. The degree of supersaturation required to make water condense on positive and negative ions respectively was measured; and an approximate determination was made of the number of ions produced per second in each c.c. of air at atmospheric pressure. The number of ions produced per c.c. was found to be nearly proportional to the pressure.

In addition to the problems considered in the two papers named, several other questions have been investigated; the results arrived at are, however, of less importance, and I have not considered them deserving of publication.

An attempt to derive information from a comparison of the Greenwich and Kew electrograph curves was abandoned on account of the methods employed at the two observatories not being comparable, and from the want of knowledge of the scale values of the Greenwich curves.

The study of the electrograph curves showed how difficult it is to obtain really trustworthy measurements of the variations of electrical potential at a point by means of recording apparatus. This is mainly due to the difficulty of maintaining efficient insulation for long periods. My own experience has led me to conclude that sulphur is probably the most satisfactory insulating material for such work; this is in accordance with the experience of Le Cadet.

A study of the electrograph curves from Kew in connexion with the corresponding rain gauge curves and weather registers led to the following results, most of which have for long been generally accepted conclusions.

(1). The atmospheric potential is almost invariably positive except when precipitation is taking place in the neighbourhood.



## APPENDIX X.

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A study of the electrograph curves from Kew in connexion with the corresponding rain gauge curves and weather registers led to the following results, most of which have for long been generally accepted conclusions.

(1). The atmospheric potential is almost invariably positive except when precipitation is taking place in the neighbourhood.

Practically all cases in which even momentary periods of negative values of the potential occur, not coincident with rain, are within 36 hours of the beginning or end of the period of fine weather in which they occur.

(2). When there is precipitation, negative potentials nearly always occur. Thunderstorms, snowstorms, hail, and heavy rain are accompanied by rapid alternations of high positive and high negative values. Distant thunder is accompanied by such reversals, sheet lightning without thunder is not accompanied by any disturbance on the electrograph curve.

(3). There are cases of rain not associated with negative potentials, sometimes, in fact, accompanied by a rise in the positive potential. These seem, however, to be all cases of slight rain, generally mist or drizzle.

(4). Fogs are nearly always accompanied by abnormally high values.

(This may, perhaps, be explained if we take into account the ionisation of the air, for under the influence of the earth's potential gradient there will be a continuous streaming of positive ions down to the negatively charged surface of the earth. These will become entangled in the fog, and a positive charge will go on accumulating in the fog so long as the supply of positive ions is maintained. This action of clouds or fogs in destroying the mobility of the ions has been pointed out by Elster and Geitel in the *Ann. der Physik.*, vol. 2, 1900, p. 425.)

(5). Clouds not associated with rain do not cause negative potentials.

(6). The usually accepted diurnal and annual variations of potential appear to be indicated by the curves.

Experiments were made on the efficiency as "collectors" of atmospheric electricity of electrometer matches and of platinum wires maintained at a bright red heat by means of a current from a secondary cell.

It was found that collectors of the latter form worked very well if not exposed to air currents strong enough to reduce their temperature below bright redness. It is probable that they would be suitable for use in balloon ascents, in which the measurements would be made with only a slight relative motion of the wire and air.

With hot wire collectors, so long as the wire is glowing brightly, the rate at which the potential of the air at the point under investigation is acquired by the electrometer is the same whether the potential of the electrometer is initially above or below that of the air; *i.e.*, whether positive or negative electricity is escaping from the collector. This is not the case, as is well known, if the wire be only dull red; positive electricity escapes from such a wire much more readily than negative. I have found the behaviour of the ordinary electrometer match to be similar to that of the dull-red wire; in this case, however,

negative electricity escapes much more readily than positive; the time required for the difference between the initial and final potential to be reduced by one-half being frequently five or six times as great when the initial potential is above the final than when it is below it. It is evident that in the case of rapidly changing potentials, whether actual reversals occur or not, this may lead to serious error; positive values of potential tending to be over-estimated and negative values under-estimated.

C. T. R. WILSON.

Sidney Sussex College,  
January 30, 1901.



## APPENDIX XI.

ADDITIONS TO THE LIBRARY DURING THE YEAR ENDING  
31ST MARCH, 1901.

**Aachen, Meteorologische Station.**—Deutsches meteorologisches Jahrbuch für 1899. Meteorologische Station I. Ordnung in Aachen. Ergebnisse der meteorologischen Beobachtungen. . . . Herausgegeben . . . von P. Polis. Jahrg. 5. 1a. 4°. Karlsruhe, 1900.

——— Ergebnisse der 1900 in Aachen von der meteorologischen Station Aachen des Königl. Preuss. Meteorologischen Instituts angestellten Beobachtungen. sm. f°. Sheet.

——— **Centralstation.**—Uebersicht der Witterung. 1900, Jan.—Dec. Slips.

**Adelaide Observatory.**—Meteorological observations made at the Adelaide Observatory, and other places in South Australia and the northern territory, during the year 1897, under the direction of C. Todd. sm. f°. Adelaide, 1900.

[———] Rainfall in South Australia and the northern territory, during 1897, with weather characteristics of each month. By Sir C. Todd. f°. Adelaide, 1900.

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## APPENDIX XII.

ACCOUNT of RECEIPTS and PAYMENTS for the year ending 31st March, 1901:—

RECEIPTS.			PAYMENTS.		
	£	s. d.		£	s. d.
Balance from year 1899-1900 .. .. .	—	3,702 11 11	ADMINISTRATION:	£	s. d.
Parliamentary vote ..	—	15,300 0 0	Council .. .. .	917 19 10	
Repayment of expenses charged under—			Secretary .. .. .	627 11 2	
(1.) Incidental expenses .. ..	23 11 1		Salaries and wages ..	912 9 0	
(2.) Observatories ..	25 11 6		Rent, fuel, and lighting	733 16 0	
		49 2 7	Incidental and contingent expenses ..	245 10 7	
SPECIAL RESEARCHES:			Furniture and fittings ..	124 15 6	
Grant for investigation on atmospheric electricity .. .. .	—	80 0 0	Expenses incidental to International Meteorological Congress ..	26 5 11	3,588 8 0
SUPPLY OF INFORMATION:			SPECIAL RESEARCHES:		
Daily Weather Charts and Forecasts .. ..	324 3 1		Salaries and other charges .. .. .	703 14 3	
6 p.m. Charts .. ..	25 0 0		Investigation on Atmospheric Electricity ..	100 0 0	803 14 3
Reports for Press Agencies, &c. .. ..	117 6 6		LAND METEOROLOGY:		
Telegrams sent abroad	378 5 0	842 14 7	Observatories and stations, including remuneration of observers..	2,254 8 6	
SALE OF INSTRUMENTS, &c.:			Salaries:— Discussion and reduction of observations, &c. .. ..	1,170 19 6	3,425 8 0
Royal Navy account ..	6 13 6		WEATHER INFORMATION AND FORECASTS:		
Mercantile Marine account .. ..	23 8 0		Telegraphic reports and storm warnings, remuneration of observers, &c. .. ..	2,627 14 11	
"M.O." (Stations) account .. ..	87 5 2	117 6 8	Salaries:— Preparation and issue of reports and forecasts .. ..	1,892 3 8	4,519 18 7
Repayment of Miscellaneous commissions executed for Colonial and Foreign Institutions, &c. .. ..	—	215 17 1	INSPECTIONS:		
Commission charged on work done for Colonies, &c. .. ..	—	16 11 9	Salaries and travelling expenses .. .. .	—	401 10 2
SUPERANNUATION ACCOUNT .. .. .	—	35 12 6	OCEAN METEOROLOGY:		
			Salaries:— Discussion and reduction of observations .. ..	1,320 18 6	
			Expenses incidental to the supply of instruments:—		
			Proportion for care and issue of instruments .. ..	125 0 0	
			Royal Navy .. ..	443 10 4	
			Mercantile Marine ..	168 14 7	2,058 3 5
			Miscellaneous commissions executed for Colonial and Foreign Institutions, &c. ..	—	322 13 1
			SUPERANNUATION:		
			Pensions and Allowances	654 12 6	
			Provision for Annuities	1,463 0 0	2,117 12 6
			BALANCE:		
			Cash at Bank .. ..	3,071 4 9	
			" at Office .. ..	51 4 4	3,122 9 1
		£20,359 17 1			£20,359 17 1

In the year 1900-1 the sum of £1,599 17s. 11d. was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires, &c.



## APPENDIX XIII.

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

## I.—DAILY WEATHER REPORT.

Year.	Page.	—
1896 (July to Dec.).	1	Mean Values of Barometric Pressure for each Month and for the Whole Year, derived from Observations made at 8 a.m. daily during the 25 Years 1871-95.
1896	2 and 3	Mean Values of the Dry Bulb and Wet Bulb Temperatures for ditto, ditto.
"	4 and 5	Mean Values of the Daily Maximum and Minimum Temperatures, and of the Maximum and Minimum combined, for the 25 Years 1871-95.
"	6 and 7	Extremes of the Daily Maximum and Minimum Temperatures for ditto, ditto.
	8	Mean Rainfall for each Month and for the Whole Year—derived from Observations extending over the 30 Years 1866-95.
"	9	Mean Numbers of Hours of Bright Sunshine, with the Percentages of Possible Duration, derived from Observations extending over the 15 Years 1881-95.

## II.—WEEKLY WEATHER REPORT.

Year.	Page.	—
1884	V.	Table A.—Showing for each Degree of Latitude, from 49° N. to 58° N. the Total Number of Hours during which the Sun is above the Horizon, in each Month of the Four Quarters of the Year.
"	VI.	Table B.—Showing similar information for each Week of the Year.
1895	VI.-VII.	Mean Values of the Daily Maximum and Minimum Temperatures, and of the Maximum and Minimum combined, for each Month and for the Whole Year, derived from Observations extending over the 25 Years 1871-95.
"	VIII.	Mean Rainfall for each Month and for the Whole Year, derived from Observations extending over the 30 Years 1866-95.

Year.	Page.	
1895	IX.	Mean Numbers of Hours of Bright Sunshine, together with the Per-centages of the Possible Duration, for each Month and the Whole Year, derived from Records extending over the 15 Years 1881-95.
1900	[1-9]	Summaries of Rainfall and Mean Temperature for the First, Second, Third, and Fourth Quarters, and for the Whole Year, during the 35 Years 1866-1900. [The separate Yearly Values for 1866-85 are contained in the Reports for 1890, and previous Years.]
1895	[17]	Table I.—Showing for each District, during the Lustrum 1896-1900, and the whole Period comprehended in the 20 Years 1881-1900, the Mean Aggregate numbers of rainy days from the beginning of the Year to the end of each week in the Year.
"	[21]	Table II.—Showing in the same detail the Mean Aggregate Amounts of Rainfall.
"	[25]	Table III.—Showing in the same detail the Mean Aggregate Values for Accumulated Heat above 42° F.
"	[29]	Table IV.—Showing in the same detail the Mean Aggregate Values for Accumulated Heat below 42° F.
"	[33]	Table V.—Showing in the same detail the Mean Aggregate Numbers of Hours of Bright Sunshine.
"	[37]	Table VI.—Showing in the same detail the Mean Per-centages of the possible amount of Bright Sunshine.
"	[41]	Table showing in the same detail the Mean Temperature of the Air.

## III.—MONTHLY WEATHER REPORT.

Year.	Page.	
1884	[i.]	On London Rain. By W. J. Russell, Ph.D., F.R.S.
	[ii.]	On the Amount of Carbonic Acid in London Air. By W. J. Russell, Ph.D., F.R.S.
	[iii.]	Table showing for each Month and for each Degree of Latitude from 18° N. to 49° N. the Total Number of Hours during which the Sun is above the Horizon.
1885	[i.]	On the Impurities in London Air. By W. J. Russell, Ph.D., F.R.S.
	[ii.]	Table showing the Mean Monthly and Annual Rainfall at the Weekly and Monthly Weather Report Stations for the 20 Years 1866 to 1885.

## IV.—QUARTERLY WEATHER REPORT.

Year.	Page.	
1869	43	Factors for Calculation of Gradients.
"	[1]	Notes on Easterly Gales, by R. H. Scott.
1870	iii.	Description of Observatories, with illustrations of thermometer screens.
"	[23]	Bessel's Paper on the Determination of the Law of a Periodical Phenomenon. Translated from the <i>Astronomische Nachrichten</i> , 136, for May, 1828.
1871	[7]	Discussion of Anemometrical Results for Orkney, 1863-68.
"	[59]	Constants for the Determination of the Monthly March of Atmospherical Pressure, &c. at the Seven Observatories for 1869-70.
1872	[13]	Discussion of the Anemometrical Results at Bermuda from 1st April 1859 to 31st March 1863.
1873	[13]	Rainfall of the London District for Sixty Years, 1813-72. By G. Dines, F.M.S. [with diagram].
1874	[26]	On the Winds at Liverpool. By W. W. Rundell.
1875	[1]	Observations taken at Nine Stations of the Second Order [1875].
"	[89]	Mean Monthly Results for the Seven Observatories for the Lustrum, 1871-75.
1876	[13]	Report on the Reduction of Greenwich Curves for 1875 to a Common Standard with those of Kew [with 25 plates].
"	[20]	Results of Observations made at the Pagoda, Kew Gardens, to Determine the Influence of Height on Temperature, &c. By R. H. Scott, F.R.S. [4 plates.]
"	[39]	Comparison of Results obtained by means of the Harmonic Analyser, with similar Results got from Measurement and Numerical Calculation for the Seven Observatories.
1877	[13]	On the Diurnal Range of Rainfall at the Seven Observatories in connexion with the Meteorological Office, 1871-80. By R. H. Scott, F.R.S. [5 plates.]
"	[35]	Report on Evaporimeters. By W. N. Shaw, M.A. [2 plates.]
1878	[13]	On the Computation of the Quantity of Heat in excess of any Fixed Base Temperature, received at any place during the course of the Year, &c. By Lieut.-Gen. Strachey, R.E., F.R.S.
1879	[13]	Report on Experiments made at Strathfield Turgiss in 1869 with Thermometer Stands or Screens of various patterns, &c. By F. Gaster.
"	[41]	Report on Hygrometric Methods, &c. Part I. By W. N. Shaw, M.A.
1880	[13]	Report on Experiments made at the Kew Observatory with Thermometer Screens of different patterns during 1879, 1880 and 1881. By G. M. Whipple, Superintendent.
"	[19]	Tables and Diagrams illustrating the Diurnal Range of Barometric Pressure in the British Isles during the Years 1876-80. By F. C. Bayard, LL.M., F.R. Met. Soc. [5 plates.]



V.—REPORT of the METEOROLOGICAL COMMITTEE of the  
ROYAL SOCIETY.

Year.	Page.	—
1867	27	A Description of the Self-recording Instruments recently erected by the Meteorological Committee of the Royal Society in various parts of the United Kingdom. [With plates.]
1869	25	Note upon a Self-registering Thermometer adapted to Deep-Sea Soundings, by W. A. Miller, M.D., Treasurer and V.P.R.S., extracted from Proceedings of Royal Society, vol. XVII., p. 482.
1869	36	Description of a Self-recording Rain-gauge, invented by Robert Beckley, of the Kew Observatory; made by James Hicks, London.
1870	25	Description of the Process by which the Traces of the Self-registering Instruments are reduced suitably for publication.
1872	27	A Summary of the Results obtained from the Discussion of the Information for Square 3, being the Region of the Doldrums in the Atlantic. By Capt. H. Toynbee, Marine Superintendent.
1874	33	The International Maritime Conference.

VA.—REPORT of the METEOROLOGICAL COUNCIL.

Year.	Page.	—
1877-78	21	Account of the Experiments on Atmospheric Electricity conducted at Kew Observatory. By Prof. J. D. Everett.
1879-80	23	On the Effect of Sluggishness on the Readings of Marine Barometers on Shore, by Prof. Stokes.
"	43	On the Methods available for the Determination of the Humidity of the Atmosphere, by W. N. Shaw.
"	46	Memorandum as to the Employment of the Harmonic Analyser in the Meteorological Office, by Prof. Stokes.
1880-81	25	On the Working of the Harmonic Analyser. [Prof. Stokes.]
"	27	Report on Fogs. [W. J. Russell.]
"	28	" " Hygrometers and Evaporimeters, presented to the Meteorological Council, May 10, 1881. [W. N. Shaw.]
1881-82	25	On fogs. [W. J. Russell.]
"	29	Report on the Results of a Tentative Reduction of a Year's Electrograms at the Kew Observatory. [G. M. Whipple.]
1882-83	27	On the Results obtained by the use of the Harmonic Analyser.
1884-85	22	Note on Work done with the Harmonic Analyser.

Year.	Page.	
1885-86	22	Memorandum on Cloud Photography, by Prof. Stokes, F.R.S.
1886-87	21	On the Distribution of Gales round the Coasts of the British Isles [for the 15 years, 1871-85].
1887-88	22	On the History of the Severe Storms which visited the British Isles between August 1, 1882, and September 3, 1883, as traceable from the Atlantic Charts published by the Office. By Robert H. Scott, F.R.S., Secretary.
"	30	Abstract of Report on Hygrometric Methods, by W. N. Shaw, M.A., reprinted from the "Proceedings of the Royal Society," No. 262.
1888-89	22	Notes of some Results of an Examination of Atlantic Charts published by the Office, by R. H. Scott, F.R.S., Secretary.
"	27	Memorandum on the Measurement of Squalls shown on the Traces yielded by Robinson Anemometers of the "Standard" Pattern, by R. H. Curtis.
1889-90	24	Code of Regulations, &c. for conducting the work at the First Class Observatories, and the Examination thereof. [See also Report, 1888.]
"	36	Note on Experiments on Pressure of Wind made by W. J. Dines.
"	46	Experiments with Violle's Actinometer Apparatus.
"	47	On the Work done with the Harmonic Analyser at the Meteorological Office.
1890-91	22	On Mr. Dines' Anemometer Experiments.
1891-92	23	On Anemometer Comparisons carried out by the aid of a Grant from the Meteorological Council, by W. H. Dines, B.A.
1892-93	21	On the Construction of the Anemometer recently erected for trial on the roof of the Meteorological Office, by W. H. Dines, B.A.
"	27	On the Harmonic Analysis of Hourly Observations of Air Temperatures at British Observatories, by Lieut.-Gen. R. Strachey, F.R.S.
1894-95	22	Report on Weather Forecasts during the Hay Harvest of 1894, by H. N. Dickson.
"	27	Report on the Comparisons made between two Pressure Tube Anemometers on the roof of the Meteorological Office, by R. H. Curtis.
"	29	Note on the Exposure of the Robinson Anemometer at Holyhead, by R. H. Curtis.
1895-96	24	Note on Anemometer Experiments, by R. H. Curtis.
1897-98	21	Report upon Anemometer Experiments at Holyhead, by R. H. Curtis.
"	28	Description of the Bridled Anemometer designed by Sir G. G. Stokes, Bart., F.R.S., by R. H. Curtis.

Year.	Page.	—
1885-86	22	Memorandum on Cloud Photography, by Prof. Stokes, F.R.S.
1886-87	21	On the Distribution of Gales round the Coasts of the British Isles [for the 15 years, 1871-85].
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"	27	Memorandum on the Measurement of Squalls shown on the Traces yielded by Robinson Anemometers of the "Standard" Pattern, by R. H. Curtis.
1889-90	24	Code of Regulations, &c. for conducting the work at the First Class Observatories, and the Examination thereof. [See also Report, 1868.]
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"	28	Description of the Bridled Anemometer designed by Sir G. G. Stokes, Bart., F.R.S., by R. H. Curtis.



Year.	Page.	—
1899–1900.	104	Report upon Anemometer Experiments at Holyhead by R. H. Curtis.
„	108	Researches on Atmospheric Electricity, with Reports, by C. T. R. Wilson.

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

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

VII.—HOURLY MEANS of the READINGS obtained from the SELF-RECORDING INSTRUMENTS at the FIVE OBSERVATORIES under the METEOROLOGICAL COUNCIL.

Year.	Page.	—
1891	[1]	Tables of Hourly Sunshine Values, with Plates, for the Ten Years 1881–90, for Seven Observatories.
1895	[6–80]	Mean Hourly and Extreme Values of Pressure and Temperature, and Amount and Frequency of Rainfall, for each month of the 25 years, 1871–95; also Amount and Frequency of Sunshine for each month of the 15 years, 1881–95.

VIII.—METEOROLOGICAL OBSERVATIONS at STATIONS of the SECOND ORDER.

Year.	Page.	—
1891	[186]	Results of Observations at Stations of the Second Order for the Fifteen years, 1876–90.

## APPENDIX XIV.

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LIST OF PUBLICATIONS ISSUED UNDER THE AUTHORITY  
OF THE METEOROLOGICAL COUNCIL.

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The list is arranged under the following headings :—

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

1. Periodical Publications.

*Daily Weather Report.* (Issued to Subscribers only.) Subscription, £1 per annum.

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

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

1889–1901. Vols. VI.–XVIII. (Official, Nos. 86, 87, 96, 100, 107, 111, 116, 121, 128, 133, 138, 144, 150.) 6*d.* per week. Annual subscription, including Supplements and Appendices, 30*s.*

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

*Monthly Weather Reports* :—

1884. (Official, No. 62.) Jan.–March, May–Nov., 1*s.* 6*d.* each ; April (with two Appendices), 2*s.* 6*d.* ; Dec., 1*s.* 9*d.*

1885. (Official, No. 65.) Jan. to Dec., 1*s.* 6*d.* each

1886. (Official, No. 68.) Jan. to Dec., 1*s.* 6*d.* each.

†1887. (Official, No. 77.) Jan. to April, 1*s.* 6*d.* each ; May to Dec., in wrapper, 12*s.*

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\* The publication of the Weekly Weather Report began in February 1878. Annual subscription, including supplements and appendices, post paid, 1878–1883, 12*s.* 6*d.* ; 1884–1887, 21*s.* 2*d.*

† The publication of the Monthly Weather Report was continued after this date as a Supplement to the Weekly Weather Report.

1. Periodical Publications—*continued*.*Quarterly Weather Reports :—*

1869. (Official, No. 7.) Parts I. to IV. 5s. each.  
 1870. (Official, No. 9.) Parts I. to IV. 5s. each.  
 1871. (Official, No. 14.) Parts I. to IV. 5s. each.  
 1872. (Official, No. 16.) Parts I. to IV. 5s. each.  
 1873. (Official, No. 19.) Parts I. to IV. 5s. each.  
 1874. (Official, No. 25.) Parts I., II., and IV., 5s. each ;  
 Part III., 5s. 9d.  
 1875. (Official, No. 30.) Parts I. to IV. 5s. each.  
 1876. (Official, No. 33.) Part I., 6s. ; Parts II., III.,  
 and IV., 5s. each.  
 1877. (Official, No. 52.) Part I., 10s. ; II., 5s. ; III., 4s. 6d. ;  
 IV., 6s. ; Appendices and Plates, 27s.  
 1878. (Official, No. 55.) Parts I. to IV., 6s. each. Appen-  
 dices and Plates, 28s.  
 1879. (Official, No. 49.) Parts I. to III., 6s. each ;  
 IV., 5s. 6d. ; Appendices and Plates, 27s.  
 1880. (Official, No. 50.) Parts I. and II., 6s. each ;  
 III., 4s. ; IV., 6s. ; Appendices and Plates, 28s.

**ANNUAL** Volumes :—

## Reports of the Meteorological Committee :—

1867. (Official, No. 1.) 1s.  
 1868. (Official, No. 5.) 5d.  
 1869. (Official, No. 6.) 10d.  
 1870. (Official, No. 10.) 10d.  
 1871. (Official, No. 15.) 10d.  
 1872. (Official, No. 17.) 1s.  
 1873. (Official, No. 22.) 4d.  
 1874. (Official, No. 26.) 6d.  
 1875. (Official, No. 29.) 4d.  
 1876–77. (Official, No. 31.) 3s. 5d.

## Reports of the Meteorological Council :—

- 1877–78. (Official, No. 35.) 1s.  
 1878–79. (Official, No. 38.) 5d.  
 1879–80. (Official, No. 41.) 1s.  
 1880–81. (Official, No. 42.) 1s. 2d.  
 1881–82. (Official, No. 48.) 1s.  
 1882–83. (Official, No. 58.) 10½d.  
 1883–84. (Official, No. 64.) 1s. 2d.  
 1884–85. (Official, No. 67.) 4s. 4d.



**1. Periodical Publications—continued.****ANNUAL Volumes—continued.****Reports of the Meteorological Council—continued**

1885-86.	(Official, No. 72.)	8 <i>d.</i>
1886-87.	(Official, No. 75.)	8 <i>d.</i>
1887-88.	(Official, No. 79.)	1 <i>s.</i>
1888-89.	(Official, No. 84.)	5½ <i>d.</i>
1889-90.	(Official, No. 91.)	7½ <i>d.</i>
1890-91.	(Official, No. 99.)	5½ <i>d.</i>
1891-92.	(Official, No. 104.)	6 <i>d.</i>
1892-93.	(Official, No. 109.)	8 <i>d.</i>
1893-94.	(Official, No. 112.)	7½ <i>d.</i>
1894-95.	(Official, No. 119.)	8½ <i>d.</i>
1895-96.	(Official, No. 122.)	8½ <i>d.</i>
1896-97.	(Official, No. 130.)	8 <i>d.</i>
1897-98.	(Official, No. 136.)	11 <i>d.</i>
1898-99.	(Official, No. 140.)	7½ <i>d.</i>
1899-1900.	(Official, No. 147.)	11½ <i>d.</i>

**Observatories and Stations.**

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

1881.	(Official, No. 51.)	Part I., 10 <i>s.</i> 6 <i>d.</i> ; Parts II. III., and IV., 21 <i>s.</i> each.
1882.	(Official, No. 54.)	Parts I. and II., 20 <i>s.</i> each ; III., 22 <i>s.</i> 6 <i>d.</i> ; IV., 26 <i>s.</i>
1883.	(Official, No. 63.)	Parts I., II., and III., 21 <i>s.</i> each ; Part IV., 30 <i>s.</i>
1884.	(Official, No. 70.)	Part I., 12 <i>s.</i> ; II., 10 <i>s.</i> ; III., 10 <i>s.</i> 6 <i>d.</i> ; IV., 15 <i>s.</i>
1885.	(Official, No. 74.)	Parts I. and II., 11 <i>s.</i> each ; III., 10 <i>s.</i> 6 <i>d.</i> ; IV., 12 <i>s.</i>
1886.	(Official, No. 81.)	Parts I., II., and III., 10 <i>s.</i> 6 <i>d.</i> each ; Part IV., 12 <i>s.</i> 6 <i>d.</i>

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

1887.	(Official, No. 94.)	16 <i>s.</i>
1888.	(Official, No. 97.)	20 <i>s.</i>
1889.	(Official, No. 103.)	15 <i>s.</i>
1890.	(Official, No. 105.)	20 <i>s.</i>
1891.	(Official, No. 113.)	32 <i>s.</i> 6 <i>d.</i>

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

1. Periodical Publications—*continued.*ANNUAL Volumes—*continued.**Observatories and Stations—continued.*Hourly Means, &c.—*continued.*

1892.	(Official, No. 118.)	21s.
1893.	(Official, No. 126.)	24s.
1894.	(Official, No. 131.)	24s.
1895.	(Official, No. 135.)	38s.
1896.	(Official, No. 141.)	37s. 6d.
1897.	(Official, No. 145.)	37s. 6d.
1898.	(Official, No. 151.)	(In the Press.)

## Meteorological Observations at Stations of the Second Order :—

*1876.	(Official, No. 33 <i>a</i> .)	
1877.	(Official, No. 33 <i>b</i> .)	
1878.	(Official, No. 39.)	20s.
1879.	(Official, No. 45.)	20s.
1880.	(Official, No. 57.)	34s. 6d.
1881.	(Official, No. 66.)	35s.
1882.	(Official, No. 69.)	35s.
1883.	(Official, No. 73.)	30s.
1884.	(Official, No. 78.)	32s.
1885.	(Official, No. 82.)	31s.
1886.	(Official, No. 88.)	25s.
1887.	(Official, No. 95.)	24s.
1888.	(Official, No. 101.)	22s.
1889.	(Official, No. 108.)	34s.
1890.	(Official, No. 110.)	34s.
1891.	(Official, No. 117.)	30s.
1892.	(Official, No. 120.)	27s.
1893.	(Official, No. 125.)	27s.
1894.	(Official, No. 129.)	27s.
1895.	(Official, No. 137.)	22s. 6d.
1896.	(Official, No. 139.)	21s.
1897.	(Official, No. 146.)	22s.
1898.	(Official, No. 152.)	(In the Press.)

## 2. Occasional Publications and Reports.

## ATLAS.—

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

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

- Leipzig. 1872. (Non-Official, No. 6.) 1s.  
 Vienna. 1873. (Official, No. 21.) 1s.  
 Vienna and Utrecht. 1873 and 1874. (Non-Official, No. 9.) 1s. 6d.  
 London. 1874. Maritime Meteorology. (Official, No. 23.) 2s.  
 London. 1876. With Supplement. (Non-Official, No. 11.) 2s.  
 Utrecht. 1878. (Non-Official, No. 13.) 6d.  
 Rome. 1879. (Official, No. 36.) 1s. 6d.  
 Berne. 1880. (Non-Official, No. 14.) 1s.  
 Copenhagen. 1882. (Non-Official, No. 15.) 2s. 6d.  
 Paris. 1885. (Non-Official, No. 16.) 1s.  
 Zürich. 1888. (Non-Official, No. 17.) 4d.  
 Munich. 1891. (Official, No. 102.) 1s. 6d.  
 Upsala. 1894. (Official, No. 115.) 1s.  
 Paris. 1896. (Official, No. 127.) 1s.  
 St. Petersburg. 1899. (Official, No. 148.) 2s.  
 Report on Weather Telegraphy and Storm Warnings. 1873. (Non-Official, No. 8.) 6d.  
 Reports . . . on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy. 1878. (Non-Official, No. 12.) 2s.

**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.]  
 Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers, and the Army Medical Department, 1852–1886. (Official, No. 83. 1890.) 23s.  
 Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo, 1886–1888.—By the late W. Reid, M.D. (Official, No. 89. 1890.) 8s. 6d.  
 Report on the Meteorology of Kerguelen Island.—By Rev. S. J. Perry, S. J., F.R.S. (Official, No. 37. 1879.) 3s.

**RAINFALL :**

- Diurnal Range of Rain at the Seven Observatories in connection with the Meteorological Office, 1871–1890. (Official, No. 143. 1900.) 2s. 6d.  
 Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. (Official, No. 47. 1883.) 7s. 6d.  
 Rainfall Tables of the British Islands, 1866–90. (Official, No. 114. 1897.) 6s.



**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.

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

Barometer Manual. (Official, No. 8. 1871.) [Out of print.]

Barometer Manual for the use of Seamen. With an Appendix on the Thermometer, Hygrometer, and Hydrometer. Fourth Edition, 1900, Extensively Revised. (Official, No. 61.) 3d.

Fishery Barometer Manual. New Edition. 1887. (Official, No. 3.) 6d.

Instructions for Meteorological Telegraphy. New Edition. 1891. (Official, No. 2.) Prepared for the use of observers exclusively.

Instructions in the use of Meteorological Instruments. Reprinted 1892. (Official, No. 24.) 2s. 6d.

**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.

**4. Marine Meteorology—continued.****CHARTS—continued.***Atlantic (North) :—*

Charts of Meteorological Data for Square 3. Lat.  $0^{\circ}$ – $10^{\circ}$  N., Long.  $20^{\circ}$ – $30^{\circ}$  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  $40^{\circ}$  N., for each Month of the Year. With a General Current Chart. (Official, No. 12. 1872.) 2s. 6d.

Discussion of the Meteorology of that Part of the Atlantic lying North of  $30^{\circ}$  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.) With Book of Charts. 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.

*Atlantic, Indian, and Pacific Oceans :—*

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

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

*Atlantic and Mediterranean :—*

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

*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.

## 4. Marine Meteorology—continued.

## CHARTS—continued.

*Indian Ocean (North):—*

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

*Indian Ocean (South):—*

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

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

*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.

*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.) 12s.

## OTHER PUBLICATIONS ON MARINE METEOROLOGY:—

Contributions to our Knowledge of the Meteorology of the Antarctic Regions. (Official, No. 18. 1873.) 2s.

Contributions to our Knowledge of the Meteorology of the Arctic Regions. (Official, No. 34. 1885). Vol. I.: Part I., 2s.; II., 10s.; III. and V., 6s. each; IV., 5s.

Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. (Official, No. 11. 1871.) 2s. 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.]

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.]



**4. Marine Meteorology—continued.****OTHER PUBLICATIONS ON MARINE METEOROLOGY—continued.**

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.) 6*d*.

Report to the Committee of the Meteorological Office on the Meteorology of the North Atlantic.—By Captain H. Toynbee, F.R.A.S. (Non-Official, No. 2. 1869.) 1*s*.

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.) 7*s*. 6*d*.

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.]

**5. Miscellaneous Publications.**

Harmonic Analysis of Hourly Observations of Air Temperature and of Pressure at British Observatories. (Official, No. 93. 1891.) 12*s*.

Report of an Inquiry into the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott. (Non-Official, No. 1. 1868.) 6*d*.

Report on the Storm of October 13–14, 1881.—By Robert H. Scott, F.R.S. (Official, No. 46. 1882.) 1*s*. 6*d*.

Report to the Committee of the Meteorological Office on the Use of Isobaric Curves.—By Captain H. Toynbee, F.R.A.S. (Non-Official, No. 3. 1869.) [Out of print.]

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