

# Symons's Meteorological Magazine.

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## THE WORK OF THE METEOROLOGICAL OFFICE.

THE war, we learn from the latest Annual Report\*, has affected the work of the Meteorological Office in many ways. Permission to enlist on the terms laid down for the Civil Service was granted to seven members of the staff, and several others joined the Army under other conditions. A number of applications to join H.M. Forces had to be declined, so that the Meteorological requirements of the Admiralty and the War Office might not be interfered with owing to the loss of so many members of the staff. Steps have been taken to augment largely the staff of women clerks, and some difficulty has been experienced in keeping the routine work of the office up to date "because so much of the clerical work is of a special character, requiring long practice and experience."

A special Temporary Staff for Meteorological Field Service (Forecast Division), has been instituted under the direction of Major H. G. Lyons, R.E., in connection with which numerous offers of assistance have been accepted, amongst many others being Mr. C. J. P. Cave, M.A., and Mr. E. J. Hawke, B.A.

The scientific labours of the Meteorological Office grow in volume and importance every year, and in spite of the difficulties referred to above, a fine record of accomplished work is given in the Report. The introduction of the new units of measurement has continued to make progress, but it is remarked that "the adoption of the millimetre instead of the inch for the measurement of rainfall . . . . . has met with less appreciation." Experiments at the National Physical Laboratory have led to the discovery of an error in the method of correcting barometers of the Kew pattern.

Reference is made to the approaching publication of the representation of the meteorology of the Globe for 1911, by observations

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\*Tenth Annual Report of the Meteorological Committee to the Lords Commissioners of His Majesty's Treasury for the year ended 31st March, 1915. London, H.M. Stationery Office. Size  $9\frac{1}{2} \times 6$ , pp. 93 and plates. Price 5½d.

from two stations in each ten degrees square of latitude and longitude, which is now passing through the press under the title of the "Réseau Mondial, 1911," in which pressure is given in millibars and temperature in centigrade degrees absolute.

A request was received early in 1914, through the Foreign Office and the Board of Agriculture and Fisheries, for a statement of the legislative enactments and the administrative processes by which provision is made in this country for meteorology, with special reference to Agriculture. The reply of the Meteorological Committee to the French Ambassador is reproduced as an appendix to the report, and gives an interesting history of the Meteorological Office since its foundation, and of the growth of the various branches of the service. It is remarked that "it is really an open question whether the responsibility for the application of meteorology to agriculture belongs to the Meteorological Office or to the Board of Agriculture and Fisheries in England and the corresponding departments in Scotland and Ireland. The traditional attitude of the Meteorological Office is that it collects and digests meteorological information which the agriculturist can apply if he wishes; and from that point of view a statement is made of the data which could be utilised in this connection, viz., the "Forecasts," and the "Statistics," including the Weekly and Monthly Weather Reports. It is pointed out that "in actual practice these provisions are very little used by agriculturists." Many persons are willing to receive forecasts by telegraph, but are unwilling to pay for the telegrams; it is entirely contrary to the instinct of the British race to pay for anything until its value has been made undeniably clear, so that the farmer and the Government are both waiting for the utility of the forecasts to be demonstrated beyond cavil. Yet this can only be done by trial and nobody has yet been found who is willing to pay the cost of an adequate trial on a large scale. In this connection it is stated that when "the application of meteorology to agriculture is considered, so far as the Meteorological Office is concerned, anything which is dependent upon the detailed study of the distribution of rainfall is not necessarily included," as the important subject of rainfall in the British Isles is still the care of a private body, the British Rainfall Organization. In other parts of the Report Sir Napier Shaw refers to the co-operation which exists between the Meteorological Office and the British Rainfall Organization, the most prominent features of which are the supply of detailed maps of monthly rainfall by the Organization for publication in the Monthly Weather Report, and the help given by the Meteorological Office towards publishing the annual totals of rainfall in millimetres as well as in inches in Part III. of *British Rainfall, 1914*. Summing up Sir Napier Shaw says "In fine it may be said that at present the Meteorological Office is more concerned with the means for

organizing *la météorologie agricole* on a satisfactory basis, than with any organization actually in operation."

Appendix 3 refers to climatological stations and Local Authorities. It is submitted that the Local Authorities should give serious consideration to the question of an adequate record of the weather. It is recommended that every parish ought to have its rain gauge, and every district Council a fully equipped climatological station. Out of 500 observatories and stations which contribute observations to the Office for the benefit of the public, only 36 are maintained or subsidized out of Office funds.

Appendix 4 on a "Central Observatory for the Investigation of the Upper Air," gives the present position of this branch of the Service, and a proposal for the establishment of an adequately equipped station. Since 1905 a sum of £450 has been assigned annually to this work, and the new scheme is estimated to cost from £1050 to £1450. At present Mr. W. H. Dines receives an honorarium of £200 per annum, and the proposal is that "having regard to the high qualifications necessary," this should be increased to from £500 to £650 a year. The new station acquired by Mr. Dines at Benson, 3 miles from Wallingford and about 12 miles distant from Oxford and Henley, has many features to recommend it. We are sure that it will come as a surprise to many of our readers that the unique services of Mr. W. H. Dines to Upper Air research have hitherto been so poorly recognized, but it has been one of the special merits of British observational Meteorologists from the days of Luke Howard onwards, that their work has been done with a view to the advancement of knowledge, rather than to their own profit. The reports of the Superintendents of the Marine Division, the Forecast and Gale Warning Division, the Climatological and Statistics Division, the Instruments Division, and of the various Observatories also find a place. As regards gales, the analysis shows that for the whole country, 84 per cent. of the warnings were justified by the occurrence of winds of gale force, the highest percentage, 100, was recorded in Scotland E. and England N.E., and the lowest, 70 per cent., in England S.E., and 75 per cent. in Scotland N.E. and Ireland S. The preparation of replies to inquiries from public authorities and private persons, based upon information contained in the files of the Office, forms an increasingly important part of its work. The total number of inquiries answered in the year 1914-15 amounted to 816, being 235 below that of the year previous and the lowest since 1910-11.

Many enquiries as to Upper Air and other meteorological conditions from the scientific staff of the Royal Aircraft Factory, have been dealt with and enquiries were also received from the Royal Naval Airship Squadron while this was stationed at Farnborough.

A summary by Sir Napier Shaw shows the progress and consolidation of the work of the Meteorological Office during the

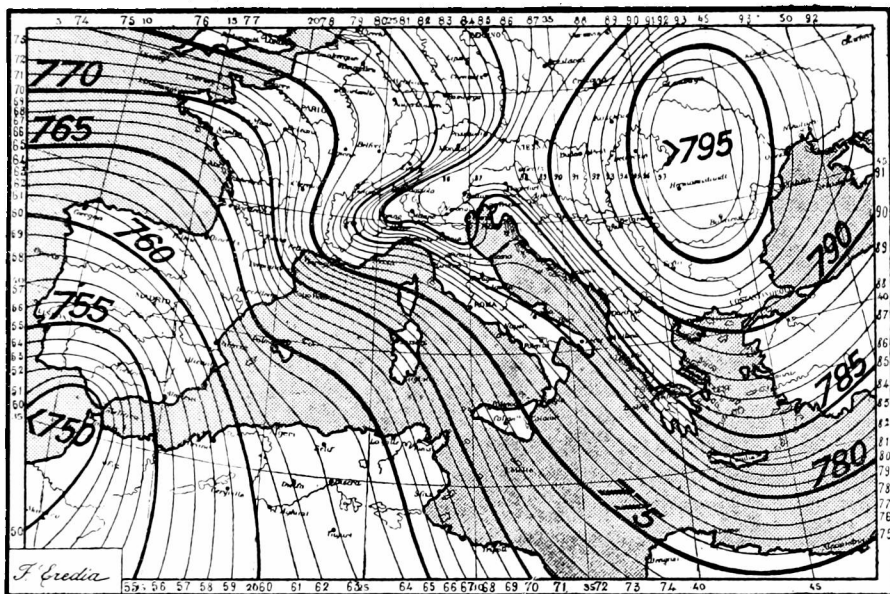
second quinquennial period of the appointment of the Meteorological Committee. These years have been marked chiefly by the co-ordination and extension of the meteorological and geophysical work within the administration of the Office. At the commencement of the period the physical observatories at Kew, and Eskdalemuir, came under the administration of the Office. The Falmouth Observatory has come under the direct control of the Committee because the Royal Cornwall Polytechnic Society was no longer able to maintain it, but was prepared to allow the use of the building rent free. At the request of the Army Council an observatory and Branch Office for the assistance of air craft pilots has been established in the Royal Aircraft Factory at South Farnborough. Subventions of long standing to Glasgow University and to Stonyhurst College, in aid of the maintenance of meteorological observations of the Kew type, have been withdrawn. A branch meteorological office has been established in Edinburgh under an arrangement with the Scottish Meteorological Society, who receive a subvention of £350 a year. On account of this consolidation the monthly weather report now presents a full summary of the climatological observations made by public authorities or private persons in the British Isles. The importance of the consolidation for the efficiency of the Office is dwelt upon at considerable length, especially as regards the relations between the Admiralty and the Meteorological Office.

But in the present time of emergency it is the organization of the Forecast Division which chiefly calls for remark. A number of provisions arranged simply with a view to the efficiency of the Office as a public institution have proved to be indispensable since the outbreak of war, in order to meet the requirements of the Admiralty. All the observatories had been newly organized to take part in the daily weather service and thereby to become cognizant of the problems which they are intended to elucidate, and they have thereby become available for supplying information to the Office at any time, day or night. The other reporting stations had also been so organized in conjunction with the observatories, that the Forecast Division has not failed to meet promptly and efficiently whatever wishes the Admiralty had expressed for information as to the weather over any part of the British Isles and neighbouring seas, for the use of the Navy, the Air Department, or the officials at headquarters. . . . . So far as the Office staff is concerned, the net result up to now has been that what was originally provided for the service of the general public has been found necessary and has, therefore, been "commandeered" by the Admiralty for the public service. The work has been carried on without any undue stress upon the staff, but at the sacrifice of certain "appropriations in aid," in consequence of the suspension of the supply of information to the public."

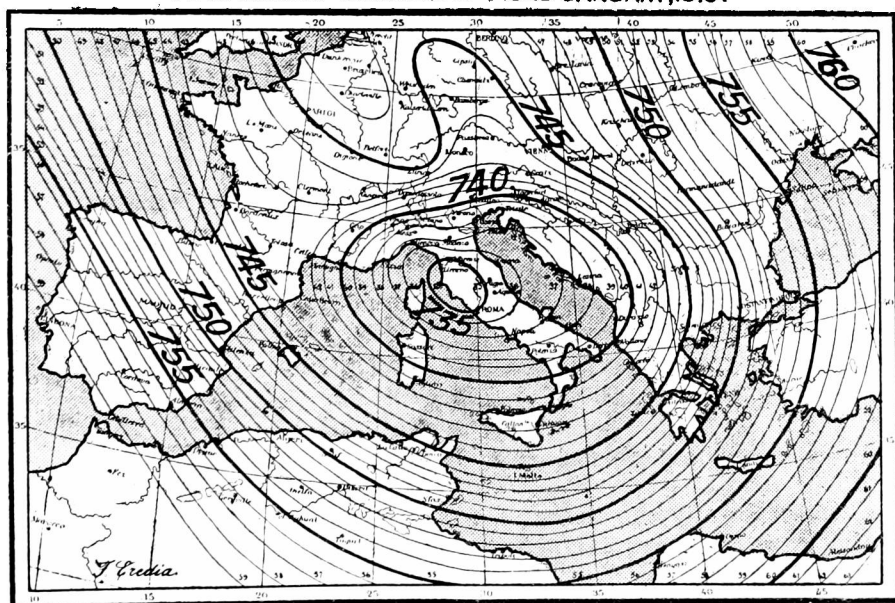
### MEDITERRANEAN PRESSURE TYPES.

We have received from Dr. F. Eredia of the Central Italian Meteorological Office the two interesting post cards reproduced below illustrating two extreme types of pressure distribution, in the south of Europe. The figures are millimetres.

REMARKABLE ANTICYCLONE OF 24TH JANUARY, 1907.



REMARKABLE CYCLONE OF 23RD JANUARY, 1915.



## INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

The last two sets of international balloon ascents which were published before the war and received in England are given below. The work done in 1913 and the first half of 1914 is not available.

*May 2nd, 1912.*

Starting Point.	Country.	A (H <sub>c</sub> ) miles.	B (T <sub>c</sub> ) ° F.	C miles.	D ° F.	E miles	F
Manchester ....	England ..	7·5	—68	14·5	—53	39	F.
Pyrton Hill ....	" ..	7·0	—73	10·0	—59	25	S.E.
Brussels .....	Belgium ..	6·6	—80	13·4	—46	26	S.S.W.
Lindenberg.....	Germany..	6·1	—71	8·3	—68	21	S.S.W.
Paris .....	France....	7·1	—77	10·7	—66	44	S.
Strassburg .....	Germany..	6·3	—60	8·2	—58	24	W. by S.
Munich .....	" ..	6·2	—59	6·9	—58	10	W.N.W.
Vienna.....	Austria ..	6·5	—68	7·0	—70	16	S.E.
Pavia .....	Italy.....	6·3	—70	13·3	—47?	9	W.
Nizhni Olchedaef	Russia ....	5·6	—58	6·9	—52	57	S.E.
Batavia .....	E. Indies ..	..	..	9·9	—113	41	S.W.

The very low temperature at Batavia, 5° S. latitude, is again remarkable. There was not much air motion over Europe, and an unusual number of balloons fell to the westward of their starting place. Barometric pressure was a little above the average at most stations.

*June 6th, 1912.*

Starting Point.	Country.	A (H <sub>c</sub> ) miles	B (T <sub>c</sub> ) ° F.	C miles.	D ° F.	E miles.	F
Limerick .....	Ireland....	5·6	—60	8·4	?	16	S.
Manchester.....	England ..	5·9	—58	7·7	—41	26	E.S.E.
Hamburg.....	Germany..	6·5	—60	6·9	—58	62	N.E.
Paris .....	France....	6·6	—67	9·7	—58	75	N.E.
Strassburg .....	Germany..	7·1	—71	9·9	—58	56	N.E.
Munich .....	" ..	7·2	—68	8·4	—66	39	N.E.
Batavia .....	E. Indies ..	..	..	10·1	—105	77	W.

A Height in miles of commencement of isothermal column.

B Temperature, F°, at bottom of column.

C Greatest height of reliable record in miles.

D Temperature, F°, at greatest height.

E Distance in miles of point where balloon fell

F Bearing of falling point from starting point

Over Europe the pressure was lower than usual, especially in the west. The low temperature at great heights near the equator is again shown.

## Correspondence.

*To the Editor of Symons's Meteorological Magazine.*

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### UNPRECEDENTED RAINS AND CYCLONE TRACKS.

THE *Monthly Weather Report* of the Meteorological Office for September, 1915, shows that the movement of the centre of the low pressure system which accompanied the great rains of September 25th—26th, in the north-east of Scotland, bore a singularly close resemblance to the tracks of the depressions of August 24th—26th, 1905, and August 25th—26th, 1912, associated with unprecedented rains in Ireland and in East Anglia. On each occasion, as was remarked at the time (see *British Rainfall, 1905*, p. [III], and *British Rainfall, 1912*, p. 28), the centre travelled nearly due north along an east coast and then turned abruptly to the east, the area of heaviest rain being on the left of the track not far distant from the point of deviation. The centre of the depression in each case moved over the sea and the maximum rain area lay near the east coast, the conditions being favourable for north-east wind, backing to north. The remarkable similarity of the atmospheric conditions during three of the most notable east-coast rains ever put upon record, occurring approximately at the same season respectively in Ireland, England and Scotland, appears to be extremely suggestive.

CARLE SALTER.

62, Camden Square, N.W., November 4th, 1915.

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### DIURNAL NATURE OF AUGUST STORMS.

DURING the first half of August there prevailed just that peculiar adjustment in the distribution of atmospheric pressure which is required in order that the diurnal swing of the weather elements may assume special prominence. Whilst the nights during this period were invariably fine and quiet, the days were no less marked by a persistent series of thunderstorms of varying degrees of intensity. In London thunder showers or storms occurred on the 3rd, 4th, 10th, and on five consecutive days from the 12th to 16th, all of them between 11 a.m. and 8 p.m. Some of these storms, notably that of the 12th, were rather severe and protracted, while the massive and, towards evening, richly coloured cloud banks were, in some instances, superbly grand and beautiful. Storms of this pronouncedly diurnal type, engendered by the heat of the sun during the daytime, are very common during spells of cool, unsettled weather, and afford a striking contrast with the more violent and protracted hot weather type of thunderstorm which often develops at nightfall (as on May 6th this year).

August 31st, 1915.

L. C. W. BONACINA.

### GREENWICH WINTERS.

Let us understand by severe winters, those with mean temperature under  $38^{\circ}\cdot3$ , *i.e.*, more than  $1^{\circ}$  under average; mild winters having mean temperature over  $40^{\circ}\cdot3$ .

Of the 74 winters since that of 1842 (*i.e.*, 1841-42), 21 were severe, 30 mild. The severe are thus about 28 per cent. of the whole. Since 1895, however, only one winter out of 20 was severe, *viz.*, 1907. In the period 1842-1895, the 20 severe winters form 37 per cent. of the whole. This recent continued mildness may, in minor part, be due to the extension of London towards Greenwich, but it seems to be a general experience in the country. Rothesay, I find, has had two severe winters since 1895. Consider all groups of five contiguous winters, 70 in number. How many are severe in each? We find no cases of five or four severe. Of three severe there are eight cases; of two severe there are twenty-six cases; of one severe there are twenty-three cases; of none severe there are thirteen cases; total, 70 cases.

The eight groups with three severe were all in 1879-93, *i.e.*, the first of them, was centred in 1879. The thirteen with no severe winter were all but two, *viz.*, 1850, and 1851, since 1898.

We might treat winter rainfall similarly, calling a winter wet which had more than one inch over the average, and one dry which had more than one inch under the average. It appears, that of 14 wet winters, 7 were mild, and only two severe. Of 23 dry winters, seven were mild and eight severe. Thus, while a wet winter is likely to be mild, a dry winter may be indifferently mild or severe.

A.B.M.

### LUNAR RAINBOW.

SINCE toiling through the graphic description in "Wilhelm Tell" of the Rütli "Verschwörung" as a schoolboy in the early sixties, it has been my ambition to witness such a display of a lunar rainbow as forms a climax to that famous scene. Only this morning was my wish fully gratified. At 5.20 a.m. to-day there was an easterly rain squall, the western sky remaining very clear so that the moon, within 20 hours of the full, was brilliant, although only about  $10^{\circ}$  from the horizon. The rainbow was, consequently, of exceptional size, the base being probably over  $100^{\circ}$  long, from N.E. to S.S.E. The vertex, however, was not visible (at about  $50^{\circ}$ ), some  $20^{\circ}$  or  $25^{\circ}$  of arc wanting. The southern arc was rather faint, but the northern, for  $60^{\circ}$  or so, strikingly bright and well defined, though without any trace of prismatic colour. I could not distinguish that one edge was fainter than the other. The width exceeded little, if at all, double the diameter of the moon.

*Asgarth, Purley, October 22nd, 1915.*

J. EDMUND CLARK.



## REVIEWS.

*Publications of the West Hendon House Observatory, Sunderland.*  
*No. IV., Meteorological Observations.* By T. W. BACKHOUSE,  
 F.R.A.S., F.R.Met.Soc. Sunderland, 1915. Size,  $11\frac{1}{2} \times 9$ .  
 Pp. 188 (44 plates).

MR. BACKHOUSE'S splendid series of observations of natural phenomena, extending back to 1857, find a fitting embodiment in these beautifully printed and lavishly illustrated memoirs. The observations although for the most part non-instrumental, nevertheless cover a wide range of meteorological phenomena. The most valuable portion of the work appears to us to be the very complete series of wind observations and the co-ordination of the wind and rainfall records. The monthly wind roses show that, as regards frequency, the westerly component preponderates in every month, though very slightly so in the early summer. The amount of rain recorded with each wind direction is set out in the same way, showing that an overwhelming proportion falls with winds blowing off the sea (N. to S.E.), especially in the winter. This is, of course, what one would expect to find at an east coast station, but the establishment of a numerical relationship is an advantage.

In the following table the rain which fell during calms and periods when no observations were available has been divided proportionately.

*Average rainfall at Sunderland per 100 hours with each wind direction.*

	N. in.	N.E. in.	E. in.	S.E. in.	S. in.	S.W. in.	W. in.	N.W. in.
January .....	·89	·64	·54	·48	·20	·15	·08	·30
February .....	·41	·35	·40	·59	·21	·11	·07	·22
March .....	·46	·40	·44	·46	·16	·11	·07	·27
April .....	·28	·26	·31	·31	·20	·14	·12	·26
May .....	·35	·26	·40	·29	·30	·19	·12	·34
June .....	·29	·31	·36	·30	·50	·14	·10	·37
July ...	·52	·57	·53	·37	·66	·27	·19	·42
August.....	·54	·53	·63	·46	·64	·31	·13	·50
September .....	·36	·54	·55	·36	·28	·24	·12	·40
October .....	1·14	·99	·74	·55	·26	·17	·11	·65
November .....	1·15	·68	·59	·76	·25	·15	·11	·54
December .....	1·06	1·01	·81	·85	·27	·14	·08	·55
Whole year .....	·51	·50	·51	·46	·28	·17	·10	·41

In discussing the long rainfall record at Sunderland, the author devotes an interesting section to a somewhat theoretical discussion of the relative value of the geometric mean and the arithmetical average for the purpose of expressing normal rainfall.\* A preference for the geometric mean is based on the argument that the object of obtaining a rainfall normal is that of ascertaining what is the

\* See *Q.J.R.Met.Soc.*, Vol. 17, p. 87.

*most probable* quantity, that is, presumably, the figure from which deviation will be of least average magnitude. Many meteorologists will dissent from this view, preferring to regard the normal as merely a convenient mode of expressing the total rainfall over a long series of years. Some point is lent to the objection since by the author's own showing in the case of daily rainfall the value which complies with his definition is 0. In the case of monthly rainfall also it is noteworthy that the geometric mean values for the twelve months add up to a total about 3 inches smaller than the geometric mean for the whole year. With yearly totals the geometric mean for 46 years at Sunderland differs from the arithmetical average only by a small fraction of an inch, or an amount smaller than the limit of observational error. These facts seem to show that the geometric mean cannot apply in the case of very widely varying quantities, and that, even if it can be shown to be theoretically more applicable when the variations are smaller, when this is the case it approximates so closely to the arithmetical average that the gain in accuracy is incommensurate with the greatly increased labour of computation.

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*Return as to Water Undertakings in England and Wales.* Issued by the Local Government Board, London. 1915. Size, 13 × 8. Pp. xli. + 599. Price 5s. 1d.

THIS return is the first instalment of the detailed and comprehensive investigation of water supplies recommended by various Royal Commissions and Departmental Committees. It consists for the most part of a complete list of public and private water supply undertakings in England and Wales, giving particulars of the nature and sources of the supply, the population and area supplied, and other important details in each case. The return is an indispensable preliminary to the creation, strongly urged by the Commission of 1910, of a Central Administrative Authority for the control of water supplies, together with the formation of Rivers Boards charged with inquiry into the local conditions in each river-basin. The most interesting feature of the proposal from a meteorological point of view is the suggestion that the Water Authority should take cognizance of all questions "both atmospheric and geological," which affect water supplies. It is not stated by what machinery it is proposed to deal with such questions, though no doubt geological matters would come naturally within the scope of the Geological Survey Department of the Board of Education. The detailed study of the distribution of rainfall which forms one of the most important branches of water

engineering has never engaged the attention of any Government Department, and the British Rainfall Organization, founded in 1860, by the late Mr. G. J. Symons, and maintained by private enterprise ever since, has been invariably made use of when any question of water supply has arisen. It is perhaps hardly too much to claim that, had the Organization served no other purpose during its long career, its maintenance would have been amply justified by its public utility in this respect alone. An accurate knowledge of the average rainfall of any area from which water supplies are drawn, is, of course, vital, not only as a guarantee of the sufficiency of the supply itself, but also for the purpose of preventing the undue depletion of streams by overtaxing their resources, a very real danger if large works are designed without the help of sufficient data as to the amount of rain which may be expected. Under central control it may be assumed that every local authority would be put under an obligation to maintain rainfall records, so that a considerable strengthening of the existing network of rainfall stations would accrue, from which meteorology would gain largely, but it is worth while to point out that such a step would not of itself provide the data necessary for computing the average rainfall of water areas for very many years to come. Such average values can only be arrived at by comparison with the long records collected and preserved by the British Rainfall Organization, and can only be interpreted by the application of the knowledge of the laws governing rainfall distribution, which are gradually emerging from the study of these records.

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## METEOROLOGICAL NEWS AND NOTES.

MR. R. M. BARRINGTON, of Fassaroe, Bray, Co. Wicklow, one of the Trustees of the British Rainfall Organization, died suddenly on September 15th, to the great regret of all students of meteorology, and we hope to publish some account of Mr. Barrington's meteorological work in an early number.

MR. F. CAMPBELL BAYARD and Commander W. F. Caborne, C.B., R.N.R., have resigned their positions as Secretaries of the Royal Meteorological Society, and, at the request of the Council, Mr. R. G. K. Lempfert has consented to act as Secretary until the annual meeting of the Society.

MR. GEORGE O. WIGGIN, for many years one of the two Sub-directors of the Argentine Meteorological Service, has been appointed Acting-director, Dr. Martin Gil having declined office after his nomination as Director.

## RAINFALL TABLE FOR OCTOBER, 1915.

STATION.	COUNTY.	Lat. N.	Long. W. [°E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875— 1909. in.	1915. in.
Camden Square.....	London.....	51 32	0 8	111	2'72	2'06
Tenterden.....	Kent.....	51 4	*0 41	190	3'48	1'74
Arundel (Patching).....	Sussex.....	50 51	0 27	130	4'01	3'83
Fawley (Cadland).....	Hampshire.....	50 50	1 22	52	4'07	3'53
Oxford (Magdalen College).....	Oxfordshire.....	51 45	1 15	186	2'82	2'31
Wellingborough (Swanspool).....	Northampton.....	52 18	0 41	155	2'60	1'06
Shoeburyness.....	Essex.....	51 31	*0 48	13	2'31	2'07
Bury St. Edmunds (Westley).....	Suffolk.....	52 15	*0 40	226	2'72	1'11
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	2'84	...
Polapit Tamar [Lanncoston].....	Devon.....	50 40	4 22	315	4'84	3'91
Rousdon [Lyme Regis].....	".....	50 41	3 0	516	3'81	7'24
Stroud (Upheld).....	Gloucestershire.....	51 44	2 13	226	3'21	3'88
Church Stretton (Wolstaston).....	Shropshire.....	52 35	2 48	800	3'77	3'13
Boston.....	Lincolnshire.....	52 58	0 1	11	2'75	1'48
Workshop (Hodsock Priory).....	Nottinghamshire.....	53 22	1 5	56	2'77	1'08
Mickleover Manor.....	Derbyshire.....	52 54	1 32	280	2'81	1'91
Macclesfield.....	Cheshire.....	53 15	2 7	501	3'53	1'37
Southport (Hesketh Park).....	Lancashire.....	53 39	2 59	38	3'74	1'33
Arncliffe Vicarage.....	Yorkshire, W. R. ....	54 8	2 6	732	6'48	1'34
Wetherby (Ribston Hall).....	".....	53 59	1 24	130	3'18	1'25
Hull (Pearson Park).....	"..... E. R. ....	53 45	0 20	6	3'19	'99
Newcastle (Town Moor).....	Northumberland.....	54 59	1 38	201	3'20	1'33
Borrowdale (Seathwaite).....	Cumberland.....	54 30	3 10	423	12'71	3'26
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	4'87	4'70
Haverfordwest.....	Pembroke.....	51 48	4 58	90	5'51	4'92
Aberystwyth (Gogerddan).....	Cardigan.....	52 26	4 1	83	5'38	2'71
Llandudno.....	Carnarvon.....	53 20	3 50	72	3'78	1'84
Cargen [Dumtries].....	Kirkcudbright.....	55 2	3 37	80	4'45	4'03
Marchmont House.....	Berwick.....	55 44	2 24	498	3'83	2'64
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	5'38	4'06
Glasgow (Queen's Park).....	Renfrew.....	55 53	4 18	144	3'36	2'23
Inveraray (Newtown).....	Argyll.....	56 14	5 4	17	6'50	3'05
Mull (Quinish).....	".....	56 34	6 13	35	5'87	2'38
Dundee (Eastern Necropolis).....	Forfar.....	56 28	2 57	199	2'81	2'65
Braemar.....	Aberdeen.....	57 0	3 24	1114	3'88	3'99
Aberdeen (Cranford).....	".....	57 8	2 7	120	3'23	2'90
Gordon Castle.....	Moray.....	57 37	3 5	107	3'38	1'88
Fort Augustus (S. Benedict's).....	E. Inverness.....	57 9	4 41	68	4'14	1'61
Loch Torridon (Bendamph).....	W. Ross.....	57 32	5 32	20	8'38	3'13
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	3'15	1'50
Wick.....	Caithness.....	58 26	3 6	77	3'14	1'08
Killarney (District Asylum).....	Kerry.....	52 4	9 31	178	5'59	5'25
Waterford (Brook Lodge).....	Waterford.....	52 15	7 7	104	4'00	7'15
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	3'48	3'26
Ennistymon House.....	Clare.....	52 57	9 18	37	4'40	4'45
Gorey (Courtown House).....	Wexford.....	52 40	6 13	80	3'75	5'81
Abbey Leix (Blandsfort).....	Queen's County.....	52 56	7 17	532	3'53	3'93
Dublin (Fitz William Square).....	Dublin.....	53 21	6 14	54	2'88	...
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	3'19	3'57
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 16	74	5'27	5'34
Cong (The Glebe).....	".....	53 33	9 16	112	4'60	5'06
Collooney (Markree Obsy.).....	Sligo.....	54 11	8 27	127	4'21	3'90
Seaforde.....	Down.....	54 19	5 50	180	3'65	4'52
Bushmills (Dundarave).....	Antrim.....	55 12	6 30	162	3'60	...
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	3'76	3'07

## RAINFALL TABLE FOR OCTOBER, 1915—continued.

RAINFALL OF MONTH (con.)					RAINFALL FROM JAN. 1.				Mean Annual 1875-1909.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.		No. of Days	Aver. 1875-1909.	1915.	Diff. from Aver. in.	% of Av.		
		in.	Date.		in.	in.			in.	
— '66	76	'99	31	12	20'64	24'23	+3'59	117	25'11	Camden Square
—1'74	50	'49	31	17	21'80	24'29	+2'49	111	27'64	Tenterden
— '18	96	'84	31	10	24'03	30'60	+6'57	127	30'48	Patching
— '54	87	1'01	31	15	25'25	31'18	+5'93	124	31'87	Cadland
— '51	82	'83	31	11	20'27	22'89	+2'62	113	24'58	Oxford
—1'54	41	'38	27	10	20'85	18'26	—2'59	88	25'20	Swanspool
— '24	90	'72	19	20	15'48	18'34	+2'86	118	19'28	Shoeburyness
—1'61	41	'34	27	11	20'86	18'86	—2'00	90	25'40	Westley
...	...	...	...	...	19'17	...	...	...	23'73	Geldeston
— '93	81	'76	23	18	29'74	33'36	+3'62	112	38'27	Polapit Tamar
+3'43	190	2'22	23	18	26'35	28'98	+2'63	110	33'54	Rousdon
+ '67	121	1'18	23	14	24'33	25'82	+1'49	106	29'81	Stroud
— '64	83	'99	23	12	26'48	30'02	+3'54	113	32'41	Wolstaston
—1'27	54	'56	27	14	19'42	19'16	— '26	99	23'35	Boston
—1'69	39	'49	27	14	20'31	18'20	—2'11	90	24'46	Hodsock Priory
— '90	68	'62	27	12	22'06	24'10	+2'04	109	26'65	Mickleover
—2'16	39	'47	27	10	28'38	27'29	—1'09	96	34'73	Macclesfield
—2'41	36	'43	23	13	26'44	23'47	—2'97	89	32'70	Southport
—5'14	21	'70	27	12	48'62	39'09	—9'53	80	61'49	Arncliffe
—1'93	39	'43	27	6	22'26	21'40	— '86	96	26'87	Ribston Hall
—2'20	31	'30	27	14	21'76	20'34	—1'42	93	26'42	Hull
—1'87	42	'20	19	17	22'85	18'12	—4'73	79	27'94	Newcastle
—9'45	26	1'00	25	8	100'75	76'50	—24'25	76	129'48	Seathwaite
— '17	97	'75	23	24	33'50	28'89	—4'61	86	42'28	Cadiff
— '59	89	1'03	27	17	36'47	36'30	— '17	100	46'81	Haverfordwest
—2'67	50	'71	23	17	36'30	33'12	—3'18	91	45'46	Gogerddan
—1'94	49	'47	24	14	24'33	24'11	— '22	99	30'36	Llandudno
— '42	91	1'61	23	13	34'28	34'02	— '26	99	43'47	Cargen
—1'19	69	'53	27	14	27'72	24'16	—3'56	87	33'76	Marchmont
—1'32	75	1'44	24	17	39'05	35'74	—3'31	92	49'77	Girvan
—1'13	66	'83	23	11	28'39	22'28	—6'11	78	35'97	Glasgow
—3'45	47	'65	11	14	52'71	46'81	—5'90	89	68'67	Inveraray
—3'49	41	'56	28	16	43'74	34'35	—9'39	79	56'57	Quinish
— '16	94	'84	28	19	23'35	22'30	—1'05	96	28'64	Dundee
+ '11	103	1'44	28	16	28'04	32'07	+4'03	114	34'93	Braemar
— '33	90	'90	28	19	26'01	26'42	+ '41	102	32'73	Aberdeen
—1'50	56	'55	28	19	24'77	28'21	+3'44	114	30'34	Gordon Castle
—2'53	39	'59	11	13	34'40	25'60	—8'80	74	44'53	Fort Augustus
—5'25	37	'78	11	11	65'17	55'98	—9'19	86	83'93	Bendamph
—1'65	48	'28	17	10	25'56	23'15	—2'41	91	31'90	Dunrobin Castle
—2'06	34	...	...	...	23'82	18'09	—5'73	76	29'88	Wick
— '34	94	'88	7, 20	23	42'35	39'09	—3'26	92	54'81	Killarney
+3'15	179	2'35	7	16	31'45	31'65	+ '20	101	39'57	Waterford
— '22	94	'90	27	18	31'21	30'54	— '67	98	39'43	Castle Lough
+ '05	101	'97	27	20	36'87	36'32	— '55	99	46'52	Ennistymon
+2'06	55	1'40	7	18	28'16	28'23	+ '07	100	34'99	Courtown Ho.
+ '40	111	'95	7	17	29'23	28'16	—1'07	96	35'92	Abbey Leix
...	...	...	...	...	22'77	...	...	...	27'68	Dublin
+ '38	112	1'15	1	11	29'38	33'20	+3'82	113	36'15	Mullingar.
+ '07	101	'99	27	20	41'01	39'96	—1'05	97	52'87	Enniscooe
+ '46	110	1'00	7	16	38'48	37'37	—1'11	97	48'90	Cong
— '31	93	1'00	7	17	34'35	35'41	+1'06	103	42'71	Markree
+ '87	124	'72	24	16	31'28	29'95	—1'33	96	38'91	Seaforde
...	...	...	...	...	29'92	...	...	...	37'56	Dundarave
— '69	82	'82	19	18	31'81	30'47	—1'34	96	39'38	Omagh

## SUPPLEMENTARY RAINFALL, OCTOBER, 1915.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road ..	2·75	XI.	Lligwy .....	2·69
„	Ramsgate .....	2·56	„	Douglas .....	5·50
„	Hailsham .....	4·05	XII.	Stoneykirk, Ardwell House...	4·77
„	Totland Bay, Aston House...	3·85	„	Carsphairn Shiel .....	6·01
„	Stockbridge, Ashley .....	3·83	„	Beattock, Kinnelhead .....	3·14
„	Grayshott .....	4·56	„	Langholm, Drove Road .....	2·18
III.	Harrow Weald, Hill House...	2·22	XIII.	Meggat Water, Cramilt Lodge	2·64
„	Caversham, Rectory Road ..	2·99	„	North Berwick Reservoir...	2·05
„	Pitsford, Sedgebrook.....	1·77	„	Edinburgh, Royal Observatry.	2·00
„	Woburn, Milton Bryant.....	1·70	XIV.	Maybole, Knockd.n Farm ..	1·75
„	Chatteris, The Priory.....	1·46	XV.	Ballachulish House .....	3·33
IV.	Elsenham, Gaunts End .....	1·43	„	Campbeltown, Witchburn ..	4·56
„	Colchester, Hill Ho., Lexden	1·42	„	Holy Loch, Ardnadam .....	4·50
„	Ipswich, Rookwood, Copdock	1·38	„	Islay, Eallabus .....	3·21
„	Blakeney .....	1·91	„	Tiree, Cornaigmore .....	2·96
„	Swaffham .....	1·29	XVI.	Dollar Academy .....	2·20
V.	Bishops Cannings .....	4·19	„	Balquhiddier, Stronvar.....	4·65
„	Wimborne, St. John's Hill ..	6·53	„	Glenlyon, Meggernie Castle..	3·86
„	Ashburton, Druid House.....	7·34	„	Blair Atholl .....	4·29
„	Cullompton .....	4·77	„	Coupar Angus .....	3·13
„	Lynmouth, Rock House .....	3·91	„	Montrose, Sunnyside Asylum.	6·17
„	Okehampton, Oaklands.....	4·04	XVII.	Alford, Lynturk Manse .....	5·02
„	Hartland Abbey.....	3·85	„	Fyvie Castle .....	3·73
„	Probus, Lamellyn.....	4·91	XVIII.	Rothiemurchus .....	86
„	North Cadbury Rectory.....	5·26	„	Loch Quoich, Loan .....	5·05
VI.	Clifton, Pembroke Road.....	4·75	„	Drumnadrochit .....	1·84
„	Ross, The Graig .....	4·62	„	Skye, Dunvegan .....	3·52
„	Shifnal, Hatton Grange.....	2·09	„	Lochnaddy, Bayhead .....	2·74
„	Droitwich .....	3·72	„	Glencarron Lodge .....	2·19
„	Blockley, Upton Wold.....	3·18	XIX.	Invershin .....	1·48
VII.	Market Overton.....	1·06	„	Melvich .....	2·06
„	Market Rasen .....	1·13	„	Loch Stack, Achfary .....	1·07
„	Bawtry, Hesley Hall .....	96	XX.	Dunmanway, The Rectory ..	7·90
„	Derby, Midland Railway.....	1·59	„	Glanmire, Lota Lodge.....	6·60?
„	Buxton .....	2·35	„	Mitchelstown Castle .....	5·50
VIII.	Nantwich, Dorfold Hall .....	1·73	„	Darrynane Abbey .....	9·76
„	Chatburn, Middlewood .....	1·86	„	Clonmel, Bruce Villa .....	4·10
„	Lancaster, Strathspey .....	1·09	„	Newmarket-on-Fergus,Fenloe	3·29
IX.	Langsett Moor, Up. Midhope	1·93	XXI.	Laragh, Glendalough .....	6·88
„	Scarborough, Scalby .....	1·69	„	Ballycumber, Moorock Lodge	3·29
„	Ingleby Greenhow .....	1·70	„	Balbriggan, Ardgillan .....	4·57
„	Mickleton .....	60	XXII.	Ballynahinch Castle.....	8·22
X.	Bellingham, High Green Manor	3·97	„	Woodlawn .....	3·97
„	Ilderton, Lilburn Cottage ..	1·91	„	Westport, St. Helens .....	4·09
„	Keswick, The Bank.....	89	„	Dugort, Slievemore Hotel ..	8·46
XI.	Llanfrechfa Grange .....	4·71	„	Mohill Rectory .....	3·70
„	Treherbert, Tyn-y-waun .....	6·30	XXIII.	Enniskillen, Portora.....	2·38
„	Carmarthen, The Friary .....	3·11	„	Dartrey [Cootehill] .....	2·60
„	Fishguard, Goodwick Station.	3·61	„	Warrenpoint, Manor House ..	5·33
„	Crickhowell, Tal-y-maes.....	6·00	„	Banbridge, Milltown .....	2·94
„	New Radnor, Ednol .....	4·20	„	Belfast, Cave Hill Road .....	3·36
„	Birmingham WW., Tyrmynydd	3·47	„	Ballymena Harryville .....	3·25
„	Lake Vyrnwy .....	...	„	Londonderry, Creggan Res...	1·93
„	Llangynhafal, Plâs Draw.....	2·64	„	Dunfanaghy, Horn Head ..	2·85
„	Dolgelly, Bryntirion.....	2·45	„	Killybegs .....	5·21
„	Bettws-y-Coed, Tyn-y-bryn...	2·20			





# THAMES VALLEY RAINFALL — OCTOBER, 1915.



**ALTITUDE SCALE**

Below 250 feet	250 to 500 feet	500 to 1000 feet	Above 1000 feet
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**SCALE OF MILES**

0
20

5

10

15



## THE WEATHER OF OCTOBER.

THE mean temperature of October was slightly more than a degree above the average in the north of Scotland, the east of England and in Ireland, but in the Channel Islands the mean was a degree under the average. In the central parts of Great Britain nearly average conditions obtained, there being thus, over the whole country, a remarkably even temperature. Sunshine was everywhere in defect, the greatest deficiency, amounting to about an hour and a half a day, being noted in the Midlands. In the east of Scotland, the N.W. of England and the south of Ireland the deficiency was less marked.

During the first six days fine cold weather prevailed generally, except on the 4th and 5th, when heavy showers fell on the coast of Kent. Frost was common and on the early morning of the 5th and 6th the shade thermometer fell to  $28^{\circ}$  at Kilmarnock, and at Newton Rigg, and to  $22^{\circ}$  at West Linton, the lowest readings of the grass thermometer being  $19^{\circ}$  at Gordon Castle and West Linton. On the 7th the advance of a depression from the west caused strong southerly winds, accompanied by heavy rain on the Devon-Cornwall Peninsula and in Ireland. On the 7th as much as 3.05 in. of rain fell at Foffany Reservoir, Co. Down, and 2.75 in. at Glendalough, Co. Wicklow (in twelve hours). On the 8th the depression filled up an anti-cyclone centred over Scandinavia dominating conditions in the British Isles, until about the 12th, when the temperature in most districts rose above  $60^{\circ}$ , reaching  $68^{\circ}$  at Geldeston, Margate and London. As far north as Gordon Castle a maximum of  $65^{\circ}$  was noted on the 13th. Cool weather prevailed at Scilly about this time, the maximum being only  $61^{\circ}$ . From the 13th to the 22nd the weather was very variable, although dry. There was a good deal of cloud with relatively high minimum temperatures and at times much mist and fog. Temperature was above the normal, touching  $64^{\circ}$  at Killarney and  $65^{\circ}$  at Waterford on the 17th. A brilliant aurora was observed at some Irish and Scottish stations on the 14th. Heavy rain fell at a number of stations on the 23rd, when a cyclonic disturbance lay over Ireland. The falls reported exceeded two inches at many stations. An easterly gale blew in the Channel on the 24th, and on the 25th at various exposed parts of our southern coasts. Very heavy rains were experienced in Ireland on the 27th and in the north-east of Scotland on the 28th. On the former date as much as 3.55 in. fell at Foffany Reservoir, Co. Down, and on the 28th the following heavy falls were noted in Aberdeenshire, viz., 3.41 in. at Crathes; 2.55 in. at Fyvie Castle; 2.12 in. at Lynturk Manse; and 1.93 in. at Balmoral. At Crathes 5.14 in. fell in 42 hours. Mr. Smith, of Crathes, reports that the River Dee was in high flood, but not so high by several feet as it was in May, 1913.

Less than half the average rainfall for the month fell over the west and north-west of Scotland, and over the northern half of England and Wales. Nearly the whole of Great Britain had a rainfall under the average. An area in which the average was exceeded occurred in Aberdeenshire, and there was another area of excess in Wessex. The greater part of Ireland was wet, except in northern inland districts. In the Thames Valley less than two inches fell in the north-east and in part of the upper Thames, and the range shown in the accompanying map exceeds six inches, the fall being less than one inch in the north-east and as much as seven inches in the south-west. Over the Kingdom as a whole the general rainfall expressed as a percentage of the average was as follows: England and Wales, 63; Scotland, 60; Ireland, 112; British Isles, 73.

The following amounts of sunshine were reported: Camden Square, 48 hours; Totland Bay, 93 hours; Copdock, 83 hours; Sidmouth, 78 hours; Weymouth, 81 hours; Felsted, 79 hours; Southport, 72 hours; Hull, 39 hours; Haverfordwest, 98 hours; Paisley, 53 hours; Loch Stack, 120 hours; Perth, 76 hours. In London (Camden Square), the mean temperature was  $49^{\circ}.8$ , or  $0^{\circ}.3$  below the average. Duration of rain, 54.5 hours. Evaporation, .56 in.

## Climatological Table for the British Empire, May, 1915.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver. Cloud.	
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.		
	Temp.	Date.	Temp.	Date.										
London, Camden Square	82°0	26	36°3	15	67°4	45°5	45°6	0-100	72	126°8	31°8	inches 3·72	8	4·6
Malta ... ..	76°6	19	54°6	1	70°5	61°3	...	90	136°0	...	...	·04	1	1·5
Lagos ... ..	90°0	20	72°0	14	88°0	75°6	74°5	75	161°0	69°0	...	11·52	18	6·3
Cape Town ...	86°9	15	37°8	26	68°9	51°9	50°6	72	...	...	...	1·94	10	4·6
Natal, Durban ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Johannesburg ...	70°2	1	31°2	15	62°8	44°5	43°5	78	...	29°9	...	1·36	5	3·4
Mauritius ... ..	84°6	6	55°5	18	79°5	67°7	65°5	77	...	47°6	...	3·33	17	5·6
Bloemfontein ...	75°4	2	30°7	9	66°3	38°6	37°8	67	...	...	...	·90	5	2·8
Calcutta ... ..	103°1	18	72°9	6	94°4	79°6	77°6	77	...	69°2	...	5·65	8	5·0
Bombay ... ..	94°2	26	79°4	1	92°0	82°4	77°2	73	136°0	66°7	...	·36	4	3·9
Madras ... ..	107°3	12	77°4	5	101°8	82°6	74°3	65	158°4	76°1	...	·36	2	2·9
Colombo, Ceylon ...	91°2	7	73°7	26	89°0	79°3	76°6	79	160°3	71°2	...	11·00	18	7·8
Hongkong ... ..	87°7	22	64°7	14	79°9	72°0	70°3	84	...	...	...	12·76	22	8·3
Sydney ... ..	72°0	2, 9	44°0	25	64°2	51°8	48°5	71	119°4	31°8	...	4·84	9	4·0
Melbourne ... ..	76°0	1	35°8	12	60°3	46°7	44°4	70	119°2	28°3	...	3·97	18	6·2
Adelaide ... ..	80°0	1	41°8	4	64°1	49°5	47°6	70	130°4	28°4	...	2·90	13	6·0
Perth ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coolgardie ... ..	81°8	1	40°4	15	67°5	49°9	46°8	63	140°2	35°0	...	3·12	10	4·7
Hobart, Tasmania ...	70°0	2	37°0	10	57°2	44°8	41°0	66	113°0	29°8	...	2·35	20	7·0
Wellington ... ..	65°4	3	35°2	25	59°1	46°5	45°7	78	120°6	25°0	...	1·12	11	6·6
Auckland ... ..	65°0	10	40°0	15	61°1	51°1	50°5	82	123°0	37°0	...	3·79	22	5·6
Jamaica, Kingston ...	91°0	7	67°9	1	87°6	73°5	72°8	76	...	...	...	3·08	5	...
Grenada ... ..	89°0	3	72°0	6	86°0	75°3	...	77	135°0	...	...	3·75	16	5·0
Toronto ... ..	74°4	12	32°9	10	61°7	42°6	40°4	68	128°8	29°0	...	1·60	11	4·4
Fredericton ... ..	75°0	7	0°0	21	59°6	38°5	41°0	73	...	...	...	5·23	14	6·4
St. John, N.B. ...	69°3	23	31°5	27	53°8	39°7	42°0	68	...	...	...	4·73	13	6·4
Alberta, Edmonton ...	80°0	9	27°2	7	65°0	41°7	...	62	136°8	20°0	...	2·21	13	6·3
Victoria, B.C. ...	72°4	4	42°0	1	60°4	47°5	47°0	78	139°8	36°6	...	1·26	13	6·5
	* 21.	† 20, 21, 23.			‡ 20.		§ 19, 28, 29.							

\* 21.

† 20, 21, 23.

‡ 20.

§ 19, 28, 29.

Johannesburg—Bright sunshine 272·8 hours.

Mauritius—Mean temp. 0°·5, dew point 1·0, and R ·06 in. above averages. Mean hourly velocity of wind ·17 mile per hour above average.

COLOMBO, CEYLON—Mean temp. 84°·2 or 1°·3 above, dew point 0°·7 above, and R ·11 in. below, averages. TS on 7 days.

HONGKONG—Mean temp. 75°·5, mean hourly velocity of wind 11·8 miles. Bright sunshine 103·7 hours.

Sydney—Mean temp. 0°·6 below average.

Melbourne—Mean temp. 0°·5 below, and R 1·80 in. above, averages.

Adelaide—Mean temp. 0°·9 below, and R ·20 in. above, averages.

Coolgardie—Temp. 1°·1 above, and R 1·75 in. above, averages.

Hobart—Mean temp. 0°·6 above, and R ·48 in. above, averages.

Wellington—Mean temp 0°·8 above, and R 3·68 in. below, averages. Bright sunshine 143·5 hours.

Auckland—Showery R ·71 in. below, and mean temp. slightly below, averages.

ALBERTA, EDMONTON—Cloudy, damp and warm. TSS on four days. Slight S on 6th. Aurora on 11th and 12th.