THE MOST REMARKABLE METEOROLOGICAL FEATURE OF THE YEAR 1912 IN THE BRITISH ISLES WAS THE EAST ANGLIAN RAINSTORM THE DISTRIBUTION OF WHICH IS DISCUSSED ON PAGES 153-161 AND 217-218. THE MAP NOW PRESENTED IS A REVISED AND CORRECTED VERSION OF PART OF THAT GIVEN ON A LARGER SCALE IN THE SEPTEMBER NUMBER.

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Edited by HUGH ROBERT MILL, D.Sc., LL.D.

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DR. SHAW ON FORECASTING WEATHER.*

This long-expected work brings before the general public the results of the researches carried on by Dr. Shaw and the staff of the Meteorological Office during the last eleven years. The main outlines of these have been recorded in this Magazine from time to time as they were published in official papers or communicated to Societies; but now that they are brought together and focussed upon the art of forecasting weather we are better able to appreciate the value of the work and the unity of the purpose which has animated it. To those of our readers who are familiar with the development of our knowledge of the distribution of heavy rains, as worked out year by year in *British Rainfall*, the volume will appeal with a peculiar force, for the data elaborated by the British Rainfall Organization is, in a considerable degree, complementary to that dealt with in the Meteorological Office, and it is a duty on our part to recognize fully and call attention to the monumental additions to the science of meteorology which Dr. Shaw has made during the past decade.

To most of us the art of forecasting weather is familiar in the form given to it in Abercromby's *Weather* a quarter of a century ago, and Dr. Shaw preserves so much of that work as remains applicable in the light of recently acquired knowledge. The amount is amazingly small. The treatment of cyclones alone can be quoted without alteration, and even here only the empirical as distinct from the theoretical part of the subject. Premising an adequate knowledge of Abercromby's work on the part of the reader, Dr. Shaw proceeds to expand and correct the earlier views until in the end he has suggested, rather than described, a new view of almost every form of weather. *Forecasting Weather* must be studied in detail, even with a magnifying glass for some of the diagrams, and every detail will

* *Forecasting Weather*. By W. N. Shaw, F.R.S., Sc.D., Hon. LL.D. (Aberdeen), Hon. Sc.D. (Dublin, Harvard and Manchester), Hon. Fellow of Emmanuel College, Cambridge, Reader in Meteorology in the University of London, Hon. Member of the Austrian Meteorological Society and of the German Meteorological Society, President of the International Meteorological Committee, Director of the Meteorological Office, London. Fully illustrated with Maps, Charts and Diagrams. Constable & Company, Ltd., 10, Orange Street, Leicester Square, W.C. 1911. Size $9 \times 5\frac{1}{2}$. Pp. xxviii + 380. Price, 12s. 6d. nett.

repay study. We are not in agreement with all parts of the plan of the exposition, nor with every point of view occupied, nor with every conclusion reached, but we say nothing of our own opinions here for two reasons, in the first place the points in which we differ from the author are so few compared with those in which we agree that to refer to them would be to give this notice a false balance, and in the second place we have read the book during a voyage in the Atlantic and are writing now, at the end of December in a temperature of 80°, to the music of the south-east trade wind and far from the books of reference necessary to justify any controversial attitude.

We believe that the best way to show our appreciation of the merits of *Forecasting Weather* is to refer to the outstanding facts of each chapter, laying stress mainly on those which strike us as introducing the most important modifications of earlier views.

Chapter I., *Synoptic Charts*, starts from the Daily Weather Chart of the Meteorological Office, touches on isobars and expounds the Beaufort scale of wind-force, giving detailed information as to the numerical value in velocities of the arbitrary numbers.

Chapter II., *The Relation of Wind to Barometric Pressure*, gives an admirable discussion of the inclination of wind to the isobars, and here the careful reader will begin to realize that he must lay aside his early belief in a cyclone as a simple region of inward and upward spiral winds, and of an anticyclone as a simple region of downward and outward spiral winds. He will also learn that a steepening of the barometric gradient may not increase the velocity of the wind but merely alter its inclination to the isobars. We have rarely seen a physical fact in meteorology set forth so simply and effectively as this is on pp. 42-45.

Chapter III., *The Relation of Temperature and Weather to Barometric Pressure*, deals with a number of typical weather charts illustrating cyclones, straight isobars, secondaries, V depressions and wedges, with many hints as to physical relationships more fully expounded later. Stress is laid on the want of the perfect accord between isobars and weather, in contrast to the rigid relation between isobars and wind. The distribution of temperature in a cyclone is shown to be "evidence against the common view that the air in any part of a cyclonic area may be regarded as having described a considerable part of a revolution." Twenty-five pages are quoted from Abercromby's *Weather* with reference to forecasting in cyclones.

Chapter IV., *Types of Weather and the Further Outlook in Weather Forecasting*, introduces us to examples of Abercromby's southerly, westerly, northerly and easterly types, illustrated by synoptic charts of the Atlantic, and raised to a very high place as controlling weather. A very brief statement is given of certain conditions in which the weather is steady enough to justify a three days' forecast for the British Isles.

Chapter V., *Local Weather in Relation to Weather Types*, is also a short chapter and consists mainly of extracts from a paper read by

Dr. Shaw to the Scottish Meteorological Society, in which data are considered for groups of stations, during the prevalence of various types of weather, in order to ascertain how far geographical conditions modify the weather of the type in different localities. Here the treatment is detailed rather than generalized, and the whole must be studied in the light of the very elaborate diagrams before the full meaning can be appreciated.

Chapter VI. is one of the most important in the book, though not so much to the forecaster in search of rules for practice as to the meteorologist desirous of understanding what he reads. It is entitled *The Physical Processes of Weather*, and starts with the consideration of the normal condition of the atmosphere being movement, not calm. It goes on to consider the thermo-dynamical conditions of the atmosphere, cooling by expansion and the formation of cloud and rain, and mentions in passing that the condensation of water on an electron, which is theoretically possible, can only occur in the absence of a dust-mote, and in nature it practically cannot occur at all. The latter part of the chapter deals in a most illuminating way with the ascent and convergence of air-streams and with atmospheric instability. In this chapter we reach Dr. Shaw's opinion that an anticyclone or cyclone may be said to be maintained by the air-currents circulating round them, rather than the winds can be said to depend on the isobaric form.

This leads directly to Chapter VII. on *The Life History of Surface Air Currents* in which the actual paths of air-particles are traced out for the circulation associated with different isobaric forms, and the areas of ascending and descending air are tentatively indicated. It is pointed out that the essential condition of a cyclone is the southerly wind which forms the eastern flank, then a cold easterly current of air crossing the southerly about the line of the path, and thirdly a westerly wind. The incidence of rain in cyclones is treated mainly from the period of occurrence as indicated by the small number of stations represented on the daily weather maps. The very important question of the source of vapour supply for a long steady rainfall is touched upon and appears at least as reasonable in Dr. Shaw's view of a cyclone as from the traditional standpoint of an inflowing spiral.

Chapter VIII., *The Minor Fluctuations of Pressure*, introduces the fascinating phenomena of line-squalls, the investigation of which is an important development since the date of Abercromby's book. The "embroidery of the barogram," showing the pressure changes during these squalls, has been studied in detail since the invention of the microbarograph, and the abrupt inflections of the isobars which express these changes in plan, have been mapped on a few special occasions when a large number of observing stations has been used, so also have the isochronous lines giving the direction and rate of travel of the squalls. A line-squall is regarded as due to the rushing over the country of a flood of colder and denser air which takes the place of the warmer current previously in possession and

advances like the bore of a river. Thunderstorms are frequently associated with this phenomenon. No instances of line-squalls in an easterly current are known. Dr. Shaw adopts M. Durand-Gréville's expression, *ruban de grain*, in preference to an English equivalent for the area in which the sudden rise of pressure in a line-squall gives rise to a crowding of the isobars, and he raises the question as to whether a *ruban de grain* or a circular depression "has the better claim to be regarded as the normal type."

Chapter IX., on *Gales and Storm Warnings*, returns from the fertile realms of new investigations to a statement of part of the routine work of the London Meteorological Office, the practical difficulties with which it has to grapple, and the degree of accuracy in prediction which has been attained; but in Chapter X., on *Anticyclones and Land Fog*, we return to the land of discovery. Here the anticyclone is shown to be an inert mass of air which for some reason is not taking part in the circulation of the atmosphere around it, and the attractive antithesis between cyclone and anticyclone, which helped so much in the popular exposition of meteorology, is pointed out to be groundless. The areas of descending air are stated to be not the centres of anticyclones but "(*a*) the shoulders, or protuberances, of anticyclones, in particular the regions of comparatively high pressure between two consecutive cyclonic depressions, and, therefore, also between two anticyclones, or the extension of an anticyclone, between a depression and its secondary; (*b*) the trough lines of travelling V-shaped depressions, and parts of the central areas of travelling circular storms." Land fogs are considered in this chapter, and Chapter XI. is devoted to *Coastal Forecasts, Sea-fogs and Thunderstorms*; the thunderstorms being land storms, not those over the sea.

Chapter XII. deals with *Forecasts for Agriculturists*, including an interesting discussion of night-frosts in spring, where the influence of the form of the land on such frosts, demonstrated by Dr. Buchan about sixty years ago, receives fuller recognition than has been accorded to it in most recent books. Chapter XIII. consists of memoranda on *Colliery Warnings*, and in Chapter XIV. we have a discussion of *The Approach of Depressions*, consisting mainly of a description of M. Guilbert's rules, to which we called attention in these pages when his book was published (see Vol. **45**, p. 55), but Dr. Shaw "confesses" that he does not feel inclined to employ the method in the work of his office. Chapter XV. continues the subject under the title of *Movements of Depressions—Isallobaric Charts.* Here the tracks of cyclonic storms are treated, and their bewildering diversity made clear by the reproduction of a chart of Rykatcheff's showing the tracks across Europe of all the October cyclones between 1872 and 1887. Ekholm's plan of dealing, not with isobars, but with isallobaric lines representing equal amounts of rise or fall of pressure in a given time is then described; this also has been tried at the Meteorological Office, but on account of the extreme westerly position of the British Isles the results have not been of practical utility.

Chapter XVI. treats of *The Upper Air—Forecasts for Aeronauts*, and it is pointed out that for weather forecasts to be of use to aeronauts the general forecasts would have to be interpreted by a local meteorologist who knew the requirements of the aeronaut, and was skilled enough to see whether the general forecast was being fulfilled, or whether it should be modified from time to time.

Chapter XVII., *Statistical Methods for Long Period and Seasonal Forecasting*, touches on the Brückner and Sunspot Cycles, refers to Schuster's Periodogram and to the work of Dr. Walker on the Indian monsoons, and in Chapter XVIII., and last, we have a brief statement of *The Practical Utility of Weather Forecasts*, as issued by the Meteorological Office. The difficulties in the way of expressing in the twelve words available for telegraphic forecasts the varying conditions of British weather, and the difficulty on the part of a public untrained in meteorology in understanding what to look for, are set forth, and Dr. Shaw urges the improvement of education so far as meteorology is concerned. With regard to the value of forecasts, he speaks guardedly; he shows that improvements have been made, and that although it may in the end prove impossible to predict all the changes of to-morrow's weather, it is yet possible that the atttempts to do so may result in the establishment of a system of more distant forecasts referring to a season or a month.

DISTRIBUTION OF RAIN IN MAURITIUS DURING THE DECADE 1891—1900.

By the late PROF. V. RAULIN.

IN the *Meteorological Magazine* for March, 1885 (Vol. **20**, p. 19) there appeared an analysis which I had made of the rainfall of Mauritius during the decade 1871 to 1880 (with a map of the island), and for February, 1893 (Vol. **28**, p. 2) during the decade 1881 to 1890. I have now the pleasure of sending a similar analysis for the decade 1891-1900.

For the data used in the analysis I am indebted to Dr. C. Meldrum, F.R.S., and Mr. T. F. Claxton, F.R.A.S., Director of the Royal Alfred Observatory, who published annually the "Results of the Meteorological Observations" made in the colony, and has been kind enough to furnish me with copies.

The yearly totals of the decade are 143·66 in. for the maximum at Mare-aux-Vacoas, and 19·93 in. for the minimum at Solitude, the extremes being 173·02 in. and 19·73 in.

*Seasonal Distribution.**—In India, at Calcutta, there is great dryness in winter and spring from December to May, and a heavy rainfall in summer and autumn from June to November; but Mauritius is in the Southern Hemisphere where the seasons are

* In consequence of an error in the volume for 1893, pages 3 and 4, the tables of the Regimes V. (page 3), and VII. (page 4), have been transposed.

inverted. The rainy season, therefore, extends from December to May, and the dry season from June to November. The inversion of the maximum of dryness between winter and spring and of the

REGIME V. (*as at Limoges*).—*Winter and Autumn wet, Spring and Summer rather dry.*

	STATIONS.	Height above Sea.	Years.	Summer.	Autumn.	Winter.	Spring.	YEAR.
		feet.		in.	in.	in.	in.	in.
Pamplemousses.	St. André	175	1891–1900 (9)	16·31	16·87	5·96	3·67	36·81
	The Mount	325	1892–1900 (9)	21·33	23·26	11·21	6·31	61·92
	Botanical Gardens ...	225	1891–1900 (9¾)	17·00	18·83	9·63	5·34	50·20
	Mon Rocher	270	1892–1900 (8⅔)	21·69	22·75	9·86	5·59	59·89
	Constance	626	1895-1899 (5)	21·36	27·40	12·91	7·79	69·52
	Beau Plan	195	1891–1900 (10)	17·45	17·88	7·28	3·59	46·20
	La Grande Rosalve ...	643	1891–1900 (10)	21·99	27·01	12·62	8·57	70·19
	Australia	430	1894–1899 (6)	22·19	29·77	17·96	8·29	78·21
	California	850	1893–1900 (8)	26·00	30·24	13·44	7·58	77·26
Riv du Rempart.	St. Antoine...	90	1891–1900 (10)	16·14	20·36	8·45	2·79	47·74
	Schœnfeld	?	1891–1899 (9)	16·45	19·59	8·67	4·95	49·66
	Mon Loiser	300	1893–1900 (8)	17·87	19·45	9·16	3·70	50·18
	Labourdonnais	290	1891–1900 (9⅓)	20·73	23·53	12·05	5·69	62·01
	Antoinette	640	1891–1900 (7)	21·03	28·10	13·98	7·80	70·91
	Mon Songe	620	1891–1900 (10)	22·34	27·59	11·93	7·57	69·43
Flacq.	Beau Bois	500	1894–1900 (7)	19·84	26·21	12·63	7·14	61·82
	Constance	100	1891–1900 (10)	17·63	22·00	10·51	5·21	55·35
	Rich Fund	300	1891–1900 (10)	23·74	30·07	14·92	7·52	76·25
	Union	600	1889–1900 (12)	21·79	28·58	12·61	7·56	70·54
	Bel Etang	700	1895–1900 (6)	23·25	44·96	20·51	8·55	97·27
	Sans Souci	910	1891–1900 (10)	35·43	49·50	26·85	14·56	126·34
	Etoile	400	1891–1900 (10)	29·61	43·43	21·85	11·94	106·83
Gr. Port.	Ferney	20	1891–1900 (10)	28·73	36·66	14·69	8·87	88·95
	Riche-en-Eau	1200	1891–1900 (10)	27·13	32·48	15·65	9·25	84·51
	Astræa	700	1891–1900 (10)	32·61	38·90	19·41	11·18	102·10
	Beau Vallon	60	1891–1900 (10)	19·29	24·72	10·70	6·02	60·73
	Eau Bleue	?	1895–1899 (5)	36·09	49·03	23·93	13·59	122·64
Savanne.	Colmar	400	1891–1900 (10)	29·24	33·54	16·42	9·87	89·07
	St. Avold	840	1891–1895 (5)	34·33	34·62	18·64	11·89	99·48
	Benarès, Residence ...	300	1891–1900 (10)	24·50	28·31	13·62	7·87	74·30
	,, Sugar House ...	200	1891–1900 (10)	23·54	27·01	11·26	7·09	68·90
	Beau Champ	60	1891–1900 (10)	22·27	23·11	8·15	5·10	58·63
	St. Aubin	300	1891–1900 (7⅞)	22·73	26·58	13·63	7·56	70·50
	Bois Ombre	50	1891–1900 (10)	23·16	24·74	11·27	5·58	64·75
	Union, Bel Air	90	1891–1900 (10)	27·11	27·41	13·89	6·73	75·14
	Terracine	50	1889–1900 (12)	22·16	24·10	9·62	4·57	60·45

maximum of wetness between summer and autumn gives indications of three European rainfall regimes.

1. The maximum of dryness in winter and of rain in summer indicates the first regime, which appears in some stations from the district of Black River in the south-west of the Island.

2. The maximum of dryness in spring and of rain in summer indicates regime VII., which advances from the western coast far into the interior everywhere in Moka and Plaines Wilhelms.

REGIME VII. (*as at Bar-le-Duc*).— *Winter and Summer wet.*

	STATIONS.	Height above Sea.	Years.	Summer.	Autumn.	Winter.	Spring.	YEAR.
		feet.		in.	in.	in.	in.	in.
Pampl	Solitude	90	1891–1900 (9½)	13·88	13·70	4·17	2·28	34·03
	Alfred Observatory ...	179	1891–1900 (10)	18·17	17·84	7·27	4·07	47·35
	Solitude, Mont. Longue ...	430	1896–1900 (5)	21·74	16·60	7·71	4·70	50·75
Moka.	Port Louis, George Street	18	1895–1900 (6)	15·23	12·72	4·04	2·51	34·50
	The Bower	1080	1891–1900 (9½)	28·32	23·03	9·41	7·03	67·79
	Gentilly	1150	1891–1900 (10)	31·43	25·23	10·59	7·84	75·09
	Lynnwood	1100	1891–1898 (8)	32·24	25·49	10·04	7·15	74·92
	Alma	1500	1891–1900 (10)	43·50	40·94	24·14	13·93	122·51
	Bon Air	1050	1891–1900 (10)	28·96	23·33	9·32	6·44	68·05
	Le Réduit	1000	1891–1900 (10)	24·53	18·59	6·41	5·21	54·74
	Minessy	1150	1891–1900 (9⅔)	28·22	25·29	10·37	6·89	70·77
Plaines Wilhems.	Bagatelle	1300	1891–1899 (8)	27·69	22·64	9·95	6·39	66·67
	Trianon	950	1891–1900 (10)	27·12	21·77	8·54	6·48	63·91
	Phœnix, Estate	1300	1891–1900 (10)	35·09	27·39	13·59	9·47	85·54
	,, Railway Station	1315	1891–1899 (7¾)	36·90	29·34	14·81	10·37	91·42
	Mare-aux-Vacoas	1850	1891–1900 (10)	47·12	46·98	32·08	17·46	143·64
	Highlands	1400	1891–1895 (5)	28·08	25·01	13·39	8·65	75·13
	Réunion	1420	1891–1900 (10)	36·17	29·18	17·35	10·73	93·43
	Marton, Vacoas	1400	1891–1900 (10)	34·29	27·34	15·50	9·80	86·93
	Curepipe	1840	1891–1900 (10)	45·92	40·90	25·61	15·39	127·82
	Villa-le-Bain	1840	1891–1900 (10)	43·21	42·00	27·16	14·25	126·62
	Henrietta	1549	1891–1899 (9)	36·56	29·33	15·93	8·83	90·65
	The Glen	1580	1891–1899 (9)	38·95	27·96	16·20	10·02	93·14
	La Marie	1715	1891–1899 (9)	40·27	32·47	20·92	10·08	103·74
	Tamarind Falls	1629	1891–1899 (9)	34·18	26·48	16·21	8·78	85·63
G.-P. & Sav.	St. Marie	100	1896–1900 (5)	26·27	31·75	13·29	6·01	77·68
	Cluny	1000	1891–1900 (10)	46·97	46·80	28·10	15·79	137·66
	Gros Bois	500	1891–1900 (10)	28·99	32·44	17·45	9·92	88·80
Black River.	Chamarel Yard	850	1891–1897 (6)	31·09	23·93	14·08	8·78	77·88

REGIME I. (*as at Moulins*).—*Dry Winter and wet Summer.*

Wolmar, Clarens	200	1891–1900 (9)	18·25	16·97	1·98	3·07	40·27
Casela	250	1891–1897 (6¼)	23·43	17·12	2·74	3·77	47·06
Tamaria	150	1891–1900 (10)	19·07	13·42	2·07	2·49	37·95

The following observations were also made on islands near Mauritius :—

Seychelles, Mahé (Reg. I.)	...	1891–1899 (9)	43·39	23·42	11·43	20·75	98·99
Ile Rodrigues (Reg. VII.)	...	1891–1899 (9)	15·91	15·02	8·77	4·54	44·24

3. The maximum of dryness in spring and of rain in autumn indicates regime V., which occupies the north-east and south quarters, Pamplemousses, Rivière du Rempart, Flacq, Grand-port and Savanne.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE DISTRIBUTION OF RAIN IN CYCLONIC STORMS.

I HAVE been considering the distribution of rain in heavy cyclonic storms. My old idea had been that the heaviest rain fell pretty evenly along the centre of the track of the depression, thinning off on each side, and it has been a revelation to me to find that the heaviest downpours are usually far away from this central line, in a broken band parallel to or gradually diverging from the central track on its left side. Since becoming aware of these peculiarities I have very carefully observed the changes of wind, both in force and direction, in such heavy rain storms as have visited this place, and I have come to the following conclusion : that when a cyclonic depression crosses this country, the bulk of the rain falls in subsidiary eddies, too shallow to be evidenced on the meteorological charts, but perceptible to a local observer by a careful observation of the variation of the wind. These eddies I suspect of having an orbital movement round their primary, at the same time sharing its forward movement. Let us consider what the effect of this condition of things would be in case of a cyclonic system crossing this country from west to east. Let us consider in the first place a subsidiary eddy to the south of the central track. Such an eddy would have its revolving movement round its primary added to the general velocity of the system ; it would, therefore, pass rapidly over an observer, giving him a comparatively brief rain storm, with a slight shift of the westerly wind towards south at the beginning, and towards north at the end, if it passed centrally over him, and an acceleration of the west wind if he were near its southern edge, and a diminution if he were near its northern edge. This is what I have noticed repeatedly in rain storms which have passed over me when I have been to the right of the central track.

Next let us consider the case of an eddy some distance on the northern side of the central track. It will have its orbital velocity subtracted from the general forward movement, and it will consequently pass very slowly over any given point, and in some cases might remain nearly stationary, giving a prolonged heavy rain as is noticed in such places. An observer on the north side of the eddy would have the east wind of the general storm accelerated, one on its southern edge would have it diminished, while an observer over whom it passed centrally would find the east wind deflected a little to the south at the commencement, and to the north at the end of the rain. I have had less opportunities of studying rain storms on the left of the track, but the observations of others would be interesting.

To account for the patchiness of the band of high rainfall, I might suggest that a number of such eddies are formed at intervals revolving round the primary, and that these successively arrive at the position where they become almost stationary, geographically speaking, thus forming a succession of patches of heavy rainfall along a band nearly parallel to the central track. If I am right, however, the patches should, I think, be somewhat crescent shaped, with the concavity towards the central track. A gradual divergence of the band of patches from the line of the central track would seem to require that the eddies should be developed further and further from the centre of the depression as the latter advances over the country, but I cannot suggest any reason why this should be so.

F. J. WARDALE.

Shrewton, Wilts, Dec. 9th, 1911.

SEA SPRAY CARRIED FAR INLAND.*

THE occurrence of a film of salt on glass windows, foliage of plants, &c., has often been observed after severe gales in localities far removed from the sea, but we do not appear to have many data recorded as to the exact amount deposited. The following may, therefore, be of interest.

This morning, November 6th, after a severe westerly gale of over 24 hours' duration, I noticed on the windows of my house a considerable incrustation, which tasted strongly of salt, so I decided to examine the water in the rain gauge. The amount of rain for the previous 24 hours, registered at 9 a.m., was ·19 inch. This water which was clear and colourless—proving the absence of any accidental organic contamination—gave on analysis 13·18 grains per gallon of combined chlorine, which is equivalent to 21·72 grains of sea salt, calculated as sodium chloride.

Now a rainfall of ·19 in. represents 19·19 tons, or rather over 4298 gallons of water per acre, so that on every acre there had fallen 13 lbs. 5 ozs. of salt, or on a square mile $3\frac{3}{4}$ tons (more exactly 3 tons. 16 cwt. 8 lbs.).

The distance from Ilkley to the nearest sea coast, at the mouth of the Lune, is 43 miles, the direction being west, but the wind during the gale blew from a slightly more southerly point, or say from Blackpool, a distance of 50 miles.

ALBERT WILSON.

28, St. James' Road, Ilkley.

FROZEN RAIN.

ON the evening and night of January 17th-18th there occurred here a somewhat remarkable instance of frozen rain. Both days were overcast, thick, with bad light. The wind on 17th moderate to

* For further particulars with regard to this subject, see *Meteorological Magazine*, Vol. 29, pp. 178-9.

rough or fresh from S.E., backing to E. and N.E. Barometer (at 365 ft.), 29·50-29·46. Temperatures :—

	Dry.	Wet.	Max.	Min.	Grass.	Rain.
17th	34°·0	33°·0	35°·2	32°·8	32°·0	·30 in.
18th	32°·1	31°·0	41°·2	29°·8	27°·0	·30 in.

The weather before and since was wet and mild; at no time did mud on the road freeze. It rained steadily and gently most of 17th, and froze as it fell, so that trees, shrubs, grass, &c., were literally coated on the east side with frozen rain to a considerable thickness, heavy enough to break or tear off big limbs of trees, elms, firs, birches, limes, etc., owing to the great weight; small twigs were entirely coated, larger branches (say, over ¾ in. in diameter) were coated mostly on E. side, and over 1¼ in. in diameter not on W. side. In coarse grass each blade was so coated as to have the appearance of glass quills, quite clear and transparent. Here it is very open to the wind, so I visited woodlands on 18th, and noticed it was mostly along the outsides excepting the west sides, on the east, north-east, and south-east. I could find no place over one mile from Wrotham Church where it was so thick and heavy as within that radius, and learn that it was unobserved at places a few miles distant: this may be accounted for by reason of Wrotham being on a prominent feature or spur projecting southwards from the North Downs. Another curious example was that of a cyclist who went from Wrotham to Tunbridge Wells on the afternoon of 17th, 3 to 5 o'clock, whose cap got frozen, not otherwise, but on returning between 7 and 9 p.m. the front part of his coat was frozen fully ½ in. thick, and cap likewise. It was some time before he could unbutton the coat, and he complained of the *heat* to his body (due to lack of air through the clothing). The road was very muddy, but not frozen or slushy.

I hear that the phenomenon was remarkable in a similar degree at Sutton Valence, about 15 miles S.E. by E. from here, but not nearly so severe at Headcorn and Hollingborne.

A. F. BOWKER.

Wrotham, Kent, 24th January, 1912.

THE WEATHER OF JANUARY.

By FRED. J. BRODIE.

JANUARY received a small legacy from the old year in the shape of a brief spell of quiet anticyclonic weather. The British Islands lay, however, on the northern edge of the continental high-pressure system, and the resulting winds, which blew from south or south-west, were accompanied by a temperature in excess of the average. On the opening day of the year the thermometer rose above 50° in nearly all districts, and reached 55° in many parts of Ireland and North Britain, and 56° at Leith and Hawarden Bridge. The anti-cyclone soon receded to the southward, and on the 5th, when a depression swiftly skirted our northern coasts on its way from Iceland

THAMES VALLEY RAINFALL JANUARY, 1912.

to Denmark and North Germany, the wind veered temporarily to W. and N.W., with cool, changeable weather and heavy rain in some of the western districts. Next day a new cyclonic system advanced in a more southerly track across Ireland and England, easterly winds and snow setting in over the northern half of the country, and heavy rain in many places further south. In the rear of the disturbance a cold current of air from the northward spread temporarily over the entire kingdom, and on the night of the 7th a sharp frost was experienced, the sheltered thermometer falling below 25° in all parts excepting the south east, and below 20° in many northern districts. The brief touch of wintry weather was soon followed by a return of southerly winds, lasting from about the 8th to the 20th, the conditions at the time being influenced by large cyclonic disturbances moving in a north-easterly direction over the northern part of the Atlantic. Gales were experienced rather frequently, especially on our western and northern coasts, and between the 15th and 17th heavy falls of snow occurred over North Britain, and exceeding heavy rain in some of the central and southern districts. Temperature was, as a rule, a little above the average, but at various times between the 17th and 20th sharp frost occurred in most parts of Great Britain, the sheltered thermometer falling at least 10° below the freezing point in many places, and touching 18° on the 20th at Balmoral. On the surface of the grass the minimum readings were as low as 15° at Balmoral, 19° at Harrogate and 20° at Marlborough. After the 20th a radical alteration in the weather took place, the chief factor in the situation being supplied by an anticyclonic area which appeared over the Icelandic region. Pressure at the same time became low over France and the Bay of Biscay, and as a result of the combined movements, a cold wind from N. and N.E. set in over the whole of the United Kingdom. Sharp nights were now experienced very generally, and towards the close of the month, when the Icelandic high-pressure system advanced southwards over the United Kingdom, a frost of considerable severity set in, the wintry weather lasting throughout the early days of February. The lowest January temperatures occurred mainly on the 29th or 30th, the sheltered thermometer falling below 15° over a large portion of the United Kingdom, and reaching 7° at Balmoral, 11° at Raunds and Aldershot, and 12° at Wokingham. On the grass a reading of 3° was registered at Balmoral, and a reading of 8° at Raunds.

The spells of mild weather in the early part of the month and of cold weather at its close fairly counterbalanced each other, and the mean temperature for the entire period differed, therefore, but little from the average, most of the individual values showing a slight excess. In many western districts the amount of bright sunshine was above the normal, but elsewhere there was a deficiency, and in the east and south-east of England a large deficiency. In London (at Westminster), the total duration, only 9½ hours, did not amount to more than one-half the average, and was smaller than in any January since that of 1897.

ROYAL METEOROLOGICAL SOCIETY.

THE Annual General Meeting of this Society was held on Wednesday evening, January 17th, at the Institution of Civil Engineers, Great George Street, Westminster, Dr. H. N. Dickson, President, in the chair.

The Council, in their Report, stated that they had decided to discontinue the collection of observations and the publication of "The Meteorological Record," as from December 31st, 1911, an arrangement having been made with the Meteorological Office for the continuation of the publication of the observations in the "Monthly Weather Report." The Council propose in the place of this work to prepare a series of normal values of climatological elements of the British Isles. Reference was made to the balloon observations and experiments which had been carried out during the year at Blackpool, Sellack, Limerick and Barbados, under the auspices of the Joint Committee appointed by the Society and the British Association.

The Report was adopted, and votes of thanks were given to the Council for their services during the past year, and also to the President and Council of the Institution of Civil Engineers for permitting the Society to hold its meetings in the rooms of the Institution.

The President then presented to Professor Cleveland Abbe the Symons' Gold Medal for 1912. Professor Abbe joined the Weather Service of the United States in 1871, and it is in connection with that organisation that his great life-work has been performed. Apart from a large amount of official work, he is notable mainly for (1) his collection of papers on the "Mechanics of the Earth's Atmosphere, (2) his "Treatise on Meteorological Apparatus and Methods," issued in 1888, (3) his "Preparatory Studies for Deductive Methods in Storm and Weather Predictions," issued in 1890, and (4) his articles on "Meteorology" in the "Encyclopædia Brittannica." He was one of the first to realise the importance of experimental investigations of atmospheric radiation, and it was largely due to his enterprise that the well-known researches of Hutchins and Pearson were undertaken. The importance of this work has recently been emphasised by its application to the explanation of the isothermal condition of the upper atmosphere. He has contributed, therefore, to instrumental, statistical, dynamical and thermodynamical meteorology, and also to forecasting.

Professor Abbe said that it gave him the greatest pleasure to have his name associated with that of his dear friend and colleague, George James Symons. He thanked the Society for the honour they had conferred on him in awarding him the medal.

The President delivered an address on "Some Meteorological Observations." He said that meteorology had at the present time reached an important and critical phase in its history. This was due, in the main, to the operation of three principal factors. (1) By the

efluxion of time a mass of observational material had been accumulated which urgently required examination and discussion, with the object of ascertaining the precise meaning and value of the records, and of improving routine methods for the future. (2) The rapid increase of knowledge of the conditions obtaining in the upper atmosphere had modified, and was modifying, current views as to atmospheric phenomena generally, and new interpretations must be placed upon the distributions observed at the surface of the Earth. (3) The importance of applied meteorology in relation to agriculture and other activities of everyday life was becoming more generally recognised. It followed that there was in many directions urgent need for the extended prosecution of research work. Increase of popular interest and public support was necessary, and the active assistance of research workers must be enlisted. It was to be noted that the investigations required were of many different qualifications; they included the criticism and improvement of methods of routine observation, participation in organised exploration of the upper air, investigation of statistical and analytical methods of dealing with data already collected, investigation of mathematical or physical problems, stated as the result of observation, and the examination or re-statement of geographical or other questions affecting the relation of meteorology to the problems of botany and other applied sciences.

A vote of thanks was passed to Dr. Dickson for his services as President during the past year, and also for his address.

The following gentlemen were elected on the Council:—*President:* Dr. H. N. Dickson. *Vice-Presidents:* Mr R. H. Hooker, M.A., Mr. R. G. K. Lempfert, M.A., Mr. H. Mellish, Colonel H. E. Rawson, C.B. *Treasurer:* Dr. C. Theodore Williams. *Secretaries:* Mr. F. Campbell Bayard, LL.M., Commander W. F. Caborne, C.B. *Foreign Secretary:* Mr. R. H. Scott, D.Sc., F.R.S. *Councillors:* Mr. W. W. Bryant, Mr. C. J. P. Cave, M.A., Dr. C. Chree, F.R.S., Mr. F. Druce, M.A., Mr. F. W. Dyson, F.R.S., Mr. E. Gold, M.A., Commander M. W. C. Hepworth, C.B., Mr. R. Inwards, Capt. H. G. Lyons, F.R.S., Mr. Carle Salter, Capt. A. Simpson, and Sir J. W. Towse.

The following new Fellows were elected: Mr. J. G. Cherry, Mr. W. M. Christy, Mr. W. P. James, Mr. W. Tattersall, and Sir Robert Walton.

SCOTTISH METEOROLOGICAL SOCIETY.

The Annual Business Meeting of the Society was held at 5, St. Andrew's Square, Edinburgh, on 12th December, 1911, Professor A. Crum Brown, F.R.S., President, in the chair.

The Report from the Council was adopted. As usual it dealt largely with matters of routine, but an important paragraph referred to the financial position of the Society, which was a source of considerable concern. During the past year losses through the

death of old supporters had been unusually numerous, whilst very few new members had been added to the roll. If the annual income from members' subscriptions was not maintained it would be necessary to draw upon the principal of the reserve fund, which the generosity of a number of members' had recently provided, and that the Council would be very reluctant to do. Profound regret was recorded at the death of Professor Chrystal: he had been a director of the Ben Nevis Observatory throughout the whole course of its existence, and had rendered great service in helping to secure funds for the publication of the Observations in complete form.

The following were appointed office-bearers and Council for the ensuing twelve months :—

President: Professor A. Crum Brown, M.D., LL.D., F.R.S., F.R.S.E. *Vice-Presidents:* Ralph Richardson, W.S., C. G. Knott, D.Sc. *Council:* Sir David Paulin, Gilbert Thomson, H. M. Cadell, Sir A. Buchan-Hepburn, G. G. Chisholm, M. M'Callum Fairgrieve, J. Mackay Bernard, J. R. Milne, T. S. Muir. *Hon. Secretaries:* R. T. Omond, E. M. Wedderburn, W.S. *Hon. Treasurer:* W. B. Wilson, W.S.

Thereafter, Mr. Ralph Richardson read a paper, with a strong literary flavour, on "The Climates of Edinburgh and Bournemouth." The personal equation, of course, affected largely the impressions of any individual as to the merits or demerits of the climate of any particular place. R. L. Stevenson, for example—(he was a member of the Society and had read a paper before it)—wrote in bitter terms about the Edinburgh climate, but found that of Bournemouth hardly more favourable for his health. The fact was that he was too confirmed an invalid to suit British weather; his splendid literary career was fitly closed amid the sunshine of Polynesia.

Mr. A. Watt, Secretary, communicated a note supplementary to his paper on "The Mean Annual Rainfall of Scotland, 1871-1910," which had just been published in the Society's Journal, with a coloured map showing the distribution of the rainfall.

METEOROLOGICAL NEWS AND NOTES.

"No subject would appear to be too gruesome to be treated of in a modern book. A volume entitled *Our Weather* has just appeared."
—*Punch.*

Messrs H. Sotheran & Co., of 43, Piccadilly, W., send us a well arranged catalogue of second-hand books on Meteorology, Terrestrial Magnetism and Airmanship, in which we notice a number of volumes offered which are not frequently met with. Meteorologists wishing to acquire early works on the subject will do well to consult the list which is peculiarly rich in them.

Floods of an extensive and serious nature took place in the Thames Valley as a result of the continued heavy rainfall during

January, following on the downpours of December in the south of England. It is understood to be largely due to increased vigilance and improved lock management by the Thames Conservancy that the water in the lower valley was got away so expeditiously, and gave rise to far less inconvenience than occurred in the memorable floods of 1894.

INTERNATIONAL BALLOON ASCENTS.

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

August 5th, 1909.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Manchester....	England	8·1	—66	10·6	—59	56	E.N.E.
Petersfield	,, ...	8·1	—65	11·3	—58	12	W.S.W.
Lindenberg....	Germany....	6·9	—61	15·5	?	11	N. by W.
Paris.....	France.....	8·8	—66	10·0	—67	98	S. by W.
Strassburg	Germany....	6·6	—66	9·9	—63	41	S.S.W.
Pavia.....	Italy.....	?	?	6·5	—60	72	W. by S.
Pavlovsk	Russia	8·0	—68	12·2	—51	51	S.E.

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.

On August 4th a high pressure area lay over West France, and a deep cyclone to the North of Iceland, with several ill-defined minima in the South-East of Europe. On the 5th both cyclone and anticyclone had moved somewhat to the eastward.

A very remarkable uniformity of temperature is shown. The weakening of the temperature gradient was so gradual that in many cases no definite height could be assigned to the commencement of the isothermal, and this accounts for the large variation of height.

September 2nd, 1909.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Pyrton Hill....	England	?	?	8·2	—63	44	S.
Hamburg.....	Germany....	5·9	—53	7·2	—42	55	E.S.E.
Lindenberg....	,, ...	6·1	—54	11·0	—56	47	E.N.E.
Strassburg	,, ...	6·7	—54	15·5	—51	33	E.S.E.
Munich.....	,, ...	6·3	—56	7·5	—54	62	N.E. by E.
Vienna.....	Austria	6·6	—63	8·0	—61	62	N.E.
Pavia.....	Italy.....	6·3	—56	10·1	—49	34	E.N.E.
Nizhni Oltchedaeff	Russia....	?	?	7·8	—58	39	N.E. by E.

On September 1st depressions lay over Scandinavia and Northern Italy. On September 2nd an anticyclone had advanced over Central Europe, and by September 3rd the whole of Mid- and South Europe was under the influence of an anticyclone.

The figures for Pyrton Hill seem doubtful; apart from Pyrton Hill there is great uniformity in the temperatures, the height of the isothermal and the direction of drift of the balloons.

RAINFALL TABLE FOR JANUARY, 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	RAINFALL OF MONTH. 1912. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	1·83	4·08
Tenterden	*Kent*	51 4	*0 41	190	2·14	2·76
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·59	3·70
Southampton (Cadland)	*Hampshire*	50 50	1 22	52	2·75	4·64
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	1·78	4·35
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	1·89	3·15
Shoeburyness	*Essex*	51 31	*0 48	13	1·33	2·93
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·70	2·60
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·53	2·12
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	3·59	4·77
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·94	4·46
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·33	4·36
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·51	3·80
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·22	4·97
Boston	*Lincolnshire*	52 58	0 1	25	1·54	2·71
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·70	3·51
Macclesfield	*Cheshire*	53 15	2 7	501	2·66	2·62?
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	2·55	3·52
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·26	5·37
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	1·89	4·48
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·70	2·84
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·90	3·28
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	13·44	11·58
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·65	5·45
Haverfordwest	*Pembroke*	51 48	4 58	95	4·69	6·47
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·91	2·83
Llandudno	*Carnarvon*	53 20	3 50	72	2·51	2·29
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·10	4·80
Marchmont House	*Berwick*	55 44	2 24	498	2·40	2·53
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·78	6·88
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·53	2·53
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	7·34	5·94
Mull (Quinish)	,,	56 34	6 13	35	5·55	4·16
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·01	2·85
Braemar	*Aberdeen*	57 0	3 24	1114	2·92	6·44
Aberdeen (Cranford)	,,	57 8	2 7	120	2·36	3·43
Cawdor	*Nairn*	57 31	3 57	250	2·28	1·14
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	5·58	2·47
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	9·42	5·84
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·75	1·73
Wick	*Caithness*	58 26	3 6	77	2·48	1·59
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·94	5·36
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·78	5·32
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·88	3·38
Miltown Malbay	*Clare*	52 52	9 26	400	4·01	3·27
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·19	5·57
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·15	3·62
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·14	3·51
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·10	4·33
Cong (The Glebe)	*Mayo*	53 33	9 16	112	4·79	3·24
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	5·35	4·10
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·87	3·03
Seaforde	*Down*	54 19	5 50	180	3·41	5·02
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·19	3·66
Omagh (Edenfel)	*Tyrone*	54 26	7 18	280	3·46	3·31

RAINFALL TABLE FOR JANUARY, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
+2·25	223	·67	6	17	...	...	...	...	25·11	Camden Square
+ ·62	129	·56	17	20	...	...	...	...	27·64	Tenterden
+1·11	143	·70	8	17	...	...	...	...	30·48	Patching
+1·89	169	·76	17	18	...	...	...	...	31·87	Cadland
+2·57	244	1·06	17	19	...	...	...	...	24·58	Oxford
+1·26	167	·50	17	18	...	...	...	...	25·17	Croyland Abbey
+1·60	197	·54	17	20	...	...	...	...	19·28	Shoeburyness
+ ·90	153	·52	23	19	...	...	...	...	25·40	Westley
+ ·59	138	·78	6	20	...	...	...	...	23·73	Geldeston
+1·18	133	·84	6	19	...	...	...	...	38·27	Polapit Tamar
+1·52	152	·60	5	19	...	..	...	...	33·54	Rousdon
+2·03	187	·92	17	23	...	...	...	...	29·81	Stroud
+1·29	151	·74	17	21	...	...	...	...	32·41	Wolstaston
+2·75	224	1·24	16	17	...	...	...	...	28·98	Coventry
+1·17	176	·65	6	24	...	...	...	...	23·35	Boston
+1·81	206	·74	6	21	...	...	...	...	24·46	Hodsock Priory
— ·04	98	·39	5	15	...	...	...	...	34·73	Macclesfield
+ ·97	138	·65	17	17	...	...	...	...	32·70	Southport
— ·89	86	·77	8	20	...	...	...	...	61·49	Arncliffe
+2·59	237	·97	16	20	...	...	...	...	26·87	Ribston Hall
+1·14	167	·78	6	19	...	...	...	...	26·42	Hull
+1·38	173	·48	24	20	...	...	...	...	27·94	Newcastle
—1·86	86	2·35	16	19	...	...	...	...	129·48	Seathwaite
+1·80	149	·75	8	22	...	...	...	...	42·28	Cardiff
+1·78	138	·98	5	18	...	...	...	...	46·81	Haverfordwest
—1·08	72	·65	4	17	...	...	...	...	45·46	Gogerddan
— ·22	91	·47	6	14	...	...	...	...	30·36	Llandudno
+ ·70	117	1·80	16	17	...	...	...	...	43·47	Cargen
+ ·13	105	·37	24	22	...	...	...	...	33·76	Marchmont
+2·10	144	1·03	17	23	...	...	...	...	49·77	Girvan
—1·00	72	·38	16	18	...	...	...	...	35·97	Glasgow
—1·40	81	1·32	15	21	...	...	...	...	68·67	Inveraray
—1·39	75	·93	12	16	...	...	...	...	56·57	Quinish
+ ·84	142	1·14	8	16	...	...	...	...	28·64	Dundee
+3·52	220	...	...	...	...	...	...	...	34·93	Braemar
+1·07	145	1·00	8	21	...	...	...	...	32·73	Aberdeen
—1·14	50	·33	26	5	...	...	...	...	29·33	Cawdor
—3·11	44	·72	2	19	...	...	...	...	44·53	Fort Augustus
—3·58	62	1·21	2	15	...	...	...	...	83·93	Bendamph
—1·02	63	·37	5	8	...	...	...	...	31·90	Dunrobin Castle
— ·89	64	·26	5	22	...	...	...	...	29·88	Wick
— ·58	90	·76	15	20	...	...	...	...	54·81	Killarney
+1·54	141	·76	15	18	...	...	...	...	39·57	Waterford
— ·50	87	·77	5	16	...	...	...	...	39·43	Castle Lough
— ·74	82	·51	6	20	...	..	...	...	45·11	Miltown Malbay
+2·38	175	1·56	15	19	...	...	...	...	34·99	Courtown Ho.
+ ·47	115	·57	10	17	...	...	...	...	35·92	Abbey Leix
+1·37	164	·77	6	19	...	...	...	...	27·68	Dublin
+1·23	140	·62	5	20	...	...	..	...	36·15	Mullingar
—1·55	68	·65	5	16	...	...	...	...	48·90	Cong
—1·25	77	·70	12	20	...	...	...	...	52·87	Enniscoe
— ·84	78	·50	8	15	...	...	...	...	42·71	Markree
+1·61	147	1·23	8	20	...	...	...	...	38·91	Seaforde
+ ·47	115	1·05	15	18	...	...	...	...	37·56	Dundarave
								...	39·38	Omagh

SUPPLEMENTARY RAINFALL, JANUARY, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	3·18	XI.	Lligwy	1·73
,,	Ramsgate	2·40	,,	Douglas	...
,,	Hailsham	3·22	XII.	Stoneykirk, Ardwell House...	4·94
,,	Totland Bay, Aston House...	4·12	,,	Dalry, The Old Garroch.....	8·87
,,	Stockbridge, Ashley..	4·34	,,	Langholm, Drove Road	4·01
,,	Grayshott	3·51	,,	Beattock, Kinnelhead	3·61
,,	Reading, Caversham Lock ...	3·58	XIII.	St. Mary's Loch, Cramilt Ldge	4·08
III.	Harrow Weald, Hill House...	3·27	,,	North Berwick Reservoir.....	1·39
,,	Pitsford, Sedgebrook.....	3·45	,,	Edinburgh, Royal Observaty.	1·14
,,	Woburn, Milton Bryant.....	4·00	XIV.	Maybole, Knockdon Farm ...	2·86
,,	Chatteris, The Priory.....	3·18	XV.	Campbeltown, Witchburn ..	4·44
IV.	Colchester, Lexden	2·47	,,	Glenreasdell Mains	4·83
,,	Newport.....	3·32	,,	Holy Loch, Ardnadam.....	6·80
,,	Ipswich, Copdock	2·31	,,	Ballachulish House	8·25
,,	Blakeney.....	2·38	,,	Islay, Eallabus	4·25
,,	Swaffham	2·64	XVI.	Dollar Academy	4·11
V.	Bishops Cannings	(4·28)	,,	Balquhidder, Stronvar.....	8·89
,,	Winterbourne Steepleton.....	7·58	,,	Coupar Angus	3·97
,,	Ashburton, Druid House.....	7·45	,,	Glenlyon, Meggernie Castle..	8·66
,,	Cullompton	4·95	,,	Blair Athol	6·29
,,	Lynmouth, Rock House	4·89	,,	Montrose, Sunnyside Asylum.	2·96
,,	Okehampton, Oaklands.....	3·83	XVII.	Alford, Lynturk Manse	5·12
,,	Hartland Abbey.....	3·17	,,	Fyvie Castle	4·83
,,	Probus, Lamellyn.....	4·46	,,	Keith Station	3·54
,,	North Cadbury Rectory.....	4·67	XVIII.	Skye, Dunvegan	5·97
VI.	Clifton, Pembroke Road.....	3·92	,,	N. Uist, Lochmaddy	2·87
,,	Ross, The Graig	4·03	,,	Glenquoich, Loan.....	11·70
,,	Shifnal, Hatton Grange.....	3·84	,,	Alvey Manse.....	1·32
,,	Droitwich.....	3·79	,,	Loch Ness, Drumnadrochit...	·96
,,	Blockley, Upton Wold.....	5·17	,,	Glencarron Lodge	6·05
VII.	Market Overton.....	3·52	XIX.	Invershin	2·36
,,	Market Rasen.....	2·58	,,	Loch Stack, Ardchullin	4·42
,,	Bawtry, Hesley Hall	3·20	,,	Melvich	2·80
,,	Derby, Midland Railway.....	3·98	XX.	Skibbereen Rectory	5·80
,,	Buxton	5·40	,,	Dunmanway, The Rectory ..	7·26
VIII.	Nantwich, Dorfold Hall	3·57	,,	Cork	...
,,	Chatburn, Middlewood	4·03	,,	Mitchelstown Castle.....	3·92
,,	Cartmel, Flookburgh	3·63	,,	Darrynane Abbey.....	5·12
IX.	Langsett Moor, Up. Midhope	4·99	,,	Clonmel, Bruce Villa	4·66
,,	Scarborough, Scalby	3·86	,,	Newmarket-on-Fergus, Fenloe	2·99
,,	Ingleby Greenhow	3·29	XXI.	Laragh, Glendalough	9·22
,,	Mickleton	2·38	,,	Ballycumber, Moorock Lodge	2·56
X.	Bellingham, High Green Manor	2·77	,,	Balbriggan, Ardgillan	3·55
,,	Ilderton, Lilburn Cottage ...	2·83	XXII.	Woodlawn	3·52
,,	Keswick, The Bank.....	4·46	,,	Westport, St. Helens	3·72
XI.	Llanfrechfa Grange	6·63	,,	Achill Island, Dugort	5·27
,,	Treherbert, Tyn-y-waun	11·14	,,	Mohill, The Rectory	3·91
,,	Carmarthen, The Friary	4·61	XXIII.	Enniskillen, Portora.....	4·23
,,	Castle Malgwyn [Llechryd]...	4·49	,,	Dartrey [Cootehill]	4·04
,,	Crickhowell, Tal-y-maes.....	5·50	,,	Warrenpoint, Manor House ..	5·46
,,	New Radnor, Ednol	4·50	,,	Banbridge, Milltown	2·61
,,	Rhayade, Tyrmynydd	6·62	,,	Belfast, Cave Hill Road	3·32
,,	Lake Vyrnwy	5·16	,,	Glenarm Castle.....	5·76
,,	Llangyhanfal, Plâs Draw.....	2·97	,,	Londonderry, Creggan Res...	2·90
,,	Dolgelly, Bryntirion.....	5·33	,,	Killybegs	3·71
,,	Bettws-y-Coed, Tyn-y-bryn...	3·37	,,	Horn Head	3·20

METEOROLOGICAL NOTES ON JANUARY, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—The dull wet weather of December continued throughout January, and until the last week it was unusually mild. The duration of R, 88·8 hours, was the greatest recorded in January in the past 32 years. The duration of sunshine was only 19·7* hours, and none at all was recorded from 10th to 26th inclusive. Mean temp. 40°·2, or 1°·7 above the average, and the ninth successive month with temp. above the average. Evaporation ·24 in. Shade max. 51°·7 on 6th; min. 17°·7 on 29th. F 8, f 10.

TENTERDEN.—Warm, dull month, with a good deal of fog. Duration of sunshine, 29·0† hours. Shade max. 52°·0 on 9th; min. 23°·0 on 29th. F 6, f 14.

TOTLAND BAY.—Duration of sunshine, 39·1* hours, the lowest ever registered in January. Shade max. 51°·4 on 8th; min. 25°·9 on 29th. F 5, f 9.

PITSFORD.—Mean temp. 35°·1. Shade max. 50°·3 on 1st; min. 16°·6 on 29th. F 16.

WINTERBOURNE STEEPLETON.—R more than double the average of 20 years. Shade max. 52°·1 on 1st; min. 20°·0 on 29th. F 11, f 14.

ROSS.—Shade max. 52°·8 on 6th; min. 11°·9 on 21st. F 11.

HODSOCK PRIORY.—The R has only been exceeded once in January during the previous 36 years, viz., in 1895, when 3·54 in. was recorded. Shade max. 55°·5 on 1st; min. 14°·5 on 29th. F 15, f 26.

SOUTHPORT.—Duration of sunshine 38·5* hours, and of R 105·0 hours. Mean temp 38°·2. Shade max. 53°·0 on 1st; min. 19°·0 on 29th. F 14, f 22.

HULL.—Shade max. 52°·0 on 1st; min. 19°·0 on 29th. F 11, f 17.

HAVERFORDWEST.—Mild, stormy and wet till 16th; fine and cold generally after. Duration of sunshine 55·5* hours. Shade max. 58°·5 on 16th; min. 17°·0 on 30th. F 15.

LLANDUDNO.—Shade max. 54°·0 on 1st and 13th; min. 25°·0 on 28th and 29th.

CARGEN.—Vegetation, which had been too forward of late, received a seasonable check. Shade max. 50°·5 on 1st; min. 22°·0 on 8th. F 15.

EDINBURGH.—Shade max. 53°·7 on 1st; min. 21°·9 on 29th. F 16, f 19.

COUPAR ANGUS.—The precipitation was persistent until the 25th, with a heavy fall of soft S on 8th. Temp. was above mean to 27th, but the closing days were cold. Shade max. 51°·5 on 1st; min. 17°·0 on 8th. F 1.

DRUMNADROCHIT.—R 2·81 in. below the average of 26 years, and the lowest ever recorded in January.

LOCH STACK.—Duration of sunshine, 31·2 hours.

MITCHELSTOWN.—The early part was wet and mild, and the latter part cold and frosty. Shade max. 51°·0 on 5th; min. 16°·0 on 31st. F 14.

DUBLIN.—Mild, rainy month until 21st, afterwards cold and drier to the close. Mean temp. 42°·2. Shade max. 53°·2 on 13th; min. 27°·1 on 30th. F 4, f 11.

MARKREE.—The first part was very rainy, but heavy on some days. Frosty from the 21st. Shade max. 53°·4 on 1st; min. 17°·0 on 30th. F 14, f 17.

WARRENPOINT.—Shade max. 52°·0 on 2nd; min. 31°·0 on 29th. F 2, f 11.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, August, 1911.

STATIONS (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	97·1	9	48·4	31	57·9	53·0	57·8	73	135·3	44·1	·49	7	4·5
Malta	94·0	1	73·4	20	86·8	75·7	70·6	73	148·8	...	·00	0	1·9
Lagos	87·2	4	69·0	18†	84·8	71·8	69·2	77	149·0	66·0	·30	7	...
Cape Town	78·6	31	39·1	27	62·2	47·3	47·2	77	...	...	2·31	13	5·6
Durban, Natal ...	79·9	15*	48·4	26	73·7	54·9	53·1	...	137·2	...	1·07	6	2·9
Johannesburg	73·0	23	28·5	31	63·7	41·9	38·2	68	124·7	27·1	·00	0	1·9
Calcutta...	92·6	3	76·9	11	88·8	79·1	78·0	86	...	74·5	8·49	19	8·5
Bombay...	86·3	10	74·4	5	83·9	77·2	75·4	85	128·0	72·8	16·90	30	8·7
Madras	103·7	15	73·9	11	97·1	78·9	72·4	69	148·0	71·7	2·16	16	5·9
Kodaikanal	68·4	25	47·4	15	64·6	50·9	47·2	72	148·3	36·2	2·08	10	5·5
Colombo, Ceylon ...	87·7	19	73·5	21	86·0	76·2	73·5	78	150·8	70·4	1·30	5	6·4
Hongkong	93·1	26	74·3	6	86·2	78·4	75·8	82	141·6	...	30·06	16	6·9
Sydney	71·3	31	43·1	1	62·5	48·2	45·2	76	119·9	32·9	7·49	23	4·3
Melbourne	72·2	31	38·2	27	61·0	47·4	44·1	69	125·3	31·0	1·37	9	6·5
Adelaide	85·0	31	37·9	21	65·1	47·9	45·5	68	138·9	28·6	·76	12	5·4
Perth	76·2	24	36·0	9	62·6	46·2	46·5	77	127·2	27·9	3·35	12	4·8
Coolgardie	76·4	29	34·4	20	63·0	42·1	40·2	64	140·0	30·0	·53	12	4·8
Hobart, Tasmania ...	67·0	7	34·2	27	56·5	41·9	41·3	70	116·0	30·5	1·30	14	5·9
Wellington ...	61·2	17	36·6	11	54·4	43·9	37·4	64	99·0	29·0	1·36	14	5·6
Auckland	62·0	3, 4	40·0	10	58·6	46·3	46·0	73	98·0	37·0	3·23	20	5·4
Jamaica, Kingston ...	95·0	15	69·9	29	91·7	73·9	70·8	74	...	...	1·48	7	4·0
Grenada	90·0	21	74·0	sev.	84·4	75·1	...	77	141·0	...	7·93	27	5·0
Toronto	89·8	8	47·2	30	79·4	59·2	...	...	105·7	42·5	2·42	12	4·7
Fredericton	87·8	10	40·0	24	75·5	52·8	...	76	...	...	4·03	5	4·9
St. John, N.B. ...	80·3	5, 6	50·0	31	69·5	56·4	...	...	...	...	3·15	9	5·1
Victoria, B.C.	79·5	23	46·2	16	69·3	51·0	...	71	...	...	·68	3	4·0
Dawson	81·0	2	31·0	19	67·7	39·0	...	...	...	...	1·39	9	5·0

* and 16. † and 28.

MALTA.—Mean temp. of air 80°·6. Average bright sunshine 11·9 hours.

Johannesburg.—Bright sunshine, 298·5 hours.

KODAIKANAL.—Bright sunshine, 214 hours.

COLOMBO.—Mean temp. of air 81°·1, or 0°·5 above, of dew point 0°·2 above, and R 2·20 in. below, averages. Mean hourly velocity of wind 7·0 miles. TS on 20th.

HONGKONG.—Mean temp. of air 81°·9. R 15·80 in. above the average. Bright sunshine 190·5 hours. Mean hourly velocity of wind 11·9 miles. Strong gales 4th to 5th.

Sydney.—Mean temp. of air 0°·5 above, and R 3·20 in. above, averages.

Melbourne.—Mean temp. of air 3°·3 above, and R ·45 in. below, averages.

Adelaide.—Mean temp. of air 56°·5, or 2°·7 above, R 1·62 in. below, averages. Only one drier August in 54 years, in 1860.

Perth.—Mean temp of air 1°·6 below, and R 2·35 in. below, records.

Coolgardie.—Mean temp. of air 0°·8 below, and R ·44 in. below, averages.

Hobart.—Mean temp of air 1°·2 above, and R ·51 in. below, averages.

Wellington.—Mean temp. of air 0°·8 above, and R 3·39 in. below, averages. Bright sunshine 170·4 hours.

Auckland.—Mean temp. exactly the average. Rainfall an inch below average of last 44 years.

Symons's
Meteorological Magazine.

No. 554. MARCH, 1912. Vol. XLVII.

Correspondence.

It is probable that to many of our readers the Correspondence forms the most interesting feature of this Magazine, and it is only right that it should now and again be given the first place. In the present issue we are devoting to the ever welcome communications of our readers a larger space than usual, holding over several of the longer articles in order to avoid an accumulation of letters which are too interesting to lose, and some of them too appropriate to the moment to postpone. We wish that we could enlarge the Magazine permanently to 24 or 30 pages, but the slow growth of the circulation, notwithstanding the steadiness of the growth in recent years, does not justify us in doing so. We would like to ask those readers who are really interested in the Magazine to help us to make it known to others to whom the study of the many aspects of meteorology appeals, and we are always happy to supply specimen numbers gratis and post-free. The Magazine is not of sufficient financial importance to make it worth the while of a publisher to "push" it by the ordinary methods, and as it is not run for profit our only object in desiring a larger circulation is to enable us to spend more money on its production, especially by increasing the size and so diminishing the number of useful communications which have to be left out.

To the Editor of Symons's Meteorological Magazine.

THE WINDS OF JANUARY AND FEBRUARY, 1912.

I wonder if the extraordinary deficiency of S.W. wind this year has been generally noticed.

I had only 2 days in January (10th and 24th), and 5 in February (12th, 16th, 22nd, 23rd, and 26th), in the 9 a.m. observations. On the other hand the wind was S. or S.E. on 7 mornings in January and 15 in February.

J. E. MACE.

Tenterden, March 5th, 1912.

LARGE SNOW FLAKES.

THIS morning, at 11 a.m., after several hours' continuous rain, sleet succeeded, and then snow fell rather heavily for two hours. The flakes were quite of abnormal size, one being 3½ inches and some others about 3 inches in their greatest diameter. The ground being sodden the snow disappeared almost as quickly as it alighted. I have been an interested spectator of most of the local snowstorms since the middle of the last century, but cannot remember to have observed larger flakes. The storm occurred on the eve of the anniversary of the great snowfall of January 18th and 19th, 1881, which wrought widespread damage and interfered seriously with railway traffic.

W. F. DENNING.

Bristol, January 17th, 1912.

EXTRAORDINARY SILVER THAW.

IN the recent frost the minimum temperature, by an exposed thermometer 4 feet above ground, was 3° on the morning of February 3rd. The maximum temperature was below the freezing point on six days, the lowest maximum being 27° on the 4th. The frost broke up on the 6th; rain began at 8 a.m. with temperature 29° and everything became a sheet of ice, only the grass being covered with half an inch of snow. The rain was not merely drizzle but heavy at times, so much so that, although it was freezing, it ran off the ice-covered slopes before it could turn into ice. Trees and everything were encrusted with ice. When the rain ceased at noon the temperature had risen to 32°, but it was not till 10 p.m. that it rose to 33°. It would be interesting to know to what height the temperature reversal existed. Mr. Gethin Jones gives me some figures from the Black Mountain for this day which show that at Capel-y-ffin, 1,350 ft. and about 10 miles distant, the air—as was only to be expected—was warmer than here, only 200 ft. above sea. His thermometer at 9 a.m. registered the same as mine, 29°, and about 9.30 he reports rain in larger drops for about 10 minutes only with temperature 30°; the rain at Capel-y-ffin, however, soon turned into drizzle and by 10 a.m. the temperature stood at 35°, *i.e.*, about 5° higher than here. The large drops of rain must have melted at a considerable height before coming down to the colder layer of air near the ground, and Mr. Jones noted next day that the snow, from 1,350 ft. up to 2,000 ft., was pitted with hundreds of holes in every square yard as if birds had been pecking it, but the marks were not visible above 2,000 ft. However, I think the rain must have started at a much greater height that 2,000 ft., perhaps as high as 3,500 to 4,000 ft. I have seen many silver thaws but never one with such a marked temperature reversal as this one. When a silver thaw occurs I find a general thaw is pretty certain within 24 hours.

R. P. DANSEY, F.R.Met.Soc.

Kentchurch Rectory, Hereford, February 13th.

JANUARY SNOWSTORM IN THE MIDLANDS.

I was much interested in the account of the fall of frozen rain at Wrotham, Kent, on January 17th and 18th, as at exactly the same time Birmingham was experiencing its deepest snowfall of the past 20 years. The type of weather here was similar to that at Wrotham, but the wind appears to have backed into the E. a day sooner in this district, with a much heavier downfall and lower temperature. Rain started about noon on the 16th, becoming mingled with hail in the early hours of the 17th, changing to snow about 8 a.m. on the same day. Snow then fell continuously until 9 p.m. on the 18th, so that the downfall of rain, hail and snow, lasted 57 hours. Below is a copy of my observations made at 7 a.m.

	Wind.	Force.	Weather.	Thermometer. Max.	Thermometer. Min.	Rain. in.	Depth of Snow. in.
Jan. 16	E.S.E....	Mod.....	Rain	43°·8	42°·0	·47	—
,, 17.....	E.....	Fresh.....	Rain & Hail	37°·3	36°·0	·86*	—
,, 18.....	N.E.....	Light	Snow.....	32°·2	26°·1	·36*	11
,, 19.....	S.S.E....	Light Air	Mist	36°·5	27°·5	·17	13

During the rest of the month the temperature was below the normal, with severe frost at the end and during the early days of February, so that the country around Birmingham was covered by snow for three weeks.

DAVID HILL OWEN.

Sparkhill, Birmingham, March 5th, 1912.

STORM OF MARCH 4th, 1912.

The extraordinary velocity of the wind on the 4th inst. deserves notice.

The following notes are from the record of the Dines Pressure Tube Anemometer erected at Pendennis Castle, Falmouth, by the Meteorological Office :—

The wind which during the morning attained a progressive hourly velocity of from 20 to 50 miles, increased in force during the afternoon, and from 6 p.m. until midnight an hourly velocity of 65 miles was sustained. Between 2 p.m. and midnight many heavy squalls were experienced, during which a velocity of 80 miles and over occurred 20 times. The climax was reached at 6 p.m., when a tremendous squall of 98 miles was registered. No such gust has been experienced since the Dines' Anemometer was fixed at Pendennis Castle in July, 1902, except on the 14th March, 1905, when 103 miles were reached at 11.30 p.m. The only other time when the velocity has reached 90 was on the 13th February, 1904, when it was 93. Several trees were blown down in the neighbourhood, and large branches from others, but little other damage appears to have been sustained.

WILSON LLOYD FOX.

Carmino, Falmouth, 9th March, 1912.

THE ZODIACAL LIGHT.

In continuation of the notes on this subject in the numbers of your Magazine for November and December, 1911, I may remark that Capt. Campbell Hepworth is perfectly correct in saying that the Light can be seen across the sky. Indeed, I have always so seen it during the last 35 or 40 years in the absence of clouds and moonlight, and other disturbing factors, such as the crossing of the Light and the Milky Way, and a small angle between the Light and the horizon.

To observe it all artificial lights must be put out or avoided, and the eyesight should be strengthened by keeping out of doors for some five or ten minutes before commencing observations.

The following are the breadths of the Light at different distances from the sun, measured along the ecliptic—

Distance from Sun...	30°	40°	50°	60°	70°	80°	90°	120°	180°
Breadth of Z. L.....	44°	38°	33°	29°	25°	21°	18°	13°	6°

The last measure does not include the large and irregular counterglow often seen diametrically opposite the sun.

The divergencies of the central line of the Light from the plane of the ecliptic are small; and there is no connection between the latitude of any point in the central line and its distances from the sun; but there is a connection between its latitude and longtitude, and it will be found that the central line closely follows the invariable plane of the solar system. This plane not only is a mathematical conception, but it may also be regarded as the original plane of the solar system throughout which was scattered the bulk of the matter subsequently condensed into the sun and planets.

The following table gives the latitudes of points on the invariable plane corresponding to points taken at every 30° along the ecliptic—

Longitude.		Latitude.
0°	.....	—1° 31′
30°	.....	1° 33′
60°	.....	1° 9′
90°	.....	—0° 28′
120°	.....	+0° 22′
150	.....	1° 5′
180°	.....	1° 31′
210°	.....	1° 33′
240	.....	1° 9′
270°	.....	+0° 28′
300°	.....	—0° 22′
330°	.....	—1° 5′

The above are heliocentric longitudes; and that we should see the Light in much the same position as from the sun is, I believe, in consequence of the small inclination of the central line to the ecliptic and the great distance of many of the particles which reflect the light of the sun.

I still observe the position of the central line every now and then :—

		Longitude.	Latitude.
1911—December	13th	313°	—0° 45′
,, ,,	14th	340°	0° 30′
,, ,,	17th	19°	1° 0′
1912—January	8th	340°	0° 30′
,, ,,	22nd	0°	—1° 30′

So the Light still follows the invariable plane as usual.

MAXWELL HALL.

Kempshot Observatory, Jamaica, January 23rd, 1912.

VARIATIONS IN OUR CLIMATE.

It is instructive, I think, to treat long series of meteorological data, such as those of Greenwich from 1841, by adding them in the 50 years ending 1890, '91, '92, and so on. The number 50 is an arbitrary choice.

When we do this, *e.g.*, with the number of frost days in the winter seasons, September to May, commencing with 1842 (*i.e.*, 1841-42), we get the series following, and I note the difference between each member and the next.

50 Winters ending	Frost Days	Diff.	50 Winters ending	Frost Days	Diff.
1891	2806		1901	2740	+ 18
1892	2816	+ 10	1902	2729	— 11
1893	2819	+ 3	1903	2718	— 11
1894	2813	— 6	1904	2705	— 13
1895	2800	— 13	1905	2655	— 50
1896	2796	— 4	1906	2658	+ 3
1897	2755	— 41	1907	2646	— 12
1898	2738	— 17	1908	2630	— 16
1899	2734	— 4	1909	2644	+ 14
1900	2722	— 12	1910	2622	— 22
			1911	2613	— 9

We notice a general decline in the figures and the last is the lowest. That is, the last 50 winters, September to May, had a smaller number of frost days than any previous 50 consecutive winters since 1841. There are 5 plus differences in 20 ; or reckoning only the groups after 1893, the highest 3 in 18.

This method implies a comparison of the 20 winters, 1842 to 1861, with the 20, 1892 to 1911. The former had 11 with an excess of frost days (over 54), the latter only 4 with an excess. Total in former, 1136 ; in latter, 943 ; difference, 193.

We may anticipate, I suppose, that the downward course of the curve will be arrested ere long, and a rise take its place. Have we any means of determining when ?

A similar treatment of the annual Greenwich rainfall yields a curve which descends in general to 1902, since which there is a general rise.

ALEX. B. MACDOWALL.

PLANETARY RAINFALL.

THE annual percentages of rainfall for Cape Town, given in my letter—printed in the September, 1911, issue of this journal—were quoted from a longer series, and consequently they do not average 100 per cent. This, perhaps, accounts for the low correlation coefficient obtained by Mr. Dines. When the true arithmetical mean of the 40 years is used the coefficient will be found nearer to +·20. This also is a low result: it is made so low by the abnormal rainfall (78·90 inches) of the last year of the series at Buenos Aires. If we reject this last year, the coefficient for the 39 years, 1861-1899, comes to nearly +·40, and the probable error ·09. This seems to me to be a better correlation than those shadowy relationships between the respective rainfalls of India and South Africa so much thought of by makers of cycles.

But I doubt the validity of deducing correlation coefficients from percentage deviations. Moreover, the coefficient obtained when, say, the spring rainfall is compared with the crop of hay, will depend largely on the units employed. However, when inches are used the correlation coefficient between Cape Town and Buenos Aires is +·39, which is nearly that found from the percentages. Whether this should be considered large or small depends upon temperament. It is, at any rate, greater than the correlation coefficient between Kimberley and Durban, which are both in the summer rainfall system of South Africa. For the winter half year, April to September, in 35 years between 1875 and 1911, this coefficient is only +·06; for the summer half-year, October to March, only +·19. So that if a correlation coefficient is of any value at all, there is more than twice the probability that Cape Town and Buenos Aires are in one (Atlantic) rainfall system than that Kimberley and Durban are in one.

In any given year let a be the deviation of rainfall at Buenos Aires, b that at Cape Town; then the product ab will be positive when a and b are both less or both greater than the mean. The computation for the 39 years in question gives 33 positive and 6 negative products. The same sort of computation for Kimberley and Durban gives 21 positive to 14 negative products in winter, and 20 positive to 15 negative products in summer, in 35 years.

I wish that some of your readers would discuss the question of the general applicability of the correlation coefficient in meteorology. A point which might be argued is whether such an extreme case as the 1900 rainfall at Buenos Aires should be allowed to stand in a comparison like this one, *i.e.*, whether it should not be treated, for numerical purposes, from the point of view of, say, Chauvenet's Criterion as a doubtful quantity. It seems to me that genuine cases of parallelism, or synchronism, among planetary phenomena may be often ruled out by the correlation coefficient if abnormal cases are allowed to stand in unweighted. It is possible, of course,

that abnormal falls of rain would be eliminated automatically from a comparison if large areas were considered instead of just two stations —if, that is, the whole littoral of the mouth of the Rio de la Plata were compared with the west coast of South Africa.

Some day, when the meteorology of the whole Atlantic Basin comes to be discussed in one piece, some valuable results will be obtained. Meanwhile records are too scanty for the southern areas, and observing stations too few. Some years ago the Royal Society of South Africa tried to fill one of the gaps, and arranged for second-order observations on Tristan da Cunha, the De Beers Company kindly supplying instruments for the purpose. So far, however, none of the observations have reached me. The rainfall of Tristan da Cunha ought to prove, or disprove, a correlation between the respective rainfalls of Buenos Aires and Cape Town.*

Kimberley, November 24th, 1911. J. R. SUTTON.

ON DATING TEMPERATURE OBSERVATIONS.

I SHOULD like to raise for discussion in your pages a question as to the dating of observed temperatures. It has always been my custom to regard the 24 hours ending at 9 a.m. as the weather-day, and I enter not only the rainfall, but also the maximum and minimum temperatures then read, to the previous civil day. I have gradually discovered that it is the almost invariable practice amongst other observers to enter the maximum to the previous, and the minimum to the current civil day. The object of this is obviously to try to make the maximum and minimum accord with those of the civil days concerned, it being assumed that the maximum will usually occur in the afternoon, or at any rate between 9 a.m. and the following midnight, and that the minimum will usually occur between midnight and 9 a.m. This would no doubt usually be the case in summer, but by no means necessarily so in winter. Let us take an instance—let us suppose that the temperature drops to 32° at 9 a.m. on 1st January, and then rises steadily with a south wind to 50° at midnight and 55° at 9 a.m. on the 2nd. At this hour the observer would read maximum 55°, which he would enter to the 1st, and minimum 32°, which he would enter to the 2nd, and both would be wrong; and it must very frequently happen that either maximum or minimum goes down to the wrong date. I would suggest that as we already have a rainfall day selected for convenience, and differing from both the civil and the astronomical days, it would make meteorology more symmetrical and less incongruous to adopt that same day for all purposes, with the possible exception of sunshine, which might be read at sunset and entered to the same day.

Shrewton, Wilts, 30th July, 1911. F. J. WARDALE.

* The mean of the annual rainfalls of Cape Town and Buenos Aires, smoothed in threes, gives a very interesting series of groups of plus and minus years.

SUSSEX DEW-PONDS AND THE 1911 DROUGHT.

THE droughts during the summer of 1911 put many of the down-land ponds to a severe test, as well as many a lowland pond. Those that were dried up showed how remarkably shallow the actual water-retaining area was. On August 7th the large pond at Patcham Church, which had never been known before to dry up completely, was perfectly dry. This was a lowland pond, being only 205 ft. O.D. A large one in the village of Ditchling, also below the hills, 210 ft. O.D., with numerous trees overhanging it on one side, maintained a considerable quantity of water, although it diminished in area. No. 1 pond* (One Tree pond), was of course dry. Nos. 3 and 4, on the Keymer Downs, were dry, the latter having a quantity of young grass growing in it. No. 22 pond (Greystones pond, Standean), was dry except for the soft, damp, peaty moss of which its centre was composed. This pond was found, on drying, to be disappointingly shallow. High Park Corner pond (No. 6), had suffered a good deal of loss. On August 12th, 1908, the circumference of the water was 227½ ft.; on August 7th, 1911, it was 105 ft., and extremely shallow. Upper Standean pond (No. 17), on which my 24 hours' experiments were made in 1909, had shrunk from a circumference of 160 ft. in August, 1909, to 120 ft. in August, 1911. Ditchling Beacon pond (No. 5), similarly had decreased from 245 ft. in December, 1910, to 155 ft. in August, 1911, but a considerable depth of water remained. Piddingworth pond (No. 21), showed practically no diminution in size. It is partly overhung on one side by trees. Ewebottom Hill pond (No. 18), was reduced from 201½ ft., December, 1909, to 137½ ft. in August, 1911. Of the nine ponds referred to and visited in the course of a single day, five were dry, four were considerably reduced in size, and one (overhung by trees), remained practically the same.

The pond at Ditchling Beacon deserves special reference. It is not actually at the highest point of the Beacon, and must not be confused with two smaller dry pond-areas which are on the line of the old vallum. It is close to the top of the road leading up the Bostel from the north, and at the head of a dry chalk valley leading up from the south. It is not a little remarkable that this pond has continued to retain so much water throughout the summer. I think we have here evidence that a position at the head of a valley leading up from the south is advantageous to the maintenance of a pond. It is deeper than most ponds in the neighbourhood, and this again must have been an advantage. Shallow ponds have no chance at all during a long spell of hot weather. In this case I think it is clear that moisture laden winds from the south, condensing into mists in the early morning, have had a good deal to do with the continuance of the supply. There has been almost a continuous absence of dew all through the summer, so that "dew-fed" it could not have been. It may be argued that others have become dry because

* See *Geographical Journal*, October, 1910, for these numbers.

of this absence of dew, but in that case you must explain why this one maintained its water so well. If you do not allow that mist has been all-powerful to this end, then you must fall back on rain, of which there was, to the end of August, 13·74 in. only, as compared with 28·63 in. during the same period of 1910. Failing rain, you have but one factor left, and that is the depth of the pond. I grant that it is probable that many ponds might have been saved during the drought if they had been deeper, and in this case many flocks of sheep might have been spared and many pounds might have been saved. Thus the whole matter resolves itself into the great subject of sufficient storage accommodation. How many droughts might have been robbed of their sting if only the storage had been ample! At the same time I must confess to my doubts if even Ditchling Beacon pond would have behaved so well, had it not been for its position, and the mist-laden winds from the south.

The rainfall at Clayton Mills was during July but ·38 in., during August only ·53 in., and during September 1·97 in. In October it was no less than 6·11 in., in November, 10 16 in., and in December, 12·86 in. With the heavy rains came the filling-up of the ponds, and on December 26th all those referred to were in a flourishing condition except in the case of No. 1 pond which was almost empty and which must have become damaged in its foundation during the drought. Patcham Church pond was full to overflowing. No. 3 pond was 170 feet, and No. 4 was 145 feet, in circumference. No. 22 was 105 feet round, and No. 17 was broader than I had ever known it before and was 177 feet in circumference. No. 18 had covered up all former marks which had shown its level at various times, and was no less than 230 feet round. Night-dews on the grass returned with the return of the rain. They all but ceased with the absence of rain. Had the ponds been fed by dew when there was no rain they might have been *dew*-ponds.

EDWD. A. MARTIN.

285, Holmesdale Road, South Norwood, S.E.

DEW AND THE DIURNAL VARIATION OF RAINFALL.

It is a fact that differences between both the rainfall, and the rain days, for the year, obtained from standard 5-inch, and from larger (including most recording) gauges, are frequently occasioned, in humid localities, by the latter being *dew*-collecting gauges, and the former "dew-less" ones, to use the name I gave, several years ago, to Snowdon glove-fitting funnels of copper which are in very good thermal contact with the warm earth; and which also, in consequence of their deep rims and small diameter together cutting off most of their sky view, are exposed to a very limited radiation area. I find that surprisingly little dew, or true hoar-frost (rime, in fog, is a different thing), collects within these.

Large recording gauges, even though of copper, generally have several joints and sharp bends in their design; the thermal con-

nection to the warm ground below the sod, is comparatively bad. Moreover, their wide opening and relatively shallow rim expose an excellent depositing surface to a considerable area of sky. Hence the funnel pretty readily cools to the dew-point, and on our humid western coasts enough dew is collected to lengthen greatly the "duration of rainfall," at all events if the chart be measured by a distant computer who is ignorant of the fine character of the night the record for which he is tabulating. The duration of dew has nothing to do with the diurnal variation of rainfall (except very indirectly), and should not be statistically confused with it; however willingly we may admit an additional dozen or so "rain days" per annum, caused solely by dew and hoar-frost, and excluded by the good-conducting and deep-rimmed little Snowdon.

Errors produced by the admission of copious dews are far from being the only ones by which determinations of the duration of rainfall—and especially of its striking diurnal inequality—are liable to be affected, but they are the most difficult of any either wholly to guard against or eliminate. Friction can, nowadays, be entirely overcome; whilst the group of errors connected with chart-sheets, viz., inaccurate printing and cutting, or placing on the drum, and stretching, can largely be corrected by the use of a horizontal reference line, in say, green ink, drawn about halfway up the drum, at the same speed as the rain line, but by a fixed pen.

JOSEPH BAXENDELL.

Fernley Observatory, Southport, Feb. 29th, 1912.

WINTERS IN THE SEVENTEENTH CENTURY.

In Mr. Sedgwick's article in the December number of this Magazine he has suggested that the Thames would have frozen more readily in the seventeenth centnry than now, and that the somewhat frequent occasions when the Thames was frozen in the life-time of Evelyn is not necessarily an indication that the weather was more severe in his day than now. With this view I quite agree.

The real reason I think why the Thames was more frequently frozen over in London in those days was the existence of Old London Bridge, which so obstructed the waterway as to create almost still water above it on the ebb tide, and to prevent there being any upward stream, or next to none, on the flood. For this reason also the water above London Bridge was probably not brackish in those days.

In these days the removal of Old London Bridge, and the Embankment of the River has very greatly increased both the horizontal and vertical range of the tide, and therefore the velocity of the current, so that the actual freezing over of the tidal portion of the Thames is very unlikely to happen again, although I have seen the river nearly covered with ice floes brought down from the upper reaches and blocked up between the bridges in the severe frosts of 1891 and 1895.

5, Queen Anne's Gate, S.W., Jan. 10th, 1912. W. VAUX GRAHAM.

SOOT FIGURES UNDER WATER.

On "taking" the rainfall on the morning of November 17th I was surprised to find on the bottom of the glass rain measure a peculiar figure or formation, a photograph of which is enclosed. I have not yet been able to obtain any explanation of it. When used on the morning of the 16th the glass was perfectly clean. The water measured that morning was ·14 in., and after reading the amount I poured a few drops on the linen of the wet bulb thermometer and then placed the glass, unemptied and upright, at the back of the Stevenson screen. It was never moved or touched again until it was necessary to measure the rainfall on the 17th, the water which had been standing was then thrown away and the figure was seen. No frost had been registered that night or for many days before, therefore it was not a frost figure such as we see on glass panes on a wintry morning. I continued my rain measuring in the ordinary course for about 3 weeks, and the application of water had no effect on the permanence or strength of the figure: consequently the substance forming the pattern cannot have been soluble. I did, however, notice that the water was somewhat turbid and this, I take it, must have been soot washed down by the rain. I had the substance examined carefully chemically, in order to find whether some solution of the copper receiver had taken place from acids dissolved by the rain, but no indication of copper, or of any other metal, was forthcoming.

On examining the deposit a black amorphous paste was all that was found—brownish by transmitted light but perfectly black on linen or clean paper, and no trace of etching on the glass was shown.

If the substance be nothing but soot I am at a loss to know how it can form such a figure, or by what power it was produced.

THOMAS NEWBITT.

20, Crescent Avenue, Whitby, Yorks, Dec. 30th, 1911.

[In a later letter Mr. Newbitt states that he was able to reproduce these designs experimentally, and we hope to have further particulars of this very interesting phenomenon.—Ed. *S.M.M.*]

THE WEATHER OF FEBRUARY.

By FRED. J. BRODIE.

THE early days of February witnessed a continuance and an intensification of the severe frost which set in at the close of January. Between the 2nd and 5th of the month the thermometer in the screen fell to 15° or less at a number of places situated in nearly all parts of the United Kingdom, and to 10° or less in many inland localities in Great Britain, a reading of 5° being recorded as far south as Wokingham. The greatest intensity occurred in Scotland, the sheltered thermometer on the morning of the 4th falling to 5° below zero at West Linton (Peebleshire), and on the morning of the 5th to 2° below zero at Balmoral. On the surface of the ground, which was at the time mostly under snow, the readings were still lower; the exposed thermometer sinking to 7° below zero at Crathes, and to slightly below zero at a few inland stations in England. The winds at the time were light in force, and chiefly from between north and east, but on the night of the 5th, when a barometrical depression, which had appeared off our south-west coast, began to move northwards along the west of Ireland, a general veering to south-east took place, and in the course of the following day a rapid thaw extended from the southward over nearly the whole country. With a subsequent strengthening of the equatorial air current, the thermometer continued to rise steadily, and between the 8th and 10th maximum readings well above 50° were recorded in nearly all districts, and a reading of 56° at Llandudno, Bath and Clifton. On the 11th and 12th, the north easterly passage of a cyclonic disturbance (which had originally advanced from the southward) across the south and east of England, caused the wind to back temporarily to the eastward and north-eastward, with colder weather, and sharp ground frosts in many parts of Ireland and North Britain. The influence of a large Atlantic low pressure system was, however, soon restored, and between the 15th and 17th, when mild southerly winds were again experienced very generally, the thermometer rose to 55° or slightly above it over a large portion of England and Ireland. Another temporary shift of wind to polar quarters occurred on the 18th and 19th, when the centre of a well marked barometrical depression travelled north-eastwards directly across the United Kingdom, causing heavy rain in Ireland, and northerly gales on many parts of our western coasts. By the 22nd the wind had again returned to the southward, and on that day or the 23rd the thermometer rose above 55° in all districts excepting the west and north of Scotland, and touched 60° in central Ireland (at Birr Castle). During the remainder of the month a strong current of air from the south and south-west, increasing at times to the force of a gale, prevailed very generally, with frequent falls of rain, the latter being occasionally heavy in the west and north. Temperature was considerably above the average, the highest readings being observed on the 27th or 28th, when a shade maximum of 60°

THAMES VALLEY RAINFALL — FEBRUARY, 1912.

was recorded at a number of places in England and Wales; and readings of 56° and upwards in several parts of Ireland and Scotland.

The exceedingly mild weather experienced in the latter half of the month more than outweighed the effect of the previous cold, the mean temperature of February being above the normal in nearly all parts of the United Kingdom. In London, and at most other places in Central and Southern England, the month proved to be upon the whole the mildest February since that of 1903. In a few scattered parts of Ireland and the west of Scotland, the total duration of bright sunshine was slightly in excess of the average, but over the country generally it was deficient. In London (at Westminster) the aggregate amount, 26 hours, was 8 below the average, and was considerably smaller than in any February since that of 1902.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, February 21st, at the Institution of Civil Engineers, Great George Street, Westminster, Dr. H. N. Dickson, President, in the chair.

Mr. J. Fairgrieve read a paper on "The Thunderstorms of May 31st, 1911," in which he dealt with the thunderstorm which visited the London district on Derby-day, and specially with the movement of the rain which accompanied the storm. Having obtained information from nearly 700 observers as to the time when rain was falling, he had prepared an interesting series of maps for each quarter of an hour from 0.30 to 8.45 p.m., showing the areas over which it was raining at the moment. From an examination of these maps there appear to have been five phases of rain movement, viz.: (1.) A storm appeared on the northern edge of the Chiltern Hills, and extended north and south while moving bodily south-westward. (2.) The northerly movement ceased, while the southerly movement continued. (3.) A separate storm appeared at Crowborough, and the two storms gradually united, (4.) Isolated rain areas appeared to the east of the main storms and united, the rain on the western margin became lighter and ceased, while the rain on the east became heavy. At the same time the storm extended north-westward along two belts, leaving an area of little or no rain between. (5.) Rain gradually ceased, leaving patches of rain for a time on a belt running north-west and south-east through London.

An interesting discussion followed the reading of this paper, in which Mr. F. C. Bayard, Colonel H. E. Rawson, Mr. C. Salter, Mr. R. H. Hooker, Mr. J. E. Clark, Mr. R. G. K. Lempfert, and Mr. W. B. Tripp took part. The author was complimented upon having achieved a piece of pioneer work by succeeding in tracing out the movements of the rain area, which could not fail to add considerably to our knowledge of the mechanism of the thunderstorm.

Mr. R. G. K. Lempfert read a paper on "The Thunderstorms of July 29th, 1911." This storm was of the line-squall type. The author has been able to trace the spread of the phenomenon across the British Isles, and he showed by an isochronic map that it first struck the extreme end of Cornwall about 2 p.m. on July 29th, and passed across Shetland at 3 p.m. the next day. From an examination of the Weather Charts, the author says that "we may regard the disturbance as being incidental to the displacement of the east wind by a southerly or south-westerly one." The extraordinary violence of the changes may probably be attributed to the temperature conditions. As far as Great Britain is concerned, the region over which we can trace the isochronous lines without difficulty corresponds almost exactly with that in which maximum temperatures of over 80° occurred. At many places in the central and southern counties of England 90° was exceeded. The temperature over the land was thus very high during the day, but over the sea much lower.

The general sequence of events seems to have been somewhat as follows:—A moderate east wind is interrupted suddenly by a squall from the south. After the squall has passed the wind returns temporarily to an easterly direction, to be again interrupted by another squall from the south. This process may repeat itself several times. A period of several hours of light and variable wind, during which easterly directions predominate, supervenes, and finally the wind settles down to a steady southerly or south-westerly wind of moderate force. In many cases the squalls were not accompanied by rainfall. What appears to have struck Observers most forcibly was the way in which huge quantities of dust were whirled up by the wind. Accounts from Cardiff state that dust was brought from the south side of the Bristol Channel by the squall winds which did much damage.

Colonel H. E. Rawson, Mr. E. Gold, Mr. W. W. Bryant, Mr. H. Harries, Dr. C. Chree and Mr. W. B. Tripp took part in the discussion, and Mr. Lempfert replied.

A paper by Mr. S. Skinner on "The Drosometer: an Instrument for Measuring the Amount of Dew," was read, and the discussion was adjourned to the next ordinary meeting.

The following gentlemen were elected Fellows of the Society:—Mr. R. Dukoff-Gordon, B.A., Dr. Marc de Levis, Rev. William O'Leary, S.J., and Capt. George Usborne, R.N.

A Provincial Meeting of the Royal Meteorological Society has been arranged by the Council of the Society, on the invitation of the Mayor and Corporation of Southport, to take place on Monday, May 13th. The Mayor of Southport has offered to entertain the Fellows who attend the meeting to lunch, and special facilities will be afforded for an inspection of the well-known Fernley Meteorological Observatory, which is under the charge of Mr. J. Baxendell.

INTERNATIONAL BALLOON ASCENTS.

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

October 6th, 1909.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Manchester....	England	6·9	—62	8·8	—62	78	E.N.E.
Pyrton Hill....	„	6·9	—73	9·4	—69	60	E.N.E.
Lindenberg....	Germany	7·0	—72	10·7	—78	63	E.N.E.
Paris.....	France	6·2	—59	7·5	—62	141	E.N.E.
Strassburg	Germany	7·1	—76	9·8	—71	84	N.E. by E.
Nizhni Olchadaeff	Russia....	7·0	—70	10·9	—66	21	E. by S.

October 7th, 1909.

Pyrton Hill....	England	6·9	—74	11·1	—78	63	E. by N.
Paris	France	6·8	—67	10·6	—75	66	E.N.E.
Strassburg	Germany....	6·3	—58	12·4	—68	58	E.N.E.
Munich (8 a.m.)	„	7·2	—71	11·2	?	125	N.E. by E.
„ (2 p.m.)	„	6·8	—63	12·7	—60	54	E.N.E.
Vienna	Austria	7·4	—67	10·7	—62	72	N.N.E.
Pavlovsk	Russia	6·7	—52	9·4	—56	53	N.E.
Nizhni Olchadaeff	„	7·0	—81	9·1	—71	26	E.

October 8th, 1909.

Manchester....	England	6·3	—56	8·1	—55	94	N. by E.
Hamburg.....	Germany....	6·8	—64	11·0	—67	56	N.E.
Lindenberg....	„	7·0	—65	8·5	—69	40	N.
Strassburg	„	6·7	—63	8·7	—72	75	N.E. by E.
Munich	„	?	..	8·6	—67	56	E. by S.
Vienna	Austria.....	?	..	7·9	—60	38	E.S.E.
Nizhni Olchadaeff	Russia....	7·6	—77	7·9	—75	45	E.N.E.

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.

The height of the isothermal layer is very badly defined in several instances, the fall of temperature ceasing gradually instead of suddenly as it usually does. At Munich and Vienna on the 8th it is doubtful if it was reached. There is a remarkable uniformity about the direction of drift of the balloons, notably on the 6th, otherwise average conditions prevailed.

On October 6th an extensive cyclone lay between Iceland and the Baltic, with an anticyclone over Spain and Central Russia. The Spanish anticyclone moved rapidly to the N.E. reaching Russia by the 8th. By the 9th a fresh deep depression had appeared near Iceland and a new anticyclone over Spain.

RAINFALL TABLE FOR FEBRUARY, 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1912. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	1·66	1·71
Tenterden	*Kent*	51 4	*0 41	190	1·90	2·46
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·17	3·16
Southampton (Cadland)	*Hampshire*	50 50	1 22	52	2·28	2·48
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	1·62	2·02
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	1·69	1·71
Shoeburyness	*Essex*	51 31	*0 48	13	1·19	1·11
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·59	1·17
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·41	·97
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·95	3·68
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·50	3·62
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·12	2·61
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·17	1·68
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·01	2·17
Boston	*Lincolnshire*	52 58	0 1	25	1·53	1·05
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·64	1·34
Macclesfield	*Cheshire*	53 15	2 7	501	2·30	·98
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	2·07	1·64
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	4·88	3·82
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	1·71	1·59
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·78	1·39
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·63	2·63
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	10·96	7·64
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·07	3·23
Haverfordwest	*Pembroke*	51 48	4 58	95	3·42	4·07
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·09	2·77
Llandudno	*Carnarvon*	53 20	3 50	72	2·11	1·65
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·42	3·88
Marchmont House	*Berwick*	55 44	2 24	498	2·15	2·73
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	3·87	4·28
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·70	2·71
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	5·71	5·30
Mull (Quinish)	,,	56 34	6 13	35	4·45	3·62
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	1·91	2·12
Braemar	*Aberdeen*	57 0	3 24	1114	2·55	2·90
Aberdeen (Cranford)	,,	57 8	2 7	120	2·36	3·35
Cawdor	*Nairn*	57 31	3 57	250	2·06	1·19
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·20	2·81
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	7·53	7·10
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·58	1·80
Wick	*Caithness*	58 26	3 6	77	2·23	2·39
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	4·99	6·08
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·18	4·51
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·89	3·58
Miltown Malbay	*Clare*	52 52	9 26	400	3·21	3·07
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·75	5·04
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·55	3·34
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	1·93	2·56
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·67	3·65
Cong (The Glebe)	*Mayo*	53 33	9 16	112	3·72	4·35
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	4·20	3·95
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·20	4·04
Seaforde	*Down*	54 19	5 50	180	2·81	5·32
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·56	1·94
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·68	3·31

RAINFALL TABLE FOR FEBRUARY, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
+ ·05	103	·36	11	20	3·49	5·79	+2·30	166	25·11	Camden Square
+ ·56	129	·43	8	20	4·04	5·22	+1·18	129	27·64	Tenterden
+ ·99	146	·67	22	23	4·76	6·86	+2·10	144	30·48	Patching
+ ·20	109	·54	22	22	5·03	7·12	+2·09	142	31·87	Cadland
+ ·40	125	·40	23	17	3·40	6·37	+2·97	188	24·58	Oxford
+ ·02	101	·40	12	16	3·58	4·86	+1·28	136	25·17	Croyland Abbey
— ·08	93	·22	23	16	2·52	4·04	+1·52	160	19·28	Shoeburyness
— ·42	74	·45	23	15	3·29	3·77	+ ·48	115	25·40	Westley
— ·44	69	·37	23	17	2·94	3·09	+ ·15	105	23·73	Geldeston
+ ·73	125	·74	7	23	6·54	8·45	+1·91	129	38·27	Polapit Tamar
+1·12	145	·60	7	21	5·44	8·08	+2·64	148	33·54	Rousdon
+ ·49	123	·78	12	22	4·45	6·97	+2·52	156	29·81	Stroud
— ·49	77	·26	12	19	4·68	5·48	+ ·80	117	32·41	Wolstaston
+ ·16	108	·73	5	14	4·23	7·14	+2·91	169	28·98	Coventry
— ·48	69	·24	12	20	3·07	3·76	+ ·69	122	23·35	Boston
— ·30	82	·32	8	15	3·34	4·85	+1·51	145	24·46	Hodsock Priory
—1·32	43	·17	6	15	4·96	3·60	—1·36	73	34·73	Macclesfield
— ·43	79	·31	17	16	4·62	5·16	+ ·54	112	32·70	Southport
—1·06	78	·59	22	16	11·14	9·19	—1·95	83	61·49	Arncliffe
— ·12	93	·22	19	17	3·60	6·07	+2·47	168	26·87	Ribston Hall
— ·39	78	·21	19	18	3·48	4·23	+ ·75	122	26·42	Hull
+1·00	161	·76	19	20	3·53	5·91	+2·38	168	27·94	Newcastle
—3·32	70	1·65	22	22	24·40	19·22	—5·18	79	129·48	Seathwaite
+ ·16	105	·46	23	23	6·72	8·68	+1·96	129	42·28	Cardiff
+ ·65	119	·69	7	22	8·11	10·54	+2·43	130	46·81	Haverfordwest
— ·32	90	·42	16	19	7·00	5·60	—1·40	80	45·46	Gogerddan
— ·46	78	·50	17	18	4·62	3·94	— ·68	85	30·36	Llandudno
+ ·46	114	·75	7	19	7·52	8·68	+1·16	115	43·47	Cargen
+ ·58	127	·90	19	22	4·55	5·26	+ ·71	116	33·76	Marchmont
+ ·41	111	·83	7	21	8·65	11·16	+2·51	129	49·77	Girvan
+ ·01	100	·46	18	14	6·23	5·24	— ·99	84	35·97	Glasgow
— ·41	93	1·95	27	17	13·05	11·24	—1·81	86	68·67	Inveraray
— ·83	81	·62	22	18	10·00	7·78	—2·22	78	56·57	Quinish
+ ·21	111	·35	19	19	3·92	4·97	+1·05	127	28·64	Dundee
+ ·35	114	...	...	...	5·47	9·34	+3·87	171	34·93	Braemar
+ ·99	142	·48	19	19	4·72	6·78	+2·06	144	32·73	Aberdeen
— ·87	58	·71	18	6	4·34	2·33	—2·01	54	29·33	Cawdor
—1·39	67	·62	18	18	9·78	5·28	—4·50	54	44·53	Fort Augustus
— ·43	94	·82	28	17	16·95	12·94	—4·01	76	83·93	Bendamph
— ·78	70	·55	18	14	5·33	3·53	—1·80	66	31·90	Dunrobin Castle
+ ·16	107	·67	19	21	4·71	3·98	— ·73	85	29·88	Wick
+1·09	122	1·30	18	23	10·93	11·44	+ ·51	105	54·81	Killarney
+1·33	142	·78	7	19	6·96	9·83	+2·87	141	39·57	Waterford
+ ·69	124	1·11	18	19	6·77	6·96	+ ·19	103	39·43	Castle Lough
— ·14	96	·99	18	19	7·22	6·34	— ·88	88	45·11	Miltown Malbay
+2·29	183	1·20	7	21	5·94	10·61	+4·67	179	34·99	Courtown Ho.
+ ·79	131	·65	7	19	5·70	6·96	+1·26	122	35·92	Abbey Leix
+ ·63	133	·59	18	18	4·07	6·07	+2·00	149	27·68	Dublin
+ ·98	137	1·02	18	18	5·77	7·98	+2·21	138	36·15	Mullingar
+ ·63	117	1·24	18	22	8·51	7·59	— ·92	89	48·90	Cong
— ·25	94	1·04	18	23	9·55	8·05	—1·50	84	52·87	Enniscoe
+ ·84	126	1·05	18	20	7·07	7·07	·00	100	42·71	Markree
+2·51	189	1·52	7	18	6·22	10·34	+4·12	166	38·91	Seaforde
— ·62	76	·90	18	11	5·75	5·60	— ·15	97	37·56	Dundarave
+ ·63	123	1·00	18	18	6·14	6·62	+ ·48	108	39·38	Omagh

SUPPLEMENTARY RAINFALL, FEBRUARY, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road .	2·66	XI.	Lligwy	1·81
,,	Ramsgate	·90	,,	Douglas	3·69
,,	Hailsham	2·75	XII.	Stoneykirk, Ardwell House...	3·42
,,	Totland Bay, Aston House...	2·62	,,	Dalry, The Old Garroch	5·22
,,	Stockbridge, Ashley..	2·88	,,	Langholm, Drove Road	3·60
,,	Grayshott	3·47	,,	Beattock, Kinnelhead	5·70
,,	Reading, Caversham Lock ...	1·81	XIII.	St. Mary's Loch, Cramilt Ldge	4·07
III.	Harrow Weald, Hill House...	1·70	,,	North Berwick Reservoir	2·17
,,	Pitsford, Sedgebrook	1·88	,,	Edinburgh, Royal Observaty.	1·81
,,	Woburn, Milton Bryant	1·85	XIV.	Maybole, Knockdon Farm ...	2·48
,,	Chatteris, The Priory	1·12	XV.	Campbeltown, Witchburn ..	4·02
IV.	Colchester, Lexden	1·26	,,	Glenreasdell Mains	3·73
,,	Newport	1·39	,,	Holy Loch, Ardnadam	7·06
,,	Ipswich, Copdock	1·08	,,	Ballachulish House	6·23
,,	Blakeney	1·22	,,	Islay, Eallabus	3·27
,,	Swaffham	1·15	XVI.	Dollar Academy	3·09
V.	Bishops Cannings	2·48	,,	Balquhidder, Stronvar	8·23
,,	Winterbourne Steepleton	4·58	,,	Coupar Angus	2·54
,,	Ashburton, Druid House	6·23	,,	Glenlyon, Meggernie Castle..	5·58
,,	Cullompton	3·72	,,	Blair Athol	2·92
,,	Lynmouth, Rock House	3·25	,,	Montrose, Sunnyside Asylum.	2·95
,,	Okehampton, Oaklands	3·94	XVII.	Alford, Lynturk Manse	2·58
,,	Hartland Abbey	2·40	,,	Fyvie Castle	2·37
,,	Probus, Lamellyn	3·82	,,	Keith Station ..	1·84
,,	North Cadbury Rectory	2·54	XVIII.	Skye, Dunvegan	7·05
VI.	Clifton, Pembroke Road	2·57	,,	N. Uist, Lochmaddy	5·13
,,	Ross, The Graig	2·26	,,	Glenquoich, Loan	11·00
,,	Shifnal, Hatton Grange	1·09	,,	Alvey Manse	1·27
,,	Droitwich	1·47	,,	Loch Ness, Drumnadrochit...	2·32
,,	Blockley, Upton Wold	2·59	,,	Glencarron Lodge	5·44
VII.	Market Overton	1·88	XIX.	Invershin	1·86
,,	Market Rasen	1·10	,,	Loch Stack, Ardchullin	5·41
,,	Bawtry, Hesley Hall	1·11	,,	Melvich	2·67
,,	Derby, Midland Railway	1·60	XX.	Skibbereen Rectory	4·60
,,	Buxton	1·80	,,	Dunmanway, The Rectory ..	8·07
VIII.	Nantwich, Dorfold Hall	1·11	,,	Cork	5·75
,,	Chatburn, Middlewood	1·87	,,	Mitchelstown Castle	4·36
,,	Cartmel, Flookburgh	2·83	,,	Darrynane Abbey	4·61
IX.	Langsett Moor, Up. Midhope	...	,,	Clonmel, Bruce Villa	4·25
,,	Scarborough, Scalby	1·61	,,	Newmarket-on-Fergus,Fenloe	2·82
,,	Ingleby Greenhow	2·16	XXI.	Laragh, Glendalough	8·47
,,	Mickleton	2·11	,,	Ballycumber, Moorock Lodge	2·91
X.	Bellingham, High Green Manor	2·91	,,	Balbriggan, Ardgillan	2·83
,,	Ilderton, Lilburn Cottage ...	2·51	XXII.	Woodlawn	3·57
,,	Keswick, The Bank	3·39	,,	Westport, St. Helens ...	4·05
XI.	Llanfrechfa Grange	4·26	,,	Achill Island, Dugort	3·44
,,	Treherbert, Tyn-y-waun	8·33	,,	Mohill, The Rectory ..	3·29
,,	Carmarthen, The Friary	4·70	XXIII.	Enniskillen, Portora	4·08
,,	Castle Malgwyn [Llechryd]...	3·17	,,	Dartrey [Cootehill]	3·17
,,	Crickhowell, Tal-y-maes	3·80	,,	Warrenpoint, Manor House ..	5·24
,,	New Radnor, Ednol	3·50	,,	Banbridge, Milltown	3·06
,,	Rhayader, Tyrmynydd	3·95	,,	Belfast, Cave Hill Road	3·24
,,	Lake Vyrnwy	3·59	,,	Glenarm Castle	4·34
,,	Llangyhanfal, Plâs Draw	2·09	,,	Londonderry, Creggan Res...	2·39
,,	Dolgelly, Bryntirion	3·22	,,	Killybegs	3·44
,,	Bettws-y-Coed, Tyn-y-bryn...	3·71	,,	Horn Head	3·24

METEOROLOGICAL NOTES ON FEBRUARY, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Very frequent though not heavy R was experienced throughout the month. The most severe frosts of the winter occurred in the first week. Temp. did not rise above 28°·3 on 4th, which with only two exceptions was the lowest shade max. recorded in February in 55 years. Temp. rose rapidly after the thaw on 6th, and remained high throughout the month. On only 5 days from 8th to the close did it fail to reach 50°. Mean temp. 43°·3, or 3°·6 above the average. Duration of sunshine 25·8* hours, and of R 44·7 hours. Evaporation ·16 in. Shade max. 58°·5 on 28th, and the highest temp. recorded in February since 1903; min. 16°·7 on 3rd. F 7, f 9.

TENTERDEN.—The first five days were cold with S; the rest of the month was warm and wet. Duration of sunshine, 58·0† hours. Shade max. 58°·0 on 28th; min. 14°·0 on 3rd. F 7, f 9.

TOTLAND BAY.—R fell on 25 days, the greatest recorded in February in 25 years. Duration of sunshine, 58·6* hours. Shade max. 52°·3 on 29th; min. 20°·9 on 3rd. F 6, f 9.

PITSFORD.—Mean temp. 40°·8. Shade max. 58°·7 on 28th; min. 15°·6 on 3rd. F 8.

NORTH CADBURY.—The month contained half of the severest and longest frost since February, 1895, and the coldest night in that time; yet a warm month with high average temp., and the warmest night in 16 Februaries. Shade max. 59°·2 on 29th; min. 15°·0 on 3rd. F 6, f 11.

ROSS.—Shade max. 58°·9 on 28th; min. 14°1. on 3rd. F 8, f 10.

HODSOCK PRIORY.—Sharp frost in the first week; very mild towards the end. Shade max. 58°·7 on 28th; min. 8°·7 on 5th. F 9, f 16.

CHATBURN, MIDDLEWOOD.—R 1·63 in. below the average of 23 years.

HULL.—Shade max. 60°·0 on 28th; min. 19°·0 on 3rd. F 6, f 12.

HAVERFORDWEST.—The first five days were cold; afterwards mild and wet. Duration of sunshine 58·2* hours.

BETTWS-Y-COED.—Cold during the early part; wet towards the close with high winds. Shade max. 59°·0 on 28th and 29th; min. 10°·0 on 4th. F 9, f 11.

CARGEN.—Shade max. 53°·5 on 28th; min. 12°·0 on 4th. F 9.

EDINBURGH.—Shade max. 53°·8 on 29th; min. 16°·8 on 5th. F 6, f 13.

COUPAR ANGUS.—The frost of January continued well into February, but high day temp. and the absence of night frosts brought up the mean temp. A sunless month with persistent light R kept back all farm work. Shade max. 58°·0 on 28th; min. 9°·0 on 5th.

FORT AUGUSTUS.—Shade max. 53°·7 on 29th; min. 8°·0 on 5th. F 9.

LOCH STACK.—Duration of sunshine, 49·5 hours.

WATERFORD.—Very mild month, and the wettest February since 1904. Shade max. 54°·5 on 21st; min. 15°·0 on 3rd. F 8.

DUBLIN.—Opening with a spell of very severe cold, February proved mild, though changeable, rainy and windy. Southerly winds prevailed. Mean temp. 43°·7. Shade max. 57°·8 on 22nd; min. 23°·8 on 3rd. F 6, f 8.

MARKREE.—Severe frost with slight S during the first few days. Very mild weather from 4th, though showery on 20 days. Shade max. 58°·0 on 28th; min. 15°·0 on 3rd. F 15, f 15.

WARRENPOINT.—A month of high winds and heavy R, but on the whole mild. Easterly winds prevailed for 20 days. Shade max. 54°·0 on 28th; min. 27°·0 on 2nd. F 4, f 7.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, September, 1911.

STATIONS (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	92·3	8	39·0	22†	73·0	50·0	52·3	79	127·7	38·0	1·31	11	3·0
Malta	90·1	17	62·6	30	81·3	71·1	66·1	73	150·0	...	1·60	3	2·5
Lagos	89·0	8	71·0	30	84·6	73·6	71·0	78	155·0	66·0	2·94	11	...
Cape Town	86·7	14	42·0	6	64·8	50·0	50·6	76	...	...	4·59	13	5·5
Durban, Natal ...	83·7	23	49·2	14	75·4	57·1	...	...	152·5	...	4·02	6	3·9
Johannesburg	86·7	23	32·9	7	72·9	49·1	39·9	51	139·7	31·9	·08	2	1·1
Blœmfontein	86·7	25	29·6	6	73·5	43·2	35·1	45	...	...	·10	2	3·0
Calcutta...	92·2	22	75·9	16	88·9	78·4	77·9	85	...	74·5	7·31	15	8·1
Bombay...	87·5	28	75·6	22	85·8	77·5	74·9	81	131·3	71·8	2·50	15	6·3
Madras	100·2	3	70·6	16	94·5	77·9	75·7	78	151·2	70·4	7·62	11	4·9
Kodaikanal	68·4	7	50·5	12	64·2	52·1	51·2	82	146·9	39·0	2·89	13	6·7
Colombo, Ceylon ...	87·5	27	72·6	8	85·9	76·1	74·5	81	153·1	70·9	4·12	18	7·0
Hongkong	92·1	17	75·0	3	86·1	77·4	73·6	78	143·9	...	6·22	10	5·7
Sydney	85·0	14	47·1	17	68·6	53·0	49·3	69	137·8	39·0	2·09	21	4·8
Melbourne	75·8	27	33·7	18	63·0	48·1	46·5	74	136·1	27·6	3·06	19	6·9
Adelaide	83·1	12	39·6	15	66·8	48·8	48·1	71	140·1	32·9	3·80	15	5·6
Perth	70·2	15	40·0	1	64·7	49·2	48·1	72	128·6	34·0	2·40	13	4·2
Coolgardie	88·2	11	34·0	1, 8	71·0	45·0	39·6	50	149·0	32·2	·10	2	2·3
Hobart, Tasmania ..	66·0	1	36·3	24	57·8	44·9	42·2	72	128·8	31·9	1·20	15	6·4
Wellington	63·0	10*	36·6	7	56·9	46·0	39·3	62	109·0	30·0	3·01	19	6·8
Auckland	65·0	11	40·0	30	60·4	47·9	46·9	76	101·0	37·0	2·70	18	6·4
Jamaica, Kingston ..	95·2	21	71·3	12	92·2	74·3	71·3	78	...	...	·86	3	5·0
Grenada	90·0	11	72·0	25	85·3	75·8	...	78	141·0	...	7·86	22	4·0
Toronto	87·3	1	34·2	14	69·9	51·2	...	...	103·4	29·9	2·57	12	4·0
Fredericton	74·2	11	26·5	29	63·0	42·7	...	80	...	...	2·69	12	6·0
St. John, N.B. ...	70·5	3	35·5	29	59·9	48·7	...	...	...	...	5·32	16	5·8
Edmonton, Alta. ...	76·8	2	19·7	22	61·2	37·8	...	75	129·2	13·2	·72	8	4·7
Victoria, B.C. ...	72·7	2	37·8	26	62·5	48·5	...	79	...	...	2·25	12	7·0
Dawson	77·0	6	12·0	19	55·8	30·7	...	...	...	...	·86	9	6·2

* and 13. † and 29.

Errata in Table for August, 1911. London, Camden Square, Average max., *for* 57°·9 *read* 80°·8; mean min., *for* 53°·0 *read* 57°·9.

MALTA.—Mean temp. of air 75°·7. Average bright sunshine 9·3 hours per day.

Johannesburg.—Bright sunshine, 305·7 hours.

KODAIKANAL.—Bright sunshine, 123 hours. TS on 12 days.

COLOMBO.—Mean temp. of air 81°·0 or 0°·3 above, of dew point 1°·2 above, and R ·55 in. below, averages. Mean hourly velocity of wind 7·4 miles.

HONGKONG.—Mean temp. of air 81°·1. R 3·40 in. below the average. Bright sunshine 211 hours, or 14 hours above. Mean hourly velocity of wind 11·4 miles.

Sydney.—Mean temp. of air 1°·9 above, and R ·80 in. below, averages.

Melbourne.—Mean temp. of air 1°·6 above, and R ·72 in. above, averages.

Adelaide.—Mean temp. of air 0°·8 above, and R 2·02 in. above, averages.

Perth.—Mean temp of air 1°·0 below, and R ·93 in. below, averages.

Hobart.—Mean temp of air 0°·7 below, and R ·90 in. below, averages.

Wellington.—R 1·25 in. below, average. Bright sunshine 151·8 hours.

Auckland.—Mean temp. below the average. R nearly one inch below average of last 44 years.

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THE ANTARCTIC EXPEDITIONS OF 1911-12.

Few of those who have followed recent polar exploration would be surprised by the news that Captain Roald Amundsen reached the South Pole on December 16th, 1911. He did so by keeping to the level surface of the great Ice Barrier for a greater distance to the south than Sir Ernest Shackleton did, and reached the surface of the great plateau at a point which left him only a short journey in the trying altitude of 10,000 feet above sea-level. The journey was made from near King Edward Land, and the detailed telegrams published by the *Daily Chronicle* on March 9th and 10th give a few notes of interest from the meteorological point of view. The lowest temperature at the base station was —74° F., but throughout the winter open water remained in sight of the Barrier. At the Pole in December the temperature was —9° F., which corresponds to a sea-level reading of +24° F.

The news of Captain Scott's expedition, received on the return of the "Terra Nova" to New Zealand on April 1st is incomplete, as the leader had not returned to his base camp when the ship left. Captain Scott had travelled southward from McMurdo Sound on the Barrier ice to the Beardmore Glacier (by which Sir Ernest Shackleton ascended to the great plateau in 1909, when he got to within 113 miles from the Pole); and he sent back a party from the Plateau 150 miles from the Pole on January 4th, 1912, stating that he was going on, and would spend a second season in the Antarctic regions. At the headquarters in latitude 77° 35′ S. very complete meteorological observations were carried on for a year under the charge of Dr. Simpson, who has returned in the ship; and observations were kept up simultaneously by the northern party at Cape Adare. These, together with the observations at Captain Amundsen's base camp near King Edward Land, will afford very interesting comparisons when the time comes to work them up. Meanwhile we note the following facts from the telegrams which appeared in *The Times* of April 2nd and 3rd, 1912. At the headquarters on McMurdo Sound the temperature during the four winter months was rarely below —40°, and at its lowest was —50° F., as compared with —58°·5 at the "Discovery's" winter quarters (78° S.) in 1903.

During a mid-winter journey to Cape Crozier, Dr. Wilson found the temperature rarely above —60° F., and the minimum was —77° F., the lowest temperature yet recorded in the Antarctic regions. When on the Ice-barrier in 83° S. on the southward march on December 4th the temperature suddenly shot up to +35° F., and the resulting thaw seriously impeded progress. Sir Ernest Shackleton observed the same phenomenon near the same place, and it may be attributed to a Föhn wind from the western mountains.

While no results of the systematic observations at the base station have arrived, we are informed that the self-recording instruments have given a continuous record of pressure, temperature, wind-velocity and direction, and that these were checked by eye-observations every four hours day and night. The upper air was investigated by means of *ballons sondes* to a height of 6 miles for direction of air current, and temperature records have been obtained from a height of 5 miles. This is the first instance of such records having been obtained in the Antarctic regions. Detailed magnetic observations were also made, and atmospheric electricity was studied. The meteorological work of previous Antarctic expeditions left several questions open for special investigation, and we do not doubt that Dr. Simpson's researches will have settled these.

INTERNATIONAL BALLOON ASCENTS.

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

November 4th, 1909.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Manchester....	England	8·1	—77	10·6	—71	56	E. by N.
Pyrton Hill....	,, ...	7·9	—89	10·9	—80	25	S. by E.
Paris.....	France	8·1	—97	10·6	—85	83	S.W.
Aachen.....	Germany....	?	?	7·1	—83	61	S. by W
Vienna.....	Austria	6·9	—62	9·5	—71	63	S.
Pavia.....	Italy.....	7·6	—77	8·5	—71	89	W. by S.
Tiflis.....	Russia	7·2	—76	9·6	—67	69	N.N.E.

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.

The temperature of —97° F. over Paris is one of the lowest recorded in Europe, as values below —90° are very rare. The heights at which the isothermal column were found are much above the average, and the directions of the drift of the balloons very various.

On November 3rd high pressure areas lay over Russia and the Atlantic with a depression over Mid-Europe. On the 4th the high pressure areas had combined and the depression moved to the south-east.

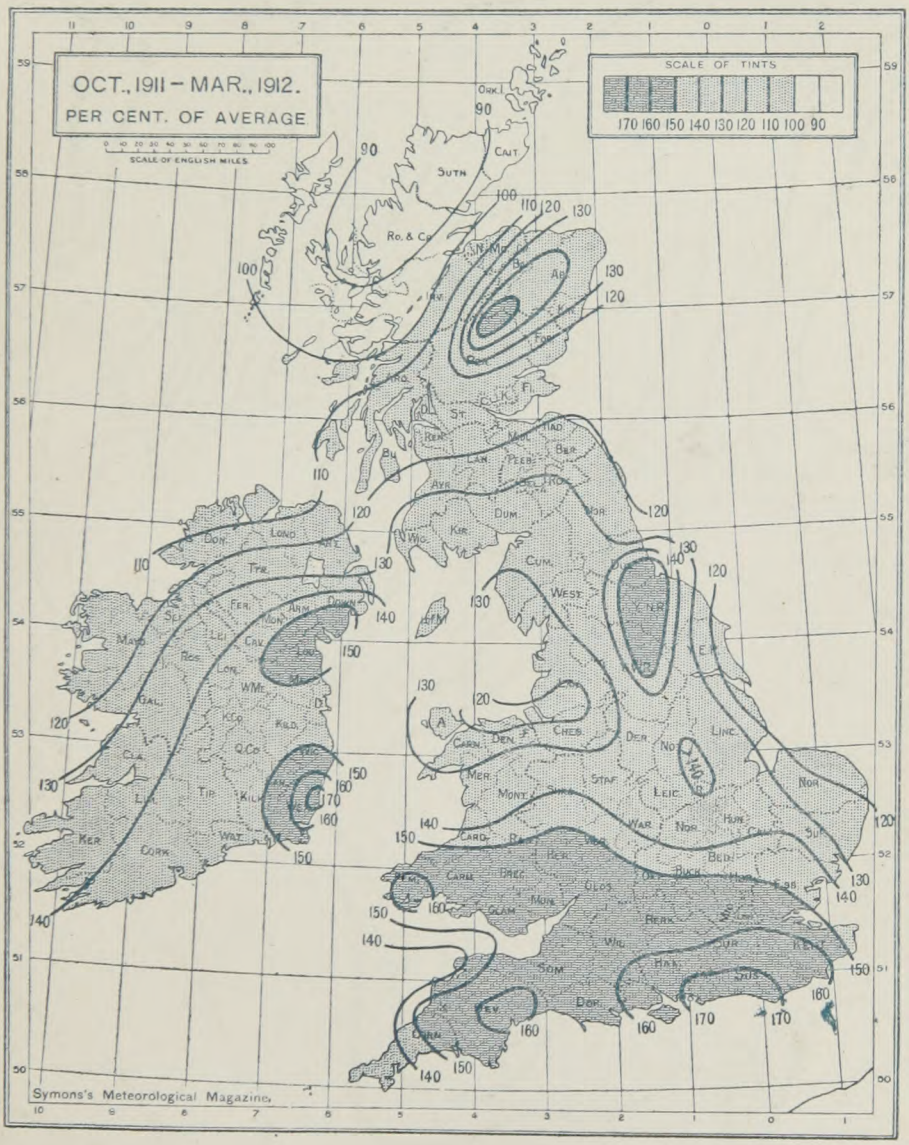
THE RAINFALL OF THE WINTER SIX MONTHS, 1911-1912.

THE remarkable drought of the summer of 1911 in the British Isles was followed by as remarkable a period of excessive rainfall, particulars of which are given in the accompanying Table and map, dealing with the winter 6 months, October, 1911—March, 1912.

The map is compiled from the percentage of the average six months' rainfall which fell at the stations quoted, supplemented by about 20 additional records for which an average is available. It shows that the rainfall was decidedly below the average in the part of Scotland which lies north and west of the Great Glen; but above the average everywhere else. In Scotland there was an excess of 40 per cent. or more only in the eastern mountain mass between Perthshire and Aberdeenshire, where a small area had an excess of over 50 per cent. In England, an excess of 40 per cent. or more occurred in two small isolated patches toward the east coast, and prevailed everywhere to the south of a line drawn across the middle of Wales through the midland counties to Suffolk. The great bulk of South Wales and the south of England showed an excess of more than 50 per cent.; the county of Sussex showing the greatest excess, over 70 per cent. for the most part, and 80 per cent. on a small area, while the greater part of Hampshire, Surrey and Kent, and patches in Pembroke and Devon, had an excess of more than 60 per cent. Comparison with the map showing the intensity of the drought of July, 1911, facing p. 130 of Vol. **46**, brings out the fact that the greatest excess of rainfall occurred to the east of the region of greatest deficiency in summer. The records of some of the stations in this region were very remarkable, though we are not in a position to say whether they are unprecedented or not. In Ireland, the same contrast of the north-west and south-east which appears in Great Britain is repeated—the extreme north-west had an excess of less than 10 per cent., while in the south-east a considerable area had more than 50 per cent., and a small patch more than 70 per cent. of excess.

The last column in the Table expresses the rainfall of the six months as a percentage of the average year's fall, and in one instance this average is actually exceeded. Speaking generally, we may say that for the south of England and Wales, the rainfall of the past six months amounted to more than the total rainfall recorded in more than one dry year. Indeed, for the British Isles, as a whole, the rainfall for the six months was greater than that for the whole year 1887, and in England, Wales and Ireland it was much greater. Because of our way of subdividing the year in the middle of winter, it may be that a succession of dry months in the coming summer will make 1912 like 1911 very nearly an average year for total rainfall; but, whether that be so or not, the remarkably wet character of the six months just past is worthy of note.

STATION	RAINFALL.			RAINFALL.	STATION.	RAINFALL.			RAINFALL.
	Oct., 1911, to Mar., 1912.	Average, October to March.	Oct., 1911, to Mar., 1912, as per cent. of Average	Oct., 1911, to Mar., 1912, as percentage of Annual Aver.		Oct., 1911, to Mar., 1912.	Average, October to March.	Oct., 1911, to Mar., 1912, as per cent. of Average	Oct., 1911, to Mar., 1912, as percentage of Annual Aver.
	in.	in.				in.	in.		
Camden Square	19·59	12·38	158	78	Cargen	35·28	24·49	144	81
Tenterden	25·02	15·31	163	91	Marchmont	22·00	17·06	129	65
Patching	30·99	17·17	181	102	Girvan	38·61	28·37	136	78
Cadland	29·21	17·89	163	92	Glasgow	22·76	19·78	115	63
Oxford	18·30	11·98	153	74	Inveraray	46·04	40·92	112	67
Wellingborough	15·51	12·24	127	62	Quinish	31·14	32·98	94	55
Shoeburyness	14·66	9·82	149	76	Dundee	15·59	14·08	111	54
Westley	17·51	12·26	143	69	Braemar	28·83	19·11	151	83
Geldeston	14·65	11·91	123	62	Aberdeen	23·12	17·32	134	71
Polapit Tamar	35·15	22·65	155	92	Cawdor	14·85	14·77	101	51
Rousdon	28·69	18·74	153	86	Fort Augustus	25·90	27·84	93	58
Stroud	23·81	15·15	157	80	Bendamph	42·82	51·06	84	51
Wolstaston	24·02	16·57	145	74	Dunrobin Castle	15·66	17·46	90	49
Coventry	20·07	14·59	138	69	Wick	14·96	16·15	93	50
Boston	15·08	11·22	134	65	**Scotland: Mean**	**26·97**	**24·39**	**111**	**63**
Hodsock Priory	16·60	11·96	139	68	Valencia	44·23	32·08	138	79
Macclesfield	18·48	17·34	107	53	Waterford	32·36	21·72	149	82
Southport	20·57	16·73	123	63	Castle Lough	30·05	21·46	140	76
Arncliffe	48·82	35·66	137	79	Miltown Malbay	31·11	23·98	130	69
Ribston Hall	20·23	13·31	152	75	Courtown House	32·84	18·80	175	94
Hull	15·25	13·17	116	58	Abbey Leix	26·23	18·51	142	73
Newcastle	16·85	13·92	121	60	Dublin	19·68	13·84	142	71
Seathwaite	97·72	76·47	128	75	Mullingar	27·28	18·37	149	75
Cardiff	35·25	23·26	152	83	Cong	32·82	27·33	120	67
Haverfordwest	43·73	27·12	161	93	Enniscoe	35·93	31·04	116	68
Gogerddan	33·32	24·58	136	73	Markree Observatory	29·89	22·97	130	70
Llandudno	18·99	16·56	115	63	Seaforde	31·24	20·34	154	80
					Dundarave	21·47	19·72	109	57
England & Wales: Mean	**26·60**	**18·89**	**141**	**76**	Omagh	25·96	20·45	127	66
					Ireland: Mean	**30·08**	**22·19**	**136**	**73**
					British Isles: Mean	**27·58**	**21·13**	**131**	**71**


OCT., 1911 – MAR., 1912.
PER CENT. OF AVERAGE
SCALE OF ENGLISH MILES
SCALE OF TINTS
170 160 150 140 130 120 110 100 90
Symons's Meteorological Magazine.

THAMES VALLEY RAINFALL — MARCH, 1912.

The monthly maps of the Thames Valley have shown the excessive rainfall of recent months in a very striking way, that for March, published in the present number, indicating the wide extent of rainfalls over 5 inches, and for the Thames Valley the rainfall of the winter six months, 1910-11, was greater than the annual rainfall of seven years out of the last twenty-nine.

THE WEATHER OF MARCH.

By FRED. J. BRODIE.

OWING partly to a large predominance of wind from a south westerly quarter, and partly to a general prevalence of cloudy weather, the mean temperature of March was above the average, and largely above it in the central and southern parts of England. In London the month was, in fact, the mildest March experienced for more than 40 years past. The effect of the cloudy skies, which were so frequently in evidence, was shown in two ways. In the daytime the ordinary rise of the thermometer was held in check, and while the mean of the maxima for the month was above the average, there was an entire absence of readings of anything like an abnormal character. Until very nearly the end of the period it seemed, in fact, extremely doubtful whether the thermometer would touch 60° in any part of the United Kingdom, but on the 25th or 26th that very moderate level was exceeded in most districts, a shade reading as high as 63° being recorded at several of the eastern, central, and southern stations. At night the cloudy weather acted as an effective hindrance to the progress of terrestrial radiation, frost being, therefore, rare, and seldom of any great severity. At only one station in the London district (Greenwich), did the sheltered thermometer at any time fall below the freezing point, a state of things without precedent in the March records of the previous 40 years. The lowest temperatures of the month occurred between the 20th and 23rd, when the thermometer in the screen fell to between 27° and 29° in many parts of England, and still lower in Scotland, the readings on the 23rd being as low as 23° at West Linton and 26° at Fort Augustus. On the surface of the grass the minimum readings about this time were as low as 19° at Rauceby and Newton Rigg, 20° at Worksop, and 21° at Durham, Burnley, and Buxton.

An almost equally sharp frost was experienced early on the 16th. In some parts of Scotland the readings on that date were rather lower than on the later occasion, the thermometer sinking to 21° at Balmoral and 25° at West Linton, but over the United Kingdom generally the frost was not so sharp. On the surface of the grass the thermometer on the 16th sank to 18° at Balmoral, 19° at Newton Rigg, and 22° at Marchmont, Durham and Worksop.

Owing to the frequent arrival of cyclonic disturbances from the Atlantic, the weather was usually in a more or less stormy condition,

with occasional heavy falls of rain, but an almost entire absence of snow. On two occasions a well-defined line squall passed swiftly from west to east across the southern parts of the country, the disturbance being accompanied in each instance by sharp thunderstorms. The first of these events occurred on the 4th, the squall passing over Valencia at 7.40 a.m. and reaching Yarmouth by 5.30 p.m. At Scilly the wind rose in gusts to a velocity of 68 miles per hour at 1.35 p.m., at Falmouth (Pendennis Castle), 89 miles at 2.15 p.m., at Pyrton Hill, 62 miles at 3.40 p.m., at Dover, 68 miles at 4 p.m., and at Kew, 60 miles at 4.30 p.m. In the evening further violent squalls were experienced along the south coast, the wind at Falmouth reaching a velocity of no less than 98 miles at 6 p.m., at Brighton, 54 miles at 6 p.m., and at Dover 71 miles in the course of the night. At several places a large amount of damage to trees and buildings was occasioned by these extremely heavy and sudden gusts. The second well-defined line squall arrived off the Cornish coast on March 21st at 7 a.m., and travelled eastward at the rate of about 50 miles per hour, the speed of the disturbance, as distinguished from the force of the accompanying winds, being much the same as in the earlier instance. London was reached at about 1 p.m., and Yarmouth at 3 p.m., sharp thunderstorms being experienced all along the route. In this case the squalls of wind were less severe than on the 4th, but a strong gale from the south-westward was experienced at most of the Channel stations.

ROYAL METEOROLOGICAL SOCIETY.

It has been the custom of the Council for some years past to arrange for a lecture to be given at the March meeting of the Society. This year they invited the eminent Swedish oceanographer, Professor Otto Pettersson, to deliver a lecture at the meeting on 20th March, and he chose for his subject "The Connection between Hydrographical and Meteorological Phenomena," the word "hydrographical" being used as equivalent to "oceanographical."

He began by saying that the mediæval age was characterised by violent climatic changes which seem to have culminated in the 13th and 14th centuries; when hot summers accompanied by droughts (which nearly dried up the rivers of Europe) alternated with cold summers and excessive rainfall. In illustration of this, reference was made to old chronicles in which it is recorded that in the years 1302 and 1324 the fruit trees in Germany blossomed in January, the vine in April, and the ripe corn was harvested in May, while the vintage began on July 25th. In winter violent storm floods occurred which entirely remoulded the coasts of the North Sea; or frost set in so severely that the entire Baltic and sometimes even the Kattegat and the Skagerak were frozen. Reference was made to the severe winters of 1048, 1224, 1294, 1394, 1407 and 1423, when the Skagerak was frozen. Hordes of wolves came over on the ice from

Norway, and in the year 1294 it was even possible to ride over the ice from Oslo (Christiania) to Denmark. The lecturer stated that such phenomena may be ascribed to alternations in the oceanic circulation caused by the influence of the moon and the sun. Experiments carried on during the last four years at Bornö, in the Gullmar fjord on the west coast of Sweden, have shown that the inflow of the undercurrent from the North Sea into the Kattegat—which brings the herring shoals in winter to the Swedish coast—is oscillatory, the boundary surface of the deep water rising and sinking from 50 to 80 feet about twice a month. The phenomenon is governed by the moon's declination and proximity to the Earth. From an examination of astronomical data, Prof. Pettersson was of opinion that the influence both of the sun and of the moon upon the waters of the ocean in winter, about the time of the solstice, must have been greater 600 to 700 years ago than at the present time. This must have caused a more intense circulation, of which we have conclusive evidence in the fact that the migrations of the herring—which now only reach as far as to the Kattegat—in those centuries extended into the Baltic. The bank water or deep water of the Kattegat in winter time must then have attained a higher level, and entered the Baltic through the Oresund. The surface layer must have been thinner; and as a thin surface layer is much more easily cooled in winter and heated in summer than a thicker one, it is evident that the controlling temperature influences of the ocean must have been different at least in northern and north-eastern Europe, whose climate in mediæval time must have had on the whole a more continental character than now.

The lecturer, in conclusion, showed that the hypothesis first proposed by A. W. Ljungman, in 1879, that the periodicity of the great secular herring fishery of Bohuslän should agree with that of the sunspots, is by no means incompatible with the phenomena here described, since the 14th century is noted in Chinese annals as an epoch of maximum solar activity, and since the sunspot frequency curve of Wolfer can be reconstructed by harmonic analysis using the moon's apside and nodal period as the basis of the analysis.

The President, Dr. H. N. Dickson, expressed the thanks of the Fellows to Professor Pettersson for his lecture.

The following gentlemen were elected Fellows of the Society, Mr. T. H. Dales, Rev. S. D. Dewey, M.A., and Dr. E. Walford.

POST-CARDS containing meteorological information in the form of tables, diagrams or maps, and with a space reserved for brief communications, are extensively utilized by the Meteorological Bureau of the Commonwealth of Australia. Several interesting specimens have been sent to us, in addition to that commented upon in a recent number of this Magazine. Their use should form a valuable means of arousing interest in the subject.

THE ARGENTINE METEOROLOGICAL OFFICE.

By WALTER G. DAVIS, Director.

THE meteorological service in the Argentine Republic was established in the year 1872, under the direction of Dr. B. A. Gould, who came to this country in 1870, to establish the National Astronomical Observatory. After two years' residence Dr. Gould was impressed with the necessity of obtaining meteorological data from as many points as possible throughout the Republic, as up to that time the climatology of the southern part—or in fact of all South America—was very little known. During the first years of the organization of this office, observations were made of the temperature, barometric pressure, direction and velocity of the wind, and the rainfall, at a limited number of stations, the work being conducted on those lines up to the time of Dr. Gould's retirement in the year 1884. The results of the observations up to that time were published in four volumes, being the results obtained from some 20 stations, so distributed as to give a general knowledge of the climatology throughout the Republic.

On the retirement of Dr. Gould the direction of the office passed to the present director. Up to the end of the year 1900 the service was carried on in the same conditions as under Dr. Gould's directorship. The number of stations at that time, that is to say, up to the year 1900, was 40 of the first order where the principal atmospheric elements were observed, and 165 rain stations. In the year 1901 the Government decreed the organization of the daily weather map, and on the 1st January, 1902, the first weather map was published, made up from the 2 p.m. observations. In September of the same year the hour was changed to 7 a.m., and on January 1st, 1904, the hour was changed to 8 a.m. Since September, 1904, two maps are made, one from the 8 a.m. observations and the other from those taken at 8 p.m., but only the former is published. From the evening observations, however, a synopsis of the weather is made, which is given to the newspapers for publication in their morning editions. The forecasts are made from the morning observations for the 36 hours following, and any change resulting from the variations during the day is noted in the evening synopsis.

At the present time the meteorological service consists of 35 stations of the first order, equipped with self-registering instruments; 156 of the second order, where observations are made at 8 a.m., 2 p.m. and 8 p.m.; 10 of the third order, being the same as those of the second order, less the barometer; and 1,600 rain gauge stations. All of these are within the limits of this Republic and of Paraguay. From Brazil observations from 12 stations are received, from Chile 10, and from Uruguay 6. Thus the daily weather map shows the meteorological conditions reigning from Para (Brazil), situated on the

Equator, to the southernmost limits of this Republic, extending over a distance of 55° of latitude, or 3,800 miles. The number of maps printed daily reaches 2,200 and is increasing almost daily. The 8 a.m. and 8 p.m. observations are sent telegraphically to this office, and the forecast is sent from the office, also by telegraph, to all parts of the Republic and the adjoining countries.

In addition to the central office in Buenos Aires there are two observatories where comparisons of instruments are made and where special meteorological observations are carried on. These are at Cordoba and at Chacarita, the latter on the outskirts of Buenos Aires; in the former, where there is a staff of forty, all the monthly observations are reduced.

At the South Orkney station, in 61° S., there is a fully equipped meteorological and magnetic station, occupied by a special commission consisting of four scientific men and a cook sent from this office and relieved every year during the month of January or February, the only season when a vessel can reach the station, as during the remaining months of the year it is ice-bound. Hourly observations have been made there, day and night, since the beginning of 1904, and the principal elements are registered by automatic instruments.

In 1903 the hydrometric service of the office was started, with the object of installing river-gauges on all the principal streams and lake outlets throughout the Republic, as well as for special studies for determining the practicability of irrigation of the contiguous lands as well as for the determination of the hydraulic power that can be developed from the water supply. At the present time there are upwards of 110 river-gauges installed at which daily observations are made. The depth of the water at the principal ports and shallow passes of the navigable rivers is published in the daily weather map, also timely warning is given of the approach of freshets in the rivers where damage is liable to be caused.

In 1904 the magnetic service was founded, with the central office at Pilar, Province of Cordoba, the office also being equipped with the necessary instruments for the observation of solar spots and spectroscopic observations of the corona, as well as for other studies of a like nature. The Observatory has also a full equipment for observations of atmospheric electricity and kite work. Determinations of the three principal magnetic elements have been made throughout the country and an isogonic chart has been published.

The office in Buenos Aires has under its charge the printing of all the publications of the different departments of the Ministry of Agriculture, employing from 80 to 100 men in the printing office.

The work of the Meteorological Office includes a seismological service, which at present is confined to the stations of Pilar and Chacarita, but will shortly embrace a line of stations from Salta to Santa Cruz, along what is practically the whole of the north to south extent of the Argentine Republic.

REVIEWS.

Home University Library of Modern Knowledge. Climate and Weather. By H. N. DICKSON, M.A., D.Sc., F.R.S.E. London, Williams and Norgate, 1911. Size 6½ × 4. Pp. viii.+256. Price 1s. net.

THIS little volume is more important than its size suggests. Dr. Dickson gives an account of climate and weather as fresh and original as his earlier book on Meteorology. He deals more with climate than weather, basing the discussion on fundamental meteorological principles. By these principles he deduces the planetary circulation of the atmosphere on the assumption that the surface of the Earth is uniform as far as thermal properties are concerned, and the forces acting on the atmosphere are simply the heat of the tropical belt, the cold of the polar area and the influence of the Earth's rotation on moving air streams. The influence of the fundamental distinctions between land and sea is then introduced, both as regards thermal effects and the action of the configuration of the land on air currents, and this leads directly to the classification of climates. The main divisions are taken as six only, based on the planetary circulation with one exception, which turns on the contrast of land and sea. They are (1) the equatorial belt; (2) the trade wind belts, north and south; (3) the high-pressure belts, north and south; (4) the west wind belts, north and south; (5) the circumpolar caps, and (6) the monsoon region of south-eastern and eastern Asia. These are broad divisions, and modifications have to be made in different localities, but Dr. Dickson does not attempt to lay down a hard and fast system of minor sub-divisions, preferring to deal with the broad types with reference to their local modifications.

The two chapters which will be read with most interest are those on Climate and Vegetation, and Climate and Man, which may be looked upon as applied climatology. In treating of vegetation, climates are divided into hot, temperate, and cold, and each group is subdivided according as it has abundant, moderate, or deficient rainfall, giving nine divisions in all. The influence of climate on man is dealt with mainly from the point of view of food supply and special attention is given to the climatic conditions of wheat-growing, that being held to be the means by which climate exercises its greatest influence on modern civilized communities; and it is pointed out that by the elaboration of new varieties wheat has been adapted to a far greater range of climates than it could stand originally. Dr. Dickson concludes the discussion thus: "one point only is clear, that the ultimate controlling factor, the one which there is least hope of being able to modify in any way—and therefore the one we need to know most about—is climate."

We very heartily recommend this book to our readers.

Our Weather. By J. S. FOWLER, F.R.Met.Soc., and WM. MARRIOTT, F.R.Met.Soc. London, Dent & Sons, Ltd., *not dated.* 6 × 3½. Pp. xi. + 131. Price 1s.

A POPULARLY and pleasantly written little book, giving an outline of the rudiments of weather lore, and addressed to the beginner rather than to the more advanced student. Meteorological ideas are at the moment being to a large extent remoulded in the hands of the physicists, and in the present incomplete stage of the process the authors wisely abstain from attempting to carry their readers too far into the unsurveyed lands of promise, and prudently confine their subject matter to the observational aspects of the science which naturally appeal most strongly to the intelligent amateur. Viewed in this light the book presents a very readable account of the methods employed in meteorological research, and provides a useful insight into the primary meaning of the results obtained. Since this object, obviously the aim of the writers, is so admirably carried out, it is perhaps unkind to be critical of *obiter dicta* as to physical facts, but we wonder why it should be considered strange (p. 18) that the sun's rays "do not warm the space through which they pass."

In matters relating to rainfall measurement we are also possibly hypercritical, but we cannot pass without comment the statement (p. 58) that on July 14th, 1875, 5 inches of rain fell in 24 hours over the *whole* of Monmouthshire. So far as we aware only three stations within the county recorded that amount and two others somewhat less, but the number of observations available is so small that in the light of modern research into the distribution of heavy rainfalls the statement is a dangerous one.

The volume is fully illustrated by numerous photographs, diagrams and maps, and the attractive cover and artistic title page of the Temple Primers form a relief to the customary "drabness" of the small textbook. C.S.

The Sugar Industry of Mauritius: A Study in Correlation. Including a Scheme of Insurance of the Cane Crop against damage caused by Cyclones. By A. WALTER, F.R.A.S., Chief Assistant at the Royal Alfred Observatory. Maps, plates, and diagrams. London, 1910, Arthur L. Humphreys. Size 8½ × 5. Pp. xvi. + 228.

To witness the practical application of scientific knowledge and methods is always a pleasure, it being the high office of science to minister to the material advancement of man's life upon the globe, and the volume before us abundantly testifies to the importance of a knowledge of climatic laws and meteorological influences as they affect the agricultural and commercial prosperity of a fertile tropical island. The subject-matter of this semi-official publication is distinctly heterogeneous, and is divisible into a large Introductory

Part, dealing with Mauritian affairs as a whole, including a general climatic survey of the island; into Parts I. and II., discussing the relation between the meteorological elements and the staple sugar crop; and into a number of Appendices, one of which explains the mathematical methods of correlation, so indispensable in modern statistical work of any kind, by means of which the influence of rainfall, temperature, wind, etc., upon the yield and quality of the sugar crop has been studied.

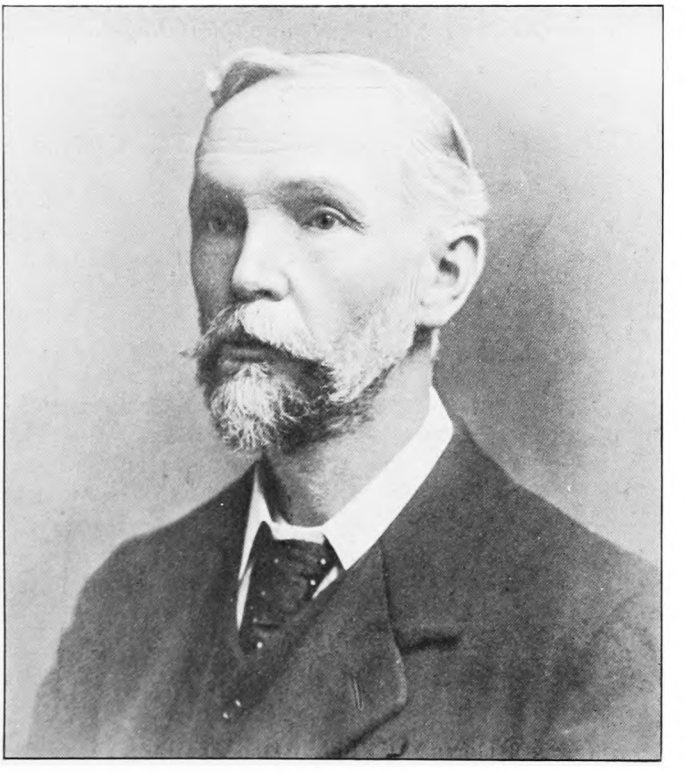
The chief climatic terror under which the Mauritians live is the dread of the "cyclone" which causes "hurricane bars" to be fitted to the doors and windows, and keeps the officials at the Royal Alfred Observatory ever on the alert. A most graphic description of the terrible devastation wrought by the unprecedented storm of April 29th, 1892, is given in several pages of text and some striking photographs. The correlation of the rainfall and sugar statistics has revealed the fact that the frequency of rain is of more importance in the formation of the crop than the amount, or, as we should put it, the raininess is of more importance than the rainfall. The "degree of wetness" of a month is represented by Mr. Walter by the combined effects of quantity and frequency of rainfall in the expression $\frac{R\,t'}{t}$, where R is the total rainfall in the month, t the number of days, and t' the number of rain days. Thus, if 5 inches fell on one day in one month, and during 20 days in another, the relative wetness of the two months is ·167 to 3·333. L.C.W.B.

The Great Star Map, being a brief general account of the international project known as the Astrographic Chart. By H. H. TURNER, D.Sc., D.C.L., F.R.S. London: John Murray, 1912. Size, 7½ × 5. Pp. viii. + 160. Price 2s. 6d. net.

SHOULD we review astronomical books? Stern Justice says, "No. Every line of your space given to Astronomy is a line stolen from Meteorology," and in general we bow to this decision. But Professor Turner is such a master of scientific irrelevance—which is a very different thing from irrelevant science—that we cannot resist the opportunity of referring to anything he writes which comes our way. Hence we allow ourselves the pleasure of welcoming his delightful little book on what is surely the greatest of all pieces of scientific work ever attempted—the mapping by photography of the stars of the whole heavens. We caught sight of the word *Fog* in the index, and hoped to find here a meteorological excuse to justify the breach of rule which we rejoice to make in this case; and on looking it up we find that we are excused, for Professor Turner uses experience in a fog happily "too thin to irritate our nostrils" to illustrate one of the most recondite properties of inter-stellar space.

RETIREMENT OF MR. R. H. CURTIS.

At the Meteorological Office, on March 30th, Mr. Richard H. Curtis, who has just retired after 51 years' service, was presented by his colleagues with a suitably inscribed silver tea service as a mark of esteem and a token of good wishes. By this retirement an interesting link in the history of the Meteorological Office was broken, Mr. Curtis being the last of the little band of workers who had been associated with Admiral Fitzroy in what was then known as the Meteorological Department of the Board of Trade. At the commencement of his career Mr. Curtis was employed in the Telegraph Room, a section of



the Office which has since developed into the Forecasting Branch. He afterwards worked in the Marine Department, side by side with the late Mr. G. J. Symons, and in 1870 he was entrusted with the charge of the Observatory Branch, a post he retained virtually until the end of his official career. In addition to his many other qualifications Mr. Curtis possessed a strong mechanical bent, and acquired an intimate acquaintance not only with the purposes but with the construction of all meteorological instruments with which

he had to deal; and his additional appointment two years ago as Superintendent of the Instruments Branch at the Meteorological Office was therefore regarded as singularly apt. Mr. Curtis was a valued Fellow of the Royal Meteorological Society, on the Council of which he served for many years. He has from time to time supplied valuable contributions to the pages of this Magazine, and we feel sure that our readers will be glad to see the excellent portrait with which we are able to illustrate this notice.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

WEATHER IN THE SEVENTEENTH CENTURY.

On looking through Mr. Sedgwick's "Weather in the Seventeenth Century" I was struck by the few references to Pepys. I think he must have taken his references from an incomplete edition. I enclose references to weather from Pepys for the winters 1663-4, and 1666-7. I have marked with a cross the references that come in Mr. Sedgwick's paper, though in several instances he has not given the whole of the reference to weather. I think that he would find in Pepys a good many more references to snow; he speaks of only 13 winters covered by the diaries of Pepys and Evelyn in which snow is mentioned; in the extracts I enclose there are two more, namely December, 1663, and December, 1666 (O.S.). By the way, the high tide given by Mr. Sedgwick as December 6th, 1663, was December 6th Old Style, not New Style, as would appear from his paper. I think the frost of January, 1666-7 should be described as certainly severe, if not very severe, seeing that there was ice on the Thames.

The dates of my references are Old Style.

In the *Quarterly Journal* of the Royal Meteorological Society for 1904, Vol. **30**, p. 264, is a paper by Mr. R. Sherward, giving weather extracts from Pepys's Diary, but his list is even more meagre than Mr. Sedgwick's.

CHARLES J. P. CAVE.

Ditcham Park, Petersfield, Dec. 16th, 1911.

1663—4.

December 4.—Cold, wet, and windy.

,, 6.—A cold day, and it began to snow (the first snow we have seen this year).

× ,, 7.—A frosty morning. Last night the greatest tide . . .

,, 8.—The very cold weather which we have.

,, 10.—The weather being become pretty warm again.

December 24.—A most foggy morning and cold, yet with a galley down to Erith, several times being at a loss whither we went.
January 18.—Played cards till 12 at night and went home in a great shower of rain, it not having rained a great while before.
,, 20.—The weather is now very warm.
,, 28.—Very cold.
February 5.—Down by water, a brave morning, to Woolwich.
,, 10.—The weather being warm.
,, 20.—A very fine evening.
,, 24.—A very fine morning.
,, 28.—Walked in the garden by brave moonshine with my wife above two hours till past 8 o'clock.

1666—7.

December 1.—I did see a cellar in Tower Street in a very fresh fire, the late great winds having blown it up.
,, 10.—A cold day.
,, 17.—It being cold.
,, 23.—It being cold and the ground all snow.
x ,, 24.—Frost and dry . . . . the snow upon the ground all day.
,, 25.—A fine frost.
,, 26.—It being a most fine frost.
x ,, 28.—A very fine walk in the frost. A most horrid cold night it was, and frosty, and moonshine.
,, 29.—Very cold.
,, 31.—It being still a very great frost and good walking.
January 1.—A bitter cold frosty day, the frost being now grown old and the Thames covered with ice.
,, 2.—Mighty cold, but dry yet bad walking because very slippery with the frost.
,, 3.—The frost continuing hard.
x ,, 6.—An excellent frosty day.
x ,, 9.—The way being most horribly bad upon the breaking up of the frost, so as not to be passed almost.
,, 24.—It proved dark, and a misly night, and very windy.
,, 27.—A fine moonshine and warm night, it having been also a very summer's day for warmth.
,, 30.—Moonshine and fair weather.
February 1.—A thick, misty, and rainy day.
,, 13.—A foul evening.
,, 17.—Fine moonshine.
,, 27.—Bitter cold weather again after all our warm weather.
,, 28.—The weather for three or four days being come to be exceeding cold again as any time this year.

[We understand that Mr. Sedgwick used an abridged edition of the famous diary—his purpose being rather to be representative than exhaustive; but it is interesting to have the more numerous references brought together by Mr. Cave in a convenient form for reference.—Ed. *S.M.M.*]

WINTER IN THE SEVENTEENTH CENTURY.

I CANNOT agree with the opinion expressed by Mr. Sedgwick and Mr. Vaux Graham that the winter climate of England is as severe as it used to be, the evidence for the opposite view seems to me clear and unmistakable.

In your December number Mr. Sedgwick states that because the roads in the winter in the seventeenth century were as a rule impassable, a fall of snow then would cause more inconvenience than now. I draw an exactly opposite conclusion. Since it was known that the roads would be impassable, stores were laid in to meet the case, and it was a matter of indifference whether the roads were blocked by snow-drifts or quagmires, neither event would call for special notice. Then Mr. Sedgwick refers to "slight falls of snow which would scarcely be noticed by town dwellers of to-day." It is town dwellers and not country folk who make an undue fuss about the weather; and surely the exaggerations and sensational headings of the daily press border on the ludicrous. A few flakes of wet snow and a moderate breeze figure as a "blizzard," and quite lately a paper not as a rule given to exaggeration reported a heavy fall of snow in London, when, on reference to the official report, it appeared that "heavy fall" was the correspondent's equivalent for ·01 inch.

I fully admit the force of the statement that Evelyn's "frozen" did not necessarily mean frozen right across, but I do not see why Mr. Sedgwick should exclude the winter of 1683-4 on the ground that it was so exceptional, especially when it is known that a somewhat similar winter occurred in 1740. That such a winter could occur at all is surely good evidence for a different set of conditions at that period.

I do not think Old London Bridge had much to do with the freezing of the river, and it is ruled out by the fact that the old records often have the words frozen both above and *below* the bridge, neither do I think the river would have frozen had the old bridge been present either in 1891 or 1895. In 1895 the river is said to have been frozen at Kingston; it undoubtedly was frozen at Oxford, but at Kingston it could not be crossed without the aid of a thick plank laid across an open channel, and half a mile up towards Hampton Court the whole expanse of water was practically free from ice. If Teddington Weir did not suffice for the complete freezing at Kingston, it is not likely that Old London Bridge would have caused the tidal portion to set at Westminster.

We have further evidence about the matter in Gilbert White's well-known Natural History of Selborne.

White gives a summary of the weather from 1768 to 1792, in which I may remark in passing snow is frequently mentioned, at least three very heavy falls occurred. The dates in the summary are not precise in the last two years, and hence I take the period of 23 years, 1768 to 1790. During these years White credits 81 weeks

with the term frost, and 48 weeks with "hard" or "severe" frost. Weeks credited with frost and rain, or weeks in April or October described as "frosty," are not included. This gives four weeks frost and two weeks hard frost as the average per winter, an amount certainly in excess of what can be fairly ascribed to any 23 consecutive winters since 1840. The question is, what did Gilbert White mean by frost? In one of his letters he describes the frost of January, 1776, and says:—"The Thames was at once so frozen over, both above and below the bridge, that crowds ran about on the ice." In his summary the words are: "Jan., 1776. To Jan. 24th dark frosty weather." In another letter he describes the damage done to plants by the frost of January, 1768. Seemingly it commenced at the end of December, and his words in the letter are: "was, for the short time it lasted, the most severe that we have known for many years." In the summary the words are: "1768. Begins with a fortnight's frost and snow." Hence it is plain that Gilbert White was not given to exaggeration. A fortnight's frost is described as "short," a frost that froze the Thames below the bridge as "dark frosty weather." Would these descriptions be used at the present time, when a couple of day's skating is considered quite an event?

W. H. DINES.

FEBRUARY STORMS IN THE UNITED STATES.

FEBRUARY of this year was one of the severest of recent years in this city and generally over the United States. The highest minimum shewn by my thermometer (made by Hicks, London) was 39°. A remarkable storm was recorded on the 21st, and 22nd. At about 3 a.m. on the 22nd, my Richard Barograph stood at 28·76 inches, while a wind of over 100 miles an hour was registered by the instruments of the Weather Bureau, which is the highest since the establishment of the Bureau in this city.

It would be interesting to know how this wind speed and the low barometer compares with the same data of the great storms experienced in Great Britain.

C. DECKER.

65, West 50th Street, New York City.

EARLY AND LATE SPRINGS.

THE following is a striking illustration of the variability of seasons. On Passion Sunday, April 4th, 1909, there were no "Palms" (willow catkins), to be had here for Church decoration because they were not yet in bloom. To-day, four days earlier, there are none to be had because the bloom is over!

ALFRED O. WALKER.

Ulcombe Place, Nr. Maidstone, Palm Sunday, March 31st, 1912.

CYCLONIC RAIN SMEARS.

THE occurrence of patches of heavy rain in cyclones as referred to by Mr. Wardale in the February number deserves more than passing mention. This patchiness has been noted by the writer in the case of many of the cyclones in the United States the smears of which have been plotted. It is interesting to note that the same conditions are found in Great Britain. A choice of isohyets for the United States could not be made which would show this patchy condition to its full extent; and the same seems to have been the case in Great Britain, as it is not brought out in the maps published in *British Rainfall.*

The study of the smears for the United States by the writer covers a period from January 1st, 1910, to October 1st, 1911, the results having been published in the October number of the *Monthly Weather Review* of the United States Weather Bureau. Smears for October and November have been drawn but no new relations have as yet appeared. The relation of the patches of heavy rainfall to the path of the cyclone and to each other, in the United States at least, is very obscure. These areas seem to be much more dependent upon the topography and the relation to large bodies of water than upon the general cyclonic motion.

In a journey from Baltimore to New York City during a cyclone the rainfall was seen to occur with the greatest irregularity. At the time the writer supposed that this was due to a slight difference between the motion of the train and that of the cyclone, the train running ahead of and falling back into the area of heavy rain. It has since seemed that the irregularity may have been due to the occurrence of the rain in patches, but the data are not complete enough to show whether this is the case.

The explanation given by Mr. Wardale that the patches are due to the formation of eddies which move around the main cyclone may be tested for cyclones which pass through regions where the data are sufficient in number and where the times of occurrence of the areas of heavy rainfall are more or less accurately known. The mode of occurrence of rainfall is of such interest and importance to the public that all studies which help to throw light upon the problem should be encouraged.

WM. GARDNER REED

University of California, Berkeley, March 7th, 1912.

[The suggestion that the patches of heavy rain in cyclones are conditioned in some way by the configuration of the country and the neighbourhood of water surfaces suggests a difference in the action of cyclones moving over an extended land surface as in the United States and across a narrow strip of land between two seas as in the British Isles. The maps of heavy rains in *British Rainfall* seem to show that the heavy rains there dealt with are independent of surface features, except in cases where the isobars are straight and parallel, *i.e.*, when the conditions are not cyclonic.—ED. *S.M.M.*]

CORRELATION—A CORRECTION.

I THINK Mr. Sutton is mistaken in supposing that a correlation coefficient is dependent upon the units adopted. If x and y be the corresponding departures of the two quantities from their mean values, to calculate the coefficient we find the value of the expression $\frac{\Sigma x y}{\sqrt{(\Sigma x^2)(\Sigma y^2)}}$. If now we express one quantity in inches say, instead of feet, we simply multiply the top and the bottom of the fraction by 12 and leave its value unaltered. Similarly for the other quantity. Hence the units are of no consequence whatever. Inches, millimetres, percentages, will serve equally well, and give the same result.

W. H. DINES.

METEOROLOGICAL NEWS AND NOTES.

OBSERVERS REPORTING TO THE METEOROLOGICAL OFFICE have been instructed by a circular recently issued to return readings of the maximum and minimum thermometers to the nearest whole degree, and when the reading happens to come to a half degree, to give the higher value in all cases. It is very properly added that no relaxation of accuracy in reading the thermometers is suggested, and that the Observer's record should continue to be entered to tenths of a degree. Another circular asks for the return of barometric pressure to hundredths of an inch only, and requires the inclusion of the correction for gravity. We hope that care will be taken to distinguish records corrected for gravity as well as temperature and altitude from those without the gravity correction as usually employed in the past.

PHILIPS' MONTHLY WEATHER CHART, which has been sent us for notice, is convenient for the plotting of daily Meteorological Observations in schools. There are four ruled forms for "Hygrometer," "Thermometer," "Rainfall" (why not Rain Gauge?), and "Barometer," and a summary for "Wind" and "Weather." The scale for temperature would not take account of our coldest winters, nor would that of rainfall accommodate our wettest days; but these facts could be utilized by the intelligent teacher to drive home the unusualness of extreme values.

TORRENTIAL RAINFALL is reported as having occurred in West Luzon, in the Philippines, in July and August, 1911. Between July 11th and August 2nd there were three typhoons, during the heaviest of which, 88 inches of rainfall were recorded at Bagnio in three days, and 32 inches within 24 hours. The mountain road leading to the town, built a few years ago at great expense, was considerably damaged by floods.

RAINFALL TABLE FOR MARCH, 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1875—1909.	1912.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	1·70	2·84
Tenterden	*Kent*	51 4	*0 41	190	1·95	3·83
Arundel (Patching)	*Sussex*	50 51	0 27	130	1·95	4·31
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·17	4·00
Oxford (Magdalen College).	*Oxfordshire*	51 45	1 15	186	1·45	2·80
Wellingborough (Croyland Abbey).	*Northampton*	52 18	0 41	174	1·69	2·30
Shoeburyness	*Essex*	51 31	*0 48	13	1·19	1·75
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·71	3·06
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·57	2·67
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·74	5·95
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·30	5·23
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·01	4·71
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·19	5·27
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	1·89	3·24
Boston	*Lincolnshire*	52 58	0 1	25	1·47	1·88
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·70	2·56
Macclesfield	*Cheshire*	53 15	2 7	501	2·50	4·43
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	2·11	4·79
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	5·17	11·63
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	1·92	3·72
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·84	2·76
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·10	1·55
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	10·63	21·26
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·89	6·96
Haverfordwest	*Pembroke*	51 48	4 58	95	3·16	7·51
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·04	9·02
Llandudno	*Carnarvon*	53 20	3 50	72	2·13	3·44
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·33	5·64
Marchmont House	*Berwick*	55 44	2 24	498	2·64	2·51
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	3·62	5·67
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·61	3·74
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	5·41	7·52
Mull (Quinish)	,,	56 34	6 13	35	4·28	4·44
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·06	2·05
Braemar	*Aberdeen*	57 0	3 24	1114	2·87	1·96
Aberdeen (Cranford)	,,	57 8	2 7	120	2·65	2·37
Cawdor	*Nairn*	57 31	3 57	250	2·35	1·57
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·79	4·02
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	7·29	6·92
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·64	3·19
Wick	*Caithness*	58 26	3 6	77	2·24	2·98
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	4·51	...
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·64	4·82
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·99	4·57
Miltown Malbay	*Clare*	52 52	9 26	400	3·11	7·10
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·28	4·26
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·59	4·23
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	1·98	2·73
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·64	4·95
Cong (The Glebe)	*Mayo*	53 33	9 16	112	3·80	5·43
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	4·36	5·99
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·33	5·79
Seaforde	*Down*	54 19	5 50	180	2·84	4·65
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·73	4·03
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·98	4·87

RAINFALL TABLE FOR MARCH, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
+1·14	167	·56	4	20	5·19	8·63	+3·44	166	25·11	Camden Square
+1·88	196	·83	4	21	5·99	9·05	+3·06	151	27·64	Tenterden
+2·36	221	·71	4	21	6·71	11·17	+4·46	166	30·48	Patching
+1·83	185	·74	5	25	7·20	11·12	+3·92	154	31·87	Cadland
+1·35	193	·44	4	22	4·85	9·17	+4·32	189	24·58	Oxford
+ ·61	136	·59	4	19	5·27	7·16	+1·89	136	25·17	Croyland Abbey
+ ·56	147	·31	4	17	3·71	5·79	+2·08	156	19·28	Shoeburyness
+1·35	179	·59	4	19	5·00	6·83	+1·83	137	25·40	Westley
+1·10	170	·50	21	21	4·51	5·76	+1·25	128	23·73	Geldeston
+3·21	217	·81	4	24	9·28	14·40	+5·12	155	38·27	Polapit Tamar
+2·93	227	·74	4	23	7·74	13·31	+5·57	172	33·54	Rousdon
+2·70	235	1·14	4	26	6·46	11·68	+5·22	181	29·81	Stroud
+3·08	240	·98	4	29	6·87	10·75	+3·88	156	32·41	Wolstaston
+1·35	171	·64	4	22	6·12	10·38	+4·26	169	28·98	Coventry
+ ·41	128	·32	4	23	4·54	5·64	+1·10	124	23·35	Boston
+ ·86	150	·40	21	25	5·04	7·41	+2·37	147	24·46	Hodsock Priory
+1·93	177	·79	14	23	7·46	8·03	+ ·57	108	34·73	Macclesfield
+2·68	227	·71	4	25	6·73	9·95	+3·22	148	32·70	Southport
+6·46	225	1·98	30	22	16·31	20·82	+4·51	128	61·49	Arncliffe
+1·80	194	·63	4	22	5·52	9·79	+4·27	177	26·87	Ribston Hall
+ ·92	150	·52	15	23	5·32	6·99	+1·67	131	26·42	Hull
— ·55	74	·30	21	19	5·63	7·46	+1·83	132	27·94	Newcastle
+10·63	200	2·62	12	28	35·03	40·48	+5·45	116	129·48	Seathwaite
+4·07	241	·78	4	30	9·61	15·64	+6·03	162	42·28	Cardiff
+4·35	238	·87	16	28	11·27	18·05	+6·78	160	46·81	Haverfordwest
+5·98	296	1·06	4	28	10·04	14·62	+4·58	146	45·46	Gogerddan
+1·31	161	·61	4	22	6·75	7·38	+ ·63	109	30·36	Llandudno
+2·31	169	·93	2	21	10·85	14·32	+3·47	132	43·47	Cargen
— ·13	95	·56	21	21	7·19	7·77	+ ·58	108	33·76	Marchmont
+2·05	157	·65	29	25	12·27	16·83	+4·56	137	49·77	Girvan
+1·13	143	·43	4	24	8·84	8·98	+ ·14	102	35·97	Glasgow
+2·11	139	·94	29	27	18·64	18·76	+ ·30	102	68·67	Inveraray
+ ·16	104	·54	12	25	14·28	12·22	—2·06	86	56·57	Quinish
— ·01	100	·28	17	24	5·98	7·02	+1·04	117	28·64	Dundee
— ·91	68	...	...	...	8·34	11·30	+2·96	136	34·93	Braemar
— ·28	89	·71	18	18	7·37	9·15	+1·78	124	32·73	Aberdeen
— ·78	67	·40	28	11	6·69	3·90	—2·79	58	29·33	Cawdor
+ ·23	106	·68	20	25	13·57	9·30	—4·27	69	44·53	Fort Augustus
— ·37	95	·78	26	26	24·24	19·86	—4·38	82	83·93	Bendamph
+ ·55	121	·35	19	23	7·97	6·72	—1·25	84	31·90	Dunrobin Castle
+ ·74	133	·41	30	22	6·95	6·96	+ ·01	100	29·88	Wick
...	...	...	...	...	15·44	...	...	...	54·81	Killarney
+2·18	182	·74	3	25	9·60	14·65	+5·05	153	39·57	Waterford
+1·58	153	·49	27	30	9·76	11·53	+1·77	118	39·43	Castle Lough
+3·99	228	1·21	25	31	10·33	13·44	+3·11	130	45·11	Miltown Malbay
+1·98	187	·57	4	23	8·22	14·87	+6·65	181	34·99	Courtown Ho.
+1·64	163	·50	20	26	8·29	11·19	+2·90	135	35·92	Abbey Leix
+ ·75	138	·44	20	24	6·05	8·80	+2·75	145	27·68	Dublin
+2·31	187	·53	27	29	8·41	12·93	+4·52	154	36·15	Mullingar
+1·63	143	·67	30	30	12·31	13·02	+ ·71	106	48·90	Cong
+1·63	137	·70	19	31	13·91	14·04	+ ·13	101	52·87	Enniscoe
+2·46	174	1·06	19	29	10·40	12·86	+2·46	124	42·71	Markree
+1·81	164	·57	20	19	9·06	14·99	+5·93	165	38·91	Seaforde
+1·30	148	·52	19	23	8·48	9·63	+1·15	114	37·56	Dundarave
+1·89	163	·55	20	30	9·12	11·49	+2·37	126	39·38	Omagh

SUPPLEMENTARY RAINFALL, MARCH, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	4·69	XI.	Lligwy	4·99
,,	Ramsgate	2·64	,,	Douglas	4·39
,,	Hailsham	4.43	XII.	Stoneykirk, Ardwell House...	4·21
,,	Totland Bay, Aston House...	3·41	,,	Dalry, The Old Garroch.....	8·01
,,	Stockbridge, Ashley..	4·93	,,	Langholm, Drove Road	7·27
,,	Grayshott	4·76	,,	Beattock, Kinnelhead	8·34
,,	Reading, Caversham Lock ...	3·55	XIII.	St. Mary's Loch, Cramilt Ldge	5·58
III.	Harrow Weald, Hill House...	3·55	,,	North Berwick Reservoir.....	2·17
,,	Pitsford, Sedgebrook.....	2·45	,,	Edinburgh, Royal Observaty.	1·77
,,	Woburn, Milton Bryan	2·75	XIV.	Maybole, Knockdon Farm ...	5·34
,,	Chatteris, The Priory.....	2·06	XV.	Campbeltown, Witchburn ..	7·15
IV.	Colchester, Lexden	2·72	,,	Glenreasdell Mains	5·79
,,	Newport.....	3·16	,,	Holy Loch, Ardnadam.....	9·56
,,	Ipswich, Copdock	3·11	,,	Ballachulish House	9·82
,,	Blakeney.....	2·09	,,	Islay, Eallabus	5·25
,,	Swaffham	3·23	XVI.	Dollar Academy	4·10
V.	Bishops Cannings	4·68	,,	Balquhidder, Stronvar.....	8·23
,,	Winterbourne Steepleton.....	6·71	,,	Coupar Angus	2·17
,,	Ashburton, Druid House.....	8·62	,,	Glenlyon, Meggernie Castle..	6·31
,,	Cullompton	7·38	,,	Blair Athol	3·65
,,	Lynmouth, Rock House	7·00	,,	Montrose, Sunnyside Asylum.	2·16
,,	Okehampton, Oaklands.....	7·24	XVII.	Alford, Lynturk Manse	2·88
,,	Hartland Abbey.....	5·73	,,	Fyvie Castle	3·30
,,	Probus, Lamellyn.....	5·45	,,	Keith Station	2·43
,,	North Cadbury Rectory.....	5·11	XVIII.	Skye, Dunvegan	6·90
VI.	Clifton, Pembroke Road.....	5·07	,,	N. Uist, Lochmaddy	4·72
,,	Ross, The Graig	4·34	,,	Glenquoich, Loan.....	16·10
,,	Shifnal, Hatton Grange.....	3·53	,,	Alvey Manse.....	1·72
,,	Droitwich	3·54	,,	Loch Ness, Drumnadrochit...	2·53
,,	Blockley, Upton Wold.....	4·95	,,	Glencarron Lodge	8·08
VII.	Market Overton.....	2·81	XIX.	Invershin	4·01
,,	Market Rasen.....	2·86	,,	Loch Stack, Ardchullin	7·94
,,	Bawtry, Hesley Hall	2·80	,,	Melvich	4·97
,,	Derby, Midland Railway.....	2·67	XX.	Skibbereen Rectory	6·27
,,	Buxton	6·54	,,	Dunmanway, The Rectory ..	6·84
VIII.	Nantwich, Dorfold Hall	3·81	,,	Cork	...
,,	Chatburn, Middlewood	6·10	,,	Mitchelstown Castle.....	4·70
,,	Cartmel, Flookburgh	6·37	,,	Darrynane Abbey.....	7·39
IX.	Langsett Moor, Up. Midhope	4·74	,,	Clonmel, Bruce Villa	4·35
,,	Scarborough, Scalby	3·48	,,	Newmarket-on-Fergus, Fenloe	4·24
,,	Ingleby Greenhow	3·71	XXI.	Laragh, Glendalough	8·79
,,	Mickleton	2·77	,,	Ballycumber, Moorock Lodge	3·93
X.	Bellingham, High Green Manor	3·72	,,	Balbriggan, Ardgillan	3·08
,,	Ilderton, Lilburn Cottage ...	2·09	XXII.	Woodlawn	4·41
,,	Keswick, The Bank.....	6·44	,,	Westport, St. Helens	5·20
XI.	Llanfrechfa Grange	7·87	,,	Achill Island, Dugort	9·16
,,	Treherbert, Tyn-y-waun	16·97	,,	Mohill, The Rectory	5·04
,,	Carmarthen, The Friary	7·30	XXIII.	Enniskillen, Portora.....	5·32
,,	Castle Malgwyn [Llechryd]...	6·34	,,	Dartrey [Cootehill]	5·14
,,	Crickhowell, Tal-y-maes.....	8·80	,,	Warrenpoint, Manor House ..	6·65
,,	New Radnor, Ednol	3·99	,,	Banbridge, Milltown	2·93
,,	Rhayader, Tyrmynydd	10·91	,,	Belfast, Cave Hill Road	4·43
,,	Lake Vyrnwy	7·17	,,	Glenarm Castle.....	5·93
,,	Llangyhanfal, Plâs Draw.....	3·03	,,	Londonderry, Creggan Res...	4·80
,,	Dolgelly, Bryntirion.....	11·93	,,	Killybegs	7·34
,,	Bettws-y-Coed, Tyn-y-bryn...	7·35	,,	Horn Head	4·08

METEOROLOGICAL NOTES ON MARCH, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—The weather throughout was remarkably changeable, dull wet periods alternating in rapid succession with bright sunshine and clear skies. The conditions were always mild, and mean temp., 46°·5, was 4°·4 above the average, and the highest recorded for March in 55 years' record. The high nocturnal temp. was very remarkable, the mean shade min., 40°·5, being the highest on record for March. There were no frosts on the screen, which also constitutes a record for March. Duration of sunshine 91·5* hours, and of R 59·8 hours. Evaporation ·79 in. Shade max. 62°·3 on 25th; min. 32°·6 on 21st. F 0, f 7.

TENTERDEN.—A warm, wet month, with a good deal of wind but none from E. Duration of sunshine, 110·0† hours. Shade max. 60°·0 on 26th and 27th; min. 31°·5 on 11th. F 2, f 12.

TOTLAND BAY.—The warmest March in 26 years. Duration of sunshine, 111·0* hours. Shade max. 55°·5 on 27th; min. 36°·0 on 20th. F 0, f 3.

MILTON BRYAN.—A showery month until the last few days. Quite a whirlwind at 4 p.m. on 4th, when trees were uprooted and many branches torn from trees in adjoining villages. Shade max. 61°·0 on 25th; min. 23°·0 on 12th. F 8.

NORTH CADBURY.—Both the R and number of rain days were the highest for March in 16 years. Abnormally warm March. Shade max. 60°·0 on 11th; min. 32°·3 on 20th. F 0, f 11.

WOLSTASTON.—Very wet, though mild, and bad for tillage. Heavy T with H at 1.20 p.m. on 4th. Heavy H and S storm on 3rd at midday. Shade max. 56°·5 on 25th; min. 31°·0. on 21st. F 1.

HODSOCK PRIORY.—The highest mean temp. ever recorded for March, and just equal to the normal for April. The nights were especially mild. Shade max. 58°·5 on 14th; min. 30°·2 on 23rd. F 3, f 15.

SOUTHPORT.—R 1·07 in. above the fall in the previous wettest March (1896) in 41 years' record. Duration of sunshine, 93·3* hours, and of R 115·7 hours. Mean temp. 45°·2, or 3°·9 above the 40 years' average. Shade max. 56°·0 on 26th; min. 33°·0 on 21st and 23rd. F 0, f 8.

HULL.—A mild month generally. Squally at times. Shade max. 61°·0 on 25th and 26th; min. 32°·0 on 21st and 23rd. F 2, f 11.

HAVERFORDWEST.—Mild and wet. Stormy at times. Duration of sunshine 105·1* hours.

LLANDUDNO.—Shade max. 56°·0 on 26th; min. 35°·0 on 21st. F 0.

CARGEN.—The R has only been exceeded in March in 1868, 1897 and 1903. Farm work was hindered by wet, the land being unfit for sowing. Shade max. 56°·0 on 25th; min. 27°·5 on 16th. F 5.

EDINBURGH.—Shade max. 58°·9 on 25th; min. 31°·9 on 21st. F 1, f 12.

MEGGERNIE CASTLE.—Wet and cold month, and very stormy near the end. A lot of fresh S on the hills. The S flakes in a very short shower on 20th were very large, some measuring 3 by 2½ inches.

FORT AUGUSTUS.—Shade max. 53°·4 on 1st; min. 26°·4 on 23rd. F 4.

LOCH STACK.—Duration of sunshine, 105·0 hours.

DARRYNANE ABBEY.—Very wet month and no day without R. The wettest March, except 1905, in 33 years.

DUBLIN.—The unsettled weather which began in October continued throughout March. Mean temp. 46°·3, or 2°·9 above the average. Shade max. 60°·2 on 25th; min. 33°·7 on 11th. F 0, f 0.

MARKREE.—Wet and mild, with a fair amount of bright sunshine. Shade max. 57°·0 on 25th; min. 32°·0 on 15th. F 2, f 15.

WARRENPOINT.—Shade max. 56°·0 on 25th; min. 36°·0 on 31st. F 0, f 0.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, October, 1911.

STATIONS (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
								0-100			inches		
London, Camden Square	63°·2	18	28°·5	29	58°·1	43°·9	46°·7	89	97°·6	27°·0	3·12	14	6·5
Lagos	89·3	31	69·0	8	85·3	73·5	72·5	75	157·0	65·0	7·98	13	...
Cape Town	84·2	3	47·4	9	71·2	55·5	56·4	79	...	...	·97	7	4·7
Durban, Natal ...	98·8	18	56·0	8	78·7	63·8	...	...	146·9	...	15·33	16	6·7
Johannesburg	86·7	20	42·8	8	74·6	51·4	49·8	68	146·2	36·6	1·73	12	3·7
Mauritius	84·4	31	55·7	6	80·1	62·8	59·1	67	154·0	47·8	·32	6	4·6
Blœmfontein	93·4	17	42·6	14	78·7	51·8	46·4	52	...	...	2·20	9	4·0
Calcutta...	90·9	3,15	68·2	31	88·0	74·8	73·7	79	...	62·7	3·45	7	3·9
Bombay...	93·0	17	73·5	29	88·7	78·0	75·0	78	136·9	66·9	·00	0	3·5
Madras	99·5	7	66·7	28	90·6	75·2	74·1	80	145·7	63·6	5·91	9	4·1
Kodaikanal	67·8	2	43·3	29	62·1	50·7	51·0	85	141·5	40·3	13·72	22	7·0
Colombo, Ceylon ...	87·4	29*	69·8	15	85·5	73·2	73·6	84	156·6	67·4	10·22	23	6·4
Hongkong	85·5	21	61·6	14	78·2	70·8	65·6	74	139·6	...	5·69	11	5·1
Sydney	88·5	23	49·1	18	70·7	55·8	50·8	63	149·1	38·0	·74	22	5·2
Melbourne	85·8	30	35·7	19	66·1	48·1	45·3	64	142·4	30·4	2·54	15	5·9
Adelaide	95·7	29	42·4	26	71·0	50·5	47·1	61	148·9	31·7	·55	7	4·2
Perth	85·7	27	43·8	1,30	72·9	51·8	48·9	61	144·7	34·2	1·01	9	3·1
Coolgardie	101·6	28	37·0	30	77·8	49·9	43·2	47	169·0	35·4	·24	2	2·9
Hobart, Tasmania ..	82·8	30	37·8	13	63·0	46·2	42·1	63	139·8	34·0	2·44	18	7·0
Wellington	64·8	7	39·2	15	59·4	48·0	42·7	67	118·0	30·0	1·97	12	5·6
Auckland	67·0	26	42·5	1	62·3	50·1	47·9	73	110·0	35·0	4·67	20	6·6
Jamaica, Kingston ..	94·9	2	71·9	9	91·7	73·5	72·4	78	...	...	1·63	7	6·3
Grenada	90·0	sev.	73·0	19	86·6	78·6	...	76	141·0	...	3·15	16	3·0
Toronto	74·6	4	27·4	28	57·7	41·3	...	...	86·0	18·7	3·57	12	4·5
Fredericton	71·0	11	23·0	15	53·9	31·5	...	77	...	...	·85	4	4·8
St. John, N.B. ...	65·5	11	27·5	28	53·0	40·1	...	...	...	...	1·08	10	5·0
Edmonton, Alta. ...	75·4	9	11·0	31	50·9	29·3	...	73	126·4	6·1	·52	2	5·3
Victoria, B.C.	66·5	7	33·5	29	57·3	42·8	...	83	...	...	·61	7	6·0
Dawson	55 ·0	10	4·0	30*	35·6	23·9	...	...	...	...	1·60	7	6·2

* and 31.

DURBAN.—The R is about 11 inches above the average for 35 years.

Johannesburg.—Bright sunshine, 275·6 hours.

Mauritius.—Mean temp. of air 1°·1, of dew point 2°·5, and R ·96 in. below averages. Mean hourly velocity of wind 9·1 miles, or 1·7 below the average.

KODAIKANAL.—Bright sunshine, 130 hours. TS on 17 days.

COLOMBO.—Mean temp. of air 79°·4 or 0°·6 below, of dew point 0°·4 above, and R 4·26 in. below, averages. Mean hourly velocity of wind 6·1 miles. TS on 5 days.

HONGKONG.—Mean temp. of air 74°·3, or 2°.0 below, R 1·12 in. above averages. Bright sunshine 214·1 hours. Mean hourly velocity of wind 13·2 miles.

Sydney.—Mean temp. of air 0°·1 below, and R 2·07 in. below, averages.

Melbourne.—Mean temp. of air 0°·4 below, and R ·12 in. below, averages.

Adelaide.—Mean temp. of air 60°·8, or 1°·1 below, and R 1·25 in. below, averages.

Perth.—Mean temp of air 1°·6 above, and R about 50 per cent. below, averages.

Coolgardie.—Mean temp. of air slightly above, R about 66 per cent. below averages.

Hobart.—Mean temp of air slightly above, and R slightly above, averages.

Wellington.—Mean temp. of air 0°·4 below, and R 1·82 in. below, averages. Bright sunshine 245·2 hours.

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THE HIGH TEMPERATURE OF THE TWELVE MONTHS, MAY, 1911, TO APRIL, 1912.

The extraordinarily high temperature records in London which have been remarked upon in these pages during the past twelve months have been maintained through April, and for the first time in the Camden Square record there has been a run of twelve consecutive months in each of which the mean temperature has been above the average of fifty years. The longest previous successions of months with mean temperature above the average were the nine months, November, 1895, to July, 1896, and the eight months, February to September, 1868. At the opposite extreme there was a succession of fourteen months with temperature below the average for each month from September, 1887, to October, 1888, and one of fifteen months from November, 1878, to January, 1880; every month of the year 1879 having had a mean temperature below the average.

In 1911 the month of April was the only one below the average; no other year in the record has had less than three months below the average temperature.

The mean temperature for the twelve months, May, 1911, to April, 1912, is 53°·1, or 3°·1 above the average. The nearest approach to this figure for any twelve successive months in the past 54 years is 52°·8 for the period, March, 1868, to February, 1869; the warmest calendar year was 1868 with 52°·3, or 2°·3 above the average, 1911 coming next with 52°·2, or 2°·2 above the average.

Five months in the twelve between May, 1911, and April, 1912, show an excess over the average of 4° or above, and three of these stand out as the warmest months of their name in the record. In May, 1911, the mean temperature was 58°·0, or 4°·0 above the average, and the highest for May in the record excepting only 1868 and 1893. The excess in June was not remarkable, but July proved to be the warmest month ever recorded at Camden Square. This was mainly due to the uncommonly high maxima, the mean shade maximum of the month being 81°·7. In this month temperature reached 80° on 20 days and rose to 90° on 5 days. August was also exceptionally hot, the mean temperature, 68°·2, being 5°·9 above the

average and the highest on record for August. In this month shade temperature readings of 80° or more were observed on 14 days, reaching 90° on 4 days and rising to the unparalleled maximum of 97°·1 on August 9th. The excess of the mean temperature over the average in September was due to the continuance of the summer conditions into the first half of the month, 8 of the first 12 days having a shade temperature of 80° or above. Temperature was only slightly in excess in October and November, but in December the excess amounted to 5°·0. December was, in fact, warmer than November, the mean temperature of which was 44°·4 as against 44°·7 in December. The mean temperature excess in January was only 1°·7, but the excess in February was remarkable. The most severe frosts of the winter occurred in the first week, but the unusual warmth of the latter part of the month raised the mean temperature 3°·6 above the average. March was also very remarkable for its warmth, both the mean temperature, 46°·5, and the mean shade minimum, 40°·5, being the highest on record for March. There were no frosts in the screen, which also constitutes a record for March. The excess of 2°·1 over the average in the mean temperature of April was chiefly due to the high shade maxima in the latter half of the month.

The following table shows the mean temperature, mean shade maxima, and mean shade minima for each of the twelve consecutive warm months, with the difference from the average. The record values are given in heavy type.

Temperature of the twelve months, May, 1911—April, 1912.

MONTHS.	MEAN TEMPERATURE.		MEAN SHADE MAX.		MEAN SHADE MIN.	
	Actual.	Diff. from Aver.	Actual.	Diff. from Aver.	Actual.	Diff. from Aver.
	°	°	°	°	°	°
May, 1911	58·0	+4·0	69·2	+4·6	47·9	+3·3
June, ,, ...	61·4	+1·3	71·8	+1·0	52·2	+1·5
July, ,, ...	**69·0**	**+5·5**	81·7	+7·4	56·9	+2·7
August, ,, ...	**68·2**	**+5·9**	**80·8**	**+8·1**	**57·9**	**+4·5**
September, ,, ...	60·4	+2·7	73·0	+5·6	50·0	+1·3
October, ,, ...	50·4	+0·3	58·1	+0·4	43·9	+0·2
November, ,, ...	44·4	+0·9	49·9	+0·8	39·3	+1·1
December, ,, ...	44·7	+5·0	49·3	+5·0	39·5	+4·5
January, 1912	40·2	+1·7	44·2	+0·9	36·1	+2·3
February, ,, ...	43·3	+3·6	48·7	+3·2	38·0	+3·3
March, ,, ...	**46·5**	**+4·4**	53·3	+3·3	**40·5**	**+5·1**
April, ,, ...	50·2	+2·1	61·1	+3·2	40·0	+0·3
May, 1911—April, 1912	**53·1**	**+3·1**	**61·8**	**+3·7**	**45·2**	**+2·5**

TEMPERATURE OBSERVATIONS DURING THE SOLAR ECLIPSE OF APRIL 17th.

IDEAL atmospheric conditions prevailed in London for observing the solar eclipse of April 17th, and during the time of the moon's passage before the sun a series of meteorological observations at Camden Square was made by Mr. H. E. Carter, acting under the instructions of Dr. H. R. Mill.

The eclipse, which was of magnitude ·92, began at 10.51 a.m., had its greatest phase at 0.11 p.m., and ended at 1.30 p.m. The meteorological observations were taken at intervals of 10 minutes from 10.40 to 11.50, at 5-minute intervals for the succeeding 40 minutes, and again every 10 minutes until 1.30 p.m.

The observations showed that there was a depression of 4°·8 in the air temperature on a Glaisher stand due to the shutting off of the sun's rays, while a thermometer laid on the grass and unsheltered from the sun showed a depression of 23°·8, and a black-bulb thermometer in vacuo showed a drop of 39° in an hour and a quarter. The lowest temperature in each case occurred simultaneously at 0.15 p.m., but the grass thermometer and solar radiation thermometer showed a tendency to fall earlier than the shade thermometer. An interesting feature of the curves is the slight depression at 11 o'clock, which is followed by a temporary recovery. At this time cumulus clouds were observed passing before the sun, and no doubt produced the irregularity in the fall of temperature. From 11.10 onwards the sky was practically cloudless, and the eclipse could be very clearly seen through a piece of smoked glass until the final stage. At 11.40 there was an appreciable lessening of the sun's light, and it was possible to see the eclipse with the naked eye. From about noon to 0.20 p.m., during the greatest phase, the sky assumed a dull leaden appearance, such as frequently heralds the approach of thunderstorms, and in the subdued light deronicum flowers in the garden showed a tendency to close their petals. The humidity of the atmosphere throughout was practically constant at 62 per cent., the 15 observations made between 11.20 a.m. and 1 p.m. showing a variation of only 2 per cent.

The readings of a Wilson Radio-Integrator were of special interest. The amount of liquid evaporated by the sun in the first ten minutes was 0·5 unit, and thenceforward there was a marked falling off in the amount until 11.55 a.m. when evaporation appears to have ceased until 0.30 p.m., after which a gradual rise took effect. The sunshine, as recorded by a Campbell-Stokes instrument, showed a gradual thinning before and thickening after the greatest phase, and a complete break in the record from noon until 0.20 p.m.

The observations made at Camden Square were as follows :—

Time.	Shade Temperature. Dry Bulb.	Shade Temperature. Wet Bulb.	Humidity.	Temp. in Sun on Grass.	Solar Radiation Temp.	Radio-Integrator.
			per cent.			units.
10.40	57°2	52°6	71	74°2	94°4	0·5
.50	57·9	52·5	69	74·2	95·2	0·5
11. 0	57·3	52·0	69	64·1	88·8	0·4
·10	57·7	52·0	67	71·5	89·3	0·4
.20	58·3	51·7	63	68·1	89·4	0·4
.30	57·2	50·2	61	69·5	85·1	0·4
.40	57·0	50·1	61	64·6	77·2	0·3
.50	55·7	48·8	61	59·5	69·5	0·2
.55	55·2	48·7	62	57·0	65·6	0·1
12. 0	54·9	48·3	61	55·0	62·2	0·0
. 5	54·3	47·9	62	52·3	58·6	0 0
.10	53·7	47·6	63	50·5	56·2	0·0
.15	53·5	47·3	63	50·4	55·8	0·0
.20	53·6	47·3	62	50·5	57·5	0·0
.25	53·6	47·4	63	53·5	60·3	0·0
.30	53·9	47·6	62	56·1	64·0	0·0
.40	54·4	48·2	63	60·5	69·7	0·1
·50	55·0	48·6	63	65·0	77·1	0·0
13. 0	55·9	49·2	61	68·4	84·4	0·1
.10	56·8	49·6	59	75·3	89·8	0·2
.20	57·6	50·2	59	77·5	94·5	0·3
.30	58·1	50·7	59	78·3	96·6	0·4

Mrs. H. R. Mill, at Mill Hill, observed the rise of temperature after the maximum of the eclipse as follows :—

Hour ...	12.10	12.20	12.30	12.40	12.50	13.0
Dry bulb ...	51°·8	51°·2	51°·4	52°·3	53°·4	53°·7
Wet bulb ...	44°·0	43°·8	44°·2	45°·0	45°·8	45°·8
Grass ...	44°·8	44°·9	46°·2	50°·1	58°·6	60°·5

Mr. J. B. Jordan, at Hythe, made observations at intervals of a quarter of an hour as given below, the temperatures in sunshine being apparently taken by a bright-bulb thermometer freely exposed to the air. It will be observed that the shade temperature dropped 8° and recovered 9°·25 by 1.30 p.m ; the sky was clear throughout.

Air Temperatures recorded at Hythe, Kent.

Hour.	In Shade.	In Sunshine.	Hour.	In Shade.	In Sunshine.
10.00	57°	67°	12.15	51°	50·5
.15	58	68	.30	51·5	52
.30	58·75	69	.45	53·5	58
.45	59	69·5	13.00	55·5	63
11.00	59	69	.15	58	69·5
.15	58·75	68·25	.30	60·25	73
.30	57	65	.45	60	72·5
.45	55·5	61	14.00	59·75	71
12.00	52·75	54	.15	59	70

Mr. W. W. Bryant has kindly furnished us with the following series of observations taken at the Royal Observatory, Greenwich, in the Magnetic Pavilion enclosure. The intervals of time are closer than in the Camden Square series, and the result differs somewhat remarkably. The fall of shade temperature was 6°·2 as compared with 4°·8 at Camden Square, but the rise to 1.30 was only 4°·1 as compared with 4°·6 at Camden Square. The black-bulb temperature at Greenwich fell 47°·2 as compared with 38°·6 at Camden Square, and the rise to 1.30 amounted to 43°·2 as compared with 40°·8 at Camden Square.

Observations in Magnetic Pavilion Enclosure, Greenwich.

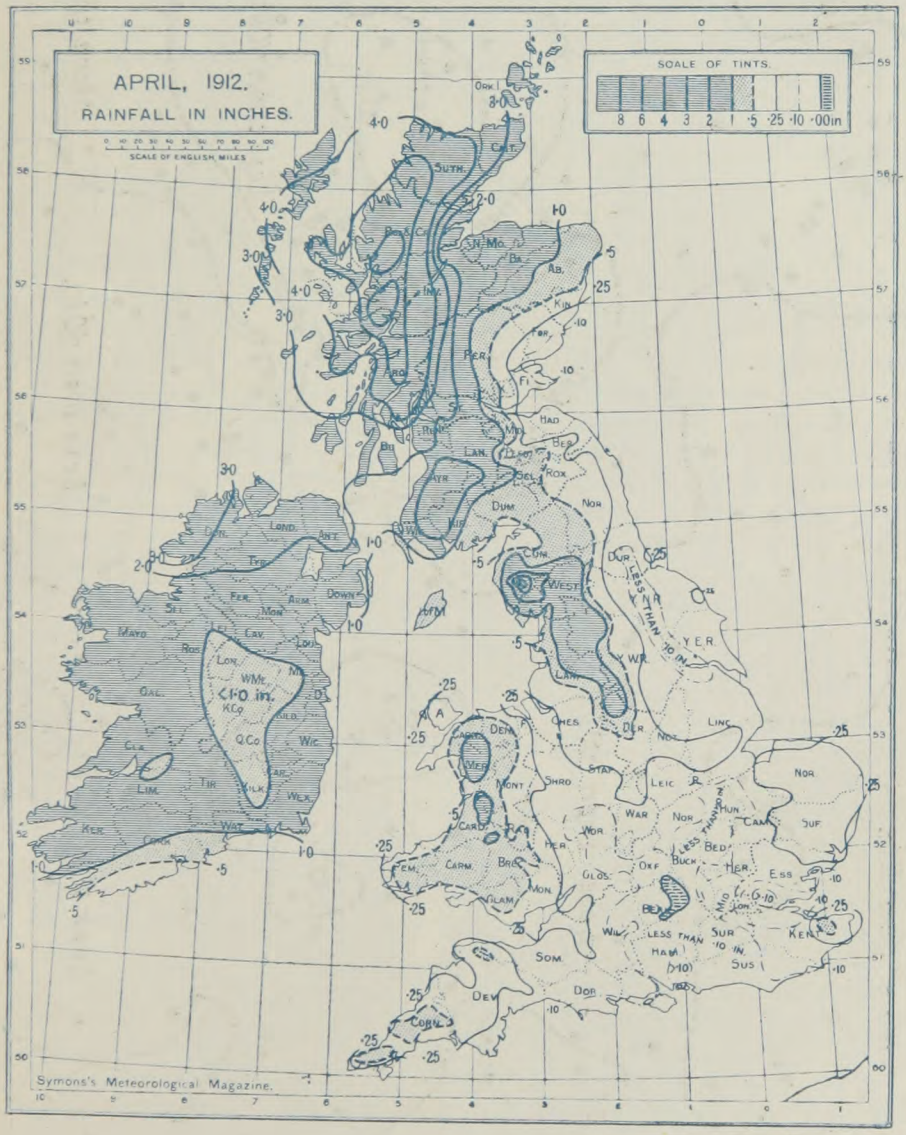
Hour.	Dry Bulb.	Wet Bulb.	Black Bulb in Vacuo.	Hour.	Dry Bulb.	Wet Bulb.	Black Bulb in Vacuo.
	°	°	°		°	°	°
10.35	57·1	49·7	75·8	12.15	52·3	42·5	57·0
.37½			80·9	.17½			56·8
.40	57·5	48·5	87·9	.20	52·0	42·7	56·8
.42½			92·8	.22½			57·5
.45	57·5	47·0	97·5	.25	52·3	42·5	58·6
.47½			98·8	.27½			59·6
.50	57·3	47·3	100·0	.30	52·4	42·7	60·8
.52½			100·3	.32½			62·1
.55	58·2	48·0	101·6	.35	52·5	42·9	63·9
.57½			102·3	.37½			65·2
11. 0	57·8	47·6	103·8	.40	53·2	43·7	67·7
. 2½			104·0	.42½			69·8
. 5	57·4	47·0	101·7 Wind freshening.	.45	53·2	43·0	71·0
. 7½			97·8	.47½			73·0
.10	57·3	46·8	97·3	.50	53·6	43·5	75·2
.12½			96·9	.52½			77·1
.15	57·3	46·1	96·6	.55	54·0	43·7	79·3
.17½			96·6	.57½			81·7
.20	56·6	45·6	95·5	13. 0	54·4	43·9	82·8
.22½			95·0	. 2½			84·6
.25	56·3	45·7	93·3	. 5	54·5	44·0	86·6
.27½			91·9	. 7½			88·2
.30	56·0	45·7	88·5	.10	54·9	44·4	89·9
.32½			86·8	.12½			91·4
.35	55·5	45·3	81·9	.15	55·0	44·1	92·9
.37½			81·2	.17½			94·3
.40	55·8	46·1	79·2	.20	56·1	45·4	95·0
.42½			78·2	.22½			97·0
.45	54·9	44·9	75·8	.25	56·2	45·3	98·0
.47½			75·1	.27½			99·3
.50	54·5	44·6	73·1	.30	56·1	45·4	100·0
.52½			71·5	.32½			100·5
.55	54·1	44·3	69·7	.35	56·2	45·4	101·0
.57½			67·0	.37½			100·5
12. 0	53·5	44·0	65·9	.40	56·6	46·0	101·3
. 2½			64·0	.42½			101·9
. 5	53·1	43·0	61·9	.45	56·7	46·0	101·3
. 7½			60·5				
.10	52·4	42·8	59·0				
.12½			57·8				

THE RAINFALL OF APRIL 1912.

APRIL was an exceptionally wet month in the west of Scotland, practically the whole of which, north of the Clyde, had more than 4 inches of rain, large areas more than 6 inches, and a few wet spots more than 10 inches. A record of 25 inches from Loan, Invernessshire, has been received, and while it is difficult to assign bounds to the possible this value seems beyond the probable and we are investigating the circumstances before accepting the figure. The east of Scotland on the contrary was very dry, having less than 1 inch for the most part, a broad margin round the coast, south of Aberdeen, with less than half an inch and a pretty large area round the Firth of Tay with less than one-tenth of an inch for the whole month, no rain at all being reported from Montrose. The distribution of rainfall thus intensified the natural contrast between east and west.

In Ireland the rainfall was little under the average for the month; very little of the country had less than 1 inch of rain, or more than 3.

In England and Wales April was extremely dry, and the drought was widespread throughout the length and breadth of the land. Indeed, so far as we can judge from a hasty comparison of former dry months, no month in the past sixty years has had less rain in England except February, 1891. We may say with confidence that no previous April since the establishment of the British Rainfall Organization has been so dry. We have accordingly supplemented our usual treatment of monthly rainfall by a map of the British Isles showing the isohyetals of ·50, ·25 and ·10 in. as well as the inch lines. The effect is seen most remarkably in our usual map of the Thames Valley, on which no higher isohyetal appears than ·25 in. and the greater part of the area lies within the ·10 in. line, while from Maidenhead to Wallingford the valley of the Thames and the section of the Chiltern Hills to the north seem to have had no rain at all throughout the month. The map of the British Isles once more brings out in extreme prominence the tendency for the north-west and south-east to deviate to opposite sides of the average. We are overwhelmed with letters from Observers in all parts of the dry area, and these have materially supplemented the ordinary monthly returns used in compiling the maps, but to our regret we are unable to deal more fully with the communications. As regards London, we have taken some trouble to ascertain whether there has ever been so dry an April since records were started. At Camden Square, since 1858, no April has had so little rain as in 1912 (·04 in.), and only one month, February, 1891, with ·01 in., had a lower figure. The record at Greenwich Observatory and other London records go farther back, and there was no year back to 1781 without one or more rainfall stations reporting in the London district. Records are also available for 1774-79 and 1729-35, and in all these there were only two Aprils (1817 and 1840) which had less than ·10 in. of rain in London, and these had each ·06. Twenty months altogether had less than ·10 in., and of these only five had less than ·04 in.


APRIL, 1912.
RAINFALL IN INCHES.
SCALE OF ENGLISH MILES
SCALE OF TINTS.
8 6 4 3 2 1 ·5 ·25 ·10 ·00in
4·0
3·0
2·0
1·0
·5
·25
·10
1·10 in.
LESS THAN ·10 IN.
Symons's Meteorological Magazine.

THAMES VALLEY RAINFALL — APRIL, 1912.

ALTITUDE SCALE: Below 250 feet | 250 to 500 feet | 500 to 1000 feet | Above 1000 feet

SCALE OF MILES: 0 5 10 15 20

Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir.

Rainfall Stations reporting ●

Isohyetals.

THE WEATHER OF APRIL.

By FRED. J. BRODIE.

AT the beginning of the month a strong northerly wind blew in the rear of a rather deep barometrical depression which had passed eastwards across the United Kingdom at the close of March. The weather was, therefore, cold and changeable, with showers of hail, sleet, or snow in most districts; and on the night of the 1st a sharp frost was experienced, the sheltered thermometer falling to between 3° and 5° below the freezing point at many inland stations, and to 10° or 12° below it on the surface of the grass. With the advance of a large anticyclone from the Atlantic the weather improved, and temperature rose steadily to about its normal level for the time of year. On the 2nd the anticyclone extended over practically the whole of western Europe, but soon receded in a southerly direction, and a mild current of air from west and south-west extended over the entire kingdom. On the 5th and 6th the thermometer rose above 65° in many parts of England, a maximum reading of 68° being recorded at Greenwich and in some parts of our eastern counties, and a reading of 69° at Geldeston and Clacton-on-Sea. On the 7th the southern anticyclone spread northwards, but on the 8th (Easter Monday), the weather in all but the southern districts was affected by a depression of considerable intensity which passed swiftly eastwards along the north of Scotland. During its progress strong gales from W. and N.W. were experienced, the wind at Aberdeen reaching, in gusts, 71 miles per hour. For a time the wind remained in a north-westerly quarter with cool but improving weather, and on the nights of the 10th and 11th sharp frosts were experienced very generally, the thermometer in the screen falling to 20° at Balmoral and West Linton. On the grass a reading of 16° was recorded as far south as Kew, and a reading of 14° at Birmingham and Newton Rigg, Cumberland. After the 11th a large anticyclone extended over the country from the Atlantic with warm days, but with cold nights and sharp ground frosts on the early mornings of the 17th and 18th. On the 18th the exposed thermometer fell to 22° at Greenwich, to 21° at Wisley and Rauceby, and to 20° at Birmingham. Between the 18th and 20th the anticyclone receded to the eastward, and with a large depression over the Eastern Atlantic the wind drew into S. or S.E., with a decided rise of temperature. The highest readings of the month were recorded between the 19th and 21st, when the thermometer rose to 70°, or a trifle above it in many parts of the country (as far north even as central Scotland), and touched 73° at Camden Square. After the 21st the anticyclone remained in possession of the situation until the end of the month. The wind blew mainly from points between north and east, so that the thermometer in the daytime failed to rise to any high level, though with a clear sky the nights were cold. The lowest night temperatures occurred at the close of the month, chiefly between the 28th and 30th, when the sheltered thermometer

fell to 4° or 5° below the freezing point in several parts of Great Britain. On the surface of the grass readings below 20° were registered very commonly.

The mean temperature of the month was everywhere above the average, and in London the mean of the daily maxima was the highest recorded in April since 1894. Bright sunshine was unusually prevalent. At Westminster the total duration, 215 hours, was 101 in excess of the normal, and although slightly smaller than in 1909, was larger than in any other April of the 29 years 1883—1911.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April 17th, at the Institution of Civil Engineers, Great George Street, Westminster, Dr. H. N. Dickson, President, in the chair.

Mr. J. E. Clark and Mr. R. H. Hooker presented the "Report on the Phenological Observations for 1911." For the past twenty years this report has been prepared by Mr. E. Mawley, but as he is no longer able to do so, the work has been taken over by Messrs. Clark and Hooker. For the present the observations are being continued on the same lines as hitherto. The outstanding features of the weather during the past year were the severe cold of early April; the summer of abnormal dryness, heat and sunshine; and the continuous rainfall when once the drought thoroughly broke about mid-October. After referring to the flowering of plants, the appearance of insects, and the song and migration of birds, the authors dealt with the yield of farm crops, and showed that potatoes and wheat were above the average, but most of the other crops were below the average, especially beans, roots and hay. Throughout Great Britain harvest began generally a fortnight to three weeks earlier than usual, and the duration was very short, the termination of the harvest being fully a month earlier than the average.

An interesting discussion followed, in which most of the speakers congratulated the authors on the way in which they had handled the facts in the report. Colonel Rawson and Mr. Southall referred to the great effect of sunshine upon plants. Mr. H. Mellish said that the season did not prove to have been so early as might have been expected. There was an exceptionally early harvest, but flowering plants were on the average only three to five days earlier than usual. This raised the question whether flowering was the stage which showed the full effect of the weather so well as some other stage, such as the ripening of the fruit, might do. Mr. Bayard, Mr. Bryant, Mr. Brodie, Mr. Gold and Mr. Tripp also spoke.

Mr. R. G. K. Lempfert and Mr. H. W. Braby contributed a joint paper on "A Method of summarising Anemograms." The tabulation of the hourly values of wind velocity and of wind direction as recorded by many anemometers in the British Isles forms part of the

routine work of the Meteorological Office, but little has been done hitherto to summarise the tabulations. The authors have made a preliminary discussion of a few records, and in this paper they gave the results of the total run and the mean velocity in the form of wind-roses for four stations which had been selected as being typical of the extreme north, the extreme south, the east coast, and the west coast of Great Britain, viz., Deerness, Scilly, Yarmouth and Holyhead. The period dealt with was the twenty years, 1891–1910, and the wind-roses were for the months of January, April, July and October.

Mr. Hooker, Mr. Bayard, Colonel Rawson, Mr. Gold and Mr. Tripp took part in the discussion, and Mr. Lempfert replied.

The following gentlemen were elected Fellows of the Society :— Lieut. F. C. Cadogan, R.N., Capt. H. D. Groom, Capt. J. R. Moore, Mr. W. G. Reed, Mr. W. E. Rees, Mr. D. M. Sen and Dr. A. E. R. Weaver.

At the Meeting of the Royal Meteorological Society on February 21st, Mr. S. Skinner read a paper on "The Drosometer; an instrument for measuring the amount of Dew." This consists of a hemispherical glass vacuum-jacketed vessel, of the type designed by Sir James Dewar for holding liquid air, which is placed in a box having a circular aperture in the top, through which the cup is exposed, with its rim flush with the exterior surface of the box. When this is exposed to the sky the glass radiates and cools until dew is deposited on the interior of the hemispherical cup. The cup has a diameter of 11·2 centimetres, and therefore exposes a virtual surface aperture of 98 square centimetres to the sky. As the vacuum at the back of the cup is an exceedingly good non-conductor, it follows that the heat which is lost by radiation from the inner surface of the cup must be drawn from the air in the cup, and as soon as this is reduced to the dew point, moisture begins to form on the glass. As the dew separates, the latent heat of the water warms the inner glass surface, and the air from which the dew has been taken. This heat is removed by further radiation from the cup, and in this way the air in the cup gradually becomes colder and drier. If now fresh air is brought in, that will go through the same process, and will add to the quantity of water collected in the cup. In the morning, after an exposure during a clear night, the small drops separated on the glass have run together, and a circular pool is found at the bottom. To measure the volume of water in this circular pool, the author takes a pair of dividers and opens them until they just stretch across the diameter of the pool. With the aid of a curve which had been constructed by plotting diameters of the pool when measured quantities of water were run into the cup, it is possible to reduce the measurements to cubic centimetres. The cup is generally exposed at sunset and taken in in the morning before the rays of the rising sun have reached the place where it stands. A rain gauge is placed by the side of the drosometer, and consequently the presence of rain in any appreciable quantity can be recognised at once.

IMPRESSIONS OF THE ARGENTINE METEOROLOGICAL SERVICE.

By THE EDITOR.

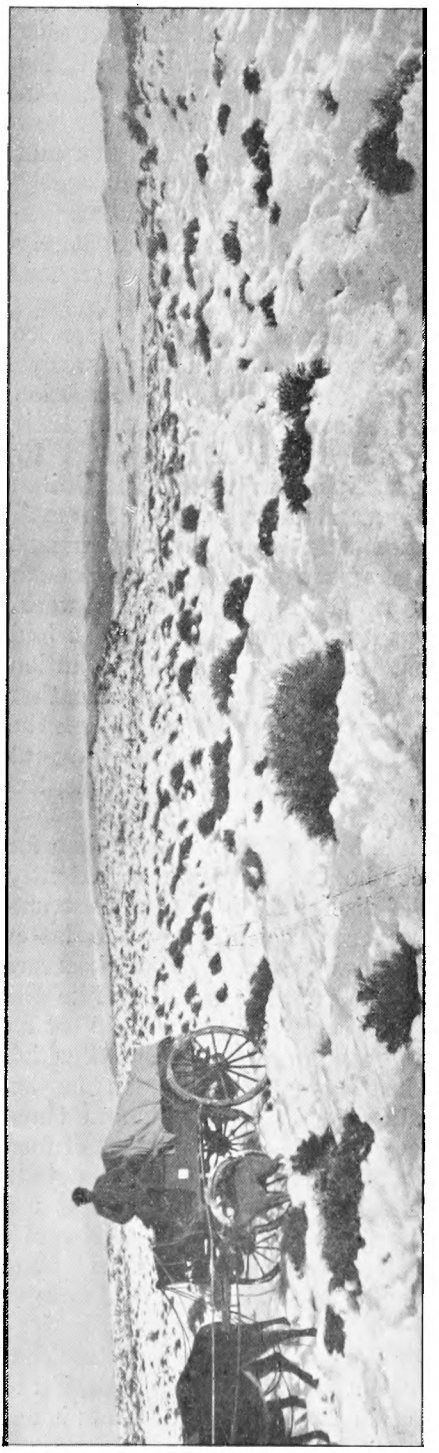
A RECENT visit to South America, gave us an opportunity of seeing something of the amazing development of the natural resources now going on in the southern republics and in Argentina in particular. There one learns at least how climate dominates the exploitation of a country. There is probably no part of the world in which a knowledge of the climate is of smaller practical importance than in western Europe. This arises mainly from the fact that the modes of life, the methods of agriculture, and the supply of power have all been imperceptibly moulded by the climatic environment until they have come into nearly complete adjustment with the natural conditions, generations of practical experience having dictated the "rules-of-thumb" by which the work of daily life is best carried on. Thus it is only in exceptional cases of destructive gales, sudden floods, or prolonged droughts, or when a source of water supply for a great community has to be found, that practical people are forced to recognise the necessity of detailed scientific study of the factors of climate. But for such occasions, the study of meteorology would be looked on merely as a hobby, like stamp-collecting. In a new country, where an alien and recently introduced population is engaged in developing the natural resources of a vast region in which the sharpest climatic contrasts occur and where there is no body of inherited practical experience to draw upon, the systematic study of climate becomes a matter of such urgent public importance that it has forced itself on the attention of communities who care little for pure science. In such a country there is no body of leisured and enlightened public to whose voluntary efforts recourse can be had as in the British Isles, and to a less but still an important degree, in North America, and thus what information is to be obtained must be organized by government departments.

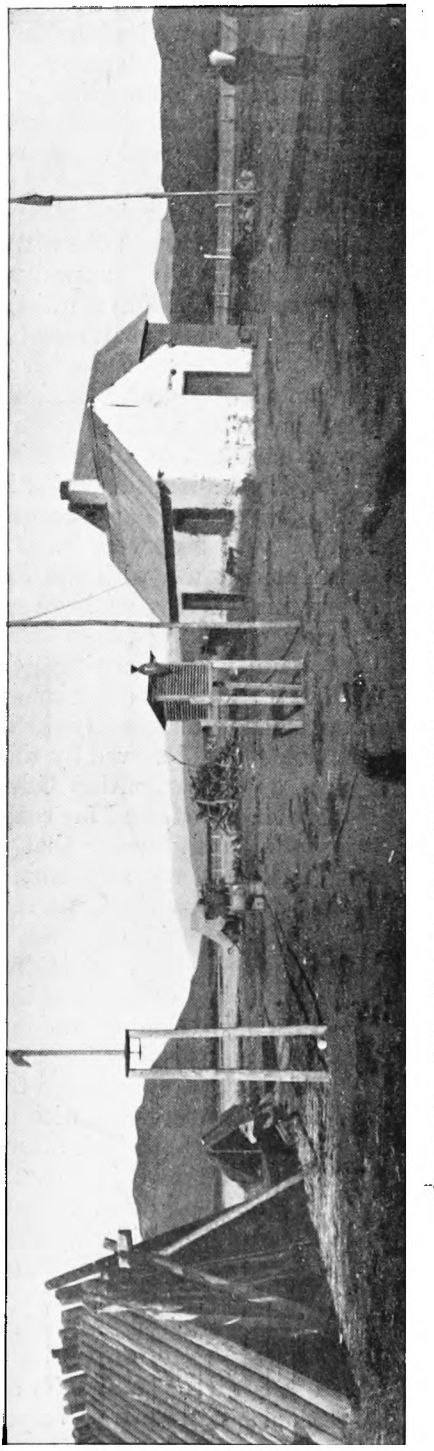
The interesting article in which Mr. Walter G. Davis the director of the Argentine Meteorological Office described his department in our last number, stated the actual conditions of a service which in some respects is the most remarkable in the world. We have pleasure in being in a position to supplement his facts by a few comments from personal observations presenting a point of view from which his modesty excludes him.

The southern countries of South America are of insignificant breadth from east to west, but of enormous length from north to south, spanning nearly half the tropical and the whole temperate zone almost from the equator to the edge of the Antarctic regions, and the whole scale of altitude from sea-level to the summits of the Andes above 20,000 feet. Chile presents only the western slope of the Andes and the Pacific coast-line making the treatment of its climatology remarkably simple; but Argentina has to do with a vast low-lying plain between the eastern slope of the Andes and the coast-line on the Atlantic. For a complete

view of the climatic conditions of temperate South America both are required; but the heavier burden falls on the Argentine. It is not easy for a European meteorologist to realize how heavy this burden is, for the distribution of population is even more unsymmetrical than in South Africa or Australia, so great is the concentration in the few large towns, so scattered the settlers upon the land. In all new and rapidly developing countries the class which contributes most largely to voluntary meteorological observations, and which alone makes possible the minute study of the distribution of rainfall, is almost entirely absent. This class in Europe and especially in the British Isles consists of people who have retired from active work, or who have sufficient means and character to live a life of unpaid public service humorously termed "leisure," or who are possessed of sufficient wealth and are sufficiently under the influence of an educated public opinion to maintain estates on which such observations are carried out by their employees as part of the routine. This class is supplemented by educational and scientific institutions, and in a country like the United Kingdom leaves little but organization and the provision of a small number of paid observers for exceptional duties to the Government Department charged with the national study of weather, or to such voluntary institutions as have grown up to supplement official work. In the new countries, where leisure and education have not yet had the opportunity of becoming general, practically the whole burden of providing as well as organizing the observations on which a weather service depends necessarily falls on the Government, and when the Government is well served by the director responsible for carrying out this work, as the Argentine Government is served by Mr. Davis, the results are enormous and far reaching.

It is common knowledge that work is better done for love than for money, and that an amateur, once he has become sufficiently instructed to realise the importance of discipline, is far more trustworthy than a paid observer, however conscientiously the latter desires to earn his pay. A staff of several thousand paid observers requires a thorough system of inspection, and, in a country like the Argentine, inspection is no mere holiday task. One trip of an Argentine meteorological inspector in Patagonia, particulars of which we heard, involved an absence from head-quarters of thirteen months, during which he travelled with a train of thirteen mules and three peons, or labourers, to look after them, carrying about 2 tons of food and camping materials in a cart, at a total expense of 4,000 dollars (about £350) in addition to salaries. The cost certainly does not appear excessive, considering the time spent and the distance covered. We are able to give two photographs (Figs. 1 and 2) taken by one of the inspectors, Mr. Mackinlay (who, despite his name, has been so completely naturalized in South America, that he speaks no English), showing the mode of travelling over the snow-covered and trackless plains of southern Patagonia, and also a typical observing station in that region. The work of inspecting in the outlying districts is not





Figures 1 and 2.—Travelling in Patagonia and A Typical Meteorological Station.

without risk, and Mr. Davis mentioned one occasion on which a mule carrying six Fortin barometers was lost by falling over a precipice while he was making his way along a difficult track in the Andes.

The central Meteorological Office in Buenos Aires, under Mr. Davis, is continually expanding the sphere of its utility. When we were there at the end of January this year, the number of rain gauge stations in the country (in addition to 240 stations with other observations) was 1,700, but it was intended to start 600 new rain gauge stations by the end of April, bringing the total up to 2,540. As the greater number of these stations report by telegraph daily when rain has fallen, the task of checking the returns as they come in is a gigantic one. We saw in preparation a new blackboard table map of the Argentine Republic on a large scale, showing all the rainfall stations, each represented by a metal socket let into the wood, with its name printed by the side. Each day's rainfall is represented on this map by a pin dropped into the socket, a distinctive colour being used for each of a selected series of ranges of amount, so that when the whole number of stations reporting has been approximately marked, a discordant colour would at once call attention to any serious discrepancy.

The unfortunate occurrence of a railway strike made it impossible for us to visit Cordoba and to see the various departments of the Meteorological Office there. Thus we missed the pleasure of meeting Professor F. H. Bigelow, who is devoting his energy to the problems of Argentine meteorology after his many years' experience in the United States Weather Bureau. We had, however, a very interesting glimpse of the meteorological observatory at Chacarita, on the outskirts of Buenos Aires, to which we were conducted by our old friend and frequent contributor, Mr. R. C. Mossman, and where we made the acquaintance of the meteorologists in charge of the observatory. The Chacarita Observatory is a small building, a view of which from the back is shown in Fig. 3. It contains the usual self-recording instruments of a first order station and a seismograph. The vanes and pressure tubes of a series of recording anemometers occupy the top of the tower, and a large enclosure, securely netted in, as shown in Fig. 4, is filled with instruments used both for routine observations and for experiment. The thermometer screen (on the right in Fig. 3) is a large louvred room similar to that at Johannesburg (see this Magazine, Vol. **40** (1905), p. 174). Special instruments are in use for experiments on solar radiation, rainfall and evaporation. The six tall cylinders shown in Fig. 5 are the special evaporimeters, on Professor Bigelow's pattern, for the measurement of the amount of evaporation from the ground in different conditions. This is an investigation of very great importance, for the agriculture of the amazingly fruitful soil of the western plains of Argentina depends entirely on irrigation from the rivers which flow from the Andes. As the irrigation channels are open streams and ditches the loss by evaporation must be great, and the determination of the amount of this loss in different

Fig. 3.

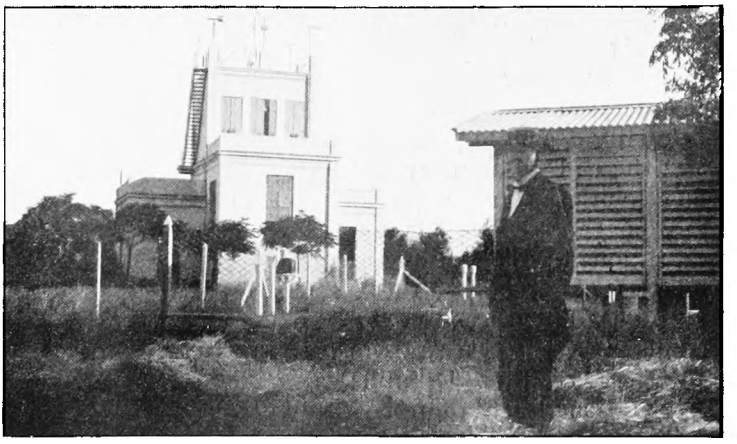


Fig. 4.

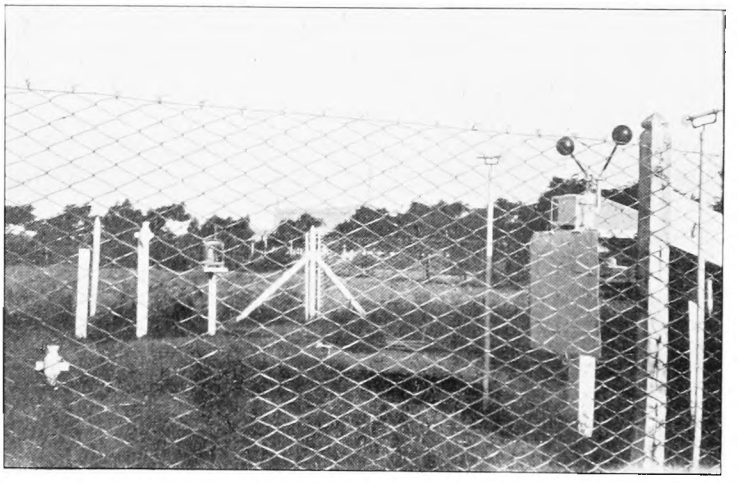
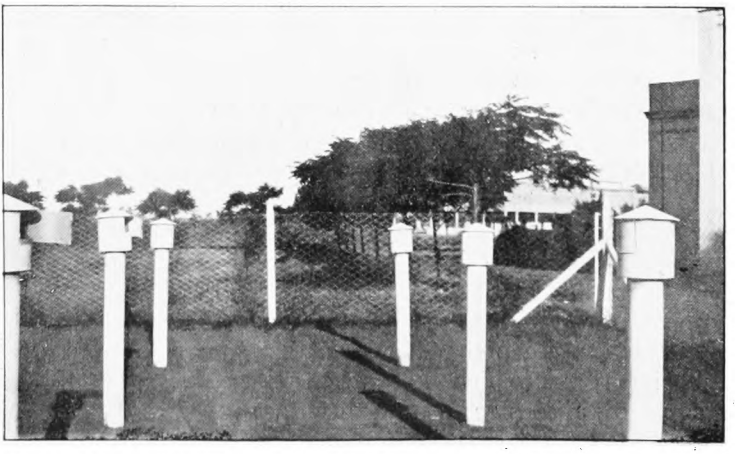


Fig. 5



Figures 3, 4 and 5.—Chacarita Observatory and Instruments.

seasons and in different districts becomes an important factor in estimating the cost and the yield of new works. If, as we believe probable, the amount of evaporation is shown to be a large fraction of the season's flow, it will doubtless be found profitable to go to the expense of covering the channels or of conveying the water in pipes to the fields where it is distributed. We look forward with interest to seeing the results of the observations.

No one who sees the enthusiasm and energy with which the work of this great meteorological office is carried on, and the rapidity and certainty of the strides with which it is being extended and developed, can feel anything except the most whole-hearted admiration for all the details of plan and management. We look at it, however, not only as a whole but in its parts, and naturally we looked more closely at the part relating to rainfall measurement, and here to our regret we find a point where our criticism cannot be expressed in terms of eulogy. This point is the construction of the official pattern of rain gauge. We demur to the construction only, because although we do not like the method of exposure on a post or on the top of the thermometer screen (see Figs. 2 and 4), we allow that an exposure at 1 ft. above the ground is impracticable in a country like Argentina as it is in South Africa, but it must be borne in mind that on the average 3 or 4 per cent. must be added to the annual rainfall of Argentina or deducted from the annual rainfall of the British Isles if quantitative comparisons are to be made between the two. With regard to the construction of the rain gauge, our feeling is that the shallow rim admits of much outsplashing in heavy rain and in loss during snowfall; this is a fairly constant loss depending only on variations in the intensity of the rain or the force of the wind. But the use of a stop-cock by which to draw off the collected rain opens a door to irregular loss which must often result in discrepancies. A tap not only invites the curious passer-by to turn it and see what will happen; but even if provided with a key it is apt to work loose and drip. Large experience has shown us that the fewer pieces of metal and the fewer openings or joints the better is the gauge.

In the retrospect of our journey around and across South America the work and organization of the Meteorological Office occupies a prominent place. We owe a special debt of gratitude to Dr. Francisco P. Moreno, the eminent Argentine geographer and man of science, for guidance and hospitality which made it possible, in a very short time, to obtain a real insight into the physical and economic conditions of the country, of which the subject of this article was merely one of the incidents. The welcome extended by Mr. Davis united with Dr. Moreno's to make our visit to Buenos Aires interesting and never to be forgotten. It was something, too, to have experienced a temperature of 97° in the shade in August, 1911, and January, 1912, though the summer heat in Buenos Aires was much more trying than that in London on account of the small diurnal range leaving the night nearly as hot as the day.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

SPRING RAINFALL AND OCEAN TEMPERATURE.

YESTERDAY I saw in *The Times* a letter on the exceptional drought in April this year, signed by Dr. H. R. Mill, which suggests the following remarks. We have had about the same weather here as in England, although the effect of the drought has not been so detrimental to vegetation in our country. April is ordinarily a dry month with us, and so, unhappily, is May also. I have put forward the hypothesis that such conditions are due to the state of the Atlantic Ocean, from which our rainfall comes. As is well known, there is a change in early spring in the meteorological conditions over the Atlantic, the great depression over its northern parts then breaking up into a number of smaller depressions, which ultimately give place to higher pressure.

The character of the cyclones which pass over Sweden and Norway in May is peculiar. Our May cyclones are small systems which pass rapidly over the Scandinavian peninsula and vanish somewhere in Finland or Russia in case they have a sufficient store of energy in themselves to pass over our mountains, but this is ordinarily not the case. They seem to be formed in the lowest part of the atmosphere, and thus are liable to be intercepted by mountain chains. They bring us showers, but not the steady rain which we would wish to have at that season of the year.

Many years ago I compiled charts showing the surface temperature of the northern Atlantic in spring, and I then found that the surface temperature in May is remarkably uniform, about 8° C. (46°·4 F.) for the whole area from Iceland to the interior of the Baltic. This uniformity of temperature is a characteristic and important fact which should be noticed and studied by meteorologists and oceanographers in the interests of agriculture. If this period of uniformity of temperature extends longer than usual, or if the ocean surface assumes this temperature earlier or later in one year than in another, it may have extremely important consequences for farmers in your country as well as in ours. I may say that a "wet" spring means an increase in the value of the harvest of Sweden equal to £10,000,000 or £12,000,000. Now, if we cannot alter our atmospheric conditions, we may at least hope to forecast them. Especially for the culture of root crops, such as turnips and beets, it would be very useful to know if we can expect a dry or a wet spring.

I think that we might arrive at this knowledge if we kept account of the state of the ocean surface and followed the changes in the surface temperature from the beginning of March to the beginning of June. At this season we have most use for surface observations, which could easily be made on board the Atlantic liners. I speak with some experience of this, as I, in company with the late

Professor Cleve and Dr. G. Ekman, instituted a system of surface observations over a great part of the North Atlantic in 1898-99. Dr. Dickson did so two years before, and later the Marine Biological Association, under the able guidance of Dr. Allen and Mr. Matthews, have kept up a record for a number of years. I think one ought first to study the material already collected and collate it with the rainfall, and then organize systematic temperature observations over the area in question. In spring this would possibly suffice for forecasting the probability of a greater or less rainfall over northern Europe. In autumn, likewise, observations on the surface temperature would be important, but at that season they must be combined with deep temperature soundings to 800 and 1000 metres at certain representative stations. The object of the observations in autumn (say November), would be to ascertain the amount of heat stored up in the upper layers of the Atlantic in order to forecast the character of the winter. Even in this case extremely valuable information could be got with relatively little work or expense, and it is to be regretted that attention has not been directed to it before. Of course the International Council for the Study of the Sea has tried to get as much information as possible, but as we have no research steamers for regular use in the Atlantic our observations there have been sporadic. Now that the United States have joined in the International work, we may hope to extend it, especially if this should be recognized as useful for Meteorology.

O. PETTERSSON.

Gothenburg, 5th May, 1912.

THE ATLANTIC ICE-DRIFT OF APRIL, 1912, AND THE UNUSUAL WEATHER OF THE SUMMER OF 1911.

THE unusually heavy drifting of ice over the Grand Banks near Newfoundland, which caused the disaster to the White Star liner Titanic on April 14th, 1912, in latitude 41° 46′ N., exactly on the agreed steamer track from England to New York, seems to fill a gap in my conclusions upon the causes of the equally unusual weather of the summer of 1911. The time agrees with the arrival near Newfoundland of ice-bergs "calved" in the preceding Arctic summer. An unusually heavy drifting may have been caused as well by storms as by earthquakes in the Arctic regions. Earthquakes are sometimes effects of heavy storms, but in any case there are no grounds for supposing that a great earthquake occurred in the Arctic regions north of Davis Strait in the first weeks of last summer. The unusually heavy drifting of ice in April, 1912, near Newfoundland, therefore, supplies one more reason for supposing that there were unusually heavy storms in the American and Atlantic areas of the Arctic regions in the summer of 1911, and thus supports my explanation of the extreme dryness of that summer in western and central Europe, and of the extreme changes observed in the weather

of these regions up to April, 1912. On the other hand, this consideration suggests the possibility of timely warning of exceptional ice movements, allowing precautions to be taken against such dreadful calamities as the shipwreck of the Titanic.

In your Magazine for March, 1907, I published a paper on "Qualitative analysis of curve diagrams," which showed a very important agreement (89 %) of the oscillations of water temperature at Horns Reef on the North Sea with the oscillations of Arctic ice near Newfoundland. This agreement related to the 14 years from 1887 to 1900. It is augmented to 94 % by taking account of the 19 years from 1881 to 1900. But, regarding the anomalous conditions of 1911, that probable connexion does not yet suffice for a sure forecast of a wet and cool summer in 1912 in western and central Europe, though such an effect is very likely.

WILHELM KREBS.

Schnelsen, Holstein, April 30, 1912.

THE MEASUREMENT OF DEW.

THE last issue of the *Quarterly Journal* of the Royal Meteorological Society provides an instance of a difficulty I have long felt in regard to "contributions to science." The practice differs in different learned societies in the matter of printing discussions, without which the value of many papers is largely discounted. Our Society follows the admirable plan of printing a full account of the discussion when held, and also of allowing the last word to an absent author. It does happen, however, at times, that a paper is read at the end of a meeting and there is no time for any discussion. An instance of this is Mr. Skinner's paper on the Drosometer, which has now appeared, as it was read, without comment. Surely this is a case where we need not use the stereotyped phrase "Comment is needless." To mention only two points that at once suggest themselves. Why should any reliance be placed on a comparison between a drosometer and an antiquated funnel and bottle rain gauge? A properly enclosed rain gauge *might* have given valuable data for comparison. Again, why should the fact that the drosometer collected more dew than the bottle be held, *ipso facto*, an advantage? Surely if the *real* deposition of dew be an important matter for measurement, the best measure would be the one that most nearly reproduced the conditions of nature, as exemplified, for instance, in a small grass plot, and not the one that collects most moisture, else why not use some hygroscopic surface at once?

I think that if you can see your way to opening a discussion in your columns, on the subject, it might serve a useful purpose, as there may well be others who have experimented on similar lines, who may be discouraged from communicating them to the Society under the circumstances.

WALTER W. BRYANT.

Royal Observatory, Greenwich, London, S.E., May 8th, 1912.

[We received an account of the paper on the Drosometer, read by Mr. Skinner at the meeting of the Royal Meteorological Society on February 21st, with a notice that the discussion was postponed to a later meeting. We were strongly impressed with the importance of a full discussion on a paper of the kind, and kept back our report until the discussion could be published along with it. We were, therefore, disappointed to find that the Society had allowed the paper to be issued before the discussion was taken; we publish our abstract on p. 73, and will welcome the views of our readers upon it.—Ed. *S.M.M.*]

WEATHER FOLLOWING WET SEASONS.

When a season is very wet, it is rare to find the next season very warm, and the latter seems more likely to be cold than warm, comparing with the average. This applies specially to spring and summer. Suppose, *e.g.*, we pick out the fifteen wettest springs (March—May) at Greenwich since 1841, and note how many hot days (with 80° or more) there were in each of these years, we find this: eleven summers (June—August) with less than fifteen, which is the average, three average, and one over average; but this last had only sixteen hot days.

The same tendency may be discerned, I think, in other pairs of seasons, and I add the following notes:—

Summer and Autumn (September—November).—Summers with more than 10 inches of rain, eight cases, and only two autumns warm.

Autumn and Winter (December—February).—Autumns with more than 8 inches, twenty-three cases; only eight winters warm.

Winter and Spring.—Winters with more than 7 inches, eight cases; only two springs warm.

I have not, in these three latter sections, dealt with the rarity of great warmth in the sequent season, but could furnish proof of this, if desired.

ALEX. B. MacDOWALL.

Mountview, Craigmore, Bute, 2nd May, 1912.

Note.—Although we have again added four pages to the normal size of this Magazine, we find that we have before us exactly twice as much matter as space permits us to insert. It has been difficult to decide what to postpone, and we have to apologize to many correspondents whose letters have to be held over, and to several publishers for the delay in inserting reviews which are ready and will, we hope, appear next month.—Ed. *S.M.M.*

RAINFALL TABLE FOR APRIL, 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1912. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	1·74	·04
Tenterden	*Kent*	51 4	*0 41	190	1·77	·14
Arundel (Patching)	*Sussex*	50 51	0 27	130	1·82	·07
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	1·98	·11
Oxford (Magdalen College).	*Oxfordshire*	51 45	1 15	186	1·67	·01
Wellingborough (Croyland Abbey).	*Northampton*	52 18	0 41	174	1·78	·11
Shoeburyness	*Essex*	51 31	*0 48	13	1·25	·09
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·62	·39
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·55	·38
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·34	·33
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·39	·14
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·09	·20
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·20	·26
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	1·96	·17
Boston	*Lincolnshire*	52 58	0 1	25	1·57	·24
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·62	·14
Macclesfield	*Cheshire*	53 15	2 7	501	2·02	·64
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	1·84	·39
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	3·73	1·81
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	1·85	·23
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·69	·13
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·84	·17
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	6·91	3·66
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·50	·42
Haverfordwest	*Pembroke*	51 48	4 58	95	2·82	·82
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·48	·65
Llandudno	*Carnarvon*	53 20	3 50	72	1·79	·42
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	2·50	·65
Marchmont House	*Berwick*	55 44	2 24	498	2·28	·27
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	2·81	1·91
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	1·86	1·38
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	3·69	5·04
Mull (Quinish)	,,	56 34	6 13	35	2·98	3·36
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	1·93	·10
Braemar	*Aberdeen*	57 0	3 24	1114	2·30	·85
Aberdeen (Cranford)	,,	57 8	2 7	120	2·23	·52
Cawdor	*Nairn*	57 31	3 57	250	1·62	1·42
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·22	4·09
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	4·70	7·34
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·02	2·24
Wick	*Caithness*	58 26	3 6	77	1·89	2·25
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·46	1·86
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·68	1·07
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·54	1·06
Miltown Malbay	*Clare*	52 52	9 26	400	2·69	1·50
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·37	1·80
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·54	·81
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·03	1·32
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·37	·85
Cong (The Glebe)	*Mayo*	53 33	9 16	112	2·98	1·41
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	3·13	1·74
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	2·52	1·58
Seaforde	*Down*	54 19	5 50	180	2·76	1·72
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·08	2·17
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·50	2·01

RAINFALL TABLE FOR APRIL, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
—1·70	2	·02	9	3	6·93	8·67	+1·74	125	25·11	Camden Square
—1·63	8	·11	18	3	7·76	9·19	+1·43	118	27·64	Tenterden
—1·75	4	·05	9	2	8·53	11·24	+2·71	132	30·48	Patching
—1·87	6	·06	9	5	9·18	11·23	+2·05	122	31·87	Cadland
—1·66	1	·01	9	1	6·52	9·18	+2·66	141	24·58	Oxford
—1·67	6	·07	9	2	7·05	7·27	+ ·22	103	25·17	Croyland Abbey
—1·16	7	·06	9	3	4·96	5·88	+ ·92	118	19·28	Shoeburyness
—1·23	24	·16	9	7	6·62	7·22	+ ·60	109	25·40	Westley
—1·17	24	·11	9	8	6·06	6·14	+ ·08	101	23·73	Geldeston
—2·01	14	·13	2	8	11·62	14·73	+3·11	127	38·27	Polapit Tamar
—2·25	6	·12	9	2	10·13	13·45	+3·32	133	33·54	Rousdon
—1·89	10	·08	2, 8	4	8·55	11·88	+3·33	139	29·81	Stroud
—1·94	12	·23	9	3	9·07	11·01	+1·94	121	32·41	Wolstaston
—1·79	9	·09	8	2	8·08	10·55	+2·47	130	28·98	Coventry
—1·33	15	·12	9	9	6·11	5·88	— ·23	96	23·35	Boston
—1·48	9	·13	9	2	6·66	7·55	+ ·89	113	24·46	Hodsock Priory
—1·38	32	·45	9	6	9·48	8·67	— ·81	91	34·73	Macclesfield
—1·45	21	·26	9	4	8·57	10·34	+1·77	121	32·70	Southport
—1·92	49	·82	9	4	20·04	22·63	+2·59	113	61·49	Arncliffe
—1·62	12	·08	9	8	7·37	10·02	+2·65	136	26·87	Ribston Hall
—1·56	8	·10	9	4	7·01	7·12	+ ·11	101	26·42	Hull
—1·67	9	·05	7, 9	5	7·47	7·63	+ ·16	102	27·94	Newcastle
—3·25	53	2·00	4	10	41·94	44·14	+2·20	105	129·48	Seathwaite
—2·08	17	·18	9	10	12·11	16·06	+3·95	133	42·28	Cardiff
—2·00	29	·73	1	5	14·09	18·87	+4·78	134	46·81	Haverfordwest
—1·83	26	·18	12	7	12·52	15·27	+2·75	122	45·46	Gogerddan
—1·37	23	·22	9	4	8·54	7·80	— ·74	91	30·36	Llandudno
—1·85	26	·35	4	6	13·35	14·97	+1·62	112	43·47	Cargen
—2·01	12	·13	7	6	9·47	8·04	—1·43	85	33·76	Marchmont
— ·90	68	·80	3	12	15·08	18·74	+3·66	124	49·77	Girvan
— ·48	74	·94	4	9	10·70	10·36	— ·34	97	35·97	Glasgow
+1·35	136	2·45	4	16	22·15	23·80	+1·65	107	68·67	Inveraray
+ ·38	113	·84	20	16	17·26	15·58	—1·68	90	56·57	Quinish
—1·83	5	·05	7	4	7·91	7·12	— ·79	90	28·64	Dundee
—1·45	37	...	...	...	10·64	12·15	+1·51	114	34·93	Braemar
—1·71	23	·20	8	7	9·60	9·67	+ ·07	101	32·73	Aberdeen
— ·20	88	·45	7	8	8·31	5·32	—2·99	64	29·33	Cawdor
+1·87	184	1·16	7	15	15·79	13·39	—2·40	85	44·53	Fort Augustus
+2·64	156	1·84	7	16	28·94	27·20	—1·74	94	83·93	Bendamph
+ ·22	111	·82	7	9	9·99	8·96	—1·03	90	31·90	Dunrobin Castle
+ ·36	119	·75	7	12	8·84	9·21	+ ·37	104	29·88	Wick
—1·60	54	1·30	20	10	18·90	20·24	+1·34	107	54·81	Killarney
—1·61	40	·65	20	8	12·28	15·72	+3·44	128	39·57	Waterford
—1·48	42	·74	20	9	12·30	12·59	+ ·29	102	39·43	Castle Lough
—1·19	56	·50	20	13	13·02	14·94	+1·92	115	45·11	Miltown Malbay
— ·57	76	1·13	21	4	10·59	16·67	+6·08	157	34·99	Courtown Ho.
—1·73	32	·42	20	8	10·83	12·00	+1·17	111	35·92	Abbey Leix
— ·71	65	·87	21	7	8·08	10·12	+2·04	125	27·68	Dublin
—1·52	36	·27	20	13	10·78	13·78	+3·00	128	36·15	Mullingar
—1·57	47	·53	20	14	15·29	14·43	— ·86	94	48·90	Cong
—1·39	56	·49	20	15	17·04	15·78	—1·26	93	52·87	Enniscoe
— ·94	63	·79	20	11	12·92	14·44	+1·52	112	42·71	Markree
—1·04	62	·88	21	9	11·82	16·71	+4·89	141	38·91	Seaforde
+ ·09	104	·76	20	10	10·56	11·80	+1·24	112	37·56	Dundarave
— ·49	80	·52	20	12	11·62	13·50	+1·88	116	39·38	Omagh

SUPPLEMENTARY RAINFALL, APRIL, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	·05	XI.	Lligwy	·34
,,	Ramsgate	·38	,,	Douglas	...
,,	Hailsham	·12	XII.	Stoneykirk, Ardwell House...	·86
,,	Totland Bay, Aston House...	·12	,,	Dalry, The Old Garroch.....	2·59
,,	Stockbridge, Ashley..	·02	,,	Langholm, Drove Road	·86
,,	Grayshott	·02	,,	Beattock, Kinnelhead	·97
,,	Reading, Caversham Lock ...	·01	XIII.	St. Mary's Loch, Cramilt Ldge	1·09
III.	Harrow Weald, Hill House...	·07	,,	North Berwick Reservoir.....	·16
,,	Pitsford, Sedgebrook.....	·14	,,	Edinburgh, Royal Observaty.	·24
,,	Woburn, Milton Bryan	·11	XIV.	Maybole, Knockdon Farm ...	1·69
,,	Chatteris, The Priory.....	·09	XV.	Campbeltown, Witchburn ..	1·99
IV.	Colchester, Lexden	·31	,,	Glenreasdell Mains	2·14
,,	Newport.....	·21	,,	Holy Loch, Ardnadam.....	4·64
,,	Ipswich, Copdock	·28	,,	Ballachulish House	7·97
,,	Blakeney.....	·23	,,	Islay, Eallabus	2·87
,,	Swaffham	·28	XVI.	Dollar Academy	·81
V.	Bishops Cannings	·06	,,	Balquhidder, Stronvar.....	3·26
,,	Winterbourne Steepleton.....	·09	,,	Coupar Angus	·18
,,	Ashburton, Druid House.....	·26	,,	Glenlyon, Meggernie Castle..	2·32
,,	Cullompton	·30	,,	Blair Athol	·58
,,	Lynmouth, Rock House	·13	,,	Montrose, Sunnyside Asylum.	·00
,,	Okehampton, Oaklands.....	·31	XVII.	Alford, Lynturk Manse	·66
,,	Hartland Abbey.....	·17	,,	Fyvie Castle	·87
,,	Probus, Lamellyn.....	·47	,,	Keith Station	1·68
,,	North Cadbury Rectory.....	·17	XVIII.	Skye, Dunvegan	6·05
VI.	Clifton, Pembroke Road.....	·32	,,	N. Uist, Lochmaddy	4·06
,,	Ross, The Graig	·17	,,	Glenquoich, Loan.....	25·40
,,	Shifnal, Hatton Grange.....	·21	,,	Alvey Manse.....	1·16
,,	Droitwich.....	·04	,,	Loch Ness, Drumnadrochit...	1·96
,,	Blockley, Upton Wold.....	·12	,,	Glencarron Lodge	10·95
VII.	Market Overton.....	·29	XIX.	Invershin	3·46
,,	Market Rasen.....	·19	,,	Loch Stack, Ardchullin	7·78
,,	Bawtry, Hesley Hall	·13	,,	Melvich	3·93
,,	Derby, Midland Railway.....	·20	XX.	Skibbereen Rectory	·41
,,	Buxton	·98	,,	Dunmanway, The Rectory ..	·45
VIII.	Nantwich, Dorfold Hall	·29	,,	Glanmire, Lota Lodge.....	·67
,,	Chatburn, Middlewood	1·32	,,	Mitchelstown Castle.....	1·18
,,	Cartmel, Flookburgh	1·15	,,	Darrynane Abbey.....	1·08
IX.	Langsett Moor, Up. Midhope	1·22	,,	Clonmel, Bruce Villa	1·34
,,	Scarborough, Scalby	·35	,,	Newmarket-on-Fergus,Fenloe	1·17
,,	Ingleby Greenhow	·15	XXI.	Laragh, Glendalough	1·96
,,	Mickleton	·42	,,	Ballycumber, Moorock Lodge	·64
X.	Bellingham, High Green Manor	·42	,,	Balbriggan, Ardgillan	1·12
,,	Ilderton, Lilburn Cottage ...	·19	XXII.	Woodlawn	1·20
,,	Keswick, The Bank.....	·85	,,	Westport, St. Helens	1·32
XI.	Llanfrechfa Grange	·39	,,	Achill Island, Dugort	1·74
,,	Treherbert, Tyn-y-waun	·78	,,	Mohill, The Rectory	·87
,,	Carmarthen, The Friary	·54	XXIII.	Enniskillen, Portora.....	1·52
,,	Castle Malgwyn [Llechryd]...	·25	,,	Dartrey [Cootehill]	1·41
,,	Crickhowell, Tal-y-maes.....	·90	,,	Warrenpoint, Manor House ..	1·57
,,	New Radnor, Ednol	·54	,,	Banbridge, Milltown	1·61
,,	Rhayader, Tyrmynydd	·63	,,	Belfast, Cave Hill Road	1·58
,,	Lake Vyrnwy	·57	,,	Glenarm Castle.....	2·88
,,	Llangyhanfal, Plâs Draw.....	·37	,,	Londonderry, Creggan Res...	2·69
,,	Dolgelly, Bryntirion.....	1·18	,,	Killybegs	3·39
,,	Bettws-y-Coed, Tyn-y-bryn...	1·01	,,	Horn Head	3·40

METEOROLOGICAL NOTES ON APRIL, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—The driest April in the 55 years' record, and with the single exception of February, 1891, the driest of all months in that time (see p. 70). There were 18 days absolute drought from 10th to 27th. Temp. remained high throughout and bright sunshine was recorded on every day, the amounts exceeding 10 hours on 8 days. The solar eclipse on 17th was observed under ideal atmospheric conditions (see p. 67). Mean temp. 50°·2 or 2°·1 above the average. Duration of sunshine 218·7* hours, and of R 1·6 hour. Evaporation 2·34 in. Shade max. 73°·1 on 21st; min. 30°·3 on 12th. F 1, f 7.

TENTERDEN.—Nearly as dry as April, 1893, but not so hot. Duration of sunshine 257·0† hours. Shade max. 70°·0 on 21st; min. 28°·0 on 12th. F 2, f 16.

TOTLAND BAY.—R less than any April since 1893, when only ·01 in. fell. Duration of sunshine 261·0* hours, and the greatest ever recorded in April. Shade max. 66°·0 on 23rd; min. 33°·7 on 12th. F 0, f 8.

PITSFORD.—R 1·70 in. below the average. Mean temp. 47°·9. Shade max. 72°·5 on 21st; min. 27°·3 on 12th. F 6.

IPSWICH, COPDOCK.—Duration of sunshine 246·6* hours. Mean temp. 47°·8. Shade max. 69°·3 on 21st; min. 29°·7 on 11th. F 4, f 22.

ASHBURTON.—The lowest R for April in 47 years. Shade max. 68°·0 on 22nd and 23rd; min. 35°·0 on 12th and 13th. F 0.

COVENTRY.—The driest April since observations began in 1867. Shade max. 72°·0 on 14th, 20th and 21st; min. 28°·0 on 11th. F 3.

HODSOCK PRIORY.—Shade max. 71°·0 on 21st; min. 26°·3 on 12th. F 7, f 23.

SOUTHPORT.—Duration of sunshine 227·7* hours or 49 hours above the average. Duration of R only 6·6 hours. Mean temp. 47°·8, or 2°·3 above the average. Shade max. 71°·0 on 22nd; min. 29°·0 on 12th F 1, f 17.

HULL.—Unsettled with squalls, S and R showers to 10th, then fine sunny days and cold clear nights to the end. Shade max. 69°·0 on 20th; min. 30°·0 on 12th and 13th. F 4, f 19.

HAVERFORDWEST.—Very dry and decidedly cold. Frost on several nights. Duration of sunshine 208·3* hours.

LLANDUDNO.—Shade max. 70°·0 on 22nd; min. 35°·0 on 1st.

CARGEN.—R only once, in 1873, lighter since observations commenced in 1860. A severe grass frost did much damage to flowering shrubs on 12th. During the solar eclipse on 17th, temp. fell 5°. Shade max. 70°·0 on 22nd; min. 25°·0 on 12th. F 6.

EDINBURGH.—Shade max. 66°·5 on 22nd; min. 28°·7 on 12th. F 2, f 10.

COUPAR ANGUS.—The driest April on record. Shade max. 63°·0 on 30th; min. 21°·0 on 12th.

FORT AUGUSTUS.—Shade max. 71°·0 on 23rd; min. 27°·0 on 12th. F 5.

LOCH STACK.—Duration of sunshine, 131·2* hours.

DUNMANWAY.—Fine and dry month. Warm as a rule, but some nights had slight frosts. The only month in the last 7 years with less R was August, 1909, which had ·32 in.

DUBLIN.—A fine, dry and bright month. Severe gale from W. to N.W. on 8th. Remarkable R with high bar. on 21st, due to a shallow depression within an anticyclone. Mean temp. 1°·9 above the average. Shade max. 62°·2 on 16th; min. 34°·1 on 9th. F 0, f 2.

MARKREE.—Shade max. 69°·0 on 24th; min. 31°·0 on 3rd and 29th. F 3, f 14.

WARRENPOINT.—A dry and mild month, with light winds and no frost. Shade max. 62°·0 on 14th; min. 39°·0 on 10th. F 0, f 0.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, November, 1911.

STATIONS (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
								0-100			inches		
London, Camden Square	59°·1	4	27°·7	22	49°·9	39°·3	40°·3	86	87°·1	26°·6	3·62	19	7·1
Malta	72·5	13*	52·0	18	69·6	60·2	56·6	79	134·7	...	10·11	14	5·7
Lagos	89·0	4†	72·0	9	87·5	74·5	74·1	73	154·0	70·0	1·54	4	...
Cape Town	85·7	1	45·0	16	74·9	55·4	55·5	72	...	...	1·19	8	4·1
Durban, Natal ...	86·9	28	60·0	22	78·1	64·6	...	...	147·1	...	3·47	21	7·6
Johannesburg	81·7	8	45·5	22	74·8	53·1	39·9	51	148·6	44·0	3·40	14	4·1
Mauritius	91·1	30	60·6	21	84·7	67·2	63·0	67	160·2	51·4	·26	4	5·0
Bloemfontein	90·3	30	48·8	7	80·6	55·7	50·9	57	...	...	2·21	9	4·2
Calcutta...	87·8	16	62·3	5	82·7	66·9	64·9	74	...	56·5	·46	3	3·8
Bombay...	92·4	1	72·5	20	87·9	75·6	72·3	75	136·4	67·3	·27	1	4·4
Madras	88·8	18	69·8	31	86·0	73·9	72·8	83	139·1	6·6	12·69	12	4·6
Kodaikanal	67·8	14	45·6	28	61·5	49·6	48·7	81	135·0	31·1	11·30	17	6·3
Colombo, Ceylon ...	88·7	14	69·2	3	86·1	73·1	72·8	81	151·6	67·5	13·63	22	6·9
Hongkong	80·5	17	55·7	24	73·0	65·7	61·4	76	130·3	...	2·72	12	6·8
Sydney	91·0	7, 15	48·9	4	77·6	60·7	54·6	58	147·9	39·1	1·92	13	4·6
Melbourne	105·2	30	36·8	4	74·4	52·0	48·4	59	158·2	31·7	1·38	6	5·1
Adelaide	102·8	30	44·5	1	84·8	59·2	50·3	46	161·0	34·3	·39	3	3·0
Perth	89·0	8	50·0	10	75·7	56·0	53·5	64	145·2	42·9	·18	5	4·1
Coolgardie	105·0	13	48·2	1	92·8	58·9	48·1	38	165·0	43·4	·06	1	2·8
Hobart, Tasmania ..	81·4	15	37·8	4	66·6	49·0	43·2	58	143·0	33·1	1·22	14	6·1
Wellington ...	67·0	28	41·2	25	61·3	50·8	44·4	65	118·0	33·0	2·13	17	6·5
Auckland	70·0	18‡	47·5	6	64·6	52·4	50·7	76	120·0	42·0	4·14	21	6·8
Jamaica, Kingston ..	92·7	7	70·5	28	89·4	72·9	71·5	80	...	...	1·78	8	4·8
Grenada	87·0	8, 9	72·0	2	84·0	75·6	...	78	140·0	...	5·86	23	4·0
Toronto	62·3	10	17·6	17	42·4	29·4	...	...	72·7	11·4	3·83	17	...
Fredericton	60·5	13	6·8	26	39·1	21·8	...	86	...	...	5·10	11	6·6
St. John, N.B. ...	58·4	13	16·0	26	42·3	28·8	...	...	...	...	4·82	10	5·9
Edmonton, Alta. ...	49·6	2	—23·0	14	26·9	9·8	...	80	105·0	—30 2	·50	11	5·0
Victoria, B.C.	56·1	3	14·2	11	47·4	38·2	...	88	...	...	7·40	21	8·0
Dawson	30·0	3	—34·0	15	1·6	—10·0	...	...	...	...	1·05	8	5·9

* and 21. † and 18, 22, 23, 26. ‡ and 19.

MALTA.—Mean temp of air 64°·0. Average bright sunshine, 6·3 hours. per day.

Johannesburg.—Bright sunshine, 260·2 hours.

Mauritius.—Mean temp. of air 0°·1 above, of dew point 1°·2 below, and R 1·48 in. below averages. Mean hourly velocity of wind 10·5 miles, or 0·8 above the average.

KODAIKANAL.—Bright sunshine, 140 hours.

COLOMBO.—Mean temp. of air 79°·5 or 0°·2 below, of dew point 0°·5 above, and R 1·82 in. above, averages. Mean hourly velocity of wind 4·5 miles. TS on 10 days.

HONGKONG.—Mean temp. of air 69°·1, R 1·27 in. above averages. Bright sunshine 155·1 hours or 34·5 hours below average.

Sydney.—Mean temp. of air 2°·2 above, and R 1·00 in. below, averages.

Melbourne.—Mean temp. of air 2°·0 above, and R ·83 in. below, averages.

Adelaide.—Mean temp. of air 72°·0, or 5°·0 above, and R ·66 in. below, averages, the highest mean max. temp. on record at this station.

Coolgardie.—Mean temp. of air 50·1 above, and R below, averages.

Wellington.—R 1·32 in. below the average. Bright sunshine 232·2 hours.

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Meteorological Magazine.

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RAINFALL AND HIGHLAND WATER POWER.

We have received a copy of a very instructive lecture delivered by Mr. Alex. Newlands, C.E., Assistant Engineer of the Highland Railway, to the Inverness Field Club, and reprinted from the *Transactions* of that society. It deals, as its title states, with "Our Sources of Power, with special reference to Highland Water Power," and we believe that the author takes a very moderate view of the available resources. He frankly acknowledges that the most important source of power in the British Isles is coal, and that this will remain the most important source for a very long time, though on the authority of Sir William Ramsay he only gives 175 years as the future duration of our coal supplies. Unquestionably the gravity of the coal question for a century before complete exhaustion is possible will lead to the introduction of economies in the use of fuel which will postpone exhaustion for a very long time, for, as Mr. Newlands points out, coal is now used in a very extravagant way, and he foresees the time when power and not coal will be transported from the mine to the factory, and in our present state of knowledge it appears that this transport of power must be effected by means of high voltage electricity. The fact that electricity can be produced by water power as readily as by the combustion of fuel affords a direct means of comparison between water-power and coal. The result of such a comparison leads Mr. Newlands to say of water powers—

"It cannot be said that as compared with coal they are of paramount importance, although Professor Forbes, F.R.S., has stated they are probably sufficient to work the whole of the Scotch railways with a substantial surplus for other purposes. . . As regards the quantity of power from water in Great Britain, a comparatively recent estimate showed that this amounted to about 1,000,000 horse-power, a national asset surely worthy of development."

It is shown that the efficiency of a source of energy depends largely on the scale on which it can be worked, small installations being more costly per unit of power than large, hence "to utilise the water power possibilities of the Highlands to the best advantage it is necessary that each entire drainage area should be developed up to its maximum output as one complete unit, or as a number of units linked into one complete system, and all generating current of the same character."

The works of the British Aluminium Company at Foyers, on Loch Ness, and at Kinlochleven, on the west coast, show the practical utility of water power in a region of high and uniform rainfall combined with a mild winter climate which makes stoppage by frost practically unknown. In such regions far from the coal-fields there seems to be no doubt that water power can be profitably used for certain manufactures, even in competition with coal, and it seems reasonable to believe that in many other places subsidiary water power would be an extremely important stand-by in permitting such essential services as the lighting of public buildings or of the streets, the running of tramways, and the maintenance of cold storage, to be carried on in the temporary stoppage of coal supplies. The recent coal strike gives a sharp point to this argument.

When Mr. Newlands tries to pass from isolated cases and general principles to the consideration of the available waterpower in the Highlands he enters upon a quaking bog of uncertainty, through which his only way is by means of assumptions which are little more than guesses, and only bear him up because they are made so very far within the mark. His difficulty is the uncertainty that exists as to the rainfall of the Highlands, but we believe that the data which have been published in the fifty annual volumes of *British Rainfall*, incomplete though they are, admit of a much closer and more favourable estimate being made than Mr. Newlands attempts. There is a very large area in the western Highlands, not on the coast but inland, in which the average annual rainfall exceeds 80 inches, and within that an imperfectly defined, but certainly large, area with an annual rainfall exceeding 100 inches. We venture to think, however, that there are few drainage areas in the Highlands the rainfall of which can be determined from existing data with a degree of accuracy to ensure equitable agreements as to water-rights between proprietors of the land and promoters of companies. It is the height of folly for a land-owner to sell all the water on his land when he does not know how much he has to sell. It is less unwise for a manufacturer to buy all the water because he may know that there is enough for his immediate requirements, and he may be able to make good use of any additional amount. We have for years been trying to induce Highland land-owners to set up rain gauges on their property and to see that they are correctly read, which is a very different thing, but with the most miserable modicum of success. Many are afraid that the rainfall observer will scare the grouse or the deer; but water power is the one resource of the country that can be worked with profit and the minimum disturbance of game. We have offered, and still offer, free instruction as to rainfall observing and free criticism and discussion of the records, not because we wish to increase the wealth of Highland lairds (though that may perhaps be a by-product of our efforts) but because we are anxious to ascertain the distribution of rainfall over the country and its relation to the configuration of the land and the direction of the prevailing winds. Our predecessor,

Mr. G. J. Symons, with the same object in view, induced the Highland Railway Company to start the observation of rainfall at each of their stations in 1872, and extremely valuable results were obtained for several years; but after a time the work at the stations increased, the high official, who was far-seeing enough to promote the enterprise, died, and one by one the records dropped out of the pages of *British Rainfall* where about 30 once appeared until now there is only one remaining.

We have upheld the efficacy of voluntary enterprise in this work, not only with words but with work and with the savings of a lifetime, so we may be excused for marvelling at the stupidity of people to whom a trifling outlay in carrying on observations might bring a large pecuniary return, and much as we dislike all compulsory legislation we are beginning to think that there is, after all, something in Mr. Newlands's suggestion that Government action is necessary to compel proprietors to take stock of resources which, in truth, are not only their property but assets of the nation :—

"These power possibilities ought to be looked upon as a national asset, and as such should be developed by Government assistance, and probably this could best be done by the appointment of a Royal Commission to examine and report on them. In Switzerland and Bavaria, Commissions appointed by these States, who own their own railway systems, are at present considering the expediency of utilising their water powers for the working of these railways; and in Norway the Government are acquiring a large interest in all the water powers available, and are developing them along the lines we are advocating."

We do not think, however, that a Royal Commission is necessary. Recent Royal Commissions on Coal Supply, Sewage Disposal, and Canals have elicited a sufficient knowledge of the ignorance which exists regarding the rainfall of remote regions of the British Isles to enable Government to deal with the matter of the Conservation of Rivers, which necessarily requires a survey of the resources available. Thanks to the enlightened action of individuals and institutions there already exist numerous records of rainfall in the Highlands which are reasonably accurate and sufficiently long to serve as standards by which the average rainfall of the country could be deduced were a close network of stations established for even a few years. We have still faith in the efficacy of voluntary individual action provided the individual adopts standard instruments and uniform methods and does not purchase "at the stores" or "from the seedsman" a rain gauge of a pattern which has been obsolete for thirty years or longer. Full instructions as to the choice and use of a rain gauge will be sent post free on application to the Director of the British Rainfall Organization, 62, Camden Square, London, N.W.

We trust that Mr. Newlands's lecture will move the leading men in the North to action, and we are sure that the Scottish Meteorological Society will support any effort that is made locally, and those practically interested in the subject will find Mr. A. Watt's recent paper on the Rainfall of Scotland and the map it contains very useful.

Abbott Lawrence Rotch.

6TH JANUARY, 1861—7TH APRIL, 1912.

THE death of Professor Rotch removes the most widely travelled and best-known of meteorologists. It would be hard to name a meteorological observatory or institution in any country which he had not visited, or a meteorologist with whom he was not on terms of personal friendship. Mr. Rotch was a familiar figure at the meetings of the British Association, and he was present at almost every international gathering connected with meteorology. Mr. Rotch lived a great deal in southern Europe in his boyhood, but his later education was in Boston, and he was a graduate of Harvard University, which later created for him a Professorship of Meteorology. Although possessed of ample means, he devoted himself to the study and advancement of his favourite science with an earnestness and constancy that no professional necessities could have increased, and in 1885 he built the celebrated meteorological observatory at Blue Hill, near Boston, where he commenced the series of researches which have made him the pioneer and one of the chief founders of the science of the upper air.

When we first met Mr. Rotch he was in Scotland to examine the equipment of the Ben Nevis Observatory, in the course of an exhaustive round of visits which took him to every high-level observatory in the world. The study of mountain observations convinced him that results of far greater interest would be secured by observations made in the free atmosphere at a great height above the ground. He made several experimental balloon trips in 1891 in Germany, where Professor Assmann was then in charge of the scientific aeronautical work, and for him Mr. Rotch carried out a series of comparisons between the sling-thermometer and Assmann's aspiration-thermometer in obtaining air temperature without the use of a thermometer screen. When the International Commission for Scientific Aeronautics was founded in 1896, it was natural that Mr. Rotch should be one of the first members, for from 1894 he had been carrying on observations by means of thermographs and barographs raised by kites at Blue Hill. Kites had been used for ascertaining temperature before by Mr. Douglas Archibald and others, and the form of kite adopted at Blue Hill was a modification of the box-kite invented by Mr. Hargraves in Australia; but it was Mr. Rotch who carried the method through the experimental stages, introduced steel wire and steam winding gear, and made it serviceable in the routine of observatories. He also adapted his kites for use at sea, and after some experiments on an Atlantic liner, he organized a series of special voyages in conjunction with M. Teisserenc de Bort, in the course of which results of the utmost importance were obtained in the Trade Wind region of the Atlantic. In 1904, on the occasion of the St. Louis Exhibition, Rotch introduced the unmanned balloon, carrying a meteorograph into the United States. He followed the development of the investigations in Europe with

the utmost attention, and his books, "Sounding the Ocean of Air," published in 1900, and "The Conquest of the Air," in 1909, did much to popularise the subject on both sides of the Atlantic. His latest published work appeared only a few months before his death, and consisted of a series of Charts of the Atmosphere for Aeronauts and Aviators.

In addition to the researches which he made personally or encouraged his assistants at Blue Hill to work out, and to the very numerous publications in the scientific journals of many countries, Mr. Rotch was closely associated with the *American Journal of Meteorology* during the greater part of its short career of twelve years, and we understand that a large share of the financial loss which it seems a meteorological monthly in the English language must entail fell upon him.

Professor Rotch leaves as his memorial a fine record of work done by his own energy and at his own cost, and his sudden death casts a wider gloom because he was not only a name but a friend to all his colleagues in the meteorological world.

METEOROLOGICAL INSTRUCTION FOR AVIATORS.

In the Government scheme of naval and military aviation outlined in a Parliamentary Paper issued on April 12th, 1912, special attention is devoted to instruction in meteorology in the courses set out for the qualification of airmen. The reference to the subject is as follows :—

METEOROLOGY.

Steps should be taken forthwith for the investigation of the atmosphere above this country. It is important if the art of aviation is to progress and accidents are to be avoided that the prevailing air currents and the meteorological conditions of the atmosphere should be studied. Such investigation must be based on the results of continuous observations from a number of stations, carefully co-ordinated, and extended over a long period. Evidence of Dr. W. N Shaw, Director of the Meteorological Office, has been taken on this question. Dr. Shaw laid stress on the importance of co-ordinating the theoretical and scientific experiments with the practical experience of flying men. It is plain that little investigation has hitherto been undertaken in respect to those meteorological problems which more particularly concern flying men. Dr. Shaw indicated that he was prepared to conduct such experiments if the necessary funds were placed at his disposal. A Meteorological Section should be established at the Central Flying School. Ultimately it may be found possible to include in this section officers who have been compelled to give up actual flying. For the immediate present, however, it will be sufficient to attach a meteorological expert to the Central Flying School for instructional purposes. All officers at the Central Flying

School should be instructed in meteorology. All members of the Royal Flying Corps should be directed to report any unusual meteorological phenomena to the Meteorological Office. Each Wing or Squadron of the Royal Flying Corps, as well as the Flying School, should keep a meteorological log, and forward a monthly report to the Meteorological Office. Such investigation of the air currents near the ground and in the upper atmosphere as will be useful to flying men should be undertaken by the Meteorological Office, and the results of their investigations and any phenomena of special interest should be communicated without delay to all branches of the Royal Flying Corps.

INTERNATIONAL BALLOON ASCENTS.

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

December 6th, 1909.

Starting Point	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles	F
Crinan	Scotland	5·2	—75	6·2	—70	23	N. by E.
Pyrton Hill....	England	4·7	—62	8·1	—56	36	N.E. by E.
Paris.....	France	6·2	—57	11·0	—69	146	E.N.E.
Strassburg	Germany	6·6	—69	10·1	—67	98	N.E. by E.
Vienna.....	Austria	7·2	—71	13·2	—72	75	E.N.E.
Pavia	Italy.....	7·1	—79	9·2	—74	44	E.N.E.

December 7th, 1909.

Manchester....	England	5·6	—60	10·6	—61	25	E.S.E.
Pyrton Hill....	„	5·2	—60	9·6	—60	53	E.
„	„	4·7	—65	6·9	—62	29	S.E.
Petersfield	„	5·0	—62	10·7	—58	80	E. by N.
Hamburg.....	Germany	6·0	—68	8·0	—62	31	N.E.
Lindenberg....	„	5·6	—76	6·7	—68	98	N. by E.
Paris	France.....	4·8	—63	8·8	—63	85	E. by N.
Strassburg	Germany	*4·8	—65	7·2	—60	43	E.N.E.
Vienna.....	Austria.....	6·4	—80	9·5	—70	73	N.E.
Pavia.....	Italy.....	7·0	—65	8·2	—63	94	E. by N.

December 8th, 1909.

Crinan	Scotland	*6·9	—63	12·5	—74	67	S.E.
Manchester....	England	6·3	—60	12·0	—64	91	S.S.E.
„	„	5·9	—60	6·9	—61	109	S.S.E.
Brussels	Belgium	5·2	—75	7·5	—62	40	S.E.
Hamburg.....	Germany	5·6	—66	10·7	—63	22	N.E. by E.
Lindenberg....	„	5·4	—67	10·3	—69	26	N.E.
Paris.....	France.....	5·6	—69	10·2	—69	94	S.E.
„	„	4·9	—67	8·3	—65	233	S.E.
Munich	Germany	5·4	—74	9·4	?	94	N.E.
Vienna.....	Austria.....	5·8	—72	7·8	—67	45	N.E.
Pavia	Italy.....	4·9	—63	8·0	—61	26	N.E.
Omsk	Russia	6·9	—81	9·6	—72	?	?

December 9th, 1909.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Crinan	Scotland	7·8	—89	12·5	—80	70	E.S.E.
Manchester	England	7·5	—85	8·8	—82	109	S.S.E.
Pyrton Hill	,, ...	7·8	—81	8·9	—76	62	S.S.E.
Brussels	Belgium	6·4	—83	9·8	—83	196	S. by E.
Hamburg	Germany	6·6	—72	9·0	—66	23	S. by E.
Paris	France	7·1	—87	9·0	?	202	S.
Strassburg	Germany	*5·0	—61	9·5	—71	53	S.
,, ...	,, ...	*..	..	7·7	—69	66	S.S.W.
Vienna	Austria	5·4	—66	6·7	—67	8	N.W.byW.
Pavia	Italy	5·3	—69	10·1	—69	54	S.
Omsk	Russia	6·5	—81	10·5	—70	?	?

December 10th, 1909.

Pyrton Hill	England	7·3	—89	9·7	—81	32	E. by S.
Brussels	Belgium	..	..	6·8	—74	78	S.
Hamburg	Germany	7·9	—92	9·8	—80	45	S.S.W.
Lindenberg	,, ...	6·9	—58	8·9	?	29	S.W.byW.
Paris	France	6·9	—89	7·4	—85	46	S.
Strassburg	Germany	6·1	—72	8·4	—74	75	S.S.W.
Munich	,, ...	*7·6	—72	9·8	—74	88	S.W.
Vienna	Austria	5·9	—74	6·9	—68	31	W.
Pavlovsk	Russia	6·3	—72	10·4	—78	31	E.S.E.
Nizhni Olchadaeff	,, ...	6·1	—74	7·5	—71	17	N.

December 11th, 1909.

Petersfield	England	6·9	—73	10·3	—78	10	W.
Brussels	Belgium	..	..	6·9	—78	34	S.W.
Lindenberg	Germany	6·9	—69	8·8	—70	33	W.N.W.
Paris	France	7·4	—81	10·9	—84	41	S.
Strassburg	Germany	6·0	—67	..	..	53	S.W.
Zurich	Switzerland ..	*6·5	—60	9·0	—71	24	W.
Munich	Germany	*..	..	8·1	—69	47	W.N.W.
Vienna	Austria	5·7	—68	9·2	—63	66	N.W.byW.
Pavlovsk	Russia	7·5	—89	8·3	—83	17	S.E.
Omsk	,, ...	..	..	6·7	—86	?	?

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.

An * denotes that the beginning of the isothermal column was badly defined, and in some instances it was so badly defined that no precise height could be given.

On December 6th the barometer was low over the whole region, and exceptionally low (29·00 in.) over England. Similar conditions held on the 7th, but the barometer had risen somewhat. By the 8th a complete change had occurred in the west; a normal pressure prevailed over England, with a gradient for north-west winds. The rise continued till the 9th, which found the south-west of Europe under the influence of an anticyclone; but a steep gradient for S.W. winds had appeared over England, and a deep depression lay to the N.W. These conditions were maintained on the 10th. On the 11th the gradient over England had slackened, the barometer stood at about 29·60 in. in the west of Ireland and 30·20 in. over mid-Europe.

There are many interesting points about the set of figures for this week. Some of them are discordant, the —58° on the 10th at Lindenberg, for example; but similar discrepancies do occur, and it does not follow that the observation is in error. The low temperature in the north (Crinan and Pavlovsk) is not in accordance with the usual rule; but the usual change of temperature and change of the height of the isothermal column accompanying the rise and fall of the barometer is very plainly shown, especially over the west of Europe. Thus England and France show —60° at the beginning of the week, and about —85° after the rise of the barometer on the 9th. The general drift became reversed during the week, beginning at W.S.W. and passing through N.W. to N.E. Much importance cannot be attached to the distance a balloon travels, since accidental circumstances, such as the non-bursting of the balloon, may largely alter this; but the two long runs to the south from Paris and Brussels on the 9th are noticeable.

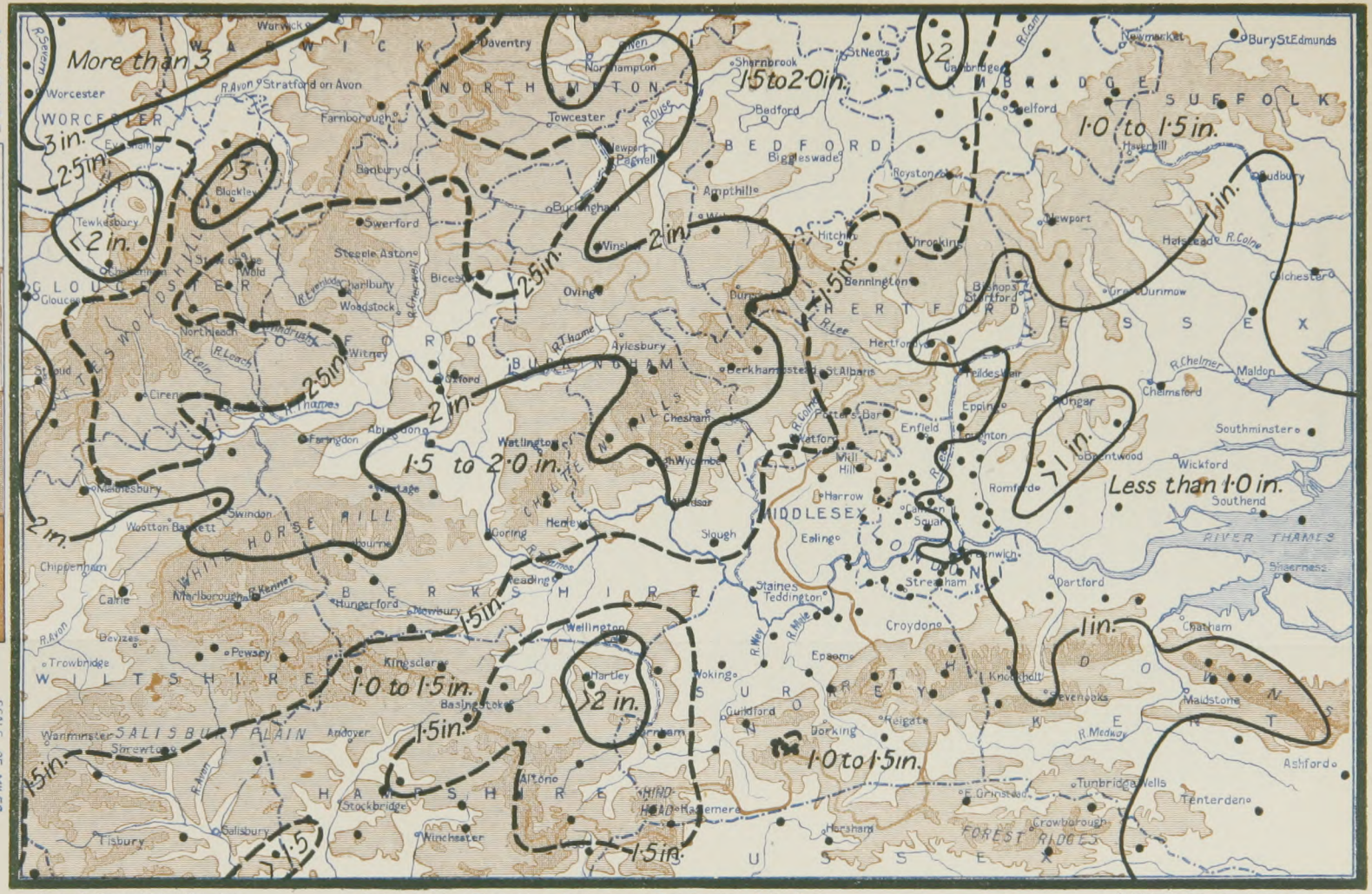
THE WEATHER OF MAY.

By Fred. J. Brodie.

Owing to frequent changes in the type of pressure distribution the weather of May was usually in a more or less unsettled state. In the south and east of England, however, there was a decided preponderance of anticyclonic conditions, and in many places a partial drought continued to prevail until very nearly the end of the month.

During the first three days the weather over a large portion of the country was affected by a cyclonic disturbance of increasing intensity, which moved eastwards along the north of Scotland and subsequently passed on to the Baltic and Northern Russia. During its presence in our own neighbourhood southerly to westerly winds prevailed, with a temperature differing but little from the normal, the highest readings being recorded on the 2nd, when the thermometer reached 65° in many parts of England and touched 71° at Greenwich. As the depression passed away an anticyclone spread over the United

THAMES VALLEY RAINFALL —— MAY, 1912.



Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir.

Rainfall Stations reporting

Isohyetals.

Kingdom from the north-westward, and on the nights of the 4th and 5th a rather sharp ground frost occurred in some parts of the northern and central districts, the exposed thermometer falling to 25° at Crathes and to 27° at Birmingham. After the 5th a mild breeze set in from the south-westward, the drift of warm air over the cold sea surface resulting in much fog round our western and southern coasts. Thunderstorms occurred in many parts of Scotland on the 7th and 8th; and on the 11th, when a small depression moved north-eastwards across the country, the weather was in a generally unsettled condition, the barometric oscillations in the south of England being unusually sudden and violent. On the same day a peculiar rising and falling of the tide was reported at Watchet (Somerset). Over our eastern and south-eastern counties the weather at the time was warmer than in any other part of the month, the thermometer on the 11th rising slightly above 80° in several places, and reaching 83° at Greenwich. Between the 14th and 16th the weather was influenced by a cyclonic system which advanced northwards from Spain and moved directly across England to the upper part of the North Sea. The progress of the disturbance was marked by thunderstorms in many parts of the country and by heavy rains over northern and central Scotland. Prior to the advance of the disturbance the wind was light and variable, and on the nights of the 12th and 13th sharp ground frosts were experienced in many western and northern districts, the exposed thermometer falling to 23° at Balmoral and Newton Rigg, 24° at Crathes, and 25° at West Linton and Armagh. In the rear of the depression a cool north-westerly breeze set in over the entire kingdom, but this soon gave way under the influence of a new area of low pressure which spread in from the Atlantic, the wind becoming variable in the south but north-easterly in the north. Between the 21st and 24th the weather was in a very unsettled state generally, with thunderstorms in many parts of England; and on the nights of the 23rd and 24th further sharp ground frosts were experienced in the north, the thermometer on the grass falling to 22° at West Linton, 24° at Crathes and Newton Rigg, and 25° at Balmoral. With the formation of an anticyclone on the 25th night frosts became more general, and caused locally a considerable amount of damage to vegetation. On the night of the 25th the exposed thermometer fell to 24° as far south even as Greenwich. Towards the close of the month numerous small barometrical depressions were developed over the United Kingdom and its immediate neighbourhood, and the weather again became very unsettled, with thunderstorms on the 30th and 31st in many parts of England.

The mean temperature of the month was nearly everywhere above the average; in London May was the thirteenth consecutive month with an excess of warmth, such a sequence being altogether without precedent. Bright sunshine was below the normal, the presence of much cloud resulting in most places in an unusually high mean minimum temperature.

METEOROLOGICAL ORGANIZATION IN SOUTH AFRICA.

We have received an intimation from Mr. R. T. A. Innes, Union Astronomer, dated from the Union Observatory, Johannesburg, on 8th May, 1911, in the following words:—

This Institution is now re-named "The Union Observatory," and its activities will be mainly of an astronomical nature, but the 1st order meteorological observations will be continued, and the Observatory will also collect seismological data for the Union.

The Natal Observatory at Durban has been closed and the Cape Meteorological Commission dissolved.

On the 1st April last a new Department of Meteorology was formed in Pretoria which will embrace the meteorology of the four provinces of the Union (Cape Colony, Transvaal, Orange Free State, and Natal).

In future will you kindly address as follows:—

Meteorological affairs—To the Chief Meteorologist, Department of Irrigation, P.O. Box 399, Pretoria, Union of South Africa;

Astronomical affairs—To the Astronomer, Union Observatory, Johannesburg, Union of South Africa;

And delete from your address book the Transvaal Observatory, the Natal Observatory, the Cape Meteorological Commission.

We have not yet been informed who the Chief Meteorologist is, but we welcome the news of the unification of the meteorological service over the southern portion of South Africa, and trust that the constitution of the new Department has been so designed as to give to it the weight due to its importance. The placing of the Chief Meteorologist in the Department of Irrigation suggests that special attention will be devoted to rainfall, while the separation of astronomical and meteorological affairs will, we believe, be to the ultimate advantage of both sciences. We heartily wish prosperity to the new arrangements.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

A RAINLESS APRIL.

Last month my rain gauge registered no rain. My record commences on the 1st April 1869, and the last was the first month in the record in which no rain was registered. CHAS. ALFRED CASE.

18, Lansdown Road, Sundridge Park, Bromley, 3rd May, 1911.

THE MEASUREMENT OF DEW.

My attention has been called to Mr. Bryant's letter in your May number. I am not sure that I understand his questions, but it may help if I state that, besides the meteorological interest, two important problems, one of engineering and the other of terrestrial physics, lie behind the drosometer measurements. For the civil engineer the question of what amount of water might be collected by radiation is an important one, and the measurements go far to answering this for the south of England. We learn that we cannot expect more than 1 or 2 inches of water per annum when the most advantageous conditions are adopted, and so the dew supply is not comparable with rain, which amounts, on the average, to 30 inches.

The other problem, what is the loss of heat by the Earth by radiation, has been prominently in my mind. We have many measurements of the heat received from the sun, but the great problem of the Earth's heat losses is still almost unattacked. The average surface temperature of the Earth remains approximately constant from year to year. It should be possible, therefore, to make a kind of profit and loss account of the heat, and in it the loss by radiation will be a notable item. If we could work at the upper surface of the atmosphere the problem would appear to be easier, but working as we do, at the bottom of the atmosphere, there come in the same difficulties which affect the measurement of the sun's heat supply. It has been suggested that the isothermal layer represents in effect the outside of the Earth. About this we want to know more.

In reference to my note on "The Simple Rain Gauge as a Dew Collector," it had been pointed out to me that rain gauge observers often report that they obtain dew in their gauges. A paper on this subject appeared in your Magazine, March, 1910, page 33, where a list of Dew days for 1905 to 1909 is given. I wanted to show that the simple rain gauge is certainly an inadequate dew collector, and I have given an explanation of the reason in the failure of the simple Howard pattern to collect dew. I think it likely that the more complex instruments are not much more suitable.

Mr. Bryant refers to the fact that a comparison is made between the drosometer and the rain gauge. May I say that the rain gauge was used not so much for the purpose of comparison as for the purpose of indicating whether any rain had fallen? It was not possible to watch during the whole time of exposure of the drosometer, and the rain gauge was employed to keep this watch. It has done this effectively for it has failed to collect dew. If a comparison is required it can easily be made, for at St. Leonards there is an official rain station not far off; and at Roche Court, Fareham, the drosometer was exposed by the side of the official rain gauge kept by Mrs. Rawstorne. In fact the figures for the Roche Court rain gauge are given in Table III.

The publication of my paper attracted the attention of Professor W. H. Pickering, of Harvard College Astronomical Observatory, Mass., U.S.A., who is now staying at Mandeville, Jamaica. He tells me that in Jamaica he has been making measurements of the dew by an instrument of his own design. He estimates the annual dew deposit in Jamaica at 2 centimetres per annum. I have not his permission to give more details of his method, but it seems to me to be a fact of special interest that in Jamaica the dew per annum reaches a quantity 0·8 in. of the same order as the dew in England about 1 inch. It would be interesting to have the results of observations at other parts of the Earth. SIDNEY SKINNER.

South-Western Polytechnic Institution, Chelsea, 4th June, 1912.

THE LATEST SNOW SPOT IN WALES.

In company with Rev. R. P. Dansey I visited the "latest snow spot" on Carnedd Llewelyn on May 8th.* Mr. Dansey had written to me in April expressing the opinion that, owing to the exceptional mildness of the winter, no snow would be found, to which I replied that, to me, would be nothing less than a miracle. On approaching the place we could see a small speck of snow, some 100 yards distant from the gully, leading me to expect that there would be snow to a considerable depth in the latter. The small speck was visited first, and measured only 18 in., by 12 in. and an inch in depth ; it would be all melted by the following day. On entering the gully we found, to my great disappointment and Mr. Dansey's great glee, that it was quite bare of snow. His prophecy and my miracle were both fulfilled. On examining the gully we found that it had not been filled at all during the winter, but had only held some drifted snow at the sides. It would seem that this gully provides a good climatic index, not only by acting as a reservoir for the winter's snow, but by showing whether the past months have been cold or warm. The excess of 3°·0 in mean temperature during the winter of 1911-12 would represent a raising of the snow-line of about 1,000 ft., and the conditions at the gully, which is 3,000 ft. in altitude, would probably coincide approximately with those at 2,000 ft. in an average year.

I was much interested in the rainfall map for April in the last number of the Magazine, especially in regard to the high reading of 25·40 in. at Loan, and the great difference between the east and west of Scotland. I see that you doubt the high figure, but from my own experience I quite believe it. The weather was, for at least a fortnight, probably comparatively warm, moist and misty, with *moderate* wind from the west, these being the precise conditions to produce a high rainfall. With moderate winds the greatest precipitation would be concentrated on the first lee slope, and the fall would decrease greatly towards the east. In Snowdonia the same effect is noticed from similar weather conditions. J. R. GETHIN JONES.

Capel-y-ffin, Llanthony, 28th May, 1912.

* See this Magazine, Vol. **46** (1911), 139, and *British Rainfall*, 1909, p. 46.

IS OUR WINTER BECOMING LESS SEVERE.

TREATING the evidence to hand as reliable, it seems to me the opinion of Mr. W. H. Dines, as expressed in the last number of this Magazine, is sound. For some years past I have called attention through the *English Mechanic* to old records of meteorological phenomena; the great difficulty having been to satisfy oneself that the old chroniclers were free from the vice of exaggeration. I was frequently in the neighbourhood of the Thames off Westminster during the winters of 1890-91 and 1895, and it occurred to me that if the river had never been nearer freezing over than at those times, old reports were unreliable. However, the freezing over below bridges is to me the most amazing part of the old annalists' tales. Just now I am quite unable to follow the suggestion of Mr. W. Vaux Graham in your issue for March, that embanking the river above bridges would neutralise the tendency to freeze below the same. The scour of the stream would doubtless be increased thereby; but would also the *vertical* range of the water as measured from the estuary?

So that *if* old reports are dependable, I think we ought to consent to it our climate *has* assumed a milder character in recent centuries. But it does not speak well for the effect of "education" if misrepresentation and exaggeration are excrescences only of the modern social system. We are regaled from time to time with stories of storm-water four feet (not inches) deep in the London streets. The other day we were privileged to witness a fine partial eclipse of the sun. One usually well-conducted journal informs its readers subsequently there will be no other before June, 1927! As a matter of fact in the interval there will be seven partial solar eclipses, large or small, visible here.

WILLIAM GODDEN.

84, High Road, Willesden, N.W., 22nd April, 1912.

THE WEATHER IN THE SEVENTEENTH CENTURY.

I HAVE read with much interest Mr. Dines's letter on this subject. I did not say that the winter climate of England is as severe as it used to be, but merely that the records of the freezing of the Thames in London, by Evelyn and Pepys, afforded, in my opinion, no evidence of it. There may be other evidence, upon the strength of which I should not venture to oppose my opinion to that of so well-known a meteorological authority as Mr. Dines.

Notwithstanding what Mr. Dines says, I do not think there can be any doubt that Old London Bridge constituted a much greater obstruction to the water-way than does Teddington Weir at the present time. The Bridge consisted of nineteen arches, in one of which in 1582, in another in 1590, in a third in 1701, and in a fourth in 1761, water wheels were fixed, actuating pumps to supply the City with water. Two other arches were closed to throw more water upon the wheels. In addition to this, the waterway was still further

contracted by "starlings" built round the piers for their protection. The wharfingers and lightermen of the time complained of this state of things, and the rather curious defence was made "that the Bridge was originally constructed as to restrain the ebbing of the tide, and preserve the navigation of the river above it; and that if the arches were widened the tide would ebb away so fast that there would be scarcely any navigation above the bridge a little after high water." The effect of the obstruction caused by the bridge would be to create comparatively still water below as well as above. But I need not tell Mr. Dines this. I may, however, point out, for the benefit of those of your readers who may be unfamiliar with questions of this nature, that the name "The Pool," by which the reach of the river between London Bridge and Shadwell has so long been known, sufficiently indicates that this was the case.

That the river between Surbiton and Hampton Court was not frozen in 1891 or 1895 is not remarkable, because the stream there is always, even in summer time, very strong. On January 18th, 1891, I skated from Hampton Court to Halliford, and I have a photograph, taken on that occasion, showing the river completely frozen over between Hampton and Sunbury. Walton Reach was also frozen from bank to bank. Of the conditions in 1895 I have no personal knowledge.

W. VAUX GRAHAM.

5, Queen Anne's Gate, Westminster, May 6th, 1912.

On page 56 of this month's Magazine Mr. W. H. Dines states that the River Thames "could not be crossed without the aid of a thick plank" at Kingston during the great frost of 1895. This is incorrect. On Sunday, February 10th, 1895, my sister and I walked across the frozen river without any support whatever. We started from the iron foundry at the beginning of the High Street. I may also mention that in November, 1894, we punted up the High Street during the great flood.

C. PRICE.

The Avenue, Elmers, Surbiton, April 22nd, 1912.

COLOURED RAIN.

I have been looking through the papers to see if there was any notice of "coloured" rain on the night of Sunday, May 12th. On Monday morning my gardener called my attention to a deposit on the glass in the greenhouses, very much like that we noticed in January, 1902, and February, 1903, and I should be glad to know if it has been noticed in other places.

We had some thunder and lightning about 7 p.m. on Sunday, and on Monday morning I recorded ·09 in. of rain; with no rain on the three previous days and none on the following day.

LEWIS C. FOSTER.

Trevillis, Liskeard, 16th May, 1912.

ROYAL METEOROLOGICAL SOCIETY.

THE second meeting of this Society out of London was held on the invitation of the Mayor and Corporation at Southport, on Monday, May 13th. The Fellows who attended the meeting greatly appreciated the arrangements which had been made by the Corporation for their comfort and entertainment.

On the previous Saturday evening Mr. W. Marriott gave a popular lantern lecture, entitled "A Chat about the Weather," at the Temperance Institute. The Mayor, who presided, extended a very warm welcome to the Fellows of the Society in connection with their visit to Southport. He said that it was felt that the visit from such a Society, which had so seldom held its meetings anywhere but in London, was a compliment to the town, and the people of Southport highly appreciated it.

On Monday morning the Fellows assembled at the Town Hall at 11 o'clock, and were received by the Deputy Mayor. They then proceeded in wagonettes along the promenade, the marine drive and some of the principal streets to the Anemograph Station at Marshside. Here they had an opportunity of seeing the Dines pressure-tube anemometers and the Baxendell Anemoscope at work. The head of the latter is 62 feet above the ground and 80 feet above sea level. The exposure is very open, as the district is an extensive reclaimed marsh adjoining the beach.

On their return to the Town Hall the Fellows and some members of the Corporation were entertained at lunch by the Mayor, who was unfortunately not able to be present, but his place was taken by the Deputy Mayor. At the conclusion of the repast the President asked the Deputy Mayor to convey the cordial thanks of the Fellows to the Mayor for his hospitable entertainment.

A visit was then paid to the Fernley Observatory in Hesketh Park. Here a demonstration was given by Mr. J. S. Dines of the method of filling and sending up a *ballon-sonde* with meteorograph attached for ascertaining the temperature in the upper atmosphere. The balloon could be followed by the naked eye until it had reached an altitude of about two miles in fifteen minutes. Observations of the track of the balloon were made by means of a theodolite. The visitors fully appreciated the great care bestowed upon the various instruments and the remarkably clear and valuable records obtained from them.

A meeting of the Society was subsequently held in the Science and Art School, Dr. H. N. Dickson, President, in the chair. Mr. W. Marriott read a paper on the "Results of Hourly Wind and Rainfall Records at Southport, 1902-1911," which was based upon data supplied by Mr. J. Baxendell, the Borough Meteorologist. When the hourly results were grouped according to summer and winter seasons a great contrast in the figures is at once apparent. A most marked diurnal variation in the direction of the wind is shown in the

summer—which is due to an extreme local development of those coastal phenomena, popularly called "land and sea breezes," that is, winds blowing off the land to the sea during the night and early morning, and off the sea to the land during the late morning and afternoon. The maximum frequency of easterly winds occurs about 4 a.m., and of south-easterly winds about 5 a.m. Westerly breezes are most frequent from noon to 1 p.m., and north-westerly ones from 3 to 4 p.m. Each of the two groups of winds is nearly twice as frequent at its hour of maximum as at its time of minimum. In winter there is comparatively little diurnal variation in the duration of the wind. The wind attains its greatest diurnal velocity from 1 to 3 p.m., and its least velocity from 11 p.m. to 3 a.m. The hourly values of the amount of rainfall for the year show a diurnal variation, the maximum occurring from 4 to 5 a.m., and the minimum from 10 a.m. to noon. There is also a secondary maximum at 3 p.m., and a secondary minimum at 9 p.m. The values of the average duration of rainfall in hours also show a well-marked diurnal variation. There is an early morning maximum from 4 to 7 a.m., and a midday minimum from 10 a.m. to 1 p.m.

Mr. J. S. Dines read a paper on "Some long period fluctuations in the Trade Winds of the Atlantic." He had discussed the hourly wind observations at St. Helena from 1892 to 1910, and finds that they tend to confirm the hypothesis of a long period oscillation. He has further discussed data dealing with the Trade Winds at San Juan, Porto Rico, and finds that there is a certain similarity in the changes at the two stations, a backing of one wind being accompanied by a veering of the other, while the St. Helena curve seems to be about one year in advance of the San Juan. There thus appears to be a distinct suggestion that the two variations are connected.

An interesting discussion followed the reading of these papers, in which Colonel H. E. Rawson, Mr. R. G. K. Lempfert, Mr. J. A. Curtis, Mr. R. Inwards, and others took part.

In the evening the Fellows and their friends dined together at the Prince of Wales Hotel.

The ordinary meeting of the Society was held at the Society's Rooms, 70, Victoria Street, Westminster, on Wednesday afternoon, May 22nd, Dr. H. N. Dickson, President, in the chair.

Mr. C. J. P. Cave read a paper on "The Thunderstorm of March 11th, 1912, in Hampshire and Sussex." The storm was not of the line-squall type, but was of the type of summer thunderstorms with very little movement, and besides being severe it appeared to be very local. As the result of information supplied by 132 observers, Mr. Cave has been able to investigate the storm thoroughly. Thunderstorms appear to have occurred in five patches, viz.: (1) a small patch near Alresford; (2) an area stretching from Privett in Hampshire nearly to Fernhurst in Sussex, with its centre near Liss; (3) an

area north-east of Haslemere; (4) a small patch north of Chilgrove; and (5) a patch near West Grinstead. The thunder of the Alresford storm was heard at a distance of over 18 miles. Heavy rain occurred, especially in the Liss storm; nearly an inch and a half fell at Durford Farm, between Rogate and Petersfield, and at Bordon Wood, north of Chithurst. Hail also occurred at several places. One of the peculiarities of the storm was the intense darkness that occurred near the centre, which was accompanied by black rain. This is believed to have been due to soot from London. Mr. Cave concluded by saying: "In a way the storm of March 11th resembled a line-squall; there was a long narrow band of rain, which, however, was split up into separate showers; there seems to have been a considerable difference of temperature between the two sides of the line, and in one case, at Bordon Wood, there was a fall of temperature at the beginning of the storm; it seems probable that the cause of this storm was the flowing of a cold current under a warmer one, as is the case with line-squalls. This storm differed from line-squalls in that it moved very slowly, but I believe there was a slow motion from north to south, at any rate in the neighbourhood of Petersfield. It also differed from the line squall in the important particular of being accompanied by no squall, nor did I see, or have any account of, the peculiar cloud which gives the name to the line-squall.

Mr. E. S. Bruce read a paper on "The Automatic Release of Self-recording Instruments from *Ballons-Sondes*." He pointed out that when a balloon is sent up with a meteorograph attached, it is doubtful whether these will be recovered, for they may not be seen at all, or they may fall into the sea. In order to diminish the chance of the recording instruments being lost, Mr. Bruce has devised a simple apparatus called the "Meteoparachute," which brings down the meteorograph from the balloon at any moment the observer chooses to fix before he sends the balloon up. A demonstration of the working of the arrangement was shown to the meeting.

A discussion followed the reading of these two papers, in which Dr. W. N. Shaw, Mr. W. W. Bryant, the Hon. R. Russell, Mr. E. Gold, Mr. C. Salter, Mr. W. Marriott, Colonel H. E. Rawson, Mr. R. Strachan, Mr. W. B. Tripp, Mr. R. Inwards, Mr. W. Greatheed, and the President took part.

The Hon. Rollo Russell exhibited a large number of very beautiful lantern slides of photomicrographs of snow crystals. These were made by Mr. W. A. Bentley, of Jericho, Vermont, U.S.A., who had been observing snow crystals for many years.

Mr. W. G. FitzGibbon and Mr. P. K. P. Pillay were elected Fellows of the Society.

It has been pointed out by the correspondent who favours us with these reports, that the intimation of the postponement of the discussion on Mr. Skinner's paper on the Drosometer was not made by him.

REVIEWS.

Studies in Terrestrial Magnetism. By C. CHREE, M.A., F.R.S., Sc.D. (Camb.), LL.D. (Aberdeen), Superintendent of Kew Observatory. London, 1912, Macmillan & Co., Ltd. Size 9 × 6. Pp. xii. + 206. Price 5s. net.

THIS is one of the series of Macmillan's Science Monographs, and the author explains in the preface that it does not aim at being a text-book of Terrestrial Magnetism, or as summarizing existing knowledge in those branches of the subject with which it deals, but is intended to give a connected account of his own original work. The book deals with "facts or supposed facts," the author explaining that "the absence of a definite theory as to the origin of the several magnetic changes is due to no lack of curiosity as to the causes of things, but to a belief that at the present stage theorising is less likely to be of substantial advantage than the extension of positive knowledge." This is a position with which we, in common with every student of nature through observation, have much sympathy, though it must be confessed that it does not tend to present known facts in the most attractive guise. Dr. Chree's work is laborious and profound, but it makes no appeal to the general reader or to the skimmer of the cream of science. It is eminently for the student, and even the student must read with his brain as well as his eyes. The concluding chapter on "General Conclusions" may, however, be read profitably even by the scientific amateur. Here, in a few pages, there is much information, and a clearness and moderation of statement that cannot be too highly commended. The summary of our knowledge of the relation of magnetic changes to sunspot frequency is particularly good, and we quote two sentences which might be written in letters of gold for the edification of all who deal in cycles as prophetic adjuncts :—

"The existence of a relation between sunspots and Terrestrial Magnetism is widely known, but its character is usually misunderstood. The only parallelism that may be regarded as fully established is that between the mean sunspot frequency of the year or season—not of the individual day—and the range of the corresponding diurnal inequality of the magnetic elements."

Are there Equinoctial Storms? Development of the Marine Barometer in American Waters. By JOHN H. MORRISON. New York [not dated], W. F. Sametz & Co. Size 7 × 5. Pp. 30.

THE writer has charted the precipitation at New York for 21 days centred on the equinox for 40 years, *i.e.*, on 80 consecutive occasions from 1871 to 1910, and as he found that in the 21 days in March there were 50 per cent. of the days with no rain, and in the 21 days in September 60 per cent. of days having no rain, he answers the question on his title-page with "there **are not.**"

Meteorology. A text-book of the weather, the causes of its changes and weather forecasting for the student and general reader. By WILLIAM ISBISTER MILHAM, Ph.D., Field Memorial Professor of Astronomy in Williams College. New York, 1912, The Macmillan Company. Size 9 × 6. Pp. xviii. + 550, and 40 charts. Price $4.50 net.

WE have had occasion in these pages recently to review, or rather to give hasty and inadequate notices of a good many new works on meteorology. When we opened Professor Milham's volume with a sigh for the size of it, we expected to find it another of one or other of the familiar types. However, it turns out to be quite different. The author is not a literary man, an amateur observer, a professional forecaster, or a distinguished meteorologist. He is an astronomer and a teacher. As the teaching of meteorology was part of his duties, he proceeded in a methodical and scientific manner to read up the subject, and to select and classify in orderly form the resulting material in a series of lectures for his students. These lectures he has now reduced to book form, and we find the result admirable. The chief characteristics are the systematic arrangement, the able marshalling of facts, and the concise expression of theories. The book is frankly American, that is to say, the examples dealt with are examples of American climate and weather; the only meteorological organization described is the U.S. Weather Bureau, the references to the meteorological services of other countries being little more than the statement that such exist.

We commend the courage of Professor Milham in distinguishing, after the manner of Baedeker's Guides, the titles of certain works in his bibliographies by one or two stars; these are not, however, quite so invidious as might appear, for the one star is given to the hundred best books, and the two stars to the twenty-five best books. Mr. Inwards in the department of "Weather Prediction, including Weather Proverbs and Prognostics," is decorated with two stars for his "Weather Lore," certainly the best depository of proverbs and prognostics, and Dr. W. N. Shaw gets one star for his "Forecasting Weather, 1911;" but, in another list, "William H. Shaw" gets none for the "Life History of Surface Air Currents." Of course, the author had not had time to study the more recent works in his bibliography, especially those like Dr. Shaw's "Forecasting Weather," which were still unpublished when the preface of Dr. Milham's work was signed in July, 1911, and of the originality and value of which he could have had no idea. We adopt no lofty station in commenting on the matter of assigning merit to books which have not been fully mastered, for what reviewer can read all on which he professes to pass judgment? And we ourselves are willing to decorate Professor Milham's work with a small constellation, from the examination of his plan, and the perusal of a few pages here and there which treat of matters coming within our own competence. We consider that his book should be in the library of every student of meteorology who desires to understand what he reads.

RAINFALL TABLE FOR MAY, 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1912. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	1·75	1·08
Tenterden	*Kent*	51 4	*0 41	190	1·65	·47
Arundel (Patching)	*Sussex*	50 51	0 27	130	1·80	1·51
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	1·96	1·27
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	1·81	2·07
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	1·99	1·57
Shoeburyness	*Essex*	51 31	*0 48	13	1·27	·55
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·93	1·22
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·78	·58
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·08	1·65
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·02	2·10
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·10	1·66
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·64	2·79
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·15	3·69
Boston	*Lincolnshire*	52 58	0 1	25	1·80	2·42
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·08	3·28
Macclesfield	*Cheshire*	53 15	2 7	501	2·43	2·41
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	2·13	2·22
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	3·55	3·81
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·09	3·40
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·98	2·99
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·04	2·72
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	7·50	5·02
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·56	1·86
Haverfordwest	*Pembroke*	51 48	4 58	95	2·62	1·32
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·63	1·32
Llandudno	*Carnarvon*	53 20	3 50	72	1·86	1·58
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	2·87	2·10
Marchmont House	*Berwick*	55 44	2 24	498	2·53	1·64
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	2·98	1·60
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·40	1·10
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	3·53	3·47
Mull (Quinish)	,,	56 34	6 13	35	2·99	2·81
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·05	1·52
Braemar	*Aberdeen*	57 0	3 24	1114	2·33	1·23
Aberdeen (Cranford)	,,	57 8	2 7	120	2·40	1·98
Cawdor	*Nairn*	57 31	3 57	250	2·07	2·16
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·36	1·78
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	4·54	3·33
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·19	1·99
Wick	*Caithness*	58 26	3 6	77	2·04	3·51
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·05	1·55
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·33	1·25
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·51	1·65
Miltown Malbay	*Clare*	52 52	9 26	400	2·57	1·85
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·24	1·21
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·43	1·35
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·07	1·04
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·51	1·22
Cong (The Glebe)	*Mayo*	53 33	9 16	112	2·94	2·22
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	3·17	3·13
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	2·80	2·11
Seaforde	*Down*	54 19	5 50	180	2·72	1·68
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·37	1·18
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·66	1·59

RAINFALL TABLE FOR MAY, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
— ·67	62	·28	30	9	8·68	9·75	+1·07	112	25·11	Camden Square
—1·18	28	·12	7	10	9·41	9·66	+ ·25	103	27·64	Tenterden
— ·29	84	·33	7	13	10·33	12·75	+2·42	123	30·48	Patching
— ·69	65	·40	21	10	11·14	12·50	+1·36	112	31·87	Cadland
+ ·26	114	·76	21	13	8·33	11·25	+2·92	135	24·58	Oxford
— ·42	79	·56	21	10	9·04	8·84	— ·20	98	25·17	Croyland Abbey
— ·72	43	·16	15	10	6·23	6·43	+ ·20	103	19·28	Shoeburyness
— ·71	63	·26	22	14	8·55	8·44	— ·11	99	25·40	Westley
—1·20	33	·17	15	12	7·84	6·72	—1·14	86	23·73	Geldeston
— ·43	79	·57	21	17	13·70	16·38	+2·68	119	38·27	Polapit Tamar
+ ·08	104	·74	21	10	12·15	15·55	+3·40	128	33·54	Rousdon
— ·44	79	·27	31	13	10·65	13·54	+2·89	127	29·81	Stroud
+ ·15	106	·81	22	14	11·71	13·80	+2·09	118	32·41	Wolstaston
+1·54	171	1·07	23	13	10·23	14·24	+4·01	139	28·98	Coventry
+ ·62	134	·91	22	17	7·91	8·30	+ ·39	105	23·35	Boston
+1·20	157	·73	22	14	8·74	10·83	+2·09	124	24·46	Hodsock Priory
— ·02	99	·92	15	16	11·91	11·08	— ·83	93	34·73	Macclesfield
+ ·09	104	·41	20	14	10·70	12·56	+1·86	117	32·70	Southport
+ ·26	107	·88	20	17	23·59	26·44	+2·85	112	61·49	Arncliffe
+1·31	162	1·30	22	11	9·46	13·42	+3·96	142	26·87	Ribston Hall
+1·01	151	·77	22	14	8·99	10·11	+1·12	112	26·42	Hull
+ ·68	133	·79	20	16	9·51	10·35	+ ·84	109	27·94	Newcastle
—2·48	67	1·17	2	17	49·44	49·16	— ·28	99	129·48	Seathwaite
— ·70	73	·60	21	14	14·67	17·92	+3·25	122	42·28	Cardiff
—1·30	50	·29	7	14	16·71	20·19	+3·48	121	46·81	Haverfordwest
—1·31	50	·22	21, 31	14	15·15	16·59	+1·44	109	45·46	Gogerddan
— ·28	85	·46	31	14	10·40	9·38	—1·02	90	30·36	Llandudno
— ·77	73	·60	20	22	16·22	17·07	+ ·85	105	43·47	Cargen
— ·89	65	·63	15	8	12·00	9·68	—2·32	81	33·76	Marchmont
—1·38	54	·31	1	17	18·06	20·34	+2·28	113	49·77	Girvan
—1·30	46	·50	8	11	13·10	11·46	—1·64	88	35·97	Glasgow
— ·06	98	·76	8	18	25·68	27·27	+1·59	106	68·67	Inveraray
— ·18	94	·46	8	16	20·25	18·39	—1·86	91	56·57	Quinish
— ·53	74	·75	15	10	9·96	8·64	—1·32	87	28·64	Dundee
—1·10	53	...	...	...	12·97	13·38	+ ·41	103	34·93	Braemar
— ·42	82	·90	15	15	12·00	11·65	— ·35	97	32·73	Aberdeen
+ ·09	104	·71	15	13	10·38	7·48	—2·90	72	29·33	Cawdor
— ·58	76	·44	8	20	18·15	15·17	—2·98	84	44·53	Fort Augustus
—1·21	73	·63	10	16	33·48	30·53	—2·95	91	83·93	Bendamph
— ·20	91	·61	15	11	12·18	10·95	—1·23	90	31·90	Dunrobin Castle
+1·47	172	1·63	15	20	10·88	12·72	+1·84	117	29·88	Wick
—1·50	51	·59	19	20	21·95	21·79	— ·16	99	54·81	Killarney
—1·08	54	·37	19	9	14·61	16·97	+2·36	116	39·57	Waterford
— ·86	66	·60	19	10	14·81	14·24	— ·57	96	39·43	Castle Lough
— ·72	72	·34	19	18	15·59	16·79	+1·20	108	45·11	Miltown Malbay
—1·03	54	·35	1	9	12·83	17·88	+5·05	139	34·99	Courtown Ho.
—1·08	54	·40	19	15	13·26	13·35	+ ·09	101	35·92	Abbey Leix
—1·03	50	·30	19	19	10·15	11·16	+1·01	110	27·68	Dublin
—1·29	49	·21	5	16	13·29	15·00	+1·71	113	36·15	Mullingar
— ·72	75	·44	6	17	18·23	16·65	—1·58	91	48·90	Cong
— ·04	99	1·07	30	16	20·21	18·91	—1·30	94	52·87	Enniscoe
— ·69	75	·32	16	16	15·72	16·55	+ ·83	105	42·71	Markree
—1·04	62	·51	20	14	14·54	18·39	+3·85	126	38·91	Seaforde
—1·19	50	·24	1	15	12·93	12·98	+ ·05	100	37·56	Dundarave
—1·07	60	·40	1	15	14·28	15·09	+ ·81	106	39·38	Omagh

SUPPLEMENTARY RAINFALL, MAY, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	1·19	XI.	Lligwy	1·02
,,	Ramsgate	1·01	,,	Douglas	...
,,	Hailsham	1·30	XII.	Stoneykirk, Ardwell House...	1·51
,,	Totland Bay, Aston House...	1·23	,,	Dalry, The Old Garroch.....	2·07
,,	Stockbridge, Ashley..	1·41	,,	Langholm, Drove Road	2.06
,,	Grayshott	1·54	,,	Beattock, Kinnelhead	2·27
,,	Caversham, Rectory Road	1·22	XIII.	St. Mary's Loch, Cramilt Ldge	1·32
III.	Harrow Weald, Hill House...	1·23	,,	North Berwick Reservoir.....	1·44
,,	Pitsford, Sedgebrook.....	1·56	,,	Edinburgh, Royal Observaty.	1·42
,,	Woburn, Milton Bryant.....	2·04	XIV.	Maybole, Knockdon Farm ...	·70
,,	Chatteris, The Priory.....	1·46	XV.	Campbeltown, Witchburn ..	1·82
IV.	Colchester, Lexden	1·23	,,	Holy Loch, Ardnadam.....	3·07
,,	Newport	1·18	,,	Ballachulish House	3·51
,,	Ipswich, Copdock	·65	,,	Islay, Eallabus	1·65
,,	Blakeney.....	1·66	,,	Tirie, Cornaigmore	2.31
,,	Swaffham	1·98	XVI.	Dollar Academy	1·90
V.	Bishops Cannings	1·60	,,	Balquhidder, Stronvar.....	2·58
,,	Winterbourne Steepleton.....	2·06	,,	Coupar Angus	1·58
,,	Ashburton, Druid House.....	2·16	,,	Glenlyon, Meggernie Castle..	1·96
,,	Cullompton	2·20	,,	Blair Athol	1·71
,,	Lynmouth, Rock House	1·18	,,	Montrose, Sunnyside Asylum.	·64
,,	Okehampton, Oaklands... ...	2·13	XVII.	Alford, Lynturk Manse	2·54
,,	Hartland Abbey	·81	,,	Fyvie Castle	3·46
,,	Probus, Lamellyn.....	1·94	,,	Keith Station	4·44
,,	North Cadbury Rectory.....	1·66	XVIII.	Skye, Dunvegan	4·36
VI.	Clifton, Pembroke Road.....	2·51	,,	N. Uist, Lochmaddy	2·62
,,	Ross, The Graig	3·20	,,	Glenquoich, Loan.....	6·10
,,	Shifnal, Hatton Grange.....	2·71	,,	Alvey Manse.....	2·26
,,	Droitwich.....	3·07	,,	Loch Ness, Drumnadrochit...	1·35
,,	Blockley, Upton Wold.....	3·23	,,	Glencarron Lodge	4·19
VII.	Market Overton.....	2·81	XIX.	Invershin	2·87
,,	Market Rasen.....	2·32	,,	Loch Stack, Ardchullin	2·83
,,	Bawtry, Hesley Hall	3·01	,,	Melvich	2·82
,,	Derby, Midland Railway.....	2·56	XX.	Skibbereen Rectory	2·67
,,	Buxton	3·16	,,	Dunmanway, The Rectory ..	1·94
VIII.	Nantwich, Dorfold Hall	2·44	,,	Glanmire, Lota Lodge.....	1·69
,,	Chatburn, Middlewood	2·37	,,	Mitchelstown Castle.....	1·60
,,	Cartmel, Flookburgh	2·33	,,	Darrynane Abbey.....	2·54
IX.	Langsett Moor, Up. Midhope	3·56	,,	Clonmel, Bruce Villa	1·60
,,	Scarborough, Scalby	3·60	,,	Newmarket-on-Fergus, Fenloe	1·85
,,	Ingleby Greenhow	2·07	XXI.	Laragh, Glendalough	1·61
,,	Mickleton	2·38	,,	Ballycumber, Moorock Lodge	1·26
X.	Bellingham, High Green Manor	2·36	,,	Balbriggan, Ardgillan	1·01
,,	Ilderton, Lilburn Cottage ...	1·83	XXII.	Woodlawn	1·30
,,	Keswick, The Bank.....	1·89	,,	Westport, St. Helens	3·05
XI.	Llanfrechfa Grange	2.71	,,	Achill Island, Dugort	...
,,	Treherbert, Tyn-y-waun	2·65	,,	Mohill, The Rectory	1·43
,,	Carmarthen, The Friary	1·16	XXIII.	Enniskillen, Portora.....	2·10
,,	Castle Malgwyn [Llechryd]...	·84	,,	Dartrey [Cootehill]	2·00
,,	Crickhowell, Tal-y-maes.....	3·10	,,	Warrenpoint, Manor House ..	1·39
,,	New Radnor, Ednol	2·76	,,	Banbridge, Milltown	1·28
,,	Rhayader, Tyrmynydd	1·74	,,	Belfast, Cave Hill Road	1·58
,,	Lake Vyrnwy	2·11	,,	Glenarm Castle.....	1·76
,,	Llangyhanfal, Plâs Draw.....	2·10	,,	Londonderry, Creggan Res...	1·53
,,	Dolgelly, Bryntirion.....	1·95	,,	Killybegs	2·08
,,	Bettws-y-Coed, Tyn-y-bryn...	1·64	,,	Horn Head	1·36

METEOROLOGICAL NOTES ON MAY, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Though less sunny than April, May was nevertheless a fine month generally, with a deficient R. A partial drought of 41 days with ·41 in. of R ended on 11th. The long succession of warm months was further added to, this being the thirteenth month with mean temp. above the average. Duration of sunshine 163·3* hours, and of R 25·8 hours. Mean temp. 57°·8, or 3°·8 above the average. Evaporation 2·44 in. Shade max. 81°·2 on 11th; min. 38°·5 on 25th. F 0, f 0.

TENTERDEN.—Another dry month, though R fell in small quantities nearly every other day in first half. A partial drought of 69 days with ·63 in. of R extended from March 24th to May 31st. Duration of sunshine 218·0† hours. Shade max. 72°·0 on 11th; min. 36°·0 on 25th and 26th. F 0, f 3.

TOTLAND BAY.—Duration of sunshine 198·0* hours. Shade max. 68°·8 on 29th, min. 39°·0 on 1st. F 0, f 1.

MILTON BRYANT.—Very beneficial R but rapid evaporation owing to hot sun. Shade max. 76°·0 on 29th; min. 30°·0 on 1st. F 1.

IPSWICH, COPDOCK.—A dull month with deficient sunshine and deficient R. Duration of sunshine 178·9† hours. Mean temp. 55°·5. Shade max. 81°·4 on 11th; min. 38°·0 on 24th. F 0, f 5.

POLAPIT TAMAR.—Rather dry on the whole but otherwise seasonable. Shade max. 72°·2 on 10th; min. 32°·8 on 26th. F 0, f 3.

NORTH CADBURY.—Warm days, there being only two maxima below 60° and 14 reaching 70° or above. Shade max 77°·0 on 10th; min. 36°·0 on 1st. F 0, f 2.

ROSS.—Fine month except for heavy TSS on 21st and 22nd, when the town was flooded. Shade max. 71°·6 on 10th; min. 32°·0 on 1st. F 1, f 1.

HODSOCK PRIORY.—Shade max. 74°·8 on 11th; min. 28°·5 on 1st. F 1, f 6.

SOUTHPORT.—Duration of sunshine 178·3* hours or 40 hours below the average. Duration of R 62·4 hours. Evaporation 2·59 in. Mean temp. 52°·0. Shade max. 66°·0 on 11th; min. 37°·0 on 14th F 0, f 6.

HULL.—Duration of sunshine, 118·0* hours. Shade max. 75°·0 on 11th; min. 29°·0 on 1st. F 1, f 4.

HAVERFORDWEST.—Dry and cold generally. Vegetation backward. Duration of sunshine 178·4* hours. Shade max. 67°·6 on 10th; min. 38°·0 on 26th.

BETTWS-Y-COED.—Shade max. 68°·0 on 31st; min. 30°·0 on 1st. F 1.

CARGEN.—Though R fell on 22 days the amounts were below ·10 in. on 15 days. Garden and farm work well forward, but shortage of R in April and May very appreciable. Shade max. 68°·0 on 30th; min. 34°·5 on 14th. F 0.

EDINBURGH.—Shade max. 64°·8 on 8th; min. 37°·8 on 5th. F 0, f 1.

MEGGERNIE CASTLE.—A dry month and colder than usual, with N. and E. winds from the 9th to the end. Frost did damage to potatoes, and growth of everything is very slow.

FORT AUGUSTUS.—Shade max. 65°·0 on 8th; min. 31°·0 on 13th. F 1.

LOCH STACK.—Duration of sunshine, 158·7* hours.

WATERFORD.—The driest May since 1897. Shade max. 69°·5 on 28th; min. 35°·0 on 24th. F 0.

DUBLIN.—Mean temp. 53°·9, or 1°·7 above the average. Vapour fog on morning of 10th. Shade max. 68°·9 on 11th.; min. 38°·9 on 13th. F 0, f 0.

MARKREE.—Fair generally with rather low temp. Frost recorded towards end of month. Some H showers. Shade max. 65°·0 on 9th and 27th; min. 29°·0 on 25th. F 2, f 8.

WARRENPOINT.—A dry, warm and calm month, with E. winds prevailing. Shade max. 64°·0 on 11th and 30th; min. 39°·0 on 23rd. F 0, f 0.

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* Campbell-Stokes † Jordan.

Climatological Table for the British Empire, December, 1911.

STATIONS (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	55·2	19	27·6	8	49·3	39·5	42·2	90	67·7	26·0	4·22	23	8·4
Lagos	88·0	sev.	69·0	24	87·0	72·7	71·8	77	149·0	67·0	3·69	3	...
Cape Town	85·2	6	50·7	22	75·5	58·1	58·4	75	...	...	1·39	9	4·0
Durban, Natal ...	94·2	21	59·8	3	81·5	68·3	...	...	152·5	...	3·54	20	7·2
Johannesburg	89·7	22	49·0	9	80·8	58·2	55·1	65	153·7	50·1	2·34	14	3·6
Bloemfontein	98·2	20	53·8	22	91·4	60·2	49·7	40	...	...	·31	2	2·3
Calcutta...	80·0	18	48·5	23	76·7	53·8	51·6	64	...	41·7	·00	0	2·4
Bombay...	91·0	14	70·1	20	87·7	73·6	67·9	67	134·2	62·4	·00	0	2·6
Madras	86·4	1	64·4	31	82·7	71·8	70·5	83	137·6	61·3	6·37	11	5·7
Kodaikanal	65·3	18*	45·2	28	60·5	50·0	48·4	81	127·0	35·2	6·49	20	7·0
Colombo, Ceylon ...	87·9	4	71·9	22	85·3	74·3	72·2	79	156·8	65·3	6·96	18	6·4
Hongkong	75·1	19	53·0	29	68·5	60·5	57·4	77	127·2	...	·10	5	6·6
Sydney	100·9	11	57·1	18	81·8	64·4	53·1	52	158·6	45·7	2·94	12	4·8
Melbourne	86·6	7	42·8	6	72·7	54·4	48·5	58	145·6	39·0	3·67	14	6·8
Adelaide	101·3	24	46·0	17	79·0	57·5	51·7	56	156·6	35·5	1·46	9	4·0
Perth	95·7	22	50·6	14	77·2	58·5	55·4	65	148·3	44·1	·42	7	3·0
Coolgardie	105·2	22	50·5	5	91·6	59·0	50·3	42	174·0	...	·05	3	1·6
Hobart, Tasmania ...	75·0	25	39·2	15	64·9	49·5	44·2	62	142·1	33·1	3·04	21	7·4
Wellington	73·0	24	45·8	16	63·3	51·5	46·7	67	124·0	34·0	4·50	21	6·7
Auckland	74·0	12	48·5	20	66·1	53·5	53·5	82	142·0	45·0	5·06	23	6·6
Jamaica, Kingston ..	91·8	18	65·5	12	87·6	70·0	69·3	78	...	...	1·11	3	4·2
Grenada	86·0	1, 26	71·0	29	82·0	74·0	...	78	141·0	...	5·64	20	4·0
Toronto	54·6	10	9·2	4	39·4	28·5	...	...	62·8	1·8	2·85	19	...
Fredericton	56·0	12	—2·0	31	31·5	16·9	...	87	...	...	2·03	7	6·5
St. John, N.B. ...	52·0	11	3·0	31	35·0	23·4	...	...	...	...	2·95	10	6·0
Edmonton, Alta. ...	50·7	2	—30·0	31	26·3	8·8	...	78	90·1	—35·8	·27	8	6·6
Victoria, B.C.	50·2	22	30·0	26	44·9	37·8	...	88	...	...	2·80	21	8·0

* and 29.

Johannesburg.—Bright sunshine, 296·4 hours. Absolute max. temp. the highest ever recorded here.

Bloemfontein.—Hot and dry, the whole country suffering from drought.

KODAIKANAL.—Bright sunshine, 139 hours.

COLOMBO.—Mean temp. of air 79°·8 or 0°·8 above, of dew point 1°·3 above, and R 1·69 in. above, averages. Mean hourly velocity of wind 6·7 miles. TS on 7 days.

HONGKONG.—Mean temp. of air 64°·3, or 1°·6 above, R 1·08 in. below, averages. Bright sunshine 133·9 hours or 45 hours below average.

Sydney.—Mean temp. of air 3°·0 above, and R ·34 in. above, averages.

Melbourne.—Mean temp. of air 0°·9 below, and R 1·41 in. above, averages.

Adelaide.—Mean temp. of air 2°·8, below, and R ·62 in. above, averages.

Hobart, Tasmania.—Temp. 2°·7 below, and R about 1°·00 above, averages.

Wellington.—Mean temp. 3°·0 below, R 1·20 in. above averages. Bright sunshine 233·6 hours.

Auckland.—Mean temp. below average, R nearly twice the average, and heavy gales on 4 days.

EDMONTON, ALTA.—Dry and cold, S on 12 days, fog on 4 days, aurora on 2 nights.

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THE RAINFALL OF JUNE.

It is necessary every now and again to call the attention of our readers to the last five pages of this Magazine, for they contain the earliest systematic information regarding the rainfall of the month which is presented to the public, and as they sometimes are not completed when the proofs are passed (for the telephone enables the Editor to catch the printer with corrections up to the very moment of going to press) it is not always easy to call attention in the letter-press to the facts set out in figures. The first two columns of p. 129 show that every station except two had falls of rain exceeding their average for June, and that at 18, out of the 55 stations quoted, more than twice the average fell, and at one, Cardiff, the rainfall was almost three times the average. These are interesting, though by no means very extraordinary, figures, for there is rarely a year without some months equally wet. The feature of a wet summer month is usually the irregularity of the heavy falls, and our map of the rainfall of the Thames Valley (facing p. 114) shows that in that area it varied from less than 2 inches in the east of Essex, where the amount was just the average, to more than 5 inches in the extreme south-west and north-west, the latter containing a small area with more than 6 inches between Stroud and Evesham. The irregularity of the isohyetals shows the effect of numerous thunderstorms affecting various localities.

The map of the rainfall of the British Isles, which we regret not to publish, shows that, with the exception of Essex, the only place with less than 2 inches of rain in June was a narrow strip of the east coast of Scotland north of Arbroath, and the north-east of Caithness where the rainfall was under 1 inch and less than half the average amount. Large areas in the west and south-west of Scotland received more than 6 inches of rain, and there were patches with more than 6 inches in the north of England, in north and south Wales and over the greater part of Cornwall and Devon. The west of Ireland also had more than 6 inches, and only a small area round Dublin had less than 3 inches.

The stations quoted in the Table are so uniformly distributed that the mean gives a fair approximation to the general rainfall, and dealing thus with the percentage of the average we find that (the local average for June being 100 in each case) England and Wales had 186, Scotland 156, Ireland 193, and the British Isles as a whole 180.

THE WEATHER OF JUNE.

By FRED. J. BRODIE.

IN the third week of June the country lying to the eastward of a line drawn from the Wash to the Isle of Wight experienced four or five days of brilliant summer weather. The highest temperatures of this period, and in fact of the whole month, were recorded at some stations on the 19th, and at others on the 22nd. On one or other of these occasions, and locally on each of them, the thermometer in the shade rose to 80°, or a little beyond it in many places, a reading of 84° being registered at Greenwich, and a reading of 83° at Hampstead and Camden Square. With the exception of this one fine spell in the south-east the weather of last month was of a continuously broken character, the number of days with rain being everywhere largely in excess of the normal. At the majority of stations in the western parts of the United Kingdom, and also at several places in the north, the total precipitation was equal to more than twice as much as the average. Thunderstorms were unusually frequent, and were accompanied in some instances by torrential falls of rain and hail.

The generally unsettled character of the weather was due to the almost constant extension over these islands of large cyclonic systems from the Atlantic. In the earlier half of the month the centres of the disturbances passed in many instances directly across the United Kingdom, and as a result the winds in the north were mainly from polar quarters, while those in the south blew more commonly from points between south and west. The depressions were as a rule too shallow to occasion anything beyond the force of a fresh breeze, but on the 4th, when a complex disturbance, with two distinct minima, passed eastward across the country, the wind blew very strongly from N.E. in Scotland, and from S.W. in the English Channel; while on the 15th, when a deep depression was developed over Scandinavia, the north-westerly current increased greatly over England, and reached the force of a gale in the North Sea. The lowest temperatures of the month were registered between the 3rd and 5th, when the sheltered thermometer fell below 40° in many parts of the country, and below 35° at some of the central stations in Ireland and Scotland; at Balmoral a reading of 32° was recorded early on the 4th. On the surface of the grass slight frost occurred at about the same time in a few scattered places, and as far south as Greenwich, but the cold snap was not sufficienely serious to cause any material injury to vegetation.

In the latter half of the month the central areas of the Atlantic low pressure systems passed along in a northerly or north-easterly course, well outside our western and northern coasts. Winds from the southward or south-westward were consequently experienced over the country generally, and temperature was higher than in the first

THAMES VALLEY RAINFALL —— JUNE, 1912.

Symons's Meteorological Magazine

Watershed of River Thames above Teddington, and River Lee above Feildes Weir.

Rainfall Stations reporting

Isohyetals.

fortnight, though mostly below the average. On the 17th the sheltered thermometer fell slightly below 40° at many places in the west and north, and touched 35° at Balmoral. On the 25th, when the centre of one of the large Atlantic disturbances passed across Scotland, the wind in the Channel increased to the force of a gale.

In London the total duration of bright sunshine was in excess of the normal, Westminster recording an aggregate of 195 hours, as against an average of 167 hours. Over the country generally there was, however, a deficiency of this very important element, and at many places in the west and north the deficiency was very large. At Aberdeen the total duration was less than 82 hours, being considerably less than half of the average, and by far the lowest observed in June since the record commenced in 1881. Owing to the prevalence of so much cloud the mean temperature of the month nearly everywhere was below the normal, but above it at a few places in the east of England. In some parts of London the deficit, though slight, was sufficient to break the marvellous record of undue warmth which had prevailed throughout nearly the whole of the previous 13 months [but see p. 131, first paragraph].

INTERNATIONAL BALLOON ASCENTS.

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

January, 1910.

Starting Point	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Manchester....	England	7·5	—82	11·3	—77	59	N.E.
Petersfield	,, ...	..	..	7·2	—77	20	N.N.E.
Brussels	Belgium	8·1	—96	14·1	—75	127	S.
Hamburg.....	Germany....	7·4	—87	9·9	—73	75	S. by W
Lindenberg....	,, ...	6·7	—75	9·9	—73	67	S.S.W.
Strassburg	,, ...	7·5	—84	10·3	—74	90	S. by W.
Pavlovsk	Russia	5·9	—71	9·9	—74	165	S. by 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.

An extensive region of high pressure lay over the whole area, with lower pressure over the North Atlantic and South Russia. The figures show that the commencement of the isothermal column was higher than usual, as is generally the case when the pressure is high. The temperature over Belgium, —96°, is very low, and there is a remarkable uniformity, —73° to —77° at the highest points, which must be partly a chance result.

ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of the Session was held at the Society's rooms, 70, Victoria Street, Westminster, on Wednesday afternoon, June 19th, Dr. H. N. Dickson, President, in the chair.

Dr. G. C. Simpson, Meteorologist to the British Antarctic Expedition, 1910, who had just returned to this country, read a paper on "Coronæ and Iridescent Clouds." In September, 1911, he was one of a party led by Captain Scott to survey McMurdo Sound, and on the 24th of that month, while the party was sledging on sea ice, they became enveloped in fog. During the afternoon the sun began to shine through the fog, and suddenly they saw in front of them a fine fog-bow. It was opposite the sun, and a measurement of the radius with a theodolite gave 38°. The bow was practically white, but a reddish tinge could be seen on the outer side. As the fog dissipated the upper sky became clearer and the sun shone over the top of a heavy bank of fog. For some minutes the sun had a brilliant corona with bright colours, and the diameter of this corona seemed unusually large, but there was no opportunity to make a measurement. As the fog still further cleared away glimpses of the corona appeared again, and the fog under the sun became fairly brilliantly illuminated with iridescent colours, which did not appear to be part of the corona but in places blended into it. During the whole period the temperature was between —15° and —21° F. The fur of the sleeping bags and the wool of sweaters became covered with hoar frost. These observations show that water can exist in the atmosphere in liquid drops at much lower temperatures than has generally been supposed by meteorologists. It is now generally admitted that while halos are caused by refraction and reflexion of ice crystals, coronæ are due to diffraction effects of either small drops of water or thin ice needles. From certain observations made in the Antarctic, Dr. Simpson was led to doubt the possibility of ice crystals ever producing diffraction effects. This is an important question for meteorology, for if it is true we have a powerful instrument for determining the constitution of a cloud; if there is a corona the cloud must be composed of water drops, while if there is a halo it must be composed of ice crystals.

An interesting discussion followed the reading of this paper, in which Captain D. Wilson-Barker, Dr. H. R. Mill (who suggested that optical effects alone should not be taken as positive proof of the existence of liquid water 50° below the freezing point), Dr. W. N. Shaw (who considered that it was not unreasonable to expect to find liquid water in the atmosphere at very low temperatures), Mr. W. W. Bryant, Mr. R. Inwards, Mr. R. Strachan, and the President, took part, and Dr. Simpson replied.

Mr. W. W. Bryant read a paper on "The Adoption of a Climatological Day." When observations are made only once a day, viz., at 9 a.m., it is the practice to enter the reading of the maximum

thermometer to the previous day, and the reading of the minimum thermometer to the current day. Mr. Bryant does not consider that these give correct results, but that they are higher than if the readings were taken at 9 p.m., or midnight, and applied to the civil day.

Mr. J. Baxendell sent a note in which he referred to a similar comparison made by Mr. W. Ellis many years ago, who found that the mean monthly maximum and minimum temperatures derived from the climatological (or 9 a.m.) system of observing only differ from Second Order (or 9 p.m.) ones, on the average, by some few hundredths (not tenths) of a degree. Mr. Baxendell added that at Southport, where the climate is totally different from that at Greenwich, the case is the same, the average difference being only 0°·1

Mr. R. G. K. Lempfert also sent a note with reference to the method adopted at the various stations of the Meteorological Office, and the following took part in the discussion:—Dr. W. N. Shaw, Mr. E. Gold, and Mr. J. Hopkinson, and Mr. Bryant replied.

The following gentlemen were elected Fellows of the Society:—Mr. A. J. Bamford, F.R.A.S., Capt. G. Byers, Mr. G. W. Cox, and Dr. W. A. Spence.

EARLY REFERENCE TO RAINFALL.

We have so frequently to assure the representatives of newspapers that we have no data for foretelling the rainfall of the coming week-end, month or season, that we have been strongly impressed with the human craving for knowledge of the future in this respect. It seems to be an immemorial craving of humanity to seek for signs and portents of the coming of rain, and the following note from *The Times* of 10th July, 1912, carries us very far back:—

The British Museum has acquired a collection of animal bones inscribed with archaic Chinese characters of a more primitive type than any yet found, even on the ancient bronzes. These bones were purchased some months ago by the authorities of the Museum. Owing to their extreme antiquity the characters have been deciphered only in part. Many of them, indeed, are far more primitive than any characters yet identified. It is clear, however, that these writings are the records or notes of inquiries made mostly by the king. The bones, having been inscribed with questions, were seared with hot irons, and the cracks which then appeared in the bones were interpreted according to certain rules of divination. The process of interrogation was carried out by professional diviners. The inquiries relate to such things as the prospects of rainfall, harvests, the fate of prisoners, hunting expeditions, change of residence, and so forth. One eminent authority inclines to assign the date of the inscriptions to the middle and the early part of the Chou dynasty, which lasted from B.C. 1122 to B.C. 249; but two modern Chinese critics attribute them to the Shang dynasty, which lasted from B.C. 1766 to B.C. 1122. In any case they are the oldest forms of Chinese writing that have survived.

THE DISSEMINATION OF WEATHER FORECASTS.

By H. E. CARTER.

FOR some time past there have appeared at intervals in the pages of *The Surveyor* letters regarding the effect of the weather upon the work of municipal and sanitary engineers. The keynote of the correspondence has been a plea for a wider and more efficient distribution of weather forecasts from the Forecast Branch of the Meteorological Office, and such support was given to the proposal that a deputation representing a large number of municipal bodies waited upon Dr. W. N. Shaw and urged upon him the importance of their views.

Mr. Harold G. Turner, assistant engineer and surveyor of Surbiton, was, we believe, the pioneer in this movement, and his proposal was that the daily reports and forecasts of the Meteorological Office should be supplied direct to municipal engineers, and through them to the public. Mr. Turner's suggestion was at once approved by the following engineers and surveyors:—Messrs. G. Bruce Tomes, C.E. (Barnes), A. B. Lismer, C.E. (Edmonton), H. C. Fread, A.R.I.B.A. (Esher and the Dittons), S. H. Chambers (Hampton), R. H. Jeffes, C.E. (Maldens and Coombe), G. Jerram, C.E. (Merton), H. T. Mather (Surbiton), and M. Hainsworth (Teddington). Dr. Shaw, in replying to the suggestion, recognised that trustworthy information as to future weather changes was of great service to municipal engineers. The distribution of forecasts through the press involves unavoidable delay, and direct distribution by telegram would be much more satisfactory. He continued: "The authorisation to exhibit harvest forecasts in post offices is a first step in this direction, but under present circumstances the cost of transmission of the telegrams has to be borne locally. I understand that in Germany and Denmark forecasts are transmitted regularly to all post offices or railway stations and there publicly exhibited. I believe that a similar arrangement in this country would soon develop into an important public service, and I, therefore, welcome suggestions from outside which show that there is a demand for such information. Without a public demand I cannot expect the organization which the scheme would require to be forthcoming."

The matter at once appealed to a large number of municipal engineers, and Mr. Reginald Ryves contributed a lengthy statement, setting forth the arguments in favour of such a scheme, which he regarded as a large economic gain to the country as a whole. He drew attention to the disadvantages of occasional forecasts, and said, concerning the financial position:—"An annual expenditure of £10,000 would allow of telegrams being sent to about 2,000 post offices daily, supposing the post office to charge 3d. each, which should be a liberal allowance for telegrams sent in a short, simple and easily used code. If the reader would take the trouble to mark down the share of these for any part of the country he will find that the

telegrams would be brought within a few miles of almost every spot, and could be brought within a very short distance indeed of the greater part of the population. As, however, farmers and small holders are the classes that benefit most from such telegrams, it is well not to lay stress upon the latter fact, but rather to make the smallest maximum distances the measure of the efficiency of the distribution. If we allow 5,000 stations for Ireland, Scotland and Wales, we are left with 5,000 for England. Taking, as an example, Staffordshire, which has an area of about one-twelfth that of England, and includes agricultural, pastoral, moorland and industrial areas, the allowance of 400 stations is ample, for it will be found that 350 stations command all parts of it with a maximum distance of about 3 miles. The distance is, of course, increased slightly in some parts, owing to the positions of the post offices, but there are so many ways in which the daily forecast would be passed on from mouth to mouth, that this would not be a serious matter."

A regular use of the forecasts would certainly considerably reduce the losses now incurred without their aid. The agricultural community has long since realised the value of the special "harvest forecasts" prepared for their use, and the storm warnings have proved of enormous value to the mariner. The highway engineer and district surveyor would benefit considerably, especially as regards such public work as watering, sweeping, scraping and brushing the roads, the removal of snow, and the construction and maintenance of the public highways. A weather forecast available at, say, 4.30 p.m., and covering the ensuing 24 hours, would permit of to-morrow's work being arranged over-night, with due regard to the probable state of the weather. The value of the forecast is ever increasing as the percentage of successful forecasts has, during recent years, shown a gratifying advancement. In 1909 and 1910 the percentage of complete and partial successes reached 93.

The energies of the pioneers in this movement, the work of the local Forecast Committees, and the publicity given to the matter in *The Surveyor*, resulted in the subject being discussed by Urban Councils and various Highways Committees in all parts of the country. In almost all cases these bodies offered to co-operate in the effort to secure the benefits which the better dissemination of weather forecasts would bring. The Council of the Royal Sanitary Institute passed a resolution in support of the proposition, but added a suggestion that an endeavour should be made to arrange for additional observations so that the Meteorological Office may be able to reduce the size of the areas for which the forecasts are now given.

Mr. Frank Turner, engineer and surveyor to the Tonbridge Rural District Council, did not hesitate to say that the forecasts are not sufficiently local and definite to be of any material service. While such a statement is hardly borne out by the experience of others, there can be little doubt that the adoption of the suggestion of the Royal Sanitary Institute would enhance the value of the forecasts.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

AN OPTICAL PHENOMENON.

In case any communications from other quarters have reached you in regard to the unusual appearance observed here on the 28th ult., and reported to the Meteorological Office, I am sending a note of it. What we saw was a practically complete parhelion circle with no halo and no parhelia. I first saw it when the sun was on the meridian, and the diameter of the circle about 60°. It remained generally visible for half an hour, though broken by clouds. Sighting observations and measurements confirmed the conclusion that it was a horizontal circle through the sun, and as the sun declined from the meridian the diameter increased appreciably. It was as bright as any solar halo I had ever seen.

WALTER W. BRYANT.

Royal Observatory, Greenwich, S.E., June 8th, 1912.

THUNDERSTORM FREQUENCY.

I was talking to a gentleman the other day about thunderstorms, and he said that the worst storms occurred in the lower Thames Valley, and that they were more frequent over that area than any other part of England. It would be very interesting to have the opinions of your readers, who are more learned in meteorology than I am.

G.E.D.

Lewisham, S.E.

WATERSHEDS.

May I call your readers' attention to the Dane, which is, through the Weaver, a tributary of the Mersey.

About two miles above Rushton (Staffs.) there is a flood weir, and water passing over this passes by a "feeder" to Rudyard Lake, and thence, when the lake is overflowing, by the Churnet to the Trent. Is there any other instance known of the water of a stream feeding both the North and the Irish Seas?

The river, at the point where the weir is situated, itself forms the Cheshire-Staffordshire county boundary. The coincidence of river-bed, watershed and county boundary is almost certainly unique.

JUVENIS.

Congleton.

ON DATING TEMPERATURE OBSERVATIONS.

THE subject of Mr. Wardale's communication in the March number of this Magazine has long exercised my mind, but so far I have been unable to see how the inaccuracies mentioned are to be avoided, where observations of maximum and minimum temperatures are made only once daily. I think there can be no question about 9 a.m. being the most convenient hour for observations generally, and further that it is desirable that there should be uniformity in entering the observations read at that hour to the preceeding day. The instance stated by Mr. Wardale may occur on the termination of a frost two or three times in a winter, but it is possible that even though the maximum and minimum readings in any such case may both be wrong, the mean of the two may be nearly, if not quite, the same as the mean of observations taken twice daily, where the errors would not occur, and therefore the general averages would not be affected.

W. PIFFE BROWN.

Belgrave Road, Gloucester, April 1st, 1912.

MONTHLY EXTREME TEMPERATURES.

COMING across a set of Whitaker's Almanacs some time ago, where the monthly meteorological observations at the Royal Observatory, Greenwich, are annually published, I was curious to study the extremes of air temperature that have occurred in London in every month since 1890 to 1911, both inclusive, and to compute the average extreme heat and cold for each calendar month on the basis of the 22 years average. The result is :—

WINTER.	Av. extreme max.	Av. extreme min.	SPRING.	Av. extreme max.	Av. extreme min.
November ...	58·7	26·6	February.....	55·3	22·2
December ..	54·6	23·0	March	62·3	25·6
January	53·0	22·1	April	68·9	29·6

SUMMER.	Av. extreme max.	Av. extreme min.	AUTUMN.	Av. extreme max.	Av. extreme min.
May	78·3	33·9	August.....	84·5	45·3
June	82·4	41·1	September ...	80·0	38·4
July	85·3	45·8	October.....	68·5	31·4

It will be seen that owing to accumulated heat leaving the weaker sun less work to do, the first two months of autumn show higher figures than the first month of summer. Similarly, for an inverse reason, the first month of spring appears colder than the first month of winter. Some allowance, however, should be made for the circumstance that the first week in November, February, May and August belongs, according to the sun's altitude, to the season preceding that under which the whole months are tabulated.

L. C. W. BONACINA.

THE AURORA.

By F. W. Henkel.

Few meteorological phenomena are of greater interest and beauty than the apparition of a brilliant aurora, though it must be confessed that even yet too little is known as to the cause and development of these striking manifestations. Those who "are in populous cities pent" are rarely vouchsafed the sight of an aurora, though even in London and Paris at times such occurrences are by no means unknown, the notable aurorae of September 25th, 1909, seen in the evening after the "magnetic storm" which for some hours interrupted telegraphic communications in London, and the great displays of October 24th and 25th, 1870, seen not only from Paris but over the whole of Europe, being conspicuous examples. But though this is the case, a much greater number are only visible in more northern latitudes, whilst in the latitude of London an average of six aurorae annually may be expected, this number is increased to 50 for the northern parts of our islands and Scandinavia, and for the Faroe Islands, Novaya Zemlya and Labrador, not far short of 100 aurorae is the annual average. Further north the frequency of the aurora diminishes, far fewer being seen from central Greenland, Baffin's Bay, &c., than in regions considerably further to the south. The curve of maximum frequency for the northern hemisphere passes by the North Cape, the northern extremity of Novaya Zemlya and Cape Cheliuskin (Siberia), its course over America being across Hudson's Bay and Labrador, passing to the south of Greenland and Iceland. The name of aurora borealis, or Northern Lights (literally "northern dawn"), was at first given to this phenomenon since it was not known to exist in the southern hemisphere, but since the days of Don Antonio de Ulloa, who frequently observed polar aurorae during his voyage round Cape Horn in 1745, it has been known that they are probably of quite as common occurrence south of the Equator as in our own northern hemisphere. Thus the name of aurora borealis should in strictness be restricted to those seen in the northern hemisphere towards the north, those seen in the southern hemisphere round the south pole being consequently known as "aurorae australes," whilst the common term polar aurora may be indiscriminately applied to all.

Though presenting a great variety of appearances, the most usual form assumed by the aurora, as seen from European latitudes, is that of a number of streaks or streamers of various colours, most commonly white tinged with yellow, but sometimes rose carmine and green; these streamers issuing from every direction but converging towards the same point, usually north, but occasionally west or south. From its appearance near the horizon as a vague and diffuse light, not unlike the faint streaks seen before sunrise which announce the dawn, comes the name "aurora."

Whilst, as we have just said, aurorae present the most complex and varied forms, they may be roughly divided into two principal classes,

the one comprising such as are apparently motionless, whose various parts retain for some time the same relative positions and intensity, the other class consists of such as vary rapidly and continually in shape and brightness (Angot). The first class (motionless aurorae) is again sub-divided into (1) faint lights of ill defined shape, (2) lights in the form of patches, clouds and bands, (3) homogeneous circular or elliptical arcs touching the horizon at either extremity and having their summits nearly in the magnetic meridian. Three principal sub-divisions may likewise be made of the rapidly changing aurorae, the first comprising non-homogeneous arcs or arcs with rays, and the second a number of isolated rays at a greater or less distance from one another, whose directions converge towards a fixed point in the sky, sometimes forming a sort of crown or "glory" around it, and lastly, non-homogeneous bands of varying heights, sometimes folded over on themselves and then forming the "draped" aurorae, the most beautiful manifestations of the "Northern Lights." Though these various forms are most commonly found singly, yet they may sometimes co-exist in one and the same aurora.

It is a remarkable fact that aurora borealis and australis are often simultaneously visible, of course in different hemispheres. Angot says:—"Every time that an aurora (australis) was seen at Hobart Town an aurora borealis was observed in the northern hemisphere, or at least if it were daytime in Europe there were those important magnetic pertubations which accompany polar aurorae." All authorities are agreed that the *total* illumination produced even by the finest aurorae is inferior to that of the full moon, and rarely exceeds that of the moon in her first and last quarters. Stars of the first and second magnitudes may be discerned through the brightest aurora, and fainter stars through more diffuse forms. Examined by the polariscope it was early ascertained that the light given by the aurora is not due to reflection or refraction of other light, but an intrinsic phenomenon, and the spectroscope has later shown that this is due to luminous gases, not to liquid and solid particles. A small spectroscope applied to the aurora shows only one greenish-yellow line whose position is between the two lines D and E of the solar spectrum, but an instrument of higher dispersive power used in connection with a large telescope reveals the presence of thirteen or fourteen bright lines or bands, all of which, however, are not found in one and the same spectrum. Mr. E. C. Baly concludes that he has detected the spectral lines of krypton, one of the recently discovered gases in our atmosphere (a companion of argon and helium), amongst the auroral lines, and the majority of spectroscopists consider the general character of the auroral spectrum to resemble closely that of the electric discharge through dry rarefied air.

It is still an open question whether any sound accompanies an auroral display. Many trustworthy observers vouch for its reality, others of equal eminence pronounce against it. It has even been

suggested that the faint whistling or rustling sound heard by some may have been a purely subjective phenomenon.

With regard to the height of the auroral beams above the surface of the ground, the general result of observations shows that the lowest parts have rarely a less altitude than 50 to 60 miles, whilst the upper parts may be as much as 500 miles high.

Others are at a much lower level, perhaps only at a few hundred feet from the ground. The practical difficulty of simultaneous measurements, from the same point, of so rapidly varying and sometimes ill-defined an appearance renders all numbers referring to auroral heights liable to considerable uncertainty. From comparison of his own observations with those of other Arctic explorers, Nordenskiöld considers it possible to explain the principal appearances by the hypothesis of a luminous ring encircling the earth almost continually, the plane of this ring being perpendicular to a radius of the earth passing through its surface in latitude 80° N. and longitude 81° W. This "aurora glory" is supposed to have a radius of about 2,000 kilometres (over 1,200 miles), and its height above those points where it lies in the zenith, about 200 kilometres. Though this hypothesis accounts satisfactorily for some of the phenomena, there are difficulties in accepting it in its entirety. Lemström has shown that the same appearance would be produced by a luminous arc of only 120 kilometres wide whose height was 12 kilometres, and this hypothesis of a permanent aurora gives no account of the undoubted variations in periodicity which next come in for our consideration.

Observations made in all countries have shown that the aurora has a tendency to manifest itself at certain hours of the night rather than at others. Thus the mean hour at which the aurora appears of maximum brightness seems to grow later as the latitude increases, from 8.45 p.m. at Prague (latitude 50°), 10 p.m. at Christiania (latitude 60°), midnight on Lake Athabasca, to 1.30 a.m. at Point Barrow (latitude 70°). It is, of course, not possible to determine the hour of minimum brilliancy, since the aurora is not visible by daytime, except during the winter in the Arctic regions. Observations made at Spitsbergen gave two maxima, one at 10.30 p.m., the other at 4.30 a.m., with an intervening minimum at 1.30 a.m. Tromholt has suggested that these diurnal variations might be due to a displacement of the zone of maximum frequency, southwards and northwards, in a period of twenty-four hours, but there are substantial objections to this view.

An annual periodicity seems fairly well established, though the difficulty of disentangling such a period is considerable, owing to the great variability in the length of the day in high latitudes, for during the time of perpetual day or when the sun is never more than a few degrees below the horizon, no aurorae can be seen at all, whilst during the long winter nights the possibilities of observation are greatly increased. Nevertheless it seems fairly well established

that aurorae are more frequent shortly after the equinoxes in April and October, and rarer in January and June. Since the winter minimum occurs just at the time most favourable for observation, there seems no reason for doubting its reality.

But perhaps the most interesting of the relations which are suggested is the following. One of the earliest discoveries of the telescope was that of the existence of dark markings or "spots" upon the sun, the central body of our system. These spots vary not only in size and shape, but yet more in their number upon the solar surface. About the middle of the seventeenth century scarcely any spots were seen at all, but the number visible from year to year underwent continual variation. Though a periodicity was long suspected, it was not definitely proved till 1851, when Schwabe of Dessau showed that about every eleven years or so the spots were vastly more numerous than at other times. Further researches have confirmed his results, giving an *average* interval of 11·1 years from maximum to maximum, or from minimum to minimum. The *actual* intervals between successive maxima, however, vary from 8 to perhaps nearly 16 years, and it has been suggested by Schuster and others that there is evidence of other periods of smaller and greater length than the eleven year period. The earlier observers of the aurora noticed similar variations in the occasions of the renewal of this phenomenon, and Mairan, in 1733, even suggested a possible connection between the two.

Not long after Schwabe's definite detection of the eleven year period of sunspots (and possibility of general solar activity also) Sabine and others showed that the variations in magnetic declination and intensity were subject to the same periodicity and had the same dates of maxima and minima. Fritz and Lovering, as well as the late Elias Loomis, showed that the number and importance of the aurorae follow the same law as sunspots, and that epochs of maxima and minima coincide almost exactly, as had been suspected by Mairan more than a century before. There are, however, certain discrepancies in detail. The irregular variations known as "magnetic storms," when the compass needle makes oscillations of 5° or even 10° within an hour or two (Young) are almost invariably accompanied by an aurora, and these follow, sometimes within a few hours, the appearance of unusual disturbances on the solar surface, such as the projection of vast luminous jets, prominences and great sunspots.

A connection has also been suspected between the frequency of the aurora and the solar rotation period (27 days), or possibly the moon's period of revolution, but the mention of it must here suffice. The *fact* of a connection of some kind between solar phenomena (not necessarily sunspots) and auroral and terrestrial magnetism generally seems beyond dispute, but the true nature of the connection, which is cause and which effect, or whether all are due to a common unknown cause, is a matter as to which much further investigation and less fanciful theories are greatly to be desired.

REVIEWS.

Meteorological Instruments and Weather Forecasts. Simply explained by H. T. DAVIDGE, B.Sc., M.I.E.E.. The Model Engineers' Series, No. 16. London, Percival Marshall & Co. Size $7\frac{1}{2} \times 5$. Pp. 92. Price 6d. net.

THE author is obviously not a meteorologist, and the meteorological introduction is not always accurate. The trade-winds are described as "blowing at certain times of the year between certain parallels of latitude," whereas they blow all the year round, though their margins reach a little further north or south at certain seasons. Again the saturation point of air is said to be affected by pressure. This is not so; a reduction of pressure leads to reduction of temperature by expansion, and the lowered temperature leads to saturation. It is scarcely correct to say that the Centigrade thermometer is "used for scientific purposes always," for most meteorological investigations in English speaking countries are carried out with the Fahrenheit scale. It is very misleading to show a Six's thermometer as the only example of maximum or minimum thermometer; such an instrument is never used in meteorological stations in this country. The rain gauge figured is the Glaisher pattern, while that described is the Meteorological Office pattern. It is a mistake to say that "the most favoured size now is the 8-inch gauge;" there are certainly ten 5-inch gauges in use for every 8-inch gauge. The only recording rain gauge described is one of the worst, the tipping-bucket pattern. Several pages are devoted to sun-dials, which are interesting instruments, but not meteorological. In the section on weather forecasts, the old drum and cone signals are figured with no indication that cones alone are now employed. The little book could be made useful by revision, and some notice of the Bradford rain gauge, which is that most used by Water Engineers, might appear.

The Structure of the Atmosphere in Clear Weather, and study of soundings with pilot balloons. By C. J. P. CAVE, M.A. Cambridge, University Press, 1912. Size $11 \times 8\frac{1}{2}$. Pp. xii. + 144.

MR. CAVE presents us in this volume with the results of 200 pilot balloon ascents from Ditcham Park on the South Downs. In some cases the balloons when released were followed by one or two theodolites, and their path determined in altitude and azimuth; in other cases the balloons were set free with a label, which was returned to Mr. Cave when picked up after the balloon had burst. The method of working is fully described and discussed, with tables for all ascents, and diagrams are given for about 50 cases, showing the variation of wind velocity and direction deduced from the movements of the balloons from the ground up to the maximum height attained, which was sometimes as much as 18 kilometres on about 11 miles. The

variation of the wind with height is treated in detail, with photographs of models which give a very graphic representation, and a valuable Introduction explains the phenomena in a simpler manner than that employed in the text. On several occasions the observations were continued well into the region which has usually in England been called the isothermal layer, but which, we are glad to see, Mr. Cave calls the stratosphere. The following quotation from the Introduction gives a brief statement of the varieties of structure in the atmosphere which have been observed, and Mr. Cave is to be congratulated on the fine results of the series of difficult experiments which he has carried out with the greatest skill and success. "Five types are described: (*a*) wind in the upper air steady with no increase in velocity with height; (*b*) wind in the upper air increasing, sometimes to several times the gradient value, but remaining more or less steady in direction; (*c*) wind in the upper air decreasing in velocity; (*d*) reversals or great changes in wind direction in the upper air; (*e*) wind in the upper air blowing away from centres of low pressure. In the types represented by these five classes, the wind in the upper air has been compared with that on the surface. A consideration of the higher ascents has shown that the strongest current is, as a rule, to be found in the region just below the stratosphere. This rapidly moving current must be associated with a corresponding pressure distribution in that region. Recent researches have tended to show that it is there that changes of pressure originate, and from this point of view, the layer just below the stratosphere must be regarded as controlling the conditions throughout the atmosphere beneath."

Science of the Sea, an elementary handbook of practical Oceanography for travellers, sailors and yachtsmen, prepared by the Challenger Society for the promotion of the study of Oceanography. Edited by G. Herbert Fowler, B.A., Ph.D., F.L.S., &c. With illustrations and charts. London: John Murray, 1912. Size, 8 × 5. Pp. xviii. + 452.

The growing recognition of the intimate relationship between meteorology and oceanography, the sciences of the two fluid envelopes of the Earth, will make this volume interesting to many of our readers. It consists of thirteen chapters by different authors, Chapter I., "The Air," being written by Dr. H. R. Mill and Captain D. Wilson-Barker, and Chapter II., "The Water," by Dr. H. N. Dickson and Mr. D. J. Matthews. Chapter VI., "The Sea Floor," is by Sir John Murray, and other chapters deal with shore-collecting, marine plants, animals, dredging and trawling, yacht equipment, etc., by various practical workers in the special departments. In addition to much supplementary matter, the Editor supplies valuable tables and lists of literature, as well as a classified list of firms supplying the various articles of equipment.

RAINFALL TABLE FOR JUNE, 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875—1909. in.	1912. in.
Camden Square	*London*	51 32	0 8	111	2·28	3·23
Tenterden	*Kent*	51 4	*0 41	190	2·03	3·33
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·13	3·27
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·17	3·36
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·27	3·24
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·10	3·14
Shoeburyness	*Essex*	51 31	*0 48	13	1·77	1·85
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·21	2·21
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·77	2·70
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·18	5·66
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·18	3·93
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·43	6·39
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·59	4·30
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·52	4·48
Boston	*Lincolnshire*	52 58	0 1	25	1·95	3·31
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·06	4·52
Macclesfield	*Cheshire*	53 15	2 7	501	2·85	3·90
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	2·26	4·71
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	3·63	8·98
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·17	4·73
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·09	4·89
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·04	5·08
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	6·94	10·88
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·55	7·51
Haverfordwest	*Pembroke*	51 48	4 58	95	2·74	5·94
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·97	5·78
Llandudno	*Carnarvon*	53 20	3 50	72	1·97	3·42
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	2·84	7·45
Marchmont House	*Berwick*	55 44	2 24	498	2·38	5·00
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	3·04	5·88
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·41	4·64
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	3·64	4·87
Mull (Quinish)	,,	56 34	6 13	35	3·30	5·08
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·06	3·22
Braemar	*Aberdeen*	57 0	3 24	1114	2·18	2·67
Aberdeen (Cranford)	,,	57 8	2 7	120	2·02	2·30
Cawdor	*Nairn*	57 31	3 57	250	2·13	3·72
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·07	3·76
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	4·07	4·34
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·10	2·74
Wick	*Caithness*	58 26	3 6	77	1·83	·90
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	2·92	7·04
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·79	5·20
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	2·70	5·96
Miltown Malbay	*Clare*	52 52	9 26	400	3·12	7·23
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·59	5·01
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·58	5·12
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·00	2·60
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	2·72	5·42
Cong (The Glebe)	*Mayo*	53 33	9 16	112	3·18	5·96
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	3·17	4·31
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·11	5·51
Seaforde	*Down*	54 19	5 50	180	2·88	5·85
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	2·56	4·82
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	2·82	5·94

RAINFALL TABLE FOR JUNE, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
+ ·95	142	·68	7	19	10·96	12·98	+2·02	118	25·11	Camden Square
+1·30	164	·78	15	17	11·44	12·99	+1·55	113	27·64	Tenterden
+1·14	153	·67	4	14	12·46	16·02	+3·56	129	30·48	Patching
+1·19	155	·72	7	20	13·31	15·86	+2·55	119	31·87	Cadland
+ ·97	143	·67	7	20	10·60	14·49	+3·89	137	24·58	Oxford
+1·04	149	·64	7	21	11·14	11·98	+ ·84	108	25·17	Croyland Abbey
+ ·08	105	·48	15	13	8·00	8·28	+ ·28	103	19·28	Shoeburyness
·00	100	·48	3	16	10·76	10·65	— ·11	99	25·40	Westley
+ ·93	152	·43	3	17	9·61	9·42	— ·21	98	23·73	Geldeston
+3·48	259	·84	15	22	15·88	22·04	+6·16	139	38·27	Polapit Tamar
+1·75	180	·99	7	19	14·33	19·48	+5·15	136	33·54	Rousdon
+3·96	263	1·01	4	26	13·08	19·93	+6·85	152	29·81	Stroud
+1·71	166	·64	1	20	14·30	18·10	+3·80	127	32·41	Wolstaston
+1·96	178	·96	25	23	12·75	18·72	+5·97	147	28·98	Coventry
+1·36	170	·37	30	23	9·86	11·61	+1·75	118	23·35	Boston
+2·46	220	·53	2	24	10·80	15·35	+4·55	142	24·46	Hodsock Priory
+1·05	137	·45	14	26	14·76	14·98	+ ·22	101	34·73	Macclesfield
+2·45	209	1·07	17	23	12·96	17·27	+4·31	133	32·70	Southport
+5·35	247	1·03	27	26	27·22	35·42	+8·20	130	61·49	Arncliffe
+2·56	218	·88	3	21	11·63	18·15	+6·52	156	26·87	Ribston Hall
+2·80	234	·69	3	25	11·08	15·00	+3·92	135	26·42	Hull
+3·04	248	·93	3	23	11·55	15·43	+3·88	134	27·94	Newcastle
+3·94	157	1·40	18	29	56·38	60·04	+3·66	106	129·48	Seathwaite
+4·96	295	·80	2	25	17·22	25·43	+8·21	148	42·28	Cardiff
+3·20	217	1·56	27	21	19·45	26·13	+6·68	134	46·81	Haverfordwest
+2·81	194	1·41	17	20	18·12	22·37	+4·25	123	45·46	Gogerddan
+1·45	174	·60	17	22	12·37	12·80	+ ·43	103	30·36	Llandudno
+4·61	263	1·09	3	26	19·06	24·52	+5·46	129	43·47	Cargen
+2·62	210	·60	15	25	14·38	14·68	+ ·30	102	33·76	Marchmont
+2·84	193	·60	22	27	21·10	26·22	+5·12	124	49·77	Girvan
+2·23	193	·58	28	24	15·51	16·10	+ ·59	104	35·97	Glasgow
+1·23	134	1·00	21	26	29·32	32·14	+2·82	110	68·67	Inveraray
+1·78	154	1·22	21	22	23·55	23·47	— ·08	100	56·57	Quinish
+1·16	156	·37	27	25	12·02	11·86	— ·16	99	28·64	Dundee
+ ·49	122	...	...	...	15·15	16·05	+ ·90	106	34·93	Braemar
+ ·28	114	·56	13	25	14·02	13·95	— ·07	99	32·73	Aberdeen
1·59	175	1·11	30	19	12·51	11·20	—1·31	90	29·33	Cawdor
+1·69	182	·48	11	26	20·22	18·93	—1·29	94	44·53	Fort Augustus
+ ·27	107	·60	2	19	37·55	34·87	—2·68	93	83·93	Bendamph
+ ·64	130	·51	19	15	14·28	13·69	— ·59	96	31·90	Dunrobin Castle
— ·93	49	·14	11	17	12·71	13·62	+ ·91	107	29·88	Wick
+4·12	242	1·02	17	25	24·87	28·83	+3·96	116	54·81	Killarney
+2·41	186	·87	21	18	17·40	22·17	+4·77	128	39·57	Waterford
+3·26	221	1·01	17	23	17·51	20·20	+2·69	115	39·43	Castle Lough
+4·11	232	1·16	17	25	18·71	24·02	+5·31	128	45·11	Miltown Malbay
+2·42	193	·68	27	18	15·42	22·89	+7·47	148	34·99	Courtown Ho.
+2·54	198	·60	17	28	15·84	18·47	+2·63	117	35·92	Abbey Leix
+ ·60	130	·26	2	23	12·15	13·76	+1·61	113	27·68	Dublin
+2·70	200	·68	27	27	16·01	20·42	+4·41	127	36·15	Mullingar
+2·78	187	1·05	22	24	21·41	22·61	+1·20	106	48·90	Cong
+1·14	136	·61	9	21	23·38	23·22	— ·16	99	52·87	Enniscoe
+2·40	177	·61	25	24	18·83	22·06	+3·23	117	42·71	Markree
+2·97	203	1·30	8	24	17·42	24·24	+6·82	139	38·91	Seaforde
+2·26	188	·70	12	21	15·49	17·80	+2·31	115	37·56	Dundarave
+3·12	211	·67	27	25	17·10	21·03	+3·93	123	29·38	Omagh

SUPPLEMENTARY RAINFALL, JUNE, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	3·72	XI.	Lligwy	3·32
,,	Ramsgate	3·04	,,	Douglas	4·13
,,	Hailsham	3·55	XII.	Stoneykirk, Ardwell House...	6·30
,,	Totland Bay, Aston House...	3·77	,,	Dalry, The Old Garroch.....	7·46
,,	Stockbridge, Ashley..	4·61	,,	Langholm, Drove Road	4·93
,,	Grayshott	3·99	,,	Beattock, Kinnelhead	7·12
,,	Caversham, Rectory Road ...	3·47	XIII.	St. Mary's Loch, Cramilt Ldge	6·74
III.	Harrow Weald, Hill House...	2·33	,,	North Berwick Reservoir.....	3·09
,,	Pitsford, Sedgebrook...	2·62	,,	Edinburgh, Royal Observaty.	3·95
,,	Woburn, Milton Bryant.....	2·04	XIV.	Maybole, Knockdon Farm ...	4·13
,,	Chatteris, The Priory.....	5·14	XV.	Campbeltown, Witchburn ..	6·45
IV.	Colchester, Lexden	1·85	,,	Holy Loch, Ardnadam.....	8·15
,,	Newport.....	2·62	,,	Ballachulish House	6·21
,,	Ipswich, Copdock	2·46	,,	Islay, Eallabus	5·24
,,	Blakeney.....	3·99	,,	Tirie, Cornaigmore	5·11
,,	Swaffham	3·53	XVI.	Dollar Academy	4·85
V.	Bishops Cannings	3·42	,,	Balquhidder, Stronvar.....	8·06
,,	Winterbourne Steepleton.....	4·02	,,	Coupar Angus	2·96
,,	Ashburton, Druid House.....	6·13	,,	Glenlyon, Meggernie Castle..	4·94
,,	Cullompton	5·34	,,	Blair Athol	3·62
,,	Lynmouth, Rock House	7·33	,,	Montrose, Sunnyside Asylum.	1·31
,,	Okehampton, Oaklands.....	6·43	XVII.	Alford, Lynturk Manse	1·67
,,	Hartland Abbey.....	5·08	,,	Fyvie Castle	2·29
,,	Probus, Lamellyn.....	4·89	,,	Keith Station	2·75
,,	North Cadbury Rectory.....	4·43	XVIII.	Skye, Dunvegan	7·90
VI.	Clifton, Pembroke Road.....	4·76	,,	N. Uist, Lochmaddy	3·80
,,	Ross, The Graig	4·05	,,	Glenquoich, Loan.....	6·60
,,	Shifnal, Hatton Grange.....	5·43	,,	Alvey Manse.....	2·23
,,	Droitwich.....	5·75	,,	Loch Ness, Drumnadrochit...	5·70
,,	Blockley, Upton Wold.....	5·51	,,	Glencarron Lodge	4·63
VII.	Market Overton.....	5·07	XIX.	Invershin	3·51
,,	Market Rasen.....	4·84	,,	Loch Stack, Ardchullin	2·69
,,	Bawtry, Hesley Hall	4·57	,,	Melvich	2·11
,,	Derby, Midland Railway.....	5·22	XX.	Skibbereen Rectory	6·24
,,	Buxton	4·19	,,	Dunmanway, The Rectory ..	7·59
VIII.	Nantwich, Dorfold Hall	3·11	,,	Glanmire, Lota Lodge.....	4·69
,,	Chatburn, Middlewood	6·66	,,	Mitchelstown Castle.....	6·27
,,	Cartmel, Flookburgh	5·27	,,	Darrynane Abbey.....	8·43
IX.	Langsett Moor, Up. Midhope	3·87	,,	Clonmel, Bruce Villa	4·34
,,	Scarborough, Scalby	4·07	,,	Newmarket-on-Fergus, Fenloe	6·76
,,	Ingleby Greenhow	4·07	XXI.	Laragh, Glendalough	6·80
,,	Mickleton	6·10	,,	Ballycumber, Moorock Lodge	4·64
X	Bellingham, High Green Manor	5·47	,,	Balbriggan, Ardgillan	3·58
,,	Ilderton, Lilburn Cottage ...	5·22	XXII.	Woodlawn	5·75
,,	Keswick, The Bank.....	5·64	,,	Westport, St. Helens	5·53
XI.	Llanfrechfa Grange	8·27	,,	Achill Island, Dugort	5·60
,,	Treherbert, Tyn-y-waun	9·40	,,	Mohill, The Rectory	4·29
,,	Carmarthen, The Friary	5·84	XXIII.	Enniskillen, Portora.....	4·38
,,	Castle Malgwyn [Llechryd]...	4·94	,,	Dartrey [Cootehill]	4·51
,,	Crickhowell, Tal-y-maes.....	5·60	,,	Warrenpoint, Manor House ..	5·03
,,	New Radnor, Ednol	2·98	,,	Banbridge, Milltown	6·25
,,	Rhayader, Tyrmynydd	6·14	,,	Belfast, Cave Hill Road	7·17
,,	Lake Vyrnwy	4·91	,,	Glenarm Castle.....	6·10
,,	Llangyhanfal, Plâs Draw.....	4·31	,,	Londonderry, Creggan Res...	7·35
,,	Dolgelly, Bryntirion.....	7·92	,,	Killybegs	6·49
,,	Bettws-y-Coed, Tyn-y-bryn...	5·83	,,	Horn Head	5·39

METEOROLOGICAL NOTES ON JUNE, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—The weather in the first half was of a dull, cool and showery nature generally, relieved by some fine sunny intervals. The latter half was finer and with seasonable temp. Duration of sunshine 172·5* hours, and of R 54·2 hours. Mean temp. 60°·2, or 0°·1 above the average. Evaporation 2·49 in. Shade max. 83°·4 on 19th; min. 44°·7 on 3rd. F 0, f 0.

TENTERDEN.—Duration of sunshine 225·0† hours. Only two days with temp. over 70°. Shade max. 81°·0 on 19th; min. 45°·0 on 3 days. F 0, f 0.

TOTLAND BAY.—The wettest June in 26 years record. Duration of sunshine 209·3* hours. Shade max. 72°·3 on 22nd, min. 45°·8 on 3rd. F 0, f 0.

PITSFORD.—R ·67 above the average. Mean temp. 57°·4. Shade max. 80°·5 on 22nd; min. 39°·4 on 11th.

IPSWICH, COPDOCK.—Duration of sunshine 196·9† hours. Mean temp. 59°·0. Shade max. 80°·0 on 22nd; min. 44°·9 on 2nd. F 0, f 0.

WINTERBOURNE STEEPLETON.—Wet and cold with the exception of the third week. Shade max. 70°·6 on 22nd; min. 38°·4 on 6th. F 0, f 1.

WOLSTASTON.—Wet on the whole, with cold nights, and occasional T and L. Shade max. 70°.5 on 22nd; min. 43°·0 on 1st.

HODSOCK PRIORY.—The wettest June for at least 37 years. Shade max. 78°·0 on 22nd; min. 38°·5 on 7th. F 0, f 0.

SOUTHPORT.—Duration of sunshine 163·3* hours or 55·0 hours below the average. Duration of R 71·8 hours. Evaporation 2·91 in. Mean temp. 56°·5 or 0°·2 below the average. Shade max. 73°·0 on 19th; min. 44°·0 on 1st and 11th. F 0, f 0.

LILBURN COTTAGE.—A rainy and sunless month. Much T at a distance but none locally. Grass and grain crops have benefited, but too much R for turnips and other field and garden crops.

HAVERFORDWEST.—Cold and wet. Crops backward but promise well. Duration of sunshine 192·7* hours. Shade max. 64°·2 on 12th; min. 37°·0 on 5th.

BETTWS-Y-COED.—The wettest June here since records have been kept. More sunshine than in June, 1907, when the R was 5·15 in. Shade max. 70°·0 on 12th and 22nd; min. 38°·0 on 5th. F 0, f 0.

CARGEN.—The bar. never touched 30 inches, and the mean reading was the lowest since 1860. Shade max. 68°·0 on 12th; min. 44°·0 on 12th.

EDINBURGH.—Shade max. 66°·6 on 23rd; min. 42°·2 on 17th. F 0, f 0.

INVERARAY.—The whole month was cold for June, and after the first week very unsettled with constant showers, but not without some sunshine.

COUPAR ANGUS.—A cold and sunless month. Almost daily light R up to 27th, after which, and following a TS, the R was excessive. Bar. was never below 29·5 inches, and never exceeded 30 inches. Shade max 71°·0 on 23rd; min. 35°·5 on 17th. F 0, f 0.

FORT AUGUSTUS.– Shade max. 69°·2 on 23rd; min. 37°·5 on 17th.

LOCH STACK.—Duration of sunshine, 91·7* hours.

GLANMIRE.—A wild unsettled month. Much damage was done to tender vegetation on the morning of 4th by frost. TSS with accompanying R and H were frequent from 5th to 9th.

CLONMEL.—The wettest June since 1900. Sunshine far below the average, no day being free from clouds. Shade max. 74°·0 on 12th; min. 34°·0 on 3rd.

DUBLIN.—A cloudy, rainy and cool month. The only fine weather coincided with a spell of E. winds from 5th to 12th. Mean temp. 57°·1, or 0°·8 above the average. Shade max. 68°·9 on 12th.; min. 45°·2 on 1st. F 0, f 0.

MARKREE.—Heavy R with frequent H showers and TSS, and a low temp. Small sunshine record. Shade max. 68°·0 on 22nd; min. 39°·0 on 12th and 16th. F 0, f 0.

WARRENPOINT.—Shade max. 64°·0 on 6th, 7th and 26th; min. 48°·0 on 11th and 16th. F 0, f 0.

* Campbell-Stokes † Jordan.

Climatological Table for the British Empire, January, 1912.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity. 0-100	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°		°	°	inches		
London, Camden Square	51·7	6	17·7	29	44·2	36·1	38·0	91	66·4	16·2	4·08	17	8·6
Malta	65·7	9	46·5	2	60·2	52·7	49·2	81	125·8	..	3·84	17	6·2
Lagos	90·0	4	72·3	27	88·1	75·9	74·1	74	143·0	70·1	·64	1	...
Cape Town	100·8	10	51·0	23	79·6	59·5	60·8	67	...	...	·17	3	3·1
Durban, Natal ...	90·1	21	61·2	17	82·4	68·3	66·7	69	151·2	...	2·96	12	6·3
Johannesburg	87·3	27	49·6	17	79·8	57·8	56·4	74	150·8	46·8	2·83	10	5·5
Bloemfontein	98·8	2	46·5	16	89·3	62·9	55·5	54	...	...	1·01	6	4·5
Calcutta...	86·9	23	52·0	1	79·7	57·1	55·8	66	...	45·3	·00	0	2·0
Bombay...	92·1	26	64·5	12	85·2	69·6	65·0	68	137·2	56·9	·00	0	2·0
Madras	87·1	13	60·5	4	83·5	65·7	66·2	78	137·5	54·9	2·83	2	1·9
Kodaikanal	72·7	10	40·7	7	65·6	46·2	33·4	49	135·9	24·1	·70	4	2·0
Colombo, Ceylon ...	91·2	27	66·4	7	86·4	71·3	67·4	69	150·0	57·3	·75	6	3·4
Hongkong	72·3	6	46·0	30	60·2	54·5	51·4	79	122·0	...	2·71	13	9·1
Sydney	102·9	15	56·8	13	78·7	63·9	56·0	59	159·0	46·9	1·34	12	5·2
Melbourne	102·7	14	47·3	3	77·9	56·1	50·1	53	157·1	40·6	·47	5	3·9
Adelaide ...	109·8	31	49·3	3	85·9	59·8	51·8	46	162·8	38·4	·21	2	2·3
Perth	106·0	11	52·8	14	85·3	64·2	59·5	60	164·6	50·1	·12	2	3·1
Coolgardie	111·0	29	53·0	9	96·9	64·4	51·9	41	175·1	50·0	·18	3	2·2
Hobart, Tasmania ...	98·2	14	45·2	12	70·5	52·5	46·7	55	155·5	38·3	1·11	15	6·2
Wellington ...	76·0	7	48·2	5	66·2	54·4	50·1	69	122·0	38·0	1·00	11	6·7
Auckland	75·0	26	47·0	22	70·0	57·2	55·6	79	118·0	47·0	1·75	11	5·4
Jamaica, Kingston ..	91·0	6	64·4	6	87·5	68·8	68·6	77	...	...	1·40	...	...
Grenada	83·0	26	71·0	22	81·2	73·5	...	76	139·0	...	4·16	21	3·5
Toronto	38·5	18	—11·7	13	21·3	6·6	...	...	118·5	—20·6	2·97	18	6·6
Fredericton	46·5	19	—31·5	27	17·2	—2·9	...	83	...	...	3·10	10	5·4
St. John, N.B. ...	46·3	19	—12·7	13	21·4	5·4	...	...	...	...	3·08	15	5·3
Edmonton, Alta. ...	45·6	29	—40·8	10	13·7	—6·1	...	89	101·1	—46·0	·93	12	7·2
Victoria, B.C.	52·5	4	23·5	1	44·2	37·0	...	90	...	...	4·15	20	8·0

MALTA.—Mean temp. of air, 55°·8. Average bright sunshine, 4·9 hours per day.

Johannesburg.—Bright sunshine, 287·6 hours.

Bloemfontein.—Hot and dry, the heat very oppressive.

KODAIKANAL.—Bright sunshine, 279 hours. Hoar frost on 19 days.

COLOMBO.—Mean temp. of air 78°·9 or 0°·1 below, of dew point 2°·6 below, and R 2·66 in. below, averages. Mean hourly velocity of wind 8·8 miles. TS on 29th.

HONGKONG.—Mean temp. of air 57°·3, or 2°·8 below, R 1·25 in. above, averages. Bright sunshine 39·4 hours or 103·4 hours below average.

Sydney.—Mean temp. of air 0°·3 below, and R 2·29 in. below, averages.

Melbourne.—Mean temp. of air 0°·5 below, and R 1·38 in. below, averages.

Adelaide.—Mean temp. of air 1°·3, below, and R ·59 in. below, averages.

Perth.—Mean temp. of air 1°·3 above, and R slightly below, averages.

Wellington.—Mean temp. of air 2°·1 below, and R ·43 in. below, averages. Bright sunshine 226·9 hours.

Auckland.—Mean temp. of air much below average of previous 45 years.

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"BRITISH RAINFALL, 1911."

Our readers are of course aware that the Editor of this Magazine is also the Editor of *British Rainfall*, and in what follows they must remember that they are not perusing the comments of an impartial critic. No one knows how far *British Rainfall* falls short of our ideal except ourselves; but we are always striving after improvement, and in this article we endeavour to state facts and repress aspirations.

The fifty-first annual volume of *British Rainfall* is now in the hands of the book-binder, and should reach subscribers in about a week's time. The volume is of substantial size, containing 496 pages, as compared with 440 last year, but it has been completed ten days earlier than in 1911. The purpose of this volume is to present to all interested in the subject as full an account of the rainfall of the British Isles for the year in question as it is possible to produce with the data and the funds available. The data are very abundant, but the limited interest in the subject, as expressed in the small income of the British Rainfall Organization, makes it necessary to compress and restrict both the figures published and the discussion of their bearings. For 1911 some 5,300 rainfall returns were received, of which some were incomplete, and a few obviously erroneous; but 5,000 gave satisfactory figures of monthly rainfall, and 3,253 were complete for daily rainfall also. The daily rainfall at one station for a year requires an octavo page, and to print over 3,000 pages of figures without discussion is obviously impossible; but the monthly figures could easily be given in about 280 pages, while the annual totals alone, with the names and necessary particulars of the stations occupy in *British Rainfall*, 1911, just 152 pages. As soon as it is possible to secure an addition to income sufficient to cover the cost of printing and checking the monthly figures in detail, this will be done. Meanwhile, the full monthly figures are printed in a special table for 300 stations, so selected as to represent as nearly uniform a distribution over the country as it is possible to secure; and, merely as a specimen, the daily values of ten stations are printed in full. The greater part of the volume is occupied by the discussion of the data, and, in order to explain how this is done, we may describe in some detail the contents of the volume just ready.

The book begins with the Report of the Director to the Trustees of the British Rainfall Organization, which takes the place of the "Report" formerly addressed to the reader of *British Rainfall*, and describes the work done at the Office, 62, Camden Square, by the Director and five permanent assistants. It contains an abstract of the accounts, which shows that the Organization is now almost self-supporting. The Treasurer gives a separate account of the Endowment Fund, which now amounts to about £1,600. Following the Report there are three special articles illustrated by diagrams and maps. The first of these deals in great detail with the rainfall of May 31st, 1911, in the Thames Valley, the second, by Mr. J. Fairgrieve, describes the time relations of the rainfall on that day, with eleven maps showing the areas on which rain was falling at different periods during the afternoon. The third article is a completion of the "Arrangement of Rainfall Stations in *British Rainfall*," dealing with Scotland and Ireland, as the first part dealt last year with England and Wales. The area of every river-basin in the two countries has been measured and the areas of the portions lying in each county given, these being the river-divisions in which the stations are arranged.

Then follows a statement of evaporation observations at twelve stations, with a comparison of the evaporation at Camden Square, with other meteorological data; as was to be anticipated, the evaporation in London was greater in 1911 than for any previous year since the observations began.

Next comes the annual article on "The Staff of Observers," dealing with the rain records which have dropped out and the new records which have come in since the issue of the previous volume. Each county is treated separately, with remarks on the more interesting gains and losses. One record drops out because the observer had his pocket-book, containing the first five months' record, stolen during the Coronation festivities; another because the gauge was continually tampered with by trippers; one of the most interesting new records is that established at The Wakes, Selborne, the house of the famous Gilbert White, who kept a rain-record there from 1782 to his death in 1793. In the summary for each county the number of existing rain records per 100 square miles is quoted. Thus, in the County of London there are 75 records for every 100 square miles; in Co. Sligo only 1 record for 1000 square miles. Most of the English counties have 6 or more records per hundred square miles, the worst being the East Riding of Yorkshire with 2 and Lincoln and Northumberland with 3. In Scotland only 11 counties out of the 33 have more than 3 rain gauges per hundred square miles, Renfrew being the best with 14, and Sutherland the worst with less than 1. In Ireland, Dublin, with 9 rain gauges per 100 square miles, is the only county with more than 2, and of the 32 counties, 17 have less than one rain record for every 100 square miles of area.

Part I. concludes with an Obituary article giving the names of 75 observers whose death has been announced since the completion of *British Rainfall 1910*, and biographical particulars of sixteen, amongst them being the late Mr. W. B. Pugh, of Patrington, who died at the age of 92, after keeping a rainfall record for 65 years, and Mr. G. Nevile, of Stubton, whose record extended unbroken over 50 years; four others had records exceeding 45 years, and altogether 18 had been observing for 30 years or more.

Part II. commences with Observers' Notes on the days and on the year 1911, dealing chiefly with rainfall in its relation to other meteorological conditions and to agriculture. This is followed by a discussion of The Distribution of Rainfall in Time, dealing with (1) Rain Days, including a new average map of the number of rain days per annum in the British Isles, (2) Droughts, with a special study of the great July drought in England, (3) Rain Spells, or periods of consecutive days with rain, (4) Representative records of daily rainfall at 10 stations, (5) the Duration of Rainfall, as measured at 20 stations where self-recording instruments are in use, and (6) Heavy Rains in short periods, taking note amongst others of two very remarkable falls, one of 2·44 in. in 50 minutes at Epsom on May 31st, 1911, the other of 3·00 in 1 hour at Fareham on May 26th.

Much space is then occupied with the discussion of heavy rains on individual days, and detailed maps are given showing the distribution of rain on eleven occasions; this includes the calculation of the total volume of water which fell upon the land of the British Isles on several occasions, and some relationships with the meteorological conditions are pointed out. While one such map and description is little more than a statement of observed facts it is hoped that the number of cases now accumulated will provide material which may yield interesting theoretical results.

Monthly rainfall next claims attention. It is pointed out that the features of the year 1911 were the exceptional drought of July and the excessive rainfall of December in England and Wales. Both these are compared with previous extremes, and it is shown that July, 1911, was drier than July, 1868, and much drier than July, 1869, the two which most nearly approached it, while December, 1911, was not quite so wet as December, 1868 or 1876, though the range of rainfall between the three did not exceed one-third of an inch. A detailed rainfall map of the British Isles (necessarily on a small scale, but prepared from about 2,000 plotted rainfalls) and a more generalized map showing differences from the average are given for each month, together with elucidatory letterpress, and there is also a discussion, with maps, of the rainfall of the successive winter and summer half-years.

Part II. terminates with an article on the total rainfall of the year in relation to the average, illustrated by a coloured map showing where an excess of rain prevailed and where there was a deficiency.

The most remarkable contrast was between the west of Scotland in Argyllshire, where there was a large area with an excess of more than 20 per cent., and the east of Scotland, round the Firth of Tay, where there was a deficiency at one point of 40 per cent. As the region of excess is normally the wettest and the region of deficiency is normally nearly the driest in Scotland, the actual fall of rain in the west was on this occasion more than six times as great as that in the east. The rainfall of the year is compared with the 35 years average for 215 stations, and the result shows that in 1911 Wales, Scotland and Ireland were within 1 per cent. of the average rainfall, while England had a deficiency of 6 per cent., which when spread over the British Isles meant a general deficiency of 2 per cent., the year being thus, on the whole, very nearly an average one.

The result of the effort which has been steadily made to elaborate the discussion of rainfall data may be judged of by a comparison of the space allocated to different parts of the volume twenty years ago and now, in actual number of pages and in percentages :—

Comparison of "British Rainfall," 1892 and 1911.

	1892.		1911.	
	pp.	Per cent. of Total.	pp.	Per cent. of Total.
PART I.—Report	3	1·1	12	2·4
Special Articles	12	4·6	56	11·3
Observers and Obituary	14	5·3	27	5·4
PART II.—Observers' Notes	98	37·1	73	14·7
Discussion of Daily Rainfall Data	29	11·0	101	20·4
Monthly and Annual Rainfall ...	17	6·4	62	12·5
PART III.—General Tables	71	27·0	152	30·7
Introductory and Miscellaneous	20	7·5	13	2·6
Size of Volume	264	100·0	496	100·0
No. of records dealt with	2850		5071	

This shows that while the proportion of letterpress to the General Tables remains not far from the same, the proportion devoted to Observers' Notes has had to be reduced to relatively less than one-half, while the proportion devoted to Special Articles and to the discussion of daily, monthly and annual rainfall has been practically doubled. The most remarkable difference, however, does not appear from this comparison : it consists in the geographical as distinguished from the merely statistical treatment of the whole subject, the weight laid on distribution, and the use of maps throughout to give in lines ten times as much exact information as is expressed in words.

We would like to think that the data sent in to the British Rainfall Organization are turned to as good account and at as small expense as any scientific material in any scientific institution in the world, and we believe that the quality of the work done by the Observers is second to none, and that the Organization is a triumph of voluntary co-operation.

THE WEATHER OF JULY.

By FRED. J. BRODIE.

THE earlier half of last month witnessed two periods of fine anticyclonic weather, separated by nearly a week of disturbed southerly conditions. The first seasonable spell was preceded by a few days of cool northerly breezes, but between the 4th and 6th of the month, when an anticyclone extended in from the Atlantic, the polar current died away, and the thermometer rose to a more seasonable level. In Ireland and Scotland the highest readings were recorded mostly on the 4th or 5th, but over England they occurred very generally on the 6th. In nearly all parts of the United Kingdom the thermometer on one or other of these dates rose above 70°; on the 6th it touched 77° at Camden Square, while on the 5th it is reported to have reached 78° at Balmoral. After the 6th the anticyclone passed away to the Continent, and for the next few days the weather was influenced by a large Atlantic depression, which occasioned frequent falls of rain in the west and north, and occasional showers in the east and south, with frequent thunderstorms in nearly all districts. With these conditions the thermometer was mostly below its average level, but after the 11th it rose decidedly over England, and a day or two later, when an anticyclone appeared over our northern districts, fine warm weather became general. The highest temperature of the period occurred either on the 12th or on the 14th or 15th. On the earlier occasion shade maxima of 85° and upwards were recorded in many parts of eastern, central and southern England, the thermometer reaching 90° at Greenwich and 91° at Tottenham and Camden Square. On the 14th and 15th the heat was more general, maxima of 85° and upwards being observed over a large portion of Great Britain. As far north as Balmoral the thermometer on the 15th reached 87°, while at Camden Square it rose on the same day to a maximum of 90°. After the 17th the weather entirely broke up, and for the remainder of the month it was in an extremely unsettled state, with cool breezes mainly from the north-easterly quadrant. During the 18th and 19th the fall in temperature was very brisk, and on the latter day the maximum readings in many parts of Great Britain were below 60° or nearly 30° lower than those of the preceding three or four days. A subsequent veering of the wind to east and south-east resulted in the temporary extension of a warmer air from the Continent, and between the 24th and 26th the thermometer rose above 75° in many districts, the readings of the 24th being as high as 81° at Camden Square and 82° at Greenwich. Later on, when deep depressions advanced over our islands from the Atlantic, the wind shifted to the south-westward and ultimately to the north-westward, and the weather became generally cool and thundery, with extremely heavy falls of rain in all the more western parts of the kingdom.

The counteracting influence of warm and cool spells resulted in a mean July temperature differing but little from the average, the

general tendency being for a slight excess over England, and a slight deficiency in Ireland and Scotland. The total duration of bright sunshine was, as a rule, considerably below the normal, a number of places in the west and south of Great Britain recording less than two-thirds of the average quantity. In London (at Westminster), the aggregate amount, 150 hours, was 31 less than the normal and was considerably less than half that recorded in the July of last year. In 1910 the July total was only 102 hours, but in every other year back to 1891 it was considerably larger than in 1912.

THAMES VALLEY RAINFALL, JULY, 1912.

THE July map of the Thames Valley rainfall indicates certain points of unusual interest. The effect of the height of the land on the total fall of rain is not so clearly shown as is frequently the case, especially in the winter months. Traces of this action appear in the heavy rainfall over the Cotteswolds, and to a slighter degree on the Chilterns. Within the watershed of the Thames, above Teddington, the average fall of 24 selected stations was 2·57 in., with an average of 16 rain days. On the crests of the Cotteswolds the total was as high as five inches, and at the other extreme it was less than 1·50 in. in the lower valley.

The most striking feature of the map is the peculiar tongue-like promontory of high rainfall which, commencing at the north of the map, stretches almost into London. During the month thunderstorms were frequent, and on the 23rd many districts were visited by torrential rain which produced the feature in question. The map of the rainfall on this day alone exhibits a striking similarity to that of the monthly map of the district under discussion.

The storm appears to have been centred at Hitchin, where the rainfall was as much as 3 inches for the day. The 1 inch isohyetal here enclosed a long almond shaped area within which there were two splashes of upwards of 2 inches near Hitchin and Shenley. One inch splashes are also shown at Warwick and at Olney. At Oxford the amount recorded for the 23rd is sufficient to account for the noticeable bend in the 3 inch isohyetal on the monthly map. Two large areas were without rain on this date, the first being all that land in the north-east corner of the map outside a curved line through Newmarket, Great Dunmow, and Southend; the second was a long ribbon-like strip running from Gloucester along the Thames watershed and then along the North Downs as far as Maidstone. It has not been possible, on this occasion, to prepare the map of the whole of the British Isles which we usually have before us in discussing the rainfall of the month. We should have been glad to have been able to trace out the effect of the numerous thunderstorms of the month over the whole country, but we have been

THAMES VALLEY RAINFALL — JULY, 1912.

Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir.

Rainfall Stations reporting

Isohyetals.

obliged to lay that interesting task on one side until the more pressing one of seeing *British Rainfall 1911* through the press has been finished.

INTERNATIONAL BALLOON ASCENTS.

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

February 2nd, 1910.

Starting Point	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Manchester....	England	5·0	—60	7·6	—56	48	N.E. by N.
Petersfield	„	5·6	—64	10·5	—62	51	N.E.
Paris.....	France	5·6	—62	5·8	—62	43	N.E.
Brussels	Belgium	6·8	—69	8·8	—60	67	E. by N.
Strassburg	Germany....	6·4	—76	8·6	—69	26	W.N.W.
Munich.....	„	6·6	—80	9·2	?	47	N. by E.
Vienna.....	Austria	6·6	—81	10·9	—76	18	N.N.W.
Pavlovsk	Russia	6·8	—92	6·6	—87	37	S.E.
Nizhni Olchedaeff	„	6·9	—76	9·9	—76	35	N.E.

February 3rd, 1910.

Paris.....	France	5·1	—60	9·4	—71	67	E.N.E.
Brussels	Belgium	5·5	—62	9·9	—71	35	N.E. by N.
Hamburg.....	Germany....	5·9	—69	7·9	—60	43	N. by W.
Strassburg	„	5·9	—63	10·9	—71	39	N.N.E.
Zurich	Switzerland..	5·7	—62	12·0	—72	44	N.E. by E.
Vienna.....	Austria	6·2	—72	9·6	—69	11	N.N.E.
Pavlovsk	Russia	7·3	—89	7·5	—83	17	N.
Nizhni Olchedaeff	„	5·6	—65	10·5	—72	39	N.

February 4th, 1910.

Paris.....	France	4·9	—55	6·7	—54	47	S.E. by E.
Lindenberg....	Germany....	5·9	—60	9·9	—62	30	N.E.
Strassburg	„	5·2	—62	6·3	—54	6	N.E. by N.
Munich.....	„	5·7	—60	7·1	—50	39	N.
Pavlovsk	Russia	6·4	—74	6·9	—73	53	N.

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.

On February 2nd a deep depression, with the barometer under 28·60 in., lay over Iceland, and a trough of low pressure extended to a shaltow depression over the Adriatic. Over Russia and Spain lay anticyclones with pressures of 30·30 in. and 30·10 in. respectively. The low pressure moved slowly to the east, and on the 4th many partial depressions lay over mid-Europe and the weather was influenced by the high pressure over Spain.

The ascents in England seem to have been very unfortunate, owing, perhaps, to the strong W. wind. On the Continent too many balloons burst prematurely or the record failed.

The figures show the relation that usually holds between the barometric pressure and the height and temperature of the isothermal column, and also the tendency that prevails in winter of the temperature to fall again after the inversion point is reached over a low pressure area is well shown at several stations on February 3rd.

HISTORIC RAINS.

THE accompanying extracts may interest our readers. They have been sent to us by the Rev. James Cross, Wimborne House, Dorset, who has frequently communicated similar quaint news-notes from the past.

From "Home Counties Magazine," March, 1912, page 55, but extracted from "Gentleman's Magazine," June, 1803, page 587.

On the evening of Thursday, June 9th, 1803, at 5 o'clock, a most singular phenomenon took place in Panton Street, Haymarket. The inhabitants were alarmed by a violent and a tremendous hail and shower storm, which extended only to Oxendon Street, Whitcombe Street, Coventry Street and the Haymarket, that is to say, over a space not more than about 200 acres. The torrent was so great that it could only be likened to a wonderful cascade from the brow of the most tremendous precipice for seven minutes, so that the cellars of all the inhabitants in Panton Street and Oxendon Street were filled with water. And in the midst of this hurricane an electric cloud descended in the middle of the street, fell in the centre of the coach-way, and sunk to a great depth, without leaving a vestige of any particle of matter, but instead forming a complete pit. The smell of brimstone for some considerable seconds was so strong that the inhabitants expected every minute to be suffocated. A Mr. Madden, who kept a public-house near the spot, had water and beer butts thrown flat from the stillions, and no other damage done.

Miscellaneous extracts from Diaries of Rev. Wm. Stukeley, M.D. Surtees Society, 1887. *No.* 80, *p.* 461.

On June 30th [1736] it began to rain in an extraordinary manner, and continued with little intermission four days and nights, the wind being N. and N.E. The quantity would have covered the surface of the earth 7 in. ·77 supposing none had run off or sunk in. This produced a most extraordinary flood in our river, the Welland, in the Nyne, the Trent, and all the kingdom over as the newspapers inform us. It is remarkable that a fortnight before, Mr. Wyng told to Mr. Lawrence and W. Stukeley with the greatest confidence that there would be a deluge (as he expressed it) that week. N.B.—3 in. ·76 of rain fell on July 3rd in 24 hours. Mr. Lawrence observed the barometer fall gradually for 5 days together preceding the great rain, from 30 in. ·2 to 29 in. ·41 ; long experience shows that falling half-an-inch gradually in such a space of 5 days betokens much rain.—*Diary*, vol. ii. 15-18.

JUNE IN THE PYRENEES.

By the Rev. R. P. Dansey.

The following account of an expedition to the Pyrenees, under the leadership of Mr. V. H. Gatty, who had kindly invited me to accompany him on his second visit to the range, may not be without interest to readers of this Magazine. First it may be noted that these mountains are quicker of access than many parts of Switzerland, and Pau—whence on a clear day there is a magnificent panorama of the range—can be reached in 23 hours from London. Leaving England on the 5th of June last we reached Gabas *via* Larums (the terminus of the line from Pau) the following afternoon in a thunderstorm. Gabas lies toward the western end of the range, near the Pic du Midi D'Ossau, a rocky pinnacle of some 9400 feet. Bad weather made this ascent out of the question. On the night of our arrival a second thunderstorm came on followed by a deluge of rain throughout the night, of possibly three or four inches. Indeed this western part of the range seems to be especially favoured by Jupiter Pluvius; the vegetation is luxuriant, consisting chiefly of fir, beech, yew and box scrub. At the ends of the branches of many of the trees are clumps of moss, quite disconnected with any growth on the stem, evidently testifying to the excessive moisture. From Gabas a good road, but seemingly little used, crosses the frontier (5890 feet) in ten miles, into Spain. We frequently found it finer and drier on the south side of the watershed, notably on two occasions, one in the western the other in the eastern Pyrenees, when on the north side showers, mist, or both had prevailed all day. On the latter of these two occasions we were driving from Ax over the watershed; the day was dull and the clouds down on the slopes on each side of the valley; above Hospitalet they enveloped us, making everything as wet as rain. On reaching the col (6290 ft.) we suddenly emerged from them, and soon reached sunshine. All the afternoon we could see from Porté—on the south side of the watershed—dense volumes of white cloud rushing vehemently through the low part of the watershed surrounding the col through which we had come, and speedily fining down to a tail and disappearing in the drier and warmer air on the south side of the range, and by moonlight the process was still being continued, though next morning the sky was cloudless.

Tourists are not catered for in these parts before July; the law is rigidly adhered to at Gabas, where we could obtain neither milk nor butter. A portly landlord and a man-of-all-work were the sole occupants of the Hotel des Pyrenees; the former did indeed catch trout for our dinner, while the latter waited on us as he smoked with nonchalance his ever-present cigarette.

Leaving Gabas on the 9th, we made our way to Gavarnie, about 4500 ft., near the centre of the range. The meteorological conditions still continued bad with heavy rain—chiefly at night—and fresh snow on the mountains, which on the 11th lay down to at

least 6500 ft. On the 12th, a fine morning, the summit of the Pimené, 9200 ft., was reached, but the clouds quickly descended, and with a temperature of 28°, accompanied with a cutting wind, a long stay was not desirable, and rain set in before we reached the valley. This was, however, the last of the bad weather, and from the 13th to the end of our stay, nearly two weeks later, brilliant hot days were our lot, and the peaks usually cloudless, with the exception of a short thunderstorm on the evening of the 19th, which did not unsettle the spell in the least. Shade temperatures of 62°—64° were experienced at 7500 ft, and 116° in the sun, while the highest noted at Gavarnie was 77°, though this was not on the same day, as I had no registering instrument to leave below in my absence. On the 17th, one of the most brilliant days, an early start was made, via the Cirque of Gavarnie, for the Brêche de Roland, about 9200 ft., a cleft in a huge

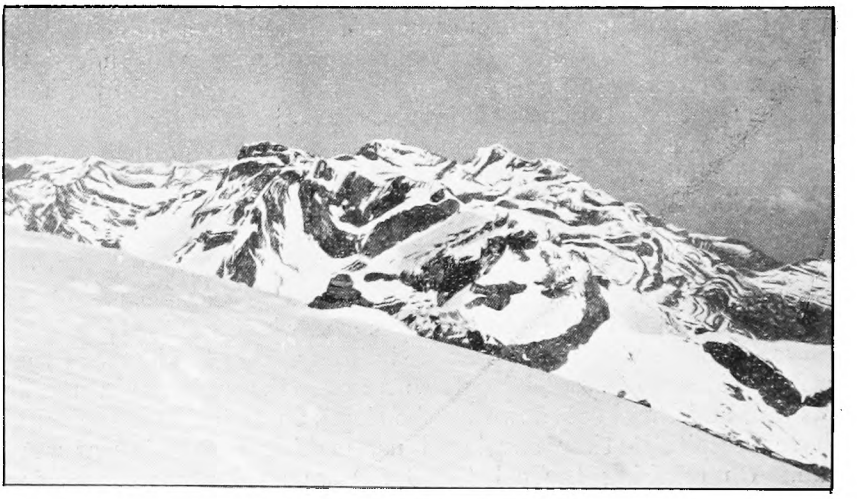

Fig. 1.

wall of rock on the watershed and frontier line. This wonderful ridge of naked rock is wider at the top than the bottom, with the result that the water which runs off from the melting snow falls clear from the top to the snow below, between 200 and 300 ft.; as the sun was almost vertical, on looking up it appeared to be pouring forth showers of golden rain. An hour's further toil brought us to the summit of The Taillon, 10,300 ft., about 3 p.m., this being our highest point. There was no shade, and the heat and glare were terrific. The top sloped up from the south to a cornice overhanging the northern precipices, and the actual cairn showing through the snow was several feet below the then highest point. By vigorously swinging the thermometer it descended to about 45°, but it *felt* 90. An interesting point occurs to me here. Does the temperature on Mont Blanc ever exceed the freezing point? I should be inclined to say "Yes" in settled anticyclonic weather, but only comparatively

rarely. Also, does rain ever fall on the summit? Surely not, for in anything but sunny settled weather the temperature there must always be too low. Is M. Vallot's observatory still existent there? I have never seen any published figures emanating from it, but there are perhaps those who could answer these queries—let us hope they will see them.

To return to the summit of The Taillon: northwards over France appeared a sea of cumuli, whilst southwards over Spain the sky was cloudless; this feature was also in evidence a week or so later, and may have marked the dividing line between our anticyclonic conditions and the low pressure systems so continuously prevalent over these islands throughout June. Four or five miles away to the east, were the highest of the Gavarnie peaks, Marboré, The Cylindre and Perdu, the latter 10,995 ft.

Fig. 2.

Owing to the amount of fresh soft snow and the extreme heat the going was decidedly trying. The Val d'Arazas, in Spain, was reached about sunset, the descent below the snows being by an extremely precipitous path; this valley much resembles a Colorado canyon, and looking at it from above or below it appears impossible of ingress or exit; layers of precipices line the sides interspersed with belts of fir trees which seem to have little else but rock for sustenance. Gavarnie was regained next day, via Bouchario and over the Porte d'Espagne—the regular mule track, 7,485 ft.

Mr. Gatty suggested a look at the Eastern Pyrenees for the last part of our programme, so we repaired, on the 22nd, to Ax-les-Thermes. The heat this day was unforgettable, 89° in the railway carriage before reaching Lourdes at 11 a.m., and on leaving Lourdes at 1 p.m. the thermometer stood at 94° till 4 p.m., and on holding it out of the window while the train was in full motion, it

indicated 95°, so that, in all probability, an instrument in a sun-baked screen would have shown quite 100°. From what I could gather it was an exceptionally hot day even for that district. This reminds me of the fact that in the grounds of one of the Hotels at Gavarnie, there reposes a meteorological stand, not a screen, presented by the Touring Club of France, but not a single instrument hangs thereon; perhaps meteorology is another item only catered for after July 1st, if then.

Ax-les-Thermes is about 2,350 ft. above sea, and appears to be built above a natural cavity of hot sulphur water. Our shaving water was brought from a spring in the road opposite the hotel, and was quite hot enough and pleasantly sulphurous; the hottest sulphur spring has a temperature of 172°, and is led into an open fountain in the town "place," where the poorer class come and wash their clothes.

Fig. 3.

Our objective from Ax was the Pic de Carlitte, 9500 ft., the best starting point for the ascent being the village of Porté, 21½ miles distant, on the south side of the range. Porté was reached by driving over the watershed past Hospitalet, the highest village on the north side. From the latter place a tunnel is being pierced to Porté for the Trans-Pyrenean Railway, which will be continued up this valley from Ax, the present terminus, and thence on to Barcelona. The col is 6290 ft.; usually it is blocked by snow for 4 or 5 months during the year, but so mild was last winter (1911-12) that the road had never been closed. After sleeping at the little inn at Porté, where the fowls and pigeons disputed with us their right to the stairs, we were off about 5 a.m., on the 25th for Carlitte, accompanied by a wily chasseur of the district, who hunts the izard—in season and out. On the way we were fortunate enough to see one of these

animals, the chamois of the Pyrenees, quite unconscious of our presence, the chasseur, meanwhile, announcing his intention to come stalking this way on the morrow, regardless of the fact that the opening of the season was more than a month ahead. Carlitte's top was reached by a rocky scree slope, and it was only necessary to cross two or three patches of snow, indeed it would have been possible to have reached the summit of 9500 feet without touching snow at all, though there were deep beds in the hollow which Carlitte forms with a ridge on the west. At this height we basked in glorious sun from 10 to 12.30 p.m., with temperature well above 50°. A glorious view ; a cloud-sea over the French plain to the north, Canigou looking quite near in the south-east, the Pic de Nethou, 11,165 feet, the highest point of the range, about 65 miles away, in the west.

The rainfall is evidently much less in the Eastern Pyrenees than in the centre or further west, where snow patches began at 6,000 ft. and were in masses at 7,000 ft. Round Gavarnie the peaks above 9,500 ft. usually have small glaciers ; some of these form in the ledges of the Cirque and show no signs of advance or fracture over the precipices below. The flora between 6,500 ft. and 7,500 ft., when the snow has just melted, is wonderful, the grass in places blue with gentians and pink primulas in profusion among the rocks even at 8,000 ft., while multi-coloured gorgeous butterflies hold high revel in the sunshine. We were very lucky in the weather, especially for the higher ascents of The Taillon and Pic de Carlitte ; previous to the fine spell which set in on the 13th, we were told that there had not been a fine day since the beginning of May.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE THUNDERSTORM OF MAY 30th AT MANSFIELD.

I ENCLOSE a cutting from our local newspaper *re* the heavy thunderstorm we had last Thursday afternoon, May 30th. The rain commenced about 3 o'clock, and at 3.40 p.m., when the rain slightly abated, I measured 1·26 inches. At 9 o'clock on the following morning the total for the preceding 24 hours was 1·54 inches, practically all of which fell between 3 and 4 o'clock. The thunder was nearly continuous for about half-an-hour, but only one flash of lightning was close to and struck a house in the town, not doing much damage.

WM. PICKARD.

West Bank, Mansfield, June 14th, 1912.

" The surface drainage system was utterly unable to cope with the waters, and even the sewers were choked with the rushing, seething flood.

From the higher parts of the town converging on St. John-street and Wood-street, the waters flooded down the roadways into the old Market-place and West-gate, Stockwell-gate, and eventually down Church-street into the natural water-courses there.

But the centre of the town for several hours was chaos personified, the water in places rising to several feet in depth, and executing incalculable damage in the emporiums of the principal tradesmen of the town."

TORRENTIAL RAIN ON JULY 23rd.

THE rainfall here this afternoon may interest you. Steady and heavy rain began about 2.50 p.m., and ceased about 4 p.m. The fall for this period was 1·10 inches.

It began to rain steadily again about 5 p.m., and ceased at 7.15 p.m. The fall during this period was 1·93 in., or 3·03 inches for the afternoon. Showers are still passing. The rain was accompanied by some thunder and lightning, but not of violent or alarming character.

The Maples, Hitchin, 23rd July, 1912. WILLIAM HILL.

THE WETTEST FIRST QUARTER ON RECORD.

MAY BE the above title is a little too strong; but the three months ending March 31st have certainly proved to be the wettest quarter in 18 years' observations. The total fall is 14·62 in. compared with only 4·74 in. in 1911. Viewed in another way the contrast with last year appears still more startling, for the amount of rain which has fallen this year from January 1st to March 31st had not fallen last year till September 29th. The previous wettest first quarter comes far behind these figures, viz.: 1903 with 10.89 in. Three years in the last eighteen have had less rain than has fallen in the four months, December—March.

	Fall.	Excess (on 6 year's average).
January	5·45	..... 3·20
February..... ..	2·85	..... ·72
March	6·32	..... 3·34
Total.....	14·62	7·26

Kentchurch Rectory, Hereford. R. P. DANSEY.

THE THUNDERSTORM OF MAY 31st.

WE are indebted to Mr. J. Shipley Ellis for some interesting details of a storm which circled round the west and north of Peterborough at about five miles distance on the evening of May 31st. The storm appears to have extended from Alwalton and Castor, round through Stibbington, and across by Barnack to Tallington, Bourne and Peakirk. In Peterborough there were thunder showers, but only

·11 in. of rain was measured, whereas at Bourne the fall amounted to 2·12 in. It is a regrettable fact that no records are available for Castor and Stibbington, where the storm seems to have been even more severe, but we have heard that at Waternewton the Rector recorded 3·00 in.

Some interesting details of the storm and the havoc wrought by it are given in *The Citizen* and in the *Lincolnshire, Boston and Spalding Free Press.* An extraordinary darkness settled over the country, and a traveller in the 6 o'clock train from Peterborough to Oundle declared that near Elton the darkness was so intense that people sitting in the same railway compartment could only be seen very indistinctly. Candles were lighted in the cottages and houses. The lightning and thunder were very severe, but the hail and rain which accompanied the storm descended with a roar that deadened the thunder, and clattered on the top of the trains with such a noise that if the travellers had shouted they would probably not have been heard. After the storm an extraordinary scene presented itself. The country was inundated; not merely roads, but hundreds of acres of arable and grass land being under water. Two hours afterwards the hail lay thick on the banks and sheltered places as though a snow-storm had passed, and it was still in such quantities near Alwalton the next morning that it could have been shovelled away. Extensive lakes were formed on the fields on the Castor side of the railway and great damage was done to growing crops. About seven tons of granite were swept down Castor Hill, and almost all the shops and cottages in the neighbourhood were flooded.

At Bourne several cottages were struck by lightning, a house in Manning Road being considerably damaged. At about 8 p.m. the lightning struck the chimney, and there was a big fall of bricks which crashed through the roof. A considerable number of the tiles were displaced and the roof of an outhouse was also damaged. Some horses and cattle were killed in villages north-west of the town and trees were also destroyed. At Market Deeping the storm was most violent and lasted about an hour and a half. Houses were flooded and the streets in some places were eighteen inches deep in water. The driver of the 7 p.m. train from Essendene stopped his engine outside Braceborough Station owing to the blinding nature of the lightning which was so vivid that at times it was impossible to see anything. Telegraphic and telephonic communication was temporarily suspended and some of the wires were broken down. The roads in the hilly districts have been much damaged by the torrential rainfall.

In Mr. Dansey's paper the titles of the illustrations on pp. 142—144 were accidentally omitted. They are :—

Fig. 1.—Brêche de Roland. Fig. 2.—Summit of the Taillon, looking east.
Fig. 3.—At the Brêche de Roland, 9,200 feet.

RAINFALL TABLE FOR JULY, 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1912. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·57	1·44
Tenterden	*Kent*	51 4	*0 41	190	2·21	1·02
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·46	2·09
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·42	2·88
Oxford (Magdalen College).	*Oxfordshire*	51 45	1 15	186	2·43	2·95
Wellingborough (Croyland Abbey).	*Northampton*	52 18	0 41	174	2·54	4·20
Shoeburyness	*Essex*	51 31	*0 48	13	1·73	1·35
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·68	2·82
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·37	3·30
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	2·74	2·65
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·68	2·24
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·75	5·90
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·58	2·66
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·60	3·44
Boston	*Lincolnshire*	52 58	0 1	25	2·35	4·16
Worksop (Hodsock Priory).	*Nottinghamshire*	53 22	1 5	56	2·35	4·82
Macclesfield	*Cheshire*	53 15	2 7	501	3·41	3·58
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	2·92	4·23
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	4·75	5·74
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·56	4·11
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·39	3·39
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·90	...
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	8·91	10·26
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·26	3·48
Haverfordwest	*Pembroke*	51 48	4 58	95	3·39	4·37
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·03	4·62
Llandudno	*Carnarvon*	53 20	3 50	72	2·52	4·17
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·20	4·68
Marchmont House	*Berwick*	55 44	2 24	498	3·30	1·62
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	3·73	1·86
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·91	2·13
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	4·72	3·38
Mull (Quinish)	,,	56 34	6 13	35	4·12	4·56
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·84	2·45
Braemar	*Aberdeen*	57 0	3 24	1114	2·65	2·46
Aberdeen (Cranford)	,,	57 8	2 7	120	3·00	1·98
Cawdor	*Nairn*	57 31	3 57	250	3·14	1·66
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·98	2·45
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	5·35	3·62
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·91	2·25
Wick	*Caithness*	58 26	3 6	77	2·67	2·19
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·53	3·38
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·13	5·98
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·02	4·08
Miltown Malbay	*Clare*	52 52	9 26	400	3·59	4·10
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·90	5·60
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·99	5·06
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·60	3·06
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·16	4·37
Cong (The Glebe)	*Mayo*	53 33	9 16	112	3·72	3·82
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	3·26	2·36
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·36	3·79
Seaforde	*Down*	54 19	5 50	180	3·32	4·25
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·28	2·71
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·34	4·49

RAINFALL TABLE FOR JULY, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
—1·13	56	·26	2	12	13·53	14·42	+ ·89	107	25·11	Camden Square
—1·19	46	·22	1	13	13·65	14·01	+ ·36	103	27·64	Tenterden
— ·37	85	·61	13	12	14·92	18·11	+3·19	122	30·48	Patching
+ ·46	119	·58	30	15	15·73	18·74	+3·01	119	31·87	Cadland
+ ·52	121	·79	23	17	13·03	17·44	+4·41	134	24·58	Oxford
+1·66	165	·69	27	18	13·68	16·18	+2·50	118	25·17	Croyland Abbey
— ·38	78	·30	1	11	9·73	9·63	— ·10	99	19·28	Shoeburyness
+ ·14	105	1·19	6	13	13·44	13·47	+ ·03	100	25·40	Westley
+ ·93	139	·76	19	17	11·98	12·72	+ ·74	106	23·73	Geldeston
— ·09	97	·49	28	20	18·62	24·69	+6·07	133	38·27	Polapit Tamar
— ·44	84	·70	27	18	17·01	21·72	+4·71	128	33·54	Rousdon
+3·15	214	·96	27	21	15·83	25·83	+10·00	163	29·81	Stroud
+ ·08	103	·40	27	20	16·88	20·76	+3·88	123	32·41	Wolstaston
+ ·84	132	·78	31	16	15·35	22·16	+6·81	144	28·98	Coventry
+1·81	177	·89	20	16	12·21	15·77	+3·56	129	23·35	Boston
+2·47	205	·91	27	18	13·15	20·17	+7·02	154	24·46	Hodsock Priory
+ ·17	105	·50	27	16	18·17	18·56	+ ·39	102	34·73	Macclesfield
+1·31	145	1·79	31	16	15·88	21·50	+5·62	135	32·70	Southport
+ ·99	121	1·03	31	16	31·97	41·16	+9·19	129	61·49	Arncliffe
+1·55	161	1·37	12	13	14·19	22·26	+8·07	157	26·87	Ribston Hall
+1·00	142	·49	19	20	13·47	18·39	+4·92	136	26·42	Hull
...	...	...	...	...	14·45	...	..	..	27·94	Newcastle
+1·35	115	1·93	28	18	65·29	70·30	+5·01	108	129·48	Seathwaite
+ ·22	107	·88	27	19	20·48	28·91	+8·43	141	42·28	Cardiff
+ ·98	129	·88	31	17	22·84	30·50	+7·66	134	46·81	Haverfordwest
+ ·59	115	1·51	28	16	22·15	26·99	+4·84	122	45·46	Gogerddan
+1·65	166	1·58	31	18	14·89	16·97	+2·08	114	30·36	Llandudno
+1·48	146	·85	28	15	22·26	29·20	+6·94	131	43·47	Cargen
—1·68	49	·30	27	13	17·68	16·30	—1·38	92	33·76	Marchmont
—1·87	50	·45	12	12	24·83	28·08	+3·25	113	49·77	Girvan
— ·78	73	·54	28	12	18·42	18·23	— ·19	99	35·97	Glasgow
—1·34	72	·97	28	13	34·04	35·52	+1·48	104	68·67	Inveraray
+ ·44	111	1·14	28	14	27·67	28·03	+ ·36	101	56·57	Quinish
— ·39	86	·64	25	13	14·86	14·31	— ·55	96	28·64	Dundee
— ·19	93	1·05	25	9	17·80	18·51	+ ·71	104	34·93	Braemar
—1·02	66	·53	25	12	17·02	15·93	—1·09	94	32·73	Aberdeen
—1·48	53	·27	25	10	15·65	12·86	—2·79	82	29·33	Cawdor
— ·53	82	·51	26	16	23·20	21·38	—1·82	92	44·53	Fort Augustus
—1·73	68	·73	10	12	42·90	38·49	—4·41	90	83·93	Bendamph
— ·66	77	·63	31	10	17·19	15·94	—1·25	93	31·90	Dunrobin Castle
— ·48	82	·61	31	15	15·38	15·81	+ ·43	103	29·88	Wick
— ·15	96	·77	26	16	28·40	32·21	+3·81	113	54·81	Killarney
+2·85	191	1·57	11	16	20·53	28·15	+7·62	137	39·57	Waterford
+1·06	135	·81	24	18	20·53	24·28	+3·75	118	39·43	Castle Lough
+ ·51	114	·82	21	14	22·30	28·12	+5·82	126	45·11	Miltown Malbay
+2·70	193	1·47	11	16	18·32	28·49	+10·17	155	34·99	Courtown Ho.
+2·07	169	·86	24	18	18·83	23·53	+4·70	125	35·92	Abbey Leix
+ ·46	118	·56	31	17	14·75	16·82	+2·07	114	27·68	Dublin
+1·21	138	1·45	27	17	19·17	24·79	+5·62	129	36·15	Mullingar
+ ·10	103	·90	24	19	25·13	26·43	+1·30	105	48·90	Cong
— ·90	72	·42	12	18	26·64	25·58	—1·06	96	52·87	Enniscoe
+ ·43	113	·50	11	18	22·19	25·85	+3·66	116	42·71	Markree
+ ·93	128	1·31	26	15	20·74	28·49	+7·75	137	38·91	Seaforde
— ·57	83	·70	12	11	18·77	20·51	+1·74	109	37·56	Dundarave
+1·15	134	·80	27	16	20·44	25·52	+5·08	125	39·38	Omagh

SUPPLEMENTARY RAINFALL, JULY, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road .	1·80	XI.	Lligwy	5·47
,,	Ramsgate	1·82	,,	Douglas	...
,,	Hailsham	1·22	XII.	Stoneykirk, Ardwell House...	1·76
,,	Totland Bay, Aston House...	1·85	,,	Dalry, The Old Garroch.....	3·63
,,	Stockbridge, Ashley..	1·95	,,	Langholm, Drove Road	4·10
,,	Grayshott	2·77	,,	Beattock, Kinnelhead	4·04
,,	Caversham, Rectory Road ...	1·49	XIII.	St. Mary's Loch, Cramilt Ldge	3·68
III.	Harrow Weald, Hill House...	1·49	,,	North Berwick Reservoir.....	1·28
,,	Pitsford, Sedgebrook....	3·77	,,	Edinburgh, Royal Observaty.	2·01
,,	Woburn, Milton Bryant.....	2·48	XIV.	Maybole, Knockdon Farm ...	1·68
,,	Chatteris, The Priory.....	3·88	XV.	Campbeltown, Witchburn ..	3·55
IV.	Colchester, Lexden	1·00	,,	Holy Loch, Ardnadam.....	4·38
,,	Newport.....	1·54	,,	Ballachulish House	3·29
,,	Ipswich, Copdock	2·40	,,	Islay, Eallabus	3·60
,,	Blakeney.....	4·34	,,	Tirie, Cornaigmore	3·22
,,	Swaffham	3·52	XVI.	Dollar Academy	1·91
V.	Bishops Cannings	2·13	,,	Balquhidder, Stronvar.....	2·98
,,	Winterbourne Steepleton.....	2·26	,,	Coupar Angus	2·58
,,	Ashburton, Druid House.....	3·33	,,	Glenlyon, Meggernie Castle..	2·67
,,	Cullompton	3·03	,,	Blair Athol	1·61
,,	Lynmouth, Rock House	3·04	,,	Montrose, Sunnyside Asylum.	1·82
,,	Okehampton, Oaklands.....	2·30	XVII.	Alford, Lynturk Manse	1·26
,,	Hartland Abbey.....	2·53	,,	Fyvie Castle	1·58
,,	Probus, Lamellyn.....	4·36	,,	Keith Station	2·66
,,	North Cadbury Rectory.....	3·01	XVIII.	Skye, Dunvegan	4·27
VI.	Clifton, Pembroke Road.....	4·89	,,	N. Uist, Lochmaddy	2·65
,,	Ross, The Graig	3·88	,,	Glenquoich, Loan.....	6·90
,,	Shifnal, Hatton Grange.....	2·50	,,	Alvey Manse.....	1·84
,,	Droitwich.....	2·83	,,	Loch Ness, Drumnadrochit...	2·18
,,	Blockley, Upton Wold.....	5·37	,,	Glencarron Lodge	4·24
VII.	Market Overton.....	5·29	XIX.	Invershin	1·39
,,	Market Rasen.....	3·92	,,	Loch Stack, Ardchullin	3·45
,,	Bawtry, Hesley Hall	3·63	,,	Melvich	2·00
,,	Derby, Midland Railway.....	3·50	XX.	Skibbereen Rectory	2·79
,,	Buxton	6·03	,,	Dunmanway, The Rectory ..	5·03
VIII.	Nantwich, Dorfold Hall	3·32	,,	Glanmire, Lota Lodge.....	5·73
,,	Chatburn, Middlewood	4·29	,,	Mitchelstown Castle.....	7·73
,,	Cartmel, Flookburgh	6·70	,,	Darrynane Abbey.....	2·86
IX.	Langsett Moor, Up. Midhope	6·23	,,	Clonmel, Bruce Villa	6·01
,,	Scarborough, Scalby	4·89	,,	Newmarket-on-Fergus, Fenloe	4·28
,,	Ingleby Greenhow	6·58	XXI.	Laragh, Glendalough	6·61
,,	Mickleton	4·35	,,	Ballycumber, Moorock Lodge	4·52
X	Bellingham, High Green Manor	1·77	,,	Balbriggan, Ardgillan	3·27
,,	Ilderton, Lilburn Cottage ...	2·81	XXII.	Woodlawn	4·22
,,	Keswick, The Bank.....	5·29	,,	Westport, St. Helens	3·11
XI.	Llanfrechfa Grange	5·05	,,	Achill Island, Dugort	2·91
,,	Treherbert, Tyn-y-waun	6·75	,,	Mohill, The Rectory	2·41
,,	Carmarthen, The Friary	4·29	XXIII.	Enniskillen, Portora.....	...
,,	Castle Malgwyn [Llechryd]...	2·59	,,	Dartrey [Cootehill]	3·59
,,	Crickhowell, Tal-y-maes.....	5·50	,,	Warrenpoint, Manor House ..	3·48
,,	New Radnor, Ednol	4·50	,,	Banbridge, Milltown	3·44
,,	Rhayader, Tyrmynydd	4·79	,,	Belfast, Cave Hill Road	3·72
,,	Lake Vyrnwy	5·07	,,	Glenarm Castle.....	3·61
,,	Llangyhanfal, Plâs Draw.....	2·56	,,	Londonderry, Creggan Res...	...
,,	Dolgelly, Bryntirion.....	5·43	,,	Killybegs	4·42
,,	Bettws-y-Coed, Tyn-y-bryn...	6·27	,,	Horn Head	5·32

METEOROLOGICAL NOTES ON JULY, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—The conditions were generally dull with frequent light showers, except for a fine dry week with high temp. from 10th to 17th. Temp. was low in the first week and in the last few days. Duration of sunshine 134·7* hours, and of R 22·2 hours. Mean temp. 64°·5, or 1°·0 above the average. Evaporation 2·55 in. Shade max. 91°·4 on 12th; min. 47°·1 on 9th. F 0, f 0.

TENTERDEN.—Hot days from 10th to 17th, five having temp. over 80°. Duration of sunshine 226·0† hours. Shade max. 88°·0 on 12th; min. 45°·0 on 19th. F 0, f 0.

PITSFORD.—Mean temp. 61°·8. Shade max. 85°·2 on 12th and 15th; min. 44°·5 on 9th.

IPSWICH, COPDOCK.—A brilliant week from the 10th to the 17th, several cold sunless days, but the R was very welcome from an agricultural point of view. Duration of sunshine 198·4† hours. Mean temp. 63°·0. Shade max. 86°·2 on 12th; min. 45°·6 on 18th. F 0, f 0.

POLAPIT TAMAR.—Shade max. 83°·9 on 15th; min. 38°·0 on 9th. F 0, f 0.

NORTH CADBURY.—Extremely humid, except from noon on the 14th to noon on 19th. Numerous showers were exasperating to haymakers, who made no real progress save in the one short dry hot spell. Last 4 days stormy and cool. Shade max. 91°·0 on 15th; min. 43°·5 on 9th. F 0, f 0.

ROSS.—Shade max. 87° 0 on 15th; min. 42°·6 on 9th. F 0, f 0.

HODSOCK PRIORY.—The wettest and dullest July since 1888, which was a little worse in both respects. The nights were very mild and the daily temp. range very small. Shade max. 83°·4 on 12th; min. 43°·6 on 9th. F 0, f 0.

SOUTHPORT.—Duration of sunshine 147·3* hours or 68·0 hours below the average, and the smallest in 20 years. Duration of R 49·6 hours. Evaporation 2·87 in. Mean temp. 60°·1 or 0°·7 above the average. An excess of E. winds and a deficiency of W. winds unprecedented in 40 years. Shade max. 78°·0 on 16th; min. 47°·0 on 5th. F 0, f 0.

HULL.—Cloudy and showery to 8th, then finer to 18th, and again unsettled with persistent R, squally winds and frequent T to the end. Shade max. 79°·0 on 12th; min. 46°·0 on 9th. F 0, f 0.

GOGERDDAN.—The month closed with heavy TSS. The R on 28th and 31st was exceptionally heavy, and on the latter day there was a strong gale. Shade max. 77°·0 on 7th; min. 36°·0 on 19th. F 0, f 0.

CARGEN.—Fine weather during the first three weeks, but last nine days wet and sunless. Shade max. 83°·5 on 15th; min. 42°·0 on 19th.

EDINBURGH.—Sunshine much below the average. Shade max. 74°·6 on 12th; min. 46°·8 on 19th. F 0, f 0.

INVERARAY.—An unusually fine July, with pleasant warm weather, but only two or three days really hot.

COUPAR ANGUS.—Mean temp. 3°·4 below the average. Shade max 78°·5 on 20th; min. 40°·0 on 23rd. F 0, f 0.

FORT AUGUSTUS.—Shade max. 74°·0 on 4th; min. 39°·0 on 23rd.

LOCH STACK.—Duration of sunshine, 123·1* hours.

GLANMIRE.—Up to 19th the month was dry and moderately warm, but a spell of heavy R storms then set in and continued to the end.

CLONMEL.—The wettest July since 1903. Shade max. 78°·0 on 15th and 16th; min. 41°·0 on 8th.

DUBLIN.—Save for a break in the second week the weather was favourable until 21st. From that day to the end very unsettled weather prevailed. Mean temp. 58°·9. Shade max. 73°·1 on 15th; min. 46°·9 on 19th. F 0, f 0.

WARRENPOINT.—A month of low temp. Fairly dry to 20th, when almost continuous R set in, with heavy clouds and fog.

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* Campbell-Stokes† † Jordan

Climatological Table for the British Empire, February, 1912.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	58·5	28	16·7	3	48·7	38·0	40·7	88	92·3	18·5	1·71	20	8·1
Malta	71·4	25	49·1	18	61·8	53·3	49·5	80	131·8	.	·64	3	5·0
Lagos	91·5	22	71·3	23	88·8	76·6	74·1	72	150·0	69·0	1·87	3	...
Cape Town	90·4	26	47·7	16	77·8	59·0	59·1	74	...	...	·34	5	3·9
Durban, Natal ...	90·3	22	63·7	27	84·1	70·2	70·6	74	152·4	...	2·58	16	6·3
Johannesburg	80·5	2	50·2	27	76·4	58·5	58·1	80	152·9	49·0	5·28	14	5·6
Mauritius	88·0	1	71·1	16	83·7	74·8	74·0	86	155·0	66·4	31·51	25	8·5
Bloemfontein	94·1	1	51·9	7	82·2	61·8	58·1	68	...	...	3·60	15	5·4
Calcutta...	93·6	29	58·0	21	84·8	64·5	62·5	69	...	51·5	·74	2	3·0
Bombay...	92·0	21	66·4	3	84·7	71·2	66·5	70	133·8	57·9	·00	0	1·3
Madras	89·3	28	66·5	26	86·7	71·3	70·3	78	135·3	62·8	·00	0	2·4
Kodaikanal	71·5	10	44·2	22	67·6	49·4	45·4	67	144·9	34·6	·64	2	3·5
Colombo, Ceylon ...	91·6	22	71·7	24	88·1	74·7	71·6	73	154·8	63·9	3·63	5	3·7
Hongkong	76·8	28	47·8	1	64·4	56·4	52·7	75	130·5	...	2·44	11	6·8
Sydney	87·4	7	60·9	20	78·0	66·3	62·9	73	148·3	51·2	7·00	26	6·8
Melbourne	106·5	1	51·6	29	79·7	60·6	55·1	58	155·6	45·5	·94	7	4·4
Adelaide	112·8	2	53·9	19	90·7	66·8	55·0	44	168·0	45·4	·38	5	2·7
Perth	106·6	19	55·2	7	85·8	64·8	59·0	59	155·6	46·8	·38	3	2·9
Coolgardie	110·5	1	58·0	17	98·4	67·6	55·9	39	175·2	57·0	·10	2	3·0
Hobart, Tasmania ...	101·0	3	47·0	15	74·2	55·5	49·1	54	146·9	42·1	·29	2	5·6
Wellington	72·4	29	47·2	18	65·4	53·7	49·6	70	126·0	38·0	3·53	9	6·4
Auckland	77·0	4	49·0	18	71·4	57·9	58·5	77	109·0	45·0	3·62	15	6·5
Jamaica, Kingston ...	90·8	23	61·2	9	85·6	68·5	67·8	81	...	...	·74	4	3·3
Grenada	84·0	var.	70·0	15	82·0	74·0	...	72	140·0	...	2·12	11	2·5
Toronto	45·6	25	—18·8	10	26·1	11·9	...	...	119·0	23·8	1·66	13	6·8
Fredericton	45·2	22	—25·0	10	26·1	5·1	...	86	...	...	2·60	10	5·1
St. John, N.B. ...	43·7	22	—12·0	11	27·8	13·0	...	...	...	...	2·99	12	4·9
Edmonton, Alta. ...	46·3	16	—20·9	8	30·8	11·7	...	80	107·4	—22·3	·10	4	6·9
Victoria, B.C.	53·9	9	28·5	27	48·2	37·7	...	82	...	...	3·14	17	7·0
Dawson	40·0	20	—23·0	26	10·6	—2·0	...	...	...	...	1·05	5	...

MALTA.—Mean temp. of air, 56°·7, or 4°·5 higher than in 1911. Average bright sunshine, 7·6 hours per day.

Johannesburg.—Bright sunshine, 208·6 hours.

Mauritius.—R 24·48 in. above average. Mean hourly velocity of wind 13·2 miles, or 4·0 above average.

KODAIKANAL.—Bright sunshine, 232 hours.

COLOMBO.—Mean temp. of air 81°·4 or 1°·2 above, of dew point 1°·0 above, and R 1·62 in. above, averages. Mean hourly velocity of wind 4·1 miles. TS on 2 days.

HONGKONG.—Mean temp. of air 59°·9. Bright sunshine 138·8 hours.

Sydney.—Mean temp. of air 1°·1 above, and R 2·26 in. above, averages.

Melbourne.—Mean temp. of air 2°·7 above, and R ·82 in. below, averages.

Adelaide.—Mean temp. of air 4°·8, above, and R ·20 in. below, averages. A hot month, max. temp. over 90° on 14, and 6 being over 100°.

Coolgardie.—Mean temp. of air 7°·5 above average, and the hottest February on record here.

Wellington.—Mean temp. of air 2°·9 below average. Bright sunshine 229·7 hours.

Symons's
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UNPRECEDENTED RAINFALL IN NORFOLK.

The rain which fell in Norfolk on August 26th and 27th, 1912, was altogether unprecedented for a cyclonic storm in the east of Great Britain. It was the crowning episode of what will probably prove the wettest August on record, and we accordingly devote all our available space to an account of what occurred, and give a preliminary map of the distribution of rain in East Anglia on the two days. The features of the storm were similar in a general way to the great cyclonic fall of rain in the Thames Valley on June 13–15, 1903 (see *British Rainfall*, 1903, pp. 19-30; also this Magazine, **39** (1904), pp. 161-165, and to that on the east coast of England on June 23-24, 1911 (see *British Rainfall*, 1911, pp. [143]–[152]; but in both of those cases the rain area lay in a loop of the track of a depression which turned to the left as it proceeded. On this occasion the relation of the track of the depression to the rain area was exactly similar to that of the great Irish fall of August 24-26, 1905 (see *British Rainfall*, 1905, pp. [110]–[114]), the coincidence of the time of year also being surprisingly close. The Irish depression appeared in St. George's Channel, passed slowly northward into the Irish Sea, and when the centre was off the most easterly point of Co. Wicklow, it turned abruptly eastward and travelled rapidly over England. Torrential rains fell in the east of Ireland, where there was an area of 310 square miles with more than 5 inches of rain (most of it falling on the 25th), and an area of 850 square miles with between 4 and 5 inches; the wettest areas lay to the north-east of the point where the track of the depression turned at right angles to the right.

At 7 a.m. on August 26th, 1912, the Daily Weather Report shows that a trough of low pressure lay across the south of England, and at the east end of it a depression, with less than 29·20 in. pressure lay off the North Foreland. This depression moved slowly northwards into the North Sea, and at 6 p.m. had deepened to less than 29·00 in. off the most easterly part of the Norfolk coast. Some time after this hour the track seems to have turned to the right, for by 7 a.m. on the 27th, the centre of the depression, now filling up, had moved

quickly across the North Sea to near Helgoland. The area of torrential rain lay centrally in the north-east of Norfolk, and a provisional computation shows that 870 square miles had more than 5 inches for the two days (but most fell on the 26th) and 900 square miles had between 4 and 5 inches.

The storm seems to have been central close to Norwich, and the following letters give some of the more important facts and impressions recorded by our correspondents. Mr. A. W. Preston, whose unremitting attention has brought rain-observing in Norfolk to a high degree of excellence, is well known to our readers, and Mr. J. H. Willis has an observational equipment as nearly perfect as instruments can be. The letters from Rev. F. W. Walter and from Mr. R. Cross show that the course of events at Worstead was very similar, though the discrepancy between the amounts measured has still to be enquired into.

At Eaton, Norwich.

We have had a most extraordinary rainfall here. My figures are :—

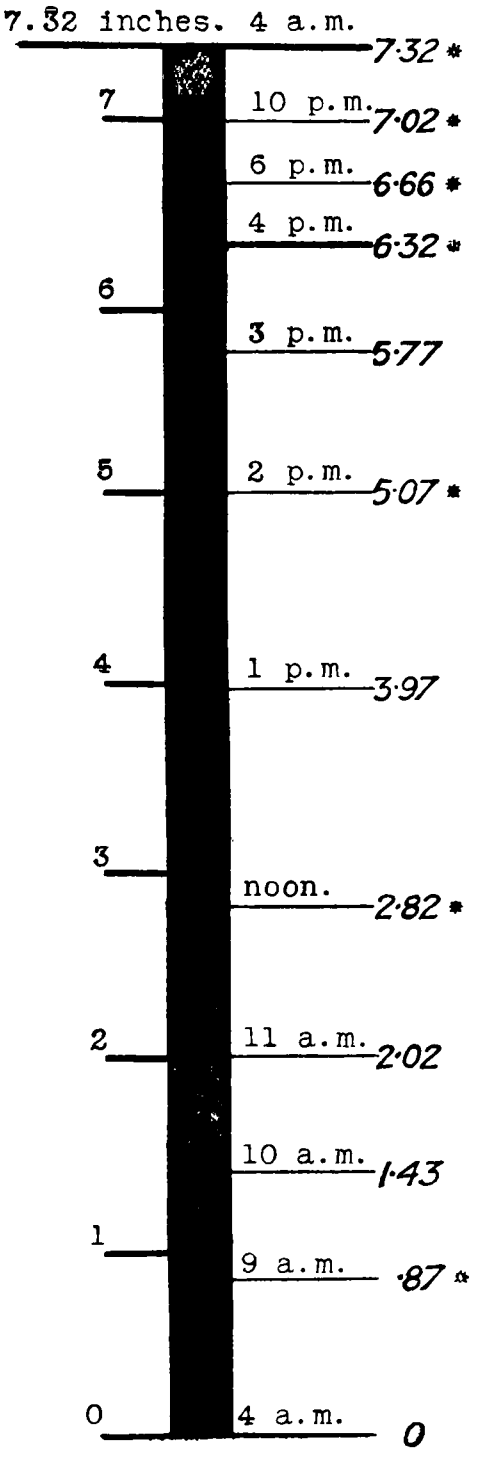
	in.
From 4 a.m. to 9 a.m. (August 26th)	1·03
,, 9 a.m. to 3.15 p.m.	4·96
,, 3.15 p.m. to 5.40 p.m.	·60
,, 5.40 p.m. to 9 a.m. (August 27th)	·75
Total in 29 hours	7·34

A gauge of a friend of mine half a mile away showed 7·36 in. in the same period.

It was an awful visitation, and I shall never forget it. It was not a straight, hard thunder-rain, but reminded me more of the blizzard of fine snow which fell during the great snowstorm of 18th January, 1881, which I well remember. We have not had such a day here since. The floods are terrible. The train service, tram service and electric light service all discontinued, and many of the streets and roads in low-lying parts of the city are like rivers, and in the Cathedral close there is a large lake. There is no record of anything like it in East Anglia, the "great Norwich flood" of November, 1878, sinking into insignificance beside it. Mr. C. Knight, Keswick, near Norwich, measured on August 26th :—

	in.
8.45 a.m.	·82
0.55 p.m.	3·35
2.15 p.m.	·95
6.35 p.m.	1·20
8.45 a.m. (August 27th) ..	·56
Total	6·88

ARTHUR W. PRESTON.



AT IPSWICH ROAD, NORWICH.

As my readings of the rainfall were more frequent than Mr. Preston's, I thought possibly the enclosed copy of a rough rainfall diagram I had prepared for the press might be of interest to you. To the right of the diagram I have entered figures giving for each hour the depth reached by the rain during the greater part of the day. The figures I have marked with an asterisk are from readings taken exactly at the hour named. In the case of figures not marked with an asterisk, readings were not taken exactly at the hour named; but though these figures are, therefore, to a slight extent estimated, they can be relied on as substantially correct.

As you will see I recorded 6·32 in. in the 12 hours to 4 p.m. on the 26th, and a further inch exactly in the following 12 hours. Only ·04 in. fell between 4 a.m. and 9 a.m. on the 27th, making 7·36 in. in the 29 hours.

My gauge was recently inspected and measured by Mr. Marriott, who found it in perfect order, and reported its exposure as excellent. The measuring glass bears Mr. Symons's certificate.

JOHN H. WILLIS.

AT THE GRANGE, WORSTEAD.

It is now possible to view with calmness, but with sadness, the dark dreadful

month of August. Never shall we forget the week commencing on Sunday, the 24th. The first day of the week was bright and hopeful, and though it closed with a slight appearance of rain, yet the moon was shining brightly and the haze towards midnight passed away. Between three and four o'clock on Monday morning rain began to fall, and fell so steadily that at 9, when I emptied my rain gauge, I recorded a fall of ·98 in. The wind was then in the N.E., and both wind and rain increased in power and fall. At 1.30 I again measured rainfall and found that 1·40 in. had to be recorded; at 3.20 I recorded 1·12 in.; at 4.15, ·92 in.; at 6, 1·15 in.; at 6.30, ·22 in.; and at 9 next morning, 1·50 in.; making a grand total, from 3.30 on Monday morning to 9 on Tuesday morning, of 7·29 in. Towards the evening of Monday the wind shifted to N.W. and increased in violence and the darkness grew in intensity, until one felt to be in the centre of an inferno, and wondered what would happen next.

FREDERICK W. WALTER, F.R.Met.Soc.

At Lyngate Cottage, Worstead.

We had a remarkable rainstorm here on August 26th which yielded 5·89 in. in the 24 hours, by far the largest amount I have ever registered in one day during the last 25 years. The total for the month is 9·86 in., which is a record. The barometer fell to 28·95 inches, which is also a record for August.

The damage done is enormous. More than 40 road bridges have been swept away, railways flooded and trains stopped. The wind backed from S.E. to N.W., and blew a gale. Thousands of trees have been blown down.

ROBERT CROSS.

Impressions of a Meteorologist.

I had the good fortune to experience the early part of the tremendous deluge of August 26th in Norfolk, which has isolated Norwich and interrupted the fine express service between London and the Norfolk coast. I left Norfolk by an early train on the morning of the 26th during a torrential downpour, but it may be that the greatest intensity was not experienced till later in the day. I can only describe the rain as like a continued shaft of arrows swept by a wind which suddenly rose to a hurricane. Like all, or very nearly all, persistent heavy rains in the level parts of England, the wind was east, and it is noteworthy that, as my train passed into Essex about 10.15 a.m., the storm abated with a shift of wind to the south-west. As the express swept through Suffolk the landscape appeared almost obliterated in the torrents of rain, and the tree forms loomed out black and impressive in the heavy gloom.

The high wind and arrow-like texture of rain accentuated the alarming character of the deluge, following after two very wet days, the 23rd and 24th.

L. C. W. BONACINA.

The fact of 7·34 in. falling in a continuous rain of 24 hours, from 4 a.m. on the 26th to 4 a.m. on the 27th, is very remarkable, and we owe a peculiar debt of gratitude to Mr. Willis for his enthusiasm in visiting his rain gauge at such an unwonted and uninviting hour. Though this is not one "rainfall day," and we cannot compare it with other falls, it has certainly not been surpassed in the British Isles on more than two or three occasions. The records exceeding 6 inches in a rainfall day are very few, and all except two of those previously experienced occurred either in the Lake District, in the mountainous part of Wales, or in the West Highlands. The fall of 8·06 in. recorded at Brundall, 5 miles east of Norwich, for the two days is greater than the largest rainfall for the 24 hours of a rainfall day ever recorded in this country, with the single exception of the Scarborough rain of 1857. We cannot rely on data previous to 1860, and we have only newspaper notices, not authenticated by a signature, of the fall of more than 9 inches in one day at Scarborough on August 9th, 1857. The rain gauge is said to have been found overflowing, with nine and a half inches in the receiver; but there is no exact measurement. The recent Norwich falls certainly help to render it more credible, and we should welcome fuller particulars if they could be obtained. The great falls which we believe to be satisfactorily established before August, 1912, are :—

in.		
8·03	at Seathwaite	12th November, 1897.
7·74	,, Ben Nevis Observatory.....	6th February, 1894.
7·29	,, ,, ,, ...	2nd October, 1890.
7·00	,, Seathwaite	29th October, 1911.
6·94	,, Rosthwaite	12th November, 1897.
6·79	,, Seathwaite	30th September, 1890.
6·78	,, ,, ...	8th May, 1884.
6·70	,, ,, ...	13th November, 1869.
6·70	,, Angerton Hall, Morpeth	7th September, 1898.
6·47	,, Seathwaite	4th December, 1864.
6·46	,, Kinlochquoich	2nd February, 1909.
6·41	,, Seathwaite	30th May, 1865.
6·38	,, ,, ...	16th November, 1866.
6·35	,, Skelwith Bridge, Ambleside ..	12th November, 1897.
6·32	,, Lochbuie	9th December, 1909.
6·15	,, Seathwaite	28th January, 1906.
6·14	,, ,, ...	24th August, 1891.
6·14	,, Bwlch, Glamorgan	10th December, 1909.
6·03	,, Skelwith Fold, Ambleside	12th November, 1897.

It thus appears that only twice since the publication of *British Rainfall, 1860*, has a greater fall than the 7·34 in., observed by Mr. Willis in 24 hours, been recorded for the British Isles, and even if we reduce the comparison to the 24 hours of the rainfall day, the 6·59 in. recorded at Heigham has only been exceeded on nine

occasions, all except one in the wettest parts of the Lake District or of Scotland.

The list which follows gives the rainfall of August 25th and 26th, 1912, separately, the total for the two days, which was all comprised in little more than 24 hours and fell in a continuous downpour, and the total for the month of August at the twenty-one stations at which more than 5 inches has been recorded in one rainfall day. It will be observed that while 50 years of observations in the wettest parts of the British Isles can only produce 19 instances of falls exceeding 6 inches in one day, and only on one occasion has so great a fall occurred at more than one station on the same day, we find here on August 26th, before half of the rainfall records of the district affected have been received, no less than 9 instances of falls exceeding 6 inches, and that not all in one spot, but at places 20 miles apart from north to south, and 12 miles apart from east to west.

Rainfall exceeding 5 inches on August 26th, 1912.

	Aug. 25th.	Aug. 26th.	Total for 2 days.	Total for August.
	in.	in.	in.	in.
Brundall	·78	7·31	8·09	11·18
Norwich (Heigham)	·92	6·59	7·51	11·36
,, (Ipswich Road)	·87	6·49	7·36	...
,, (Eaton)	1·03	6·31	7·34	11·27
Hethersett	1·75	5·58	7·33	11·21
Worstead (The Grange)	·98	6·31	7·29	10·88
Dunston	1·09	6·13	7·22	10·61
Moulton	1·12	6·01	7·13	10·41
Swainsthorpe	1·11	5·90	7·01	10·02
Gunton	·43	6·46	6·89	10·60
Coltishall	·70	6·18	6·88	10·16
Keswick	·82	6·06	6·88	10·61
Saxlingham	1·20	5·45	6·65	9·54
Sheringham	...	5·73	...	...
Drayton	·90	5·70	6·60	10·31
Ormesby	1·42	5·17	6·59	10·14
Wymondham	1·19	5·33	6·52	9·91
Honingham	·60	5·62	6·22	9·67
Cawston	·75	5·30	6·05	9·75
Rippon Hall	·51	5·54	6·05	9·43
Worstead	·34	5·55	5·89	9·86

The Angerton Hall fall of 7th September, 1898, was due to a thunderstorm, and the area with more than 4 inches of rain probably measured less than 50 square miles, while the fall only lasted for a few hours. The magnitude of the Norfolk downfall depends less on its intensity than on its long duration, and the large area which was affected. The map which we give has been compiled from the data of 129 Observers, and it has, of course, been impossible in the time at our disposal to enquire into discrepancies, or to decide between conflicting figures, though serious differences are few.

The area with more than 7 inches of rain in the two days seems to have extended from 6 miles S.W. of Norwich almost to the coast at Horsey, 15 miles to the N.E., and the greatest breadth of this very wet area from Crostwick to Cantley was about 10 miles; it included practically the whole of the Broads. The area with more than 6 inches probably reached the coast at Triningham and Caister, and extended far out to sea; while more than 5 inches descended on a great area which meets the sea between Blakeney and Gorleston.

Measurements on the preliminary map facing p. 159 show that for the two days in question the rainfall exceeded 2 inches over about 6,000 square miles, it exceeded 3 inches over 3,000 square miles, exceeded 4 inches over 1,800 square miles, exceeded 5 inches over about 900 square miles, exceeded 6 inches over more than 500 square miles, and culminated in about 180 square miles where more than 7 inches of rain fell. The county of Norfolk, with an area of 2,044 square miles, had a general rainfall of probably 4·88 in., which corresponds to 9,970 square mile inches, or 144,400,000,000 gallons of water. This is twice as much water as is contained in Windermere, the largest of the English lakes, and its weight is 644,000,000 tons. Had this precipitation fallen in the form of snow, the average depth at which it would have lain over Norfolk would have been almost 5 feet; increasing from less than 3 feet near Lynn to more than 7 feet over nearly 200 square miles around Norwich, supposing that it fell in a dead calm and did not drift. The occurrence of such a snowfall with a gale of wind would cause drifts which might have buried Norwich beneath a snow-dune, which could not have been cleared away for weeks. There is no reason why such a storm should not occur in winter, and no reason why it should not occur in any part of the British Isles; though the probability of its happening is apparently too small to make it prudent to take steps beforehand to cope with the emergency should it arise.

In a country where the configuration of the land and the direction of the prevailing wind conspire to produce a high rainfall at all times, the action of rain and the resulting streams working for ages have deepened out channels which allow the great precipitation to escape rapidly to the sea or to lakes which pass on the flood water at a uniform rate. Hence, even an occasional fall of 6 inches or more in a day produces no serious result. In the east of England, however, and especially in such a district as the north-east of Norfolk where the average annual rainfall is under 30 inches, where the land is little raised above sea-level and the valleys scarcely hollowed below the general surface, such a visitation is disastrous in the extreme, and the most remarkable feature of the flood is the extraordinarily small loss of life it occasioned. So far as we are aware only two or three persons were drowned. This immunity, as far as Norwich is concerned, was probably due to the fact that the greatest area of heaviest rain lay below the city or to the north of the watershed separating the river Bure, which flows through the Broads on the

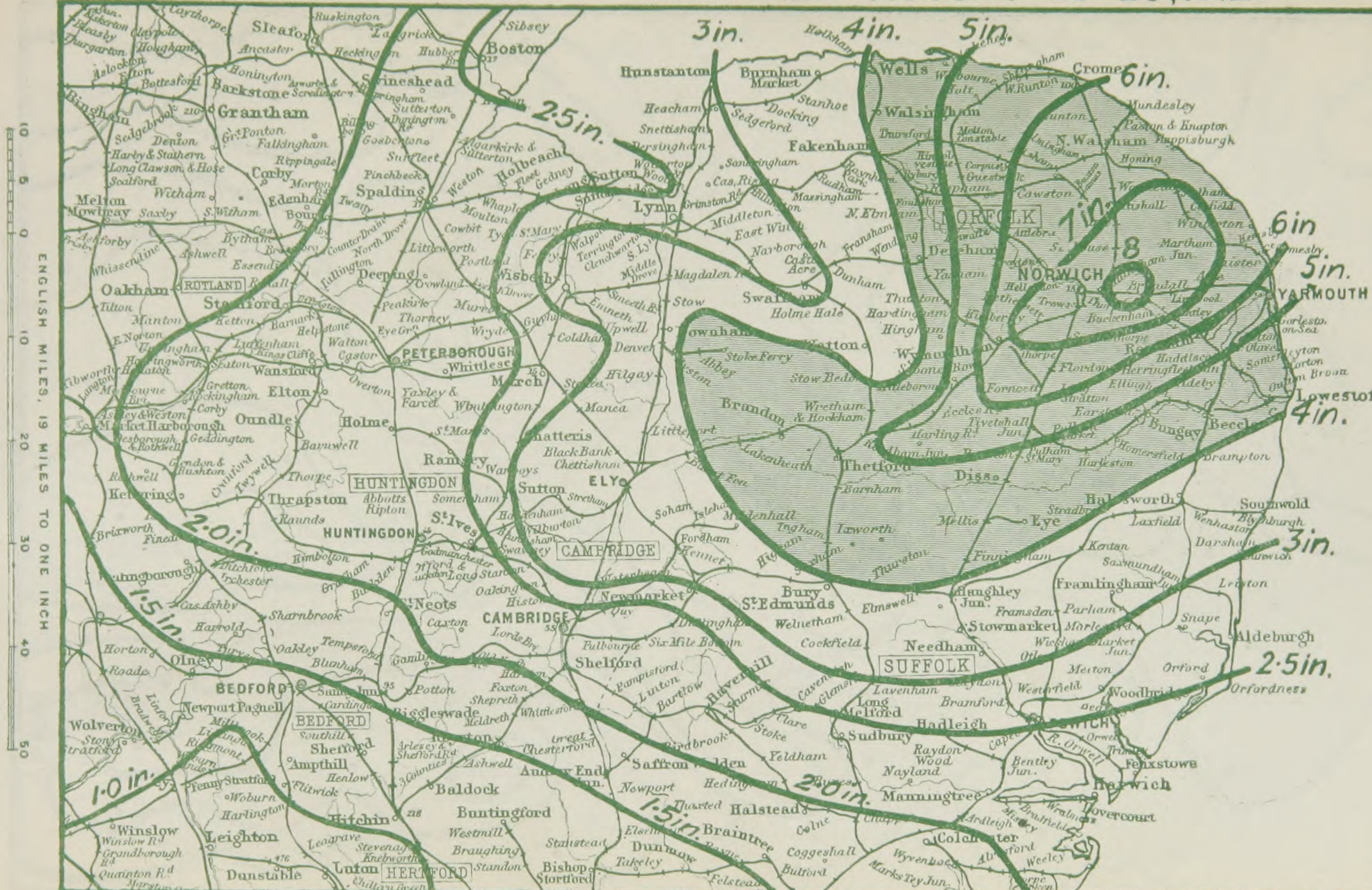
north-east, from the river Yare, which receives large tributaries from north-west, west and south at the lower end of Norwich itself. Had the centre of heaviest rainfall chanced to lie 10 or 15 miles farther to the west than it happened to be, the destruction would have been incalculably greater, as instead of the great bulk of the unexampled precipitation falling directly upon the water surface of the Broads, it would have come upon the higher land above Norwich, and the rivers converging on the city would have continued to rise for a long time instead of falling soon after the rain stopped; for it must be remembered that the distribution of the rain was actually such that least fell in the source region of the rivers and most near the mouth. But for the vast water-surface of the Broads allowing the flood to spread with the rise of a few feet, the town of Yarmouth must have suffered far more than Norwich did, and it may be said that on this occasion the Broads saved Yarmouth.

It is most difficult to give in reasonable compass a description of the nature of the floods or of the damage done. The crops in the north-east of Norfolk have been destroyed, the harvest was postponed to an exceptionally late period by the inclement weather of the earlier part of August, and the catastrophe carried away the grain that had been cut but not brought in, and made it impossible to save what remained uncut. The flooded rivers destroyed bridges over a great area, the number which went down is given officially as forty-two. Curiously enough most of the reports of damage which we have received come from places to the south and west of Norwich, where the amount of rain that fell was considerably less than to the east and north.*

The rainfall and the rising flood in Norwich stopped all railway traffic with the city on Monday afternoon, and no train entered or left on Tuesday or on Wednesday until the evening, railway communication being thus suspended for more than two days and nights. The local electric tramways were also arrested; there was no public supply of light by gas or electricity for two nights, and a square mile of streets in the lower part of the town was under water. The depth of water in the quarter where the poorer people lived was 13 feet, so that the ground floor rooms were filled and the first floor rooms flooded out. One of the minor industries of Norwich is canary breeding, and the birds are reared for the most part by working men, who keep the cages in sheds in their gardens. These were the first to be flooded, and as the first concern was necessarily the saving of human life no attempt could be made to move the cages. The fear

* The actual centre of highest rainfall may have been in Norwich itself, although the slightly higher figure at Brundall suggests a more easterly position. The risk of error in rainfall measurement is always greatest in the case of extremes, and even careful Observers may easily make mistakes when the readings are of such an altogether exceptional amount. All we say in this article, which has had to be written before any checking or critical examination of the figures is possible, has to be taken as provisional.

EAST ANGLIA — RAINFALL AUGUST 25-26, 1912.



THAMES VALLEY RAINFALL – AUGUST, 1912.

Symons's Meteorological Magazine

was expressed that at least one particular strain of Norwich canary has been wiped out. Many remarkable escapes of people rescued from the upper windows of their houses are recorded, and there were instances of heroism in saving life by means of such boats as could be secured, which would have reflected glory on the trained crew of a shipwrecked vessel, equipped with all the best appliances kept in a state of instant readiness.

The flooded roads and broken bridges made all travelling by road dangerous and circuitous. A motor car going to one of the villages in the north-east and back on the afternoon of the 26th, took seven hours to accomplish a journey which usually occupies forty minutes.

The municipal authorities rose to the occasion, and arrangements were speedily made for throwing open the schools in the higher parts of the town as temporary shelters for the thousands who were rendered homeless. Everything had to be done on the evening of Monday, and all through the long night, in an unceasing deluge of rain, driven by a furious gale. Trees were blown down, walls were sapped by the water and collapsed, and the torrents that rushed through the streets were charged with wreckage of every kind. One boatman, William John Marrison, says the *Eastern Daily News*, remained in his boat from 11 a.m. to 11 p.m. on the 27th, without intermission, and in that time conveyed a hundred people from their flooded houses to a place of safety; while he and a policeman were continuing the work, the boat was caught by a furious current, and carried into a narrow passage, where it was wedged tight. The policeman got over a wall, and made his way to the police office, where he reported that he had seen the boatman carried away and drowned; but in half an hour, Marrison also came in to report the drowning of the policeman, and this pleasant incident terminated the great day's work. The damage will take a long time to repair, and a relief fund is being raised to help the poorer inhabitants, the amount subscribed up to September 6th being £17,800.

The detail with which we have treated the Norfolk storm has made it impossible to deal with the remarkable features of the rainfall of August in the country as a whole. The month was very wet everywhere; the only places with less than 4 inches of rain were narrow strips along the estuaries of some parts of the east coast of Great Britain, the western Hebrides, and the west of Ireland, which was the driest part of the British Isles last month. More than 10 inches fell in the north-east of Norfolk, throughout Cornwall, most of Devon and much of Somerset, in central Wales and the Lake District, but no part of Scotland or Ireland seems to have had so much. Our map of the Thames valley shows high rainfall in all parts, the total fall being 240 per cent. of the average, and the month the wettest August since a systematic comparison became possible in 1883, and only four months in that time (October, 1891 and 1903, December, 1911, and September, 1896) have had more rain than August, 1912.

THE WEATHER OF AUGUST.

By FRED. J. BRODIE.

THE anticyclone which in a normally fine summer extends over these islands now and again from the southern portions of the North Atlantic, was restricted last month to its place of origin; and in the absence of this barrier, the way lay open for the advance of oceanic depressions from the westward. But this was not all. In addition to the anticyclone which occupied a very ordinary position between the Azores and the Spanish coasts, another high-pressure system of almost equal intensity lay over and to the northward of Iceland. The conditions were, therefore, not only favourable for the advance of depressions, but were eminently favourable for their development over the northern and middle portions of the Atlantic, and in the course of the month the country witnessed an almost unbroken procession of these systems, moving mostly from west to east or from south-west to north-east. The chart of mean pressure for the month shows that while the Azores readings were about equal to the average, those in Iceland were about a quarter of an inch above it. Between the two regions the British Islands lay in a trough of low pressure which stretched from the Atlantic across the entire northern half of Europe. The result was seen in what was undoubtedly the coldest and also in many places the wettest August the present generation has witnessed.

Within recent years there have been, we imagine, very few cases, if any, in which the maximum shade temperature in August has failed to reach 80° in some portion at least of the United Kingdom. An examination of a large number of records for last month yields no instance of a reading as high even as 75°, and very few cases of any reading as high as 70°. On the 3rd of the month a maximum of 71° was recorded at Camden Square, while on the following day the thermometer reached 70° in several parts of our eastern midland and south-eastern counties, and touched 72° at Margate and 73° at Greenwich and Camden Square. The only other instances of the kind occurred on the 11th, 18th, and 29th, when a reading of 70° recorded at Greenwich, and on the 30th when a similar temperature was observed at that Observatory and at Camden Square, as well as at Fulbeck. As absolute maxima for August the readings were the lowest ever recorded, but the London district seems to have been more highly favoured than other parts of the United Kingdom; at many places in the west and north the thermometer scarcely ever reached 65°. The absence of warmth was due partly to the almost constant prevalence of a current of air blowing from the cool surface waters of the Atlantic and partly to the unusual cloudiness of the sky. The sunshine records for the month show that at a very large number of places situated in nearly all parts of Great Britain, the total duration of that very desirable element was less than half the average; at Pembroke it amounted to little more than one-third.

The cloud canopy naturally served to hinder the progress, not only of solar, but also of terrestrial radiation ; and although the mean of the minimum temperatures was below the average, the deficiency of warmth was less marked at night than in the daytime. Slight frost was, however, experienced at rare intervals in many northern and inland districts, the lowest temperatures of the month being recorded, as a rule, on the night of the 2nd, when the sheltered thermometer fell below 35° in many parts of the United Kingdom. On the surface of the grass the minima on that occasion were as low as 25° at Birmingham, 28° at Crathes (Kincardineshire) and Llangammarch Wells, and 30° at West Linton and Hereford. Slight touches of ground frost were experienced also in many inland districts on the nights of the 11th, the 20th-22nd, and the 27th.

The passage of the numerous Atlantic disturbances resulted in much rough weather along our south coasts, the wind rising not infrequently to the force of a gale from the westward or south-westward. The depression which was associated with the phenomenal rain storm of the 26th came northwards from the Bay of Biscay; and on the morning of that day, when the centre lay over the Thames estuary, the surrounding winds were of little strength. Later on the disturbance increased rapidly in intensity, and produced a gale in the eastern counties, at first from the north-eastward and afterwards from the westward. The westerly gale blew with sufficient violence to overthrow trees, and to cause locally a considerable amount of structural damage.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

JUNE IN THE PYRENEES.

THE descriptions of the photographs which appeared with the above article in the last number were accidently omitted, and where appended in the note on p. 147 were given wrong.

Fig. 1 is taken from the summit of the Taillon, 10,300 ft. looking east, and shows the highest of the Gavarnie peaks, viz., Marboré, to the left; the Cylindre (centre) and Perdu 10,995 ft. to right. The actual cairn of the Taillon is seen below the then highest point, owing to the cornice which gives place on the left of the picture to the northern precipice.

Fig. 2 shows Brêche de Roland—the conspicuous gap in the rock wall. The Taillon is the snowy peak further to the right, and the lowest point of the sky line shows the Porte d'Espagne—the mule

track into Spain. The rock peak on left of the photo is some 400 ft. lower than the Taillon, and can also be seen in Fig. 1 at the end of the rock wall (in which the Brêche occurs), which is here seen end on.

Fig. 3 is taken from the Brêche, and the sunshine streaming through the gap may be seen between the two shadows on the left. In the distance, on left, appears the Vignemale, 10,820 ft. The Brêche itself was far too stupendous to photograph at such close quarters.

R. P. DANSEY.

[The description of the photographs was received after the August *Magazine* had been passed for press. The abbreviated titles had to be telephoned to the printer and it was impossible to see a proof.—Ed. *S.M.M.*]

AUGUST RAINFALL AT GREENWICH.

THE rainfall recorded at the Royal Observatory, Greenwich, in August, amounted to 4·14 in., exceeding the average for the preceding 97 years by 1·84 in. This month's fall has been exceeded six times in previous Augusts, viz., in 1837, 4·52 in.; in 1848, 4·25 in.; in 1852, 4·35 in.; in 1878, 5·38 in.; in 1879, 5·19 in., and in 1903, 4·82 in.

W. C. NASH.

Blackheath, September 5th, 1912.

AUGUST, 1912, IN YORKSHIRE.

I VENTURE to send a few notes on the above exceptional month.

		Diff. from Average.	
Barometer, 9 a.m.....	29·687	—0·239	Lowest in record.
Mean Max. Temp. ...	59°·6	—5°·6	,, ,, ,,
Absolute Max. Temp.	65°·7		,, ,, ,,
Mean Temp.	53°·8	—4°·0	One lower, 1885, 53°·7
Rainfall	6·92 in.	+3·32 in.	One higher, 1891, 7·40
Rain Days	27	+10	Most in record.

My record extends from 1879 for temperature, and from 1881 for rainfall. This, for combined wet and cold, is the worst August since 1879, and probably since 1860. 1885 was slightly colder, but was a very dry month; 1891 had more rain, but was two degrees warmer. The only summer months comparable with this are July, 1879, and July, 1888; the former was perhaps more gloomy, but had less rain; the latter was equally deficient in warmth and had rather more rain, but on fewer days.

As regards the three summer months of 1912 taken together, several years have been colder, but the rainfall (16·26 in.) is much the largest, and the rain days (72) are three in excess of 1882, the next highest number.

CHARLES L. BROOK.

Harewood Lodge, Meltham, Sept. 3rd, 1912.

AUGUST RAIN AND CRICKET.

DURING the last three days of last week, eight first-class cricket matches were in progress—namely, at Lords, Leyton, Manchester, Dover, Hastings, Worcester, Hinckley, and Cardiff.

When I opened my newspaper on Saturday morning (August 24th) it struck me as being very unusual to read that no play had been possible in any of the above matches during the previous day. But when I read in Monday's newspaper that again on Saturday not a ball had been bowled in any of these matches, it struck me as being more unusual still. I cannot remember ever having noticed before such an occurrence, even for one day, and for two days in succession it seems to be unprecedented in my recollection. The newspapers took some notice of the fact as being unusual, but I am not aware of any records by which it can be ascertained whether such an event has ever occurred before.

Of course, the absence of play in a cricket match is not necessarily due to rain falling during the day. It may equally well be due to the ground being so saturated with recent rain as to be unfit for play. But the fact that no play was possible for two days in succession in eight places so far apart as those named, does point to the recent wet weather having occurred over a very large part of England.

C. STEWART KING.

Cleveland, Mill Hill, N.W., 27th August, 1912.

CLOUD PARTICLES AT LOW TEMPERATURES.

By JOHN AITKEN, LL.D., F.R.S.

As the condition of cloud particles when the temperature is below the freezing point is at present being discussed in your pages, I would like to call attention to some experiments on this point which were communicated to the Royal Society of Edinburgh, in 1893. Observations were made on fog particles by means of a low power microscope. The particles were observed as they fell on a glass micrometer illuminated by a spot mirror. Observations were made when the temperature was 27°, after a night minimum of 24°, showed that the particles were then liquid. There were, unfortunately, no opportunities for observing at lower temperatures; but the above test showed that they were still liquid after being exposed to a temperature 8° below freezing. Artificially produced cloud particles were also found to be liquid, though formed at some degrees below freezing-point. Theory and other experiments show that this is only what might be expected.

The possibility of the presence of both ice and water particles at the same time in clouds at temperatures below 32° introduces some interesting complications. If the particles be all solid or ice, then

there will be a stable condition. It will also be stable if they be all liquid, but very unstable if some particles be solid while the others are liquid. The cause of this instability is due to the vapour pressure at an ice surface being different from that at a water surface at the same temperature. Sir William Ramsay and Dr. Young showed, in 1884, that the vapour pressure at a water surface at temperatures below 32° was greater than at an ice surface at the same temperature. We see from this that if some of the cloud particles freeze, then these ice particles will at once begin to rob the liquid ones of their water and will grow in size, while the liquid ones will decrease, and probably return to their original condition of dust nuclei. It is not at present known how cloud particles combine to form raindrops. It does not seem likely that the differentiating process which goes on in all newly-formed clouds, by which the larger particles, owing to their greater radius of curvature, rob the smaller ones of their water, can explain the process, as it seems to stop while the particles are still much under the size of raindrops. It is generally supposed that something causes a number of particles to coalesce and form raindrops. From lack of knowledge, we generally think of this as one of the many unknown effects of electricity. At all events, it is evident that raindrops might be made by the coalescing of cloud particles. Now no such process is possible in the case of snowflakes ; they evidently are not formed by aggregations of small ones, but what has been stated above about vapour pressures clearly shows how they are grown. Suppose a cloud to form and that the particles are all in the liquid condition. Then suppose some of these particles to freeze, the atmosphere will be in a supersaturated condition to these frozen particles, they will, therefore, at once begin to grow rapidly, and to rob the liquid ones and dry them up. These solid particles, being fed with vapour, are formed under conditions free from restraint, and develop those well-known beautiful and regular crystals which we call snowflakes.

In the Report of the Royal Meteorological Society, given in your July number, Dr. G. C. Simpson mentions among his experiences when enveloped in fog at a very low temperature, that "the fur of his sleeping bags and the wool of sweaters became covered with hoar frost." Hoar frost is sometimes called frozen dew. It may be, but it very often is not, and the heavy deposits of it never are. In Dr. Simpson's case it was not likely to be frozen dew, as there would under the conditions be but little radiation. In a paper communicated to the Royal Society of Edinburgh, in 1887, it is shown that the explanation above given of the growth of snowflakes, also applies in most cases to hoar frost. The heaviest deposits of hoar frost are formed during foggy conditions, when all radiation is cut off. The hoar frost is formed by the cold foggy air, the vapour tension of which is higher than that of the frozen surfaces with which it comes in contact. This also explains why it is that these hoar frosts grow mostly on the side of the branch or blade of grass towards which the

wind is coming, just as if it were grown up of solid particles carried by the wind; and, no doubt in a few cases this may be so, but in general, especially at low levels, the regularly formed crystals of these deposits show that they have been formed *in situ* out of vapour in the passing supersaturated air.

There is a point about which we are at present entirely ignorant, and that is, Does the vapour in the atmosphere ever condense in the form of ice on dust or other nuclei? I might suggest here that this is a point which some institution provided with means of producing low temperatures might make the subject of investigation.

INTERNATIONAL BALLOON ASCENTS.

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

March 3rd, 1910.

Starting Point	Country.	A miles.	B ° F.	C miles	D ° F.	E miles.	F
Manchester....	England	7·5	—71	11·6	—60	30	N.N.W.
Pyrton Hill....	,, ...	6·6	—80	7·4	—71	25	N.
Petersfield	,, ...	6·9	—76	9·1	—66	12	W.
Brussels	Belgium	6·7	—80	7·0	—78	40	W.S.W.
Hamburg.....	Germany....	7·5	—76	7·7	—72	7	W.S.W.
Lindenberg ...	,, ...	?		6·6	—78	4	N.E. byE.
Paris.....	France	6·9	—67	11·2	—65	34	S.S.W.
Strassburg	Germany....	6·4	—72	8·5	—63	35	W.
Vienna.....	Austria	7·2	—80	8·4	—63	32	W. by N.
Pavlovsk	Russia	6·4	—71	6·9	—66	40	S.E.
Nizhni Olchedaeff	,, ...	6·5	—80	7·4	—70	31	W.S.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.

An extensive anticyclone lay over the southern part of the Baltic, and the whole of Europe, except the extreme west, was under its influence. The figures are quite normal for the season and the conditions, excepting that it is unusual to find so many instances of a westerly drift of the balloons. As is usual in such cases the distances are small.

RAINFALL TABLE FOR AUGUST, 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875—1909. in.	1912. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·39	4·89
Tenterden	*Kent*	51 4	*0 41	190	2·42	6·23
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·52	7·70
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·85	6·66
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·44	4·57
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·38	6·41
Shoeburyness	*Essex*	51 31	*0 48	13	1·74	3·34
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·52	8·29
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·22	7·56
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	3·17	9·55
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·84	7·28
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·90	7·24
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	3·43	7·31
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·81	6·47
Boston	*Lincolnshire*	52 58	0 1	25	2·39	6·30
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·55	4·79
Macclesfield	*Cheshire*	53 15	2 7	501	3·76	6·86
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	3·73	4·81
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	5·62	5·80
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·78	5·37
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	3·05	4·95
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	3·20	4·33
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	11·47	12·75
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·54	9·92
Haverfordwest	*Pembroke*	51 48	4 58	95	4·21	7·66
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·88	9·59
Llandudno	*Carnarvon*	53 20	3 50	72	3·16	5·55
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·23	6·06
Marchmont House	*Berwick*	55 44	2 24	498	3·54	4·53
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·54	4·85
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·62	4·06
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	6·02	4·31
Mull (Quinish)	,,	56 34	6 13	35	5·00	3·80
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	3·34	3·91
Braemar	*Aberdeen*	57 0	3 24	1114	3·63	4·52
Aberdeen (Cranford)	,,	57 8	2 7	120	3·07	5·34
Cawdor	*Nairn*	57 31	3 57	250	3·05	4·43
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·52	3·39
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	6·61	5·79
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·71	6·38
Wick	*Caithness*	58 26	3 6	77	2·73	4·97
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	4·57	6·06
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·73	4·68
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	4·04	3·44
Miltown Malbay	*Clare*	52 52	9 26	400	4·98	5·51
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·31	6·05
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·94	4·93
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	3·08	5·28
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	4·00	5·56
Cong (The Glebe)	*Mayo*	53 33	9 16	112	4·70	3·58
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	4·68	...
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·30	5·93
Seaforde	*Down*	54 19	5 50	180	3·64	6·28
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	4·06	5·57
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	4·22	5·12

RAINFALL TABLE FOR AUGUST, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
+2·50	204	·72	25	25	15·92	19·31	+3·39	121	25·11	Camden Square
+3·81	258	·99	6	28	16·07	20·24	+4·17	126	27·64	Tenterden
+5·18	306	1·04	25	27	17·44	25·81	+8·37	148	30·48	Patching
+3·81	234	·56	26	29	18·58	25·40	+6·82	137	31·87	Cadland
+2·13	187	·61	6	20	15·47	22·01	+6·54	142	24·58	Oxford
+4·03	269	1·32	26	26	16·06	22·59	+6·53	141	25·17	Croyland Abbey
+1·60	192	1·47	25	20	11·47	12·97	+1·50	113	19·28	Shoeburyness
+5·77	329	2·83	26	24	15·96	21·76	+5·80	136	25·40	Westley
+5·34	342	3·61	26	23	14·20	20·28	+6·08	143	23·73	Geldeston
+6·38	302	1·37	5	27	21·79	34·24	+12·45	157	38·27	Polapit Tamar
+4·44	256	1·04	23	27	19·85	29·00	+9·15	146	33·54	Rousdon
+4·34	250	·85	28	29	18·73	33·07	+14·34	176	29·81	Stroud
+3·88	213	1·18	3	30	20·31	28·07	+7·76	138	32·41	Wolstaston
+3·66	230	1·04	26	25	18·16	28·63	+10·47	158	28·98	Coventry
+3·91	263	2·00	26	27	14·60	22·07	+7·47	151	23·35	Boston
+2·24	188	·94	26	21	15·70	24·96	+9·26	159	24·46	Hodsock Priory
+3·10	182	·99	23	25	21·93	25·42	+3·49	116	34·73	Macclesfield
+1·08	129	·74	23	24	19·61	26·31	+6·70	134	32·70	Southport
+ ·18	103	·95	28	22	37·59	46·96	+9·37	125	61·49	Arncliffe
+2·59	193	·82	26	17	16·97	27·63	+10·66	163	26·87	Ribston Hall
+1·90	162	1·08	26	23	16·52	23·34	+6·82	141	26·42	Hull
+1·13	135	·47	1	29	17·65	23·19	+5·54	131	27·94	Newcastle
+1·28	111	1·43	17	28	76·76	83·05	+6·29	108	129·48	Seathwaite
+5·38	218	1·29	28	24	25·02	38·83	+13·81	155	42·28	Cardiff
+3·45	182	1·07	25	25	27·05	38·16	+11·11	141	46·81	Haverfordwest
+4·71	196	1·78	23	26	27·03	36·58	+9·55	135	45·46	Gogerddan
+2·39	176	·66	4	24	18·05	22·52	+4·47	125	30·36	Llandudno
+1·83	143	·84	4	25	26·49	35·26	+8·77	133	43·47	Cargen
+ ·99	128	·90	4	20	21·22	20·83	— ·39	98	33·76	Marchmont
+ ·31	107	·74	19	24	29·37	32·93	+3·56	112	49·77	Girvan
+ ·44	112	·85	4	22	22·04	22·29	+ ·25	101	35·97	Glasgow
—1·71	72	1·12	5	20	40·06	39·83	— ·23	99	68·67	Inveraray
—1·20	76	1·00	5	15	32·67	31·83	— ·84	97	56·57	Quinish
+ ·57	117	·95	4	21	18·20	18·22	+ ·02	100	28·64	Dundee
+ ·89	124	...	...	...	21·43	23·03	+1·60	108	34·93	Braemar
+2·27	174	1·01	4	20	20·09	21·27	+1·18	106	32·73	Aberdeen
+1·38	145	·93	20	19	18·70	17·29	—1·41	92	29·33	Cawdor
— ·13	96	·79	20	21	26·72	24·77	—1·95	93	44·53	Fort Augustus
— ·82	88	·97	29	21	49·51	44·28	—5·23	89	83·93	Bendamph
+3·67	235	1·29	4	18	19·90	22·32	+2·42	112	31·90	Dunrobin Castle
+2·24	182	·96	8	21	18·11	20·78	+2·67	115	29·88	Wick
+1·49	133	1·29	7	28	32·97	38·27	+5·30	116	54·81	Killarney
+ ·95	125	·85	3	25	24·26	32·83	+8·57	135	39·57	Waterford
— ·60	85	1·20	22	22	24·57	27·72	+3·15	113	39·43	Castle Lough
+ ·53	111	1·38	23	29	27·28	33·63	+6·35	123	45·11	Miltown Malbay
+2·74	182	1·43	2	24	21·63	34·54	+12·91	160	34·99	Courtown Ho.
+ ·99	125	·73	22	27	22·77	28·46	+5·69	125	35·92	Abbey Leix
+2·20	171	1·46	4	23	17·83	22·10	+4·27	124	27·68	Dublin
+1·56	139	·82	4	27	23·17	30·35	+7·18	131	36·15	Mullingar.
—1·12	76	1·01	22	21	29·83	30·01	+ ·18	101	48·90	Cong
...	...	...	...	...	31·32	...	...	..	52·87	Enniscoe
+1·63	138	1·00	22	24	26·49	31·78	+5·29	120	42·71	Markree
+2·64	172	2·06	4	20	24·38	34·77	+10·39	143	38·91	Seaforde
+1·51	137	1·00	28	22	22·83	26·08	+3·25	114	37·56	Dundarave
+ ·90	121	1·10	4	21	24·66	30·64	+5·98	124	39·38	Omagh

SUPPLEMENTARY RAINFALL, AUGUST, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches
II.	Warlingham, Redvers Road..	6·15	XI.	Lligwy	4·27
,,	Ramsgate	5·76	,,	Douglas	5·17
,,	Hailsham	6·45	XII.	Stoneykirk, Ardwell House...	4·67
,,	Totland Bay, Aston House...	5·80	,,	Dalry, The Old Garroch.....	5·29
,,	Stockbridge, Ashley..	7·05	,,	Langholm, Drove Road	5·93
,,	Grayshott	6·08	,,	Beattock, Kinnelhead	4·87
,,	Caversham, Rectory Road ...	4·84	XIII.	St. Mary's Loch, Cramilt Ldge	4·94
III.	Harrow Weald, Hill House...	5·52	,,	North Berwick Reservoir.....	5·24
,,	Pitsford, Sedgebrook.....	6·96	,,	Edinburgh, Royal Observaty.	4·75
,,	Woburn, Milton Bryant.....	6·69	XIV.	Maybole, Knockdon Farm ...	2·87
,,	Chatteris, The Priory.....	7·66	XV.	Campbeltown, Witchburn ..	6·10
IV.	Colchester, Lexden	5·22	,,	Holy Loch, Ardnadam.....	5·40
,,	Newport.....	5·64	,,	Ballachulish House	4·13
,,	Ipswich, Copdock	6·11	,,	Islay, Eallabus	4·45
,,	Blakeney.....	8·67	,,	Tirie, Cornaigmore	3·66
,,	Swaffham	7·22	XVI.	Dollar Academy	4·64
V.	Bishops Cannings	5·45	,,	Balquhidder, Stronvar.....	4·70
,,	Winterbourne Steepleton.....	8·50	,,	Coupar Angus	3·34
,,	Ashburton, Druid House.....	10·35	,,	Glenlyon, Meggernie Castle..	4·27
,,	Cullompton	7·09	,,	Blair Athol	3·27
,,	Lynmouth, Rock House	9·59	,,	Montrose, Sunnyside Asylum.	3·70
,,	Okehampton, Oaklands.....	10·44	XVII.	Alford, Lynturk Manse	6·10
,,	Hartland Abbey.....	7·66	,,	Fyvie Castle	5·97
,,	Probus, Lamellyn.....	10·92	,,	Keith Station	6·72
,,	North Cadbury Rectory.....	6·66	XVIII.	Skye, Dunvegan	4·36
VI.	Clifton, Pembroke Road.....	8·38	,,	N. Uist, Lochmaddy	3·33
,,	Ross, The Graig	6·18	,,	Glenquoich, Loan.....	8·15
,,	Shifnal, Hatton Grange.....	5·45	,,	Alvey Manse.....	3·75
,,	Droitwich.....	7·68	,,	Loch Ness, Drumnadrochit...	4·62
,,	Blockley, Upton Wold.....	8·60	,,	Glencarron Lodge	6·17
VII.	Market Overton.....	5·52	XIX.	Invershin	5·08
,,	Market Rasen.....	5·31	,,	Loch Stack, Ardchullin	9·42
,,	Bawtry, Hesley Hall	4·82	,,	Melvich	5·22
,,	Derby, Midland Railway.....	6·12	XX.	Skibbereen Rectory	3·76
,,	Buxton	8·64	,,	Dunmanway, The Rectory ..	4·36
VIII.	Nantwich, Dorfold Hall	4·97	,,	Glanmire, Lota Lodge.....	3·67
,,	Chatburn, Middlewood	6·50	,,	Mitchelstown Castle.....	4·53
,,	Cartmel, Flookburgh	6·84	,,	Darrynane Abbey.....	5·12
IX.	Langsett Moor, Up. Midhope	7·02	,,	Clonmel, Bruce Villa	3·59
,,	Scarborough, Scalby	4·24	,,	Newmarket-on-Fergus,Fenloe	...
,,	Ingleby Greenhow	4·60	XXI.	Laragh, Glendalough	9·19
,,	Mickleton	4·80	,,	Ballycumber, Moorock Lodge	3·75
X	Bellingham, High Green Manor	5·63	,,	Balbriggan, Ardgillan	6·21
,,	Ilderton, Lilburn Cottage ...	5·16	XXII.	Woodlawn	3·94
,,	Keswick, The Bank.....	5·86	,,	Westport, St. Helens	3·57
XI.	Llanfrechfa Grange	8·49	,,	Achill Island, Dugort	4·08
,,	Treherbert, Tyn-y-waun	17·08	,,	Mohill, The Rectory	5·35
,,	Carmarthen, The Friary	8·72	XXIII.	Enniskillen, Portora.....	..
,,	Castle Malgwyn [Llechryd]...	6·39	,,	Dartrey [Cootehill]	5·53
,,	Crickhowell, Tal-y-maes.....	11·00	,,	Warrenpoint, Manor House ..	7·24
,,	New Radnor, Ednol	6·86	,,	Banbridge, Milltown	5·75
,,	Rhayader, Tyrmynydd	11·70	,,	Belfast, Cave Hill Road	6·69
,,	Lake Vyrnwy	6·53	,,	Glenarm Castle.....	5·68
,,	Llangyhanfal, Plâs Draw.....	4·91	,,	Londonderry, Creggan Res...	4·71
,,	Dolgelly, Bryntirion.....	...	,,	Killybegs	6·03
,,	Bettws-y-Coed, Tyn-y-bryn...	6·00	,,	Horn Head	4·88

METEOROLOGICAL NOTES ON AUGUST, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—The wettest August since 1881, and the wettest of all months since October, 1903. Temp. was persistently low, the mean temp., 57°·9, being 4°·4 below the average, and the lowest for August in the 55 years' record. Not since April, 1911, had the mean temp. of the month been below the average. Duration of sunshine 106·5* hours. Duration of R 66·2 hours, and the greatest recorded in August in the past 32 years. Evaporation 1·69 in. Shade max. 73°·2 on 4th; min. 43°·1 on 28th. F 0, f 0.

TENTERDEN.—The wettest August in 50 years. Duration of sunshine 145·0† hours. Shade max. 70°·0 on 4th; min. 42°·0 on 3rd. F 0, f 0.

TOTLAND BAY.—The heaviest August R in 26 years, and mean temp., 57°·6, the lowest in that time. Duration of sunshine 123·4* hours. Shade max. 67°·6 on 31st; min. 44°·2 on 3rd. F 0, f 1.

PITSFORD.—A month of almost constant gloom and R. Temp. much below, and R 5·09 in. above the average. Shade max. 70°·4 on 4th; min. 38°·0 on 12th.

BURY ST. EDMUNDS.—The greatest August R since observations began in 1856, and the most disastrous harvest known here. Shade max. 70°·0 on 4th; min. 42°·5 on 12th. F 0, f 0.

POLAPIT TAMAR.—Cold, sunless month, with the greatest August R in the past 43 years. Shade max. 62°·9 on 29th, 30th and 31st; min. 34°·4 on 3rd. F 0, f 0.

NORTH CADBURY.—By far the coldest, cloudiest and wettest August in the 16 years' record. Shade max. 74°·0 on 29th; min. 40°·0 on 3rd. F 0, f 0.

DROITWICH.—Heavy R and H from 3.2 to 3.12 p.m. on 8th, at the rate of 5·34 in. per hour. Shade max. 71°·0 on 4th; min. 36°·0 on 28th. F 0, f 0.

HODSOCK PRIORY.—Shade max. 67°·6 on 8th; min. 37°·5 on 3rd. F 0, f 0.

SOUTHPORT.—Duration of sunshine 119·3* hours, and of R 96·0 hours. Evaporation 2·30 in. Mean temp. 55°·4, or 3°·7 below the average. Three waterspouts over the sea on morning of 13th. Shade max. 67°·0 on 4th; min. 42°·0 on 3rd. F 0, f 0.

HULL.—Dull, cold and cheerless, with persistent R, and only 52·0* hours of sunshine.. Shade max. 68°·0 on 16th, 17th and 29th; min. 41°·0 on 3rd. F 0, f 0.

HAVERFORDWEST.—Very wet and with low night temps. Hay and corn crops ruined by the wet. Duration of sunshine 96·6* hours. Shade max. 65°·1 on 10th; min. 37°·7 on 3rd.

LLANDUDNO.—Shade max. 65°·0 on 17th; min. 43°·0 on 28th.

CARGEN.—The greatest number of rain days, the least sunshine, the lowest mean max. temp., and the lowest bar. for August in the record. Shade max. 66°·0 on 8th; min. 35°·0 on 3rd.

EDINBURGH.—Shade max. 64°·1 on 16th; min. 41°·2 on 3rd. F 0, f 0.

COUPAR ANGUS.—Persistent light R and cold sunless days. The mean temp., 54°·5, was about 3°·0 below the average, and ruinous to the fruit crops. Shade max. 66°·5 on 18th; min. 34°·0 on 26th.

DRUMNADROCHIT.—The R was only exceeded in August, 1889, and August, 1894. Remarkable continuance of N. and E. winds.

LOCH STACK.—Duration of sunshine, 75·5* hours.

GLANMIRE.—Harvesting and other agricultural operations have been seriously hampered by the wet.

DUBLIN.—A cloudy, cold, and wet month. Mean temp. 54°·4, or 5°·3 below the average. Shade max. 65°·9 on 16th; min. 42°·9 on 2nd. F 0, f 0.

OMAGH.—A cold wet month with a deficiency of sunshine. The main hay crop has been irretrievably damaged.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, March, 1912.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity. 0-100	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°		°	°	inches		
London, Camden Square	62·3	25	32·6	21	53·3	40·5	41·8	86	108·7	29·9	2·84	20	7·6
Malta	70·2	3	47·9	24	64·3	53·6	51·5	83	135·0	..	·84	9	4·6
Lagos	93·5	12	74·5	25	90·9	77·8	74·8	71	164·0	72·5	·20	2	...
Cape Town	98·9	18	44·0	26	79·9	60·0	57·6	67	...	...	·76	5	2·9
Durban, Natal ...	86·1	3	57·8	10	80·6	65·8	66·4	73	143·5	...	3·72	14	5·1
Johannesburg	82·0	9	40·7	11	73·0	53·8	52·3	73	148·5	39·2	2·58	13	4·1
Mauritius	86·7	29	67·5	8	83·8	72·6	70·3	78	157·3	60·8	2·92	18	5·4
Bloemfontein ...	88·1	9	42·6	27	80·8	67·6	51·3	64	...	...	1·19	7	3·0
Calcutta...	98·9	13	60·2	31	91·8	70·4	66·4	65	...	55·9	4·09	7	2·2
Bombay...	92·3	30	69·3	8	87·1	73·2	69·0	70	133·5	62·9	...	...	1·2
Madras	94·9	22	68·3	17	91·7	74·3	72·8	76	139·9	64·4	·00	0	1·3
Kodaikanal	75·8	28	45·3	11	69·7	52 2	45·6	62	150·8	38·0	1·14	6	3·8
Colombo, Ceylon ...	92·2	9	74·0	9	89·8	76·4	72·9	73	159·6	65·9	2·07	7	4·0
Hongkong	80·3	29	48·9	17	67·9	60·6	60·8	86	123·2	...	4·35	11	9·1
Sydney	88·5	24	56·5	22	75·6	63·3	59·7	72	146·0	47·3	8·68	27	5·9
Melbourne	93·9	4	45·0	7	75·4	56·5	53·0	64	147·5	39·9	·74	10	5·0
Adelaide	101·0	3	49·3	14	82·9	60·2	54·1	53	157·9	40·0	·67	5	3·7
Perth	102·2	11	53·7	26	81·9	61·4	57·7	62	159·0	47·1	·06	6	3·2
Coolgardie	105·2	18	54·3	7	88·6	63·2	58·0	54	161·6	54·0	1·21	6	3·6
Hobart, Tasmania ..	88·2	3	45·1	15*	67·1	52·5	48·1	64	137·2	38·7	2·23	12	6·5
Wellington ...	75·2	7	43·0	17	63·7	52·7	47·4	68	119·0	33·0	2·89	14	6·6
Auckland	78·0	3	49·0	11	67·8	56·0	57·8	87	135·0	45·0	6·12	16	6·7
Jamaica, Kingston ..	88·5	16	67·1	2	86·5	69·5	68·2	78	...	...	·56	4	3·8
Grenada	87·0	31	72·0	4, 29	83·0	74·0	...	71	140·0	...	1·99	14	3·0
Toronto	48·7	19	4·0	3	33·6	18·0	...	...	119·2	1·0	1·97	8	3·7
Fredericton	49·0	16	—13·0	6	35·9	14·6	...	81	...	...	4·70	10	5·5
St. John, N.B. ...	49·2	20	3·3	5	35·4	22·0	...	...	...	...	3·64	15	5·6
Edmonton, Alta. ...	55·8	26	—17·7	1	34·5	9·3	...	65	113·5	—20·8	·32	5	1·9
Victoria, B.C.	...	...	...	...	50·7	34·4	...	72	...	...	1·43	9	4·0

* And 25.

MALTA.—Mean temp. of air 58°·1. Average sunshine 8·4 hours per day.

Durban, Natal.—Rainfall 1·09 in. below 35 years' average.

Johannesburg.—Bright sunshine 222·2 hours.

Mauritius.—Mean temp. of air 0°·2 above, R 6·40 in. below, averages. Mean hourly velocity of wind 10·4 miles, or 1·0 above average.

KODAIKANAL.—Bright sunshine 222 hours.

COLOMBO.—Mean temp. of air 83°·1, or 1°·1 above, R 2·21 in. below, averages. Mean hourly velocity of wind 4·3 miles. TSS on 6 days.

HONGKONG.—Mean temp. of air 64°·3. Bright sunshine 104·6 hours.

Sydney.—Mean temp. of air 0°·3 above, and R 3·54 in. above, averages.

Melbourne.—Mean temp. of air 1°·2 above, and R 1·47 in. below, averages.

Adelaide.—Mean temp. of air 1°·7 above, and R ·47 in. below, averages.

Coolgardie.—Mean temp. of air 4°·6 above average.

Wellington.—Mean temp. of air 2°·2 below, and R ·57 in. below, averages.

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METEOROLOGY AT THE BRITISH ASSOCIATION, SECTION A.

By E. Gold, M.A.

The British Association for the Advancement of Science held its annual meeting at Dundee, from September 4th to 11th. The leading feature of meteorological interest in the proceedings was the joint discussion on Monday, September 9th, between Section A and the new Section M, Agriculture, on the Application of Meteorological Information to Agricultural Practice. Professor Middleton presided, and in introducing Dr. Shaw mentioned that the idea of that joint discussion originated in a very stiff *viva voce* examination which Dr. Shaw once conducted in his room in London with himself as the unfortunate examinee. Dr. Shaw, in opening the discussion, referred to the early work of Fitzroy in issuing forecasts and the re-introduction of the practice, after the lapse of more than a decade, in 1879. Since then they had been issued regularly for more than 30 years, and it was time to ask if they were useful and if they were used as they might be. He calculated that the annual loss to this country through unfavourable weather might be put at £20,000,000, and the saving of that sum, or part of it, was an object worthy of serious attention. But owing to the special position in which the British Empire stood, the matter was even more important, for ultimately forecasts must be forecasts for the whole globe, and the amount of money to be saved throughout the empire far exceeded the estimate mentioned. But apart from forecasts which enabled saving to be effected by preventive precautions, there was probably much to be done by the proper use of our present knowledge of climate, and in this connection the meteorologist wished to learn from the agriculturalist if he could make use of meteorological statistics, and in what form he wished the statistics to be presented to him. If the information is of no use in agriculture, the meteorologist's task is immensely lightened. If it is of use are the statistics to be quarterly, monthly, weekly, or daily? Does the agriculturist require mean temperatures, maximum temperatures, or accumulated

temperatures, rainfall or duration of rain, sunshine or intensity of radiation, or some combination of these? He had with him a copy of the questions propounded to Professor Middleton on the occasion mentioned. The agriculturist might be tempted to say that every experienced farmer was practically acquainted with the answers to the questions so far as they concerned him, but even if that were so it would be worth while to have the answers set out in a form in which they may be useful to those who have not already learned by experience. Typical questions were:—

What crops are grown in what counties and why?

What is the effect of aspect and climate upon crops?

What deviations from the normal values of the meteorological elements represent a good or a bad year?

Slides were then shown representing:—(1) The average course of the seasons in the British Isles and the values for the current year. (2) The connection between the weather and crops, using the values for the correlation co-efficients given in Mr. R. H. Hooker's valuable paper on this subject. (3) The connection between the autumn rainfall and the yield of wheat in the following year. (4) The connection between rainfall and the depth of water in a well at Ditcham Park, from which it appeared that rainfall produced very little effect upon the depth until the end of September. Reference was also made to Dr. Unstead's recent papers on the yield of wheat and the importance of an index number depending on the accumulated temperature and the duration of darkness.

Mr. A. Watt referred to the establishment of a Lectureship in Meteorology at the Edinburgh and East of Scotland Agricultural College, an event of significance both to Agriculture and to Meteorology. He then showed some results obtained for the correlation between rainfall and temperature and the yield of crops in Forfarshire. It appeared that a dry June and July were favourable for potatoes, and warmth during that period was also desirable. For oats, on the other hand, a cool June was decidedly favourable. In a recent paper on similar lines for Iowa, U.S.A., a good rainfall in June was found to be favourable to the potato crop, and a result exactly opposite to what he found for Forfarshire. The difference was probably to be attributed to the higher temperature in Iowa.

Mr. W. L. Balls showed the importance of considering temperatures nearer to the surface than the orthodox 4 feet, especially in Egypt, where the difference in the values at 1 foot and 4 feet were very large on the calm nights, which they experienced there.

Dr. E. J. Russell said that agricultural institutions were setting out to meet the Meteorologists. The effect of climate on plant-life was two-fold: it affected the plant itself, and the soil in which the plant grew. The effect on the soil might also be sub-divided into the effect on the plant food in it and the effect on its texture. A heavy

rainfall washed out the nitrates in the soil, while dry hot weather conserved them and partially sterilized the soil. At the end of the summer of 1911, the soil contained 3½ times the usual amount of nitrates, but the heavy rains of last autumn and winter washed out $\frac{9}{10}$ths of them. Frost conserved the nitrates, but generally these were at their minimum at the end of the winter. With the continental type of climate the increase in plant food in the spring was very rapid, but in the British type the increase was much more gradual. In conclusion, he asked Dr. Shaw if it was possible to forecast the general character of the seasons for the next five years.

Mr. R. M. Barrington, speaking as a practical farmer, testified to the great utility of local observations in conjunction with the reports of the Meteorological Office. He thought meteorology ought to be taught to every aspiring farmer. Chemistry was important, physics was important, and mathematics too in an indirect way; but meteorology was most important of all. If he were Chancellor of the Exchequer he would give Dr. Shaw all the money he wanted for the development of meteorology.

Major Craigie emphasized the importance of the steady and continuous utilization of meteorological forecasts and observations. He would like to make a more modest request than Dr. Russell, and ask for a forecast of the weather for the next five weeks.

Dr. Shaw said, in the course of his reply, that if the information for which Dr. Russell and Major Craigie asked could have been supplied, it would have been made public through the newspapers without any loss of time.

On Tuesday morning, Professor H. H. Turner gave an account of his investigation of periodicities in Earthquake phenomena. He found evidence of a real period of about 15 months, and an indication of a period of 11·76 months, which was also found in the record of rainfall at Greenwich. He communicated also a paper by Mr. J. I. Craig, in which the author showed that Professor Schuster's method of the periodogram and the method of correlation were practically identical.

Mr. E. M. Wedderburn gave an account of his investigations of the temperature conditions in the Madüsee in Pomerania, a fresh-water lake with shelving sides, and in Loch Earn. In both cases the temperature changes were found to be oscillatory, and capable of explanation on the assumption that the motion of the water in the lake was in opposite directions above and below the level of maximum rate of change of density.

Miss White read two papers on the results for wind and temperature obtained at the upper air station at Glossop during 1908–1909. As regards wind, she found that the average velocity changed from 5·0 m.p.s. (metres per second) at the ground level (335 metres) to 11·8 m.p.s. at 1000 metres, and to 13·6 m.p.s. at 2000 metres above mean sea level. The velocity in winter was greater than in summer at all heights, and greater for low pressure than for high pressure.

At ground level the velocity of winds from the east was about the same as that of winds from the west, but it increased less rapidly, so that at 2000 metres the velocity for westerly winds was 16 m.p.s. compared with 12 m.p.s. for easterly winds. The theoretical value for the gradient wind calculated from the pressure chart was reached by the actual wind on the average at an altitude of 650 metres, or about 300 metres above ground level. In the second paper, on Temperature, she found that the rate of fall diminished from 8°·5 C. per kilometre in the first 200 metres to 4°·3 C. per kilometre at 2000 metres, a result in good agreement with those found by previous workers. The height at which the mean annual temperature is 0° C. is about 2100 metres. Both in winter and in summer the temperatures in the upper air were found to be higher over regions of high pressure than over regions of low pressure.

Both papers were very interesting, and contained much valuable information. Professor Petavel expressed the hope that the results would be utilized by aviators. The average values furnished a basis for forecasting the probable conditions in the upper air from the actual conditions at the surface. Miss White was to be congratulated on the manner in which she had discussed the observations, and the clear way in which she had put before them the results of her investigations.

Mr. Gold referred to the work of the Joint Upper Air Committee which had been carried out at Mungret College, Limerick, with the co-operation of the Rev. W. O'Leary, S.J., who was present at the meeting. The results obtained during the past year were given in the report of the committee, and showed that the height of the stratosphere over Ireland was about the same as over England. Father O'Leary spoke of the need which he felt for definite and precise instructions as to the type of weather in which a balloon might be liberated with a reasonable chance of recovery.

It is encouraging to know that the Association made an increased grant of £50 at Dundee to aid in investigations of the upper atmosphere over the North Atlantic Ocean during the coming year.

THE METEOROLOGICAL LUNCHEON AT DUNDEE.

By E. Gold, M.A.

The annual meteorological luncheon at the meetings of the British Association seems to have become an essential complement to the proceedings of Section A. At Dundee the presence of two local secretaries of the Association, the one versed in knowledge of his city, the other an expert in all things concerning the life of the sea, evidenced the interest in matters meteorological which is characteristic of the country which investigated the meteorology of Ben Nevis and was one of the most pertinacious advocates of the usefulness of

storm-warnings and daily forecasts in the early days of organized meteorology.

It is not without significance that there were also present the President of Section A, in the proceedings of which meteorology has a long and honourable record, the President of Section M, Agriculture, with which land meteorology is closely associated and will find its greatest opportunities to justify its position as a science, by economy of practice as well as by economy of thought, and the Director of the Science Museum, in which the importance of meteorological apparatus and methods in the scientific devolopment of mankind is receiving recognition.

The following is a list of those present:—

R. M. Barrington, M.A., Trustee of the British Rainfall Organization.
Rev. W. J. Barton, M.A.
C. O. Bartrum.
Mrs. Bartrum.
Dr. H. Borns.
Prof. H. L. Callendar, F.R.S.
Rev. A. L. Cortie, S.J.
James Cossar.
J. S. Dines.
Prof. W. G. Duffield, D.Sc.
M. McCallum Fairgrieve, M.A.
Mrs. Fairgrieve.
Wilson Lloyd Fox.
E. Gold, M.A.
Mrs. Gold.
Edward Kitto.
Mrs. Kitto.
Rev. W. O'Leary, S.J.
Dr. W. J. S. Lockyer.
F. H. Marshall, M.A.
W. H. Blyth-Martin, Town Clerk of Dundee.
T. H. Middleton, M.A., Assistant Secretary, Board of Agriculture and Fisheries.
Dr. John Milne, F.R.S.
T. S. Muir.
Rev. Dr. L. Muirhead.
Mrs. L. Muirhead.
James Muirhead.
Miss Muirhead.
Dr. F. Grant Ogilvie, C.B., Director of the Science Musem.
Prof. W. Peddie.
Prof. J. E. Petavel, F.R.S.
Dr. E. J. Russell.
Dr. W. N. Shaw, F.R.S., Director of the Meteorological Office.
Mrs. W. N. Shaw.
James Smith.
F. J. M. Stratton, M.A.
Miss Strattou.
Prof. W. D'Arcy Thompson, C.B.
Andrew Watt, M.A., Secretary, Scottish Meteorological Society.
E. M. Wedderburn.
F. J. W. Whipple, M.A.
Mrs. Whipple.
R. S. Whipple.
Miss M. White.

After the toast of "The King," the Chairman, Dr. Shaw, called upon Prof. Middleton to propose a toast to "The Scottish Meteorological Society." Prof. Middleton said he envied meteorologists for many reasons. First, because of the opportunities which they had. In his subject of agriculture they had winter succeeded by spring, which in turn was followed by summer and by autumn, and they had to wait for the round of the seasons before they could judge of the success or failure of their work. The meteorologist could issue a forecast at 7 a.m., correct it at 6 p.m., and next morning take his choice of a brand new forecast or a further corrected edition of the old one. Though the agriculturist lived to the age of Methuselah, he could not hope for such a plenitude of opportunity. He also

envied the meteorologist for his caution. That very morning Dr. Russell had modestly invited Dr. Shaw to give a forecast of the general character of the weather for the next five years, but Dr. Shaw refused to be drawn; and when Major Craigie, with some diffidence, put forward an application for a forecast for the next five weeks, he was met with similar caution. Then again he envied the meteorologist his courage. Dr. Shaw had told them how during the past month he had spent his holiday in visiting different seaside resorts. He imagined that any man of ordinary courage, occupying a similar responsible position, if he found himself at a seaside resort during August of this year, would have left hurriedly by the next train. [Dr. Shaw: "I generally did."] That brought him to his last point, the philosophy of the meteorologist; which was aptly illustrated by Dr. Shaw's interruption. He had, therefore, much pleasure in proposing success to a Society of scientists with such opportunities and qualities; and he wished to couple with the toast the names of Mr. Wedderburn, and of Mr. Watt, who had put before them such interesting facts in the morning's discussion.

Mr. Wedderburn said that in connexion with Prof. Middleton's reference to grumbling farmers, he might mention that in the course of his work he had to collect rents from that class. On one occasion he remarked to a farmer that it was a good year for him, with good crops and good prices. "Ou ay," replied the farmer, "but the straw's sae guid, I dinna like to bed the beasts wi' it!" The Scottish Meteorological Society was a private society, dependent upon the voluntary support of its members; but the contributions which it had made to the progress of meteorology were not the least honourable in the annals of science. He wished to thank the company for the cordial way in which they had received the toast.

Mr. Watt associated himself with what Mr. Wedderburn had said on behalf of the Society, and added that the Society was greatly indebted to Dr. Shaw for the cordial way in which he had given advice and assistance in some of the difficulties which they had to face. Statistical work—and meteorology was very much a matter of statistics—was arduous work; but fortunately the science brought one into touch with people of very wide interests, and excellent people they were, as that gathering testified.

Dr. Shaw proposed "Bonnie Dundee," but before proceeding to the subject of the toast, he referred to the rather unsatisfactory character of the programme of Section A, as far as meteorology was concerned. Mr. Wedderburn and Miss White were keeping up the connection between the subject and the section, but no one would realize from the meetings of the section that since they had last met at Portsmouth Mr. Dines had turned our ideas upside down by his discovery that the origin of meteorological disturbances was to be sought at a height of 9 kilometres above the Earth's surface. He wished also to congratulate Father O'Leary, who had been conducting the investigation of the upper atmosphere at Mungret

College, near Limerick, and to express to him their thanks for his work in connection with the International Organization. It was also noteworthy that during the past year observations with theodolites of the motion of pilot balloons had been instituted at Aberdeen, and already valuable information had been obtained there. The meeting at Dundee was a red-letter meeting. The munificent gift by Dr. Caird of £10,000 to the funds of the Association was alone sufficient to make it so; the cordial hospitality with which the town and its citizens welcomed the Association, and the interest which they showed in the proceedings of the various sections were even more significant, for if scientific knowledge, and especially meteorological knowledge, was to be utilized fully, it could only be by each municipality or local authority undertaking the collection and discussion of data and the distribution of information. It was especially important in meteorology to get rid of the idea that observations were made in different localities for the benefit of a central office in London or Edinburgh. The *raison d'être* of such observations, if they had one, was to provide results which could receive practical application to the industry and the health of the community. The necessary contribution of this country to the meteorology of the globe could be obtained by observations at a comparatively small number of stations. He was sure that Dundee would be behindhand neither in the collection nor in the application of scientific information. He had much pleasure in proposing the toast of "Bonnie Dundee," and coupled with it the names of Mr. Blyth Martin and Prof. D'Arcy Thompson, who were largely responsible for the successful organization of that historic meeting.

Mr. Blyth Martin said that Dundee was a fitting place both historically and industrially to welcome a great scientific association, and he had very great pleasure in thanking them for the cordial way in which they had received the toast. He was sure that if as many pleasant memories were carried away as were left behind, the Dundee meeting of the Association would not soon be forgotten.

Prof. D'Arcy Thompson associated himself with Mr. Blyth Martin in expressing thanks on behalf of Dundee. There were certainly many unexpected duties which a local secretary was expected to perform, some of them simple in form but difficult in execution. During the previous week he was approached by a visiting member of the Association, who inquired respectfully, "Are you Prof. D'Arcy Thompson?" "I am," said he. "Oh! could you find me my hat and my umbrella?" There were many such amusing episodes, and the best of all occurred that very morning.

ATMOSPHERIC DISTURBANCES AND DEEP-SEA FISH.

By Rev. D. C. Bates, *Dominion Meteorologist, New Zealand.*

On the coast of the South Island of New Zealand, during and after severe frosts, a curious deep-sea fish known as the "Frost-fish" (Lepidopus Caudatus) is found lying dead upon the shore. It is a long ribbon-like silvery fish, and is delicious eating, and much sought after, so that men will scour the sands at night to find them. They are killed by the bursting of their air bladders, and the curious circumstance is their connection with hard frosts, particularly under anticyclonic conditions. They rise from very great depths, and yet are killed apparently by frosty weather.

Another remarkable occurrence occasionally accompanies storms on the New Zealand coasts, when tons of deep-sea fish are thrown up dead, and this not in parts subject to thermal or volcanic action, but in stormy periods. One Captain Doyle, in former days, reported sailing through miles of dead fish, between Cape Palliser and Kaikoura; but it is no new occurrence for the beaches to be strewn with fish from depths of over a hundred fathoms during a storm. We are accustomed to think of the depths of the ocean as still and free from the waves that ruffle the surface; but is it so? The late Government Geologist, Mr. Alexander McKay, assures me that there are no volcanic or thermal regions where these fish come ashore; and though these parts do experience earthquakes, which may release poisonous subterranean gases, yet he attributes the cause to the storm. His explanation of such an occurrence at Island Bay, Wellington, on 18th July, 1912, is: "This is not the first time, nor the tenth time, that fish have been landed on the shores of Cook Strait in precisely the same fashion, always in every case subsequent to a storm. Therefore, we must look for the cause in the storms, unless it is that storms may produce what we call fumes, by stirring up the bottom of the sea. Immediately off shore we have comparatively deep sea, inhabitated by fishes which are not usually met on the immediate coast-line. If from any cause during a high storm deep-sea fishes hug close to the land, then it only requires a very heavy sea, in which waves strike the bottom, to involve the fish, rush them ashore, and kill them by hundreds."

At the time of the occurrence a low pressure system ruled northwards, while an antarctic anticyclone was reported in the south, and a south-easterly gale swept through Cook Strait and on the shores in its vicinity. North and south of the Straits the weather was not so intense; and the gradient was not remarkably high where the storm was most felt, but just where the fish came ashore.

The report in the *Wellington Evening Post*, of the 18th, was as follows:—"A curious phenomenon was observed at Island Bay this morning. The beach was strewn with fish, some dead, some still alive—tons and tons of ling, hapuka, hake—every kind. One enterprising person collected a lorry load and brought it into town, and

dozens secured smaller quantities, ranging from a barrow-load to a "string." The phenomenon has been observed previously in New Zealand. Some thirty years ago the beach at Okarito, on the West Coast of the South Island, was strewn for seventy miles with fish of all sorts and sizes, and an old resident of Wellington remembers several occasions on which the same thing happened at Lyall Bay. As to the cause nothing is known, but it is conjectured that it may be a submarine volcanic disturbance."

THE COLD AUGUST AND SEPTEMBER IN LONDON.

THE temperature of August and September was so unusually low in London, that the long record at Camden Square, dating from 1858, contains no instance of any previous August or September with a lower mean temperature. The mean temperature of August, 57°·9, was 4°·4 below the average; and it was the coolest August in the 55 years' record. In September the mean temperature was 54°·1, or 3°·6 below the average, and only in 1877 can September show so low a record. The combined difference from the average is thus —8°·0, and though there are 10 instances of two months together showing a greater deficiency, all 10 instances are confined to the months November to February.

Temperature remained consistently low throughout the two months, but the shade maxima records are rather more remarkable than the minima. In August the mean shade maximum was 66°·6, and only in 1860 was it so low for that month. August, 1860 and 1912, are also the only months of that name in which the shade temperature failed to reach 77°. In 1912 the highest recorded was 73°·2 on the 4th. In September the records were even more remarkable, the mean maximum, 62°·4, being the lowest ever recorded for that month; and the absolute maximum, 69°·4 on the 4th, was also the lowest ever recorded in September.

The records are in striking contrast to those for August–September, 1911, two months of extraordinary brilliance and warmth. In August–September, 1911, the temperature rose to 80°, or above on 22 days and exceeded 90° on 5 days. The mean shade maximum for August, 1911, was 80°·8, or 14°·2 above the corresponding mean for 1912; and in September, 1911, it was 73°·0, or 12°·5 above that of September, 1912.

It is of considerable interest that 15 consecutive months with mean temperatures above the average, May, 1911, to July, 1912, should be followed by two months of unprecedentedly low temperature.

Summary of Maximum Temperatures of the 61 days, August 1st—September 30th.

Number of days with max. temp above:—

	60°	65°	70°	75°	80°	85°	90°
1911.....	91	55	44	36	22	13	5
1912.....	53	28	3	0	0	0	0

THE WEATHER OF SEPTEMBER.

By Fred. J. Brodie.

The abnormally bad weather of August was attributed, *inter alia*, to an unusual prevalance of winds blowing from the Atlantic, where the mean temperature of the sea surface was considerably below the average. The explanation seemed plausible enough, but in the light of recent events it can scarcely be regarded as adequate. In September the winds were more variable, but over England, and especially in the latter half of the month, they were most commonly from some easterly quarter, and originated in the farther regions of the continent. The absence of seasonable warmth was, nevertheless, as noticeable almost as in the previous month, very few places in any part of the kingdom experiencing a shade maximum temperature as high as 70°. In the London district the thermometer did not once touch that level, the absolute maximum of 69°, on the 4th of the month, being the lowest recorded in September since the year 1887, or, with that exception, in any of the previous 40 years.

In the opening week the southern half of the country was influenced by a large anticyclone lying to the south-westward of our islands, and the weather in those parts was therefore mostly fair and dry. Between the 1st and 4th the thermometer rose above 65° in many parts of England, a reading of 69° being recorded at Dublin on the 3rd, and at Greenwich, Camden Square and Clacton-on-Sea on the 4th. In the more northern districts the weather was affected by cyclonic disturbances moving from Iceland to Scandinavia. These systems produced frequent rains, the fall in Scotland on the 3rd being very heavy, and strong winds from the westward and north-westward. After the 8th, and until very nearly the close of the month, the conditions over the whole country were markedly anticyclonic, the wind being at first from some north-westerly (west to north) quarter, but afterwards from the eastward in all the more southern districts. For about three weeks the country experienced an almost entire absence of rain, and at some stations in the south of England, where the early part of the month had also been fair, the absolute drought extended over as many as 25 or 26 days. Until the fourth week the sky was usually more or less cloudy, and even in the intervals of fine weather the thermometer scarcely ever rose to its normal level, maximum readings below 60° being common in nearly all parts of the country. On the 9th and 10th the thermometer in many districts failed to reach 55°, and in the north of Scotland it did not touch 50°. The highest temperatures recorded over the United Kingdom during the entire month occurred on the 16th, not in what are usually regarded as the warmer parts of the country, but in the west and north. At Alnwick Castle and Bath the thermometer on this occasion rose to 70°, while at Crieff, Cullompton and Killarney it touched 72°. Ground frost was experienced from time to time in

THAMES VALLEY RAINFALL—SEPTEMBER, 1912.

most districts, the sharpest nights occurring between the 24th and 27th, when the thermometer in many parts of Great Britain sank below the freezing point even in the shelter of the screen; on the surface of the grass it fell to 23° at Balmoral, West Linton and Hampstead, and 24° at Greenwich, Wisley, Marlborough and Cheadle.

On the 28th a radical, though purely temporary, change in the weather was brought about by the extension over these islands of a barometrical depression from the southward. The easterly wind now increased greatly in strength on nearly all coasts, and rain set in over our southern districts. Two other disturbances afterwards came in from the south-westward and on the 29th and 30th exceedingly heavy falls of rain were experienced in nearly all parts of Great Britain. In spite of the long drought which had hitherto prevailed, the rainfall on these two days was, in many places, sufficient to raise the monthly total to a point equal to, or even slightly in excess, of the average.

Owing to the absence of midday warmth the mean temperature of the month was considerably below the average, the deficit amounting, in many districts, to between 3° and 4°. Over the country generally the coldest August was, in fact, followed by the coldest September experienced for at least 40 years past. The duration of bright sunshine was below the normal in all but the extreme western and northern parts of the kingdom. In the London district the deficiency was small, but over the eastern half of Great Britain it was considerable, Aberdeen recording only 87 hours, as against an average of 123 hours, and Yarmouth only 120, as against an average of 169.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

SKY SIGNS OF THE RAINY AUGUST.

A POINT worth noting in connection with the rainfall last August is the absence of sunset or sunrise glows, very generally, if not universally. Such has been the case here, and my attention has been called to it from Somerset and Cumberland. Associated with this has been an extreme wateriness of the "blue sky" whenever visible, naturally associated with the coldest appearance of the sunshine within two or three hours of sunrise and sunset.

J. EDMUND CLARK.

Riddlesdown Road, Purley.

THE VALLOT OBSERVATORY ON MONT BLANC.

In your August issue, Mr. Dansey, in his paper, "June in the Pyrenees," asks for enlightenment as to whether M. Vallot's observatory is still existent on Mont Blanc.

It will interest him, and I trust your other readers, to know that this Observatory *is* existent, and does excellent work. Every year M. Vallot stays up at the Observatory through the greater part of August, and the Observatory is then open to a restricted number of scientific men desirous of investigating high altitude phenomena.

The Observatory strikes the visitor as a most cosy and comfortable high mountain chalet of considerable dimensions. It is well equipped with a variety of the best meteorological apparatus. There are also biological and photographic laboratories. M. Vallot and his assistants are at present occupied in the detailed survey of the "Massif du Mont Blanc"; it is a most difficult task, carried out principally by triangulation and telephoto work.

The confusion concerning the Mont Blanc Observatories frequently arises through the disappearance of the old Janssen Observatory which was situated on the very top of Mont Blanc. It inclined to one side and gradually sank, it is believed, into a fissure due to an earthquake. The turret of this observatory may now be seen in the Alpine Museum at Chamonix; the rest of the building was mostly used up as firewood for the Vallot Observatory, which is not quite at the summit.

M. Vallot has now ascended Mont Blanc 34 times, and, notwithstanding that he is a grandfather, it is remarkable to see the agility with which he will run across ladders bridging glacier crevasses. He is an eminent meteorologist, and his work is not limited to high altitudes, but also extends to the sub-tropical climate of the Riviera, for he winters in Nice. It is mainly to him that the present *systematic* investigation of Riviera meteorology and climate is due, the Riviera being one of those "most observed" fields of which there exist no reliable observations, or practically none.

With reference to the Mont Blanc Observatory, its work is summarised in a "Bulletin," which Mr. Dansey will find in any Meteorological Society's library. Last year's work included most interesting investigations on the "artificial," or non-pulmonary oxidization of blood. At high altitudes the arterial blood has very much of a venous appearance, but the experiments carried out at the observatory demonstrated that the subcutaneous injection of oxygen gas rapidly restored a brilliant red colour to arterial blood and consequently that blood corpuscles were able to fix oxygen without the phenomena necessarily taking place in the intimacy of the lung. M. Vallot, with his customary enthusiasm, was the first human being to submit to the "treatment" and its uncertain consequences. In point of fact there was no harmful result, but the oxygen gas, travelling along in the subcutaneous tissue, localised in the most

unexpected places, causing some pain, and particularly a malformation, which gave rise to great hilarity, in which "the subject," notwithstanding considerable discomfort, heartily joined. As you see, the Vallot Observatory is not a dull place! Experience has now settled where these injections can be made without such inconvenience and they afford considerable relief when the lungs, through morbid conditions, are unable to do their work.

It is a great pity that more visitors do not ascend Mont Blanc, which practically is not a dangerous climb. Of the 180,000 tourists who went through Chamonix last year, only 180 odd went up the mountain, an average of one in a thousand.

MARC DE LEVIS,
M.D., B.Sc., F.R.Met.Soc

Villa Goiran, Place Sasserno, Nice.

EARLY SNOW.

SHARP snow showers were experienced here on the evenings of September 10th and 11th. On the former date, at 7 p.m., a well-defined pallium of mammato-cumulus spread over the sky from the north, accompanied by a keen northerly wind. Between 7.15 and 7.20 p.m., snowflakes of considerable size fell. Throughout the 11th the sky bore that peculiar appearance, hard, steely blue-black in colour, that one commonly associates with a snowfall in winter, and between 9.0 and 9.10 p.m. there was a fall of fine powdery snow. Two balloonists who made a journey from Battersea to Brighton on the evening of the 10th, experienced a very heavy snowstorm at an altitude of 5,000 feet.

During the last 11 years in the Southern Counties the earliest record that I have of snow was at Epsom, Surrey, at 10.20 p.m. on September 19th, 1910.

SPENCER C. RUSSELL.

Southwater, Sussex, September 16th, 1912.

LARGE AGGREGATE RAINFALL IN DEVON.

THE rainfall here from January 1st to August 31st has amounted to 34·69 in. The mean annual rainfall is about 33 in., so that the present year has exceeded its whole allowance by nearly two inches, with some of the usually wettest months to come. The total fall for the twelve months ending August 31st is no less than 55·12 in., or more than 22 in. in excess of a normal 12 months fall, and very nearly double the total fall for the year 1908, *i.e.*, 28 in. There was more rain during the month of August than fell from May to September, inclusive, last year, the present August producing 7·27 in., while August of last year only yielded ·56 in. The number of rain days has been, since January 1st, 155, compared with 74 days last

year, and in August this year it rained on 24 days, compared with 6 in August last year. At my Somerset station, Edington, the rainfall during August amounted to 9·65 in. on 26 days. This is the greatest amount of rain I have registered there in any month during 22 years, the next greatest being 7·75 in. in October, 1891. The rainfall there since January 1st has been 29·80 in., or about an inch above the normal for a whole year, and the twelve months since last September give 44·07 in., or more than 15 in. in excess of an average rainfall.

I should be interested to hear if any of your correspondents have experienced such an enormous excess at their stations.

A. C. F. LUTTRELL.

Lea Combe House, Axminster, Devon, September, 1912.

THE RAINFALL OF SEPTEMBER 29th TO OCTOBER 2nd, 1912.

After twenty-eight nearly rainless days, rain began at 4.30 p.m., with a S.E. wind, on September 29th, and there was measured on September 30th at 9 a.m. 1·64 in. Wind S.E. Rain stopped at 11 a.m. Wind gradually veered to N.W. Rain began again at 7 p.m. on the 30th; and on October 1st rain stopped at an early hour; that measured at 9 a.m. was ·75 in. Wind S.W.; beautifully fine. Wind gradually veered to N.W. and rain began again at 2.30 p.m. On October 2nd the measurement at 9 a.m. was ·35 in.; wind N.E. Rain stopped at 11.30 a.m., producing ·03 in. more rain. Bitterly cold. The wind was slight throughout.

	RAINFALL.		TEMPERATURE.	
			Max.	Min.
	in.		°	°
September 29th	1·64	.....	60	50
,, 30th	·75	.....	60	45
October 1st	·35	.....	61	47
,, 2nd.....	·03	.....	49	33
	2·77			

The wind is now N.E., fresh and fine.

GILBERT A. CLAYTON EAST.

Hall Place, Maidenhead, 3rd October, 1912.

METEOROLOGICAL NEWS AND NOTES.

Dr. H. R. Mill will lecture on Natural Sources of Power, for the Gilchrist Educational Trust, at Kidderminster, on Monday, October 21st; at Oldbury, near Dudley, on the 22nd; at Sowerby Bridge, near Halifax, on the 23rd; at Clayton-le-Moors, near Accrington, on the 24th; and at Padiham, near Burnley, on Friday, October 25th.

ABANA AND PHARPAR, rivers of Damascus, were, it would appear, no more jealous of the Jordan than is the Wensum of the Yare, to judge from the following complaint :—

"I, the river Wensum, which am the largest river in Norfolk, do hereby make just complaint of the neglect with which I have been treated in the printed accounts of the Norfolk deluge. The Bure, the Yare, and the Waveney have all been mentioned, but of me, beside whom the Yare is but a muddy brook, never a word! Mine is the longer course; I drain the larger area; and my clear, broad, swift stream is better than Bure and Yare combined. In the name of the bridges that I swept away in my fury I feel tempted to seek a remedy in the Court of Arches."

This reached us with an illegible water-mark, and we can only plead in extenuation of our neglect that the Wensum has allowed the Yare to give its name to the seaward end of the joint stream and so to place the longer partner in the position of a tributary.

INTERNATIONAL BALLOON ASCENTS.

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

April 14th, 1910.

Starting Point	Country.	A miles.	B ° F.	C miles	D ° F.	E miles.	F
Manchester....	England	5·9	—62	13·8	—60	122	N.
Pyrton Hill....	„ 7 a.m. ..	5·6	—63	8·8	—58	86	N.N.E.
„	„ 5 p.m. ..	5·9	—76	9·4	—64	88	N. by E.
Petersfield	„	5·6	—67	9·4	—67	?	?
Brussels	Belgium	6·4	—74	13·1	—60	89	N.E. by N.
Lindenberg ...	Germany....	6·6	—78	6·7	—78	54	E.N.E.
Paris.....	France	6·5	—73	11·5	—71	92	N.E. by E.
Strassburg	Germany....	6·5	—73	8·3	—63	59	N.E.
Munich	„	6·8	—76	12·4	—65	52	N.E. by E.
Nizhni Olchedaeff	Russia	5·5	—63	10·1	—68	51	S.E. by E.

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.

A low pressure area with the barometer below 29°·00 lay in the west, and an anticyclone over the south-east of Europe. There is considerable uniformity about the figures, but it will be noticed how the height of the isothermal column increased from west to east, in accordance with the usual rule by which a low isothermal column is associated with a low barometer.

RAINFALL TABLE FOR SEPTEMBER, 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1875—1909.	1912.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	2·00	2·14
Tenterden	*Kent*	51 4	*0 41	190	2·25	3·17
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·58	3·21
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·60	2·37
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	1·98	1·03
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·14	1·16
Shoeburyness	*Essex*	51 31	*0 48	13	1·70	2·02
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·18	2·62
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·13	2·50
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	3·11	1·19
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·69	1·39
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·39	·93
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·40	·90
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·35	·97
Boston	*Lincolnshire*	52 58	0 1	25	2·07	1·44
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·84	1·35
Macclesfield	*Cheshire*	53 15	2 7	501	2·92	1·98
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	3·09	1·39
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	4·55	2·85
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·11	...
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·05	1·91
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·00	2·00
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	11·28	6·51
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·61	·93
Haverfordwest	*Pembroke*	51 48	4 58	95	3·91	·61
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·89	·60
Llandudno	*Carnarvon*	53 20	3 50	72	2·50	1·11
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·34	2·25
Marchmont House	*Berwick*	55 44	2 24	498	2·67	3·26
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·30	3·38
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·99	1·38
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	6·15	4·32
Mull (Quinish)	,,	56 34	6 13	35	5·20	2·45
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·34	2·56
Braemar	*Aberdeen*	57 0	3 24	1114	2·73	2·72
Aberdeen (Cranford)	,,	57 8	2 7	120	2·69	2·14
Cawdor	*Nairn*	57 31	3 57	250	2·55	1·17
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·54	2·25
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	7·28	3·96
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·51	1·03
Wick	*Caithness*	58 26	3 6	77	2·57	·96
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·79	·81
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·19	·28
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·16	·47
Miltown Malbay	*Clare*	52 52	9 26	400	4·18	...
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	2·78	·37
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·93	·47
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·06	·57
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·02	·41
Cong (The Glebe)	*Mayo*	53 33	9 16	112	4·05	·71
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	4·42	·62
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·65	1·31
Seaforde	*Down*	54 19	5 50	180	3·25	·83
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·49	1·68
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·39	1·53

RAINFALL TABLE FOR SEPTEMBER, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
+ ·14	107	1·04	29	6	17·92	21·45	+3·53	120	25·11	Camden Square
+ ·92	141	1·67	30	8	18·32	23·41	+5·09	128	27·64	Tenterden
+ ·63	124	1·68	29	5	20·02	29·02	+9·00	145	30·48	Patching
— ·23	91	1·25	29	6	21·18	27·77	+6·59	131	31·87	Cadland
— ·95	52	·63	29	8	17·45	23·04	+5·59	132	24·58	Oxford
— ·98	54	·54	29	8	18·20	23·75	+5·55	130	25·17	Croyland Abbey
+ ·32	119	1·18	30	8	13·17	14·99	+1·82	114	19·28	Shoeburyness
+ ·44	120	·81	30	13	18·14	24·38	+6·24	134	25·40	Westley
+ ·37	117	·98	30	13	16·33	22·78	+6·45	139	23·73	Geldeston
—1·92	38	·64	29	9	24·90	35·43	+10·53	142	38·27	Polapit Tamar
—1·30	52	·80	29	5	22·54	30·39	+7·85	135	33·54	Rousdon
—1·46	39	·52	29	7	21·12	34·00	+12·88	161	29·81	Stroud
—1·50	38	·59	29	10	22·71	28·97	+6·26	128	32·41	Wolstaston
—1·38	41	·59	29	8	20·51	29·60	+9·09	144	28·98	Coventry
— ·63	70	·52	29	12	16·67	23·51	+6·84	141	23·35	Boston
— ·49	73	·59	29	8	17·54	26·31	+8·77	150	24·46	Hodsock Priory
— ·94	68	·46	7	13	24·85	27·40	+2·55	110	34·73	Macclesfield
—1·70	45	·31	3	10	22·70	27·70	+5·00	122	32·70	Southport
—1·70	63	1·36	3	10	42·14	49·81	+7·67	118	61·49	Arncliffe
...	...	...	...	...	19·08	...	...	...	26·87	Ribston Hall
— ·14	93	·54	29	10	18·57	25·25	+6·68	136	26·42	Hull
·00	100	·46	29	11	19·65	25·19	+5·54	128	27·94	Newcastle
—4·77	58	2·41	3	11	88·04	89·56	+1·52	102	129·48	Seathwaite
—2·68	26	·55	29	5	28·63	39·76	+11·13	138	42·28	Cardiff
—3·30	16	·18	28	12	30·96	38·77	+7·81	125	46·81	Haverfordwest
—3·29	15	·18	29	9	30·92	37·18	+6·26	120	45·46	Gogerddan
—1·39	44	·22	29	9	20.55	23·63	+3·08	115	30·36	Llandudno
—1·09	67	1·33	3	8	29·83	37·51	+7·68	126	43·47	Cargen
+ ·59	122	1·76	30	6	23·89	24·09	+ ·20	101	33·76	Marchmont
— ·92	79	1·22	3	13	33·67	36·31	+2·64	108	49·77	Girvan
—1·61	46	·36	7	9	25·03	23·67	—1·36	95	35·97	Glasgow
—1·83	70	2·26	3	10	46·21	44·15	—2·06	96	68·67	Inveraray
—2·75	47	1·23	3	9	37·87	34·28	—3·59	91	56·57	Quinish
+ ·22	109	1·38	30	7	20·54	20·78	+ ·24	101	28·64	Dundee
— ·01	100	1·60	30	...	24·16	25·75	+1·59	107	34·93	Braemar
— ·55	80	1·05	30	12	22·78	23·41	+ ·63	103	32·73	Aberdeen
—1·38	46	·39	4	6	21·25	18·46	—2·79	87	29·33	Cawdor
—1·29	64	·98	3	9	30·26	27·02	—3·24	89	44·53	Fort Augustus
—3·32	54	1·47	4	12	56·79	48·24	—8·55	85	83·93	Bendamph
—1·48	41	·40	3	8	22·41	23·35	+ ·94	104	31·90	Dunrobin Castle
—1·61	37	·27	5	14	20·68	21·74	+1·06	105	29·88	Wick
—2·98	21	·16	1	13	36·76	39·08	+2·32	106	54·81	Killarney
—2·91	9	·15	29	5	27·45	33·11	+5·66	121	39·57	Waterford
—2·69	15	·23	3	9	27·73	28·19	+ ·46	102	39·43	Castle Lough
...	...	...	...	...	31·46	...	...	...	45·11	Miltown Malbay
—2·41	13	·29	29	3	24·41	34·91	+10·50	143	34·99	Courtown Ho.
—2·46	16	·14	29	7	25·70	28·93	+3·23	112	35·92	Abbey Leix
—1·49	28	·24	29	8	19·89	22·67	+2·78	114	27·68	Dublin
—2·61	14	·15	3	6	26·19	30·76	+4·57	117	36·15	Mullingar
—3·34	17	·46	3	8	33·88	30·72	—3·16	91	48·90	Cong
—3·80	14	·33	3	6	35·74	...	...	..	52·87	Enniscoe
—2·34	36	·45	3	12	30·14	33·09	+2·95	110	42·71	Markree
—2·42	26	·23	29	10	27·63	35·60	+7·97	129	38·91	Seaforde
—1·81	48	·75	3	8	26·32	27·76	+1·44	105	37·56	Dundarave
—1·86	45	·79	3	7	28·05	32·17	+4·12	115	39·38	Omagh

SUPPLEMENTARY RAINFALL, SEPTEMBER, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	3·85	XI.	Lligwy	·79
,,	Ramsgate	2·89	,,	Douglas	1·46
,,	Hailsham	3·79	XII.	Stoneykirk, Ardwell House...	2·84
,,	Totland Bay, Aston House...	2·50	,,	Dalry, The Old Garroch.....	3·10
,,	Stockbridge, Ashley..	2·32	,,	Langholm, Drove Road	3·84
,,	Grayshott	4·21	,,	Beattock, Kinnelhead	2·28
,,	Caversham, Rectory Road ...	2·47	XIII.	St. Mary's Loch, Cramilt Ldge	3·11
III.	Harrow Weald, Hill House...	2·29	,,	North Berwick Reservoir... .	2·99
,,	Pitsford, Sedgebrook....	·88	,,	Edinburgh, Royal Observaty.	2·60
,,	Woburn, Milton Bryant.....	1·61	XIV.	Maybole, Knockdon Farm ...	2·11
,,	Chatteris, The Priory.....	1·39	XV.	Campbeltown, Witchburn ..	2·34
IV.	Colchester, Lexden	2·54	,,	Holy Loch, Ardnadam.....	4·82
,,	Newport.....	2·50	,,	Ballachulish House	4·57
,,	Ipswich, Copdock	2·58	,,	Islay, Eallabus	3·01
,,	Blakeney.....	2·58	,,	Tiree, Cornaigmore	2·82
,,	Swaffham	2·64	XVI.	Dollar Academy	2·89
V.	Bishops Cannings	1·37	,,	Balquhidder, Stronvar.....	3·49
,,	Winterbourne Steepleton.....	1·72	,,	Coupar Angus	2·12
,,	Ashburton, Druid House.....	1·40	,,	Glenlyon, Meggernie Castle..	3·44
,,	Cullompton	1·57	,,	Blair Athol	1·68
,,	Lynmouth, Rock House	·91	,,	Montrose, Sunnyside Asylum.	2·40
,,	Okehampton, Oaklands.....	1·59	XVII.	Alford, Lynturk Manse	3·07
,,	Hartland Abbey.....	·74	,,	Fyvie Castle	2·03
,,	Probus, Lamellyn.....	...	,,	Keith Station	1·81
,,	North Cadbury Rectory.....	1·14	XVIII.	Skye, Dunvegan	2·72
VI.	Clifton, Pembroke Road.....	·60	,,	N. Uist, Lochmaddy	2·03
,,	Ross, The Graig	·67	,,	Glenquoich, Loan.....	11·05
,,	Shifnal, Hatton Grange.....	·83	,,	Alvey Manse.....	1·30
,,	Droitwich.....	·75	,,	Loch Ness, Drumnadrochit ..	1·89
,,	Blockley, Upton Wold.....	1·05	,,	Glencarron Lodge	5·15
VII.	Market Overton.....	1·25	XIX.	Invershin	2·22
,,	Market Rasen.....	1·40	,,	Loch Stack, Ardchullin	5·00
,,	Bawtry, Hesley Hall	1·05	,,	Melvich	1·73
,,	Derby, Midland Railway.....	1·02	XX.	Skibbereen Rectory	1·41
,,	Buxton	2·57	,,	Dunmanway, The Rectory ..	1·53
VIII.	Nantwich, Dorfold Hall	1·65	,,	Glanmire, Lota Lodge.....	1·14
,,	Chatburn, Middlewood	1·96	,,	Mitchelstown Castle.....	·93
,,	Cartmel, Flookburgh	2·82	,,	Darrynane Abbey.....	2·87
IX.	Langsett Moor, Up. Midhope	1·92	,,	Clonmel, Bruce Villa	·49
,,	Scarborough, Scalby	2·71	,,	Newmarket-on-Fergus, Fenloe	·53
,,	Ingleby Greenhow	2·16	XXI.	Laragh, Glendalough	1·56
,,	Mickleton	2·35	,,	Ballycumber, Moorock Lodge	·23
X	Bellingham, High Green Manor	3·02	,,	Balbriggan, Ardgillan	·75
,,	Ilderton, Lilburn Cottage ...	2·78	XXII.	Woodlawn	·37
,,	Keswick, The Bank.....	1·83	,,	Westport, St. Helens	·54
XI.	Llanfrechfa Grange	·96	,,	Achill Island, Dugort	1·35
,,	Treherbert, Tyn-y-waun	1·76	,,	Mohill, The Rectory	·57
,,	Carmarthen, The Friary	·75	XXIII.	Enniskillen, Portora.....	·66
,,	Castle Malgwyn [Llechryd]...	·57	,,	Dartrey [Cootehill]	·76
,,	Crickhowell, Tal-y-maes.....	1·70	,,	Warrenpoint, Manor House ..	·70
,,	New Radnor, Ednol	1·22	,,	Banbridge, Milltown	·70
,,	Rhayader, Tyrmynydd	1·23	,,	Belfast, Cave Hill Road	1·44
,,	Lake Vyrnwy	1·18	,,	Glenarm Castle.....	1·84
,,	Llangyhanfal, Plâs Draw.....	1·36	,,	Londonderry, Creggan Res...	2·32
,,	Dolgelly, Bryntirion.....	...	,,	Killybegs	1·93
,,	Bettws-y-Coed, Tyn-y-bryn...	2·04	,,	Horn Head	2·36

METEOROLOGICAL NOTES ON SEPTEMBER, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Fair to fine and dry weather prevailed throughout the month until the last two days, in which 2·03 in., or 95 per cent. of the total R of the month, fell. There were 16 days' absolute drought from 12th to 27th. Temp. was low throughout, the mean temp. being 54°·1, or 3°·6 below the average, and with September, 1877, the lowest for that month in the 55 years' record (see p. 181). Duration of sunshine 112·1* hours, and of R 25·7 hours. Evaporation 1·41 in. Shade max. 69°·4 on 4th; min. 35°·7 on 27th. F 0, f 1.

TENTERDEN.—Dry and cold until 29th and 30th, when 2·97 in. fell in two days. Duration of sunshine 149·0† hours. Shade max. 68°·5 on 4th; min. 38°·0 on 27th. F 0, f 1.

TOTLAND BAY.—Absolute drought from 1st to 27th, and heavy R with S. gale on last two days. Mean temp. 54°·4, or 3°·8 below the average, and the lowest for September in 26 years. Shade max. 67°·1 on 15th; min. 39°·5 on 25th. F 0, f 9.

PITSFORD.—R 1·72 in. below the average. Mean temp. 51°·8. Shade max. 65°·4 on 16th; min. 31°·0 on 27th. F 1.

IPSWICH, COPDOCK.—As dull, cold and cheerless as August, but very dry until the last two days, when more than the average R for the whole month fell in about 30 hours. Mean temp. 52°·7. Duration of sunshine 123·0† hours. Shade max. 65°·2 on 4th; min. 41°·0 on 20th and 26th. F 0, f 0.

WINTERBOURNE STEEPLETON.—Absolute drought of 24 days from 4th to 27th. Shade max. 67°·6 on 15th; min. 31°·4 on 25th F 1, f 8.

NORTH CADBURY.—The lowest mean temp. for September in 16 years, but a marked absence of extremes. Absolute drought of 24 days from 4th to 27th. Shade max. 75°·5 on 16th; min. 37°·5 on 11th and 25th. F 0, f 5.

ROSS.—Shade max. 67°·8 on 15th; min. 36°·7 on 27th. F 0, f 0.

HODSOCK PRIORY.—The coldest September since 1887, when the mean temp. was the same. Shade max. 67°·9 on 16th; min. 30°·8 on 27th. F 1, f 4.

SOUTHPORT.—Duration of sunshine 109·1* hours, or 34·0 hours below the average. Duration of R 34·0 hours. Evaporation 1·68 in. Mean temp. 52°·1, or 3°·3 below the average. Shade max. 64°·0 on 18th; min. 38°·0 on 1st and 22nd. F 0, f 7.

HULL.—Unsettled and rainy to the 10th, then fine autumn days following clear dewy nights to 27th. The last three days again unsettled with R and high winds. Shade max. 69°·0 on 2nd; min. 38°·0 on 25th. F 0, f 1.

HAVERFORDWEST.—A fine month but cold and stormy at times. Much corn harvested in good condition. Duration of sunshine 154·1* hours.

LLANDUDNO.—Shade max. 66°·0 on 3rd; min. 42°·0 on 27th.

CARGEN.—More than half the R of the month fell on 3rd. Absolute drought from 9th to 28th. Excellent harvest weather, but crops owing to "twist" and laid condition were difficult to reap. Shade max. 66°·0 on 13th; min. 33°·5 on 27th.

EDINBURGH.—Shade max. 64°·6 on 16th; min. 36°·9 on 9th. F 0, f 1.

ARDNADAM.—Storms of wind and R in the first week. The 3rd was the wettest and the 4th the windiest day for years. Last three weeks were fine and dry. Shade max. 65°·2 on 18th; min. 32°·2 on 27th.

WATERFORD.—The driest September for 60 years. Absolute drought from 3rd to 26th. Shade max. 67°·0 on 3rd and 15th; min. 36°·0 on 13th.

DUBLIN.—Very fine month. Slight R at beginning and heavier R at close, but only ·01 in. between 5th and 28th. Mean temp. 53°·7, or 2°·2 below the average. Shade max. 68°·8 on 3rd; min. 43°·3 on 13th. F 0, f 0.

OMAGH.—No R fell for 23 days from 6th to 28th, which proved a godsend to the farmers and enabled the harvest to be secured in good order.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, April, 1912.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	73·1	21	30·3	12	61·1	40·0	42·1	76	119·7	25·1	·04	3	4·7
Malta	71·1	18	49·0	5	63·5	54·8	55·6	80	136·0	...	1·34	10	6·5
Lagos	93·0	5	70·5	19	89·7	78·0	75·3	71	157·0	70·0	3·97	8	...
Cape Town	95·6	20	47·8	6	72·6	57·1	58·3	81	...	...	3·32	11	5·2
Johannesburg	74·4	4	45·2	29	68·4	51·4	49·5	76	138·2	42·0	2·93	12	4·4
Mauritius	84·7	1	66·1	10	82·1	70·1	68·4	79	153·9	60·6	5·69	22	5·3
Bloemfontein ...	81·9	12	39·3	9	70·2	49·5	49·3	75	...	...	3·04	13	4·2
Calcutta...	98·7	8	63·0	1	93·4	75·0	72·6	72	...	57·1	2·46	4	3·7
Bombay...	94·2	25	74·6	1	91·3	78·6	74·3	72	132·0	67·8	·00	0	2·3
Madras	97·2	30	72·5	3	92·9	77·4	75·4	77	141·8	69·6	·00	0	2·0
Kodaikanal	75·8	9	50·6	2	71·0	53·4	50·1	68	146·9	41·7	10·05	14	4·2
Colombo, Ceylon ...	90·6	1	73·4	4	89·2	76·3	74·4	77	150·8	66·7	10·45	23	5·7
Hongkong	85·5	24	56·3	11	74·9	65·6	64·2	81	134·4	...	4·00	7	6·3
Sydney	82·2	18	50·8	25	70·8	56·8	53·1	74	135·9	42·8	5·87	23	4·5
Melbourne	80·4	16	39·2	14	65·4	51·1	48·6	67	129·0	34·5	2·33	16	6·9
Adelaide	86·2	3	45·8	28	69·7	52·8	49·8	65	145·0	35·1	1·75	9	5·7
Perth	89·9	25	53·6	14	78·5	58·1	52·1	55	143·9	44·8	·16	2	3·9
Coolgardie	88·4	13	47·0	8	74·0	54·6	48·8	55	147·8	43·4	1·11	7	6·0
Hobart, Tasmania ..	70·0	17	38·7	30	60·7	47·4	44·8	69	126·9	31·7	1·60	14	6·6
Wellington ...	69·8	3	42·8	27	62·6	51·5	47·9	71	120·0	34·0	4·18	15	6·9
Auckland	71·5	9	47·0	27	65·8	54·1	54·7	84	101·0	44·0	5·58	22	7·0
Jamaica, Kingston ..	90·5	5	68·1	7	87·7	70·7	74·0	70	...	...	·51	5	...
Grenada	88·0	(*)	73·0	(*)	85·2	75·1	...	70	140·0	...	1·19	12	3·6
Toronto	71·0	15	19·2	3	50·0	33·5	...	...	137·4	13·2	2·47	15	5·8
Fredericton	65·2	16	7·5	5	47·7	25·4	...	73	...	...	3·12	10	5·4
St. John, N.B. ...	56·5	17	16·7	9	45·0	30·8	...	...	...	...	3·35	13	4·9
Edmonton, Alta. ...	67·2	2	22·0	6	54·3	31·1	...	61	122·6	16·2	1·65	14	6·3
Victoria, B.C.	61·8	24	30·2	5	55·8	41·4	...	72	...	...	1·30	13	8·0
Dawson	55·0	19†	0·0	5	44·8	17·2	...	...	...	...	·00	0	8·0

(*) Several. † And 27.

MALTA.—Mean temp. of air 58°·7. Bright sunshine 8·2 hours per day.

Johannesburg.—Bright sunshine 219·6 hours.

Mauritius.—Mean hourly velocity of wind 9·4 miles or 0·3 above, R 1·3 in. above, averages.

KODAIKANAL.—Bright sunshine 232 hours; TS8 on 15 days.

COLOMBO.—Mean temp. of air 82°·8 or 0°·2 above, of dewpoint 0°·1 below, and R ·50 in. above, averages. Mean hourly velocity of wind 3·4 miles. TS8 on 21 days.

HONGKONG.—Mean temp. of air 69°·9. Bright sunshine 196·5 hours. Mean hourly velocity of wind 12·9 miles.

Sydney.—Mean temp. of air 0°·8 below, and R ·62 in. above, averages.

Perth—Mean temp. of air 1°·9 above, and R 1·53 in. below, averages.

Coolgardie.—Mean temp. of air 2°·9 above, and R ·50 in. above, averages.

Hobart.—Mean temp. of air 1°·3 below, and R slightly below, averages.

Auckland.—Wet and stormy, mean temp. rather more than a degree under average, and R nearly double the average for previous 45 years.

Symons's
Meteorological Magazine.

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INTERNATIONAL METEOROLOGICAL MEETING IN LONDON.

September is pre-eminently a month of meetings, and in a subject which depends upon co-operation to the extent that meteorology does, we almost expect to hear of foregatherings of its representatives as Autumn draws near. This year London witnessed a meeting of two International "Commissions," appointed by the International Meteorological Committee to deal with Weather Telegraphy and Maritime Meteorology respectively. Both these bodies had held meetings in London in 1909, and a short account of their earlier proceedings appeared in the July number of this Magazine for that year. These reports were considered by the International Meteorological Committee at a meeting held in Berlin in the following year. At that meeting the Committee decided that both Commissions, which at first consisted of only a few persons, should be enlarged to include representatives of all countries interested, and become permanent. The following members of one or both Commissions were able to be present at the recent meetings:—Dr. W. N. Shaw, Director of the Meteorological Office and President of the International Committee, President of both Commissions; M. A. Angot, France; Professor Hellmann and Prof. Crossmann, Germany; Prof. Mohn, Norway; Prof. Palazzo and Commendatore Santi, Italy; Prof. van Everdingen and Dr. van der Stok, Netherlands; Captain Ryder, Denmark; General Rykatcheff, Russia; Captain M. W. C. Hepworth and Mr. R. G. K. Lempfert, Great Britain.

His Highness the Raj Rana of Jhalawar and Señor Duarte, *chef de service* of the Brazilian Service, now being re-organized, were invited to attend the meeting.

The representatives of Japan, Dr. Nakamura and Dr. Okada were prevented from coming by the death of the Mikado; and letters of regret were received from Prof. Willis Moore, U.S.A.; Mr. H. A. Hunt, Commonwealth of Australia; Rev. L. Froc, Zikawei; Mr. T. F. Claxton, Hong Kong Observatory, and others.

The question specially remitted to the Commission for Telegraphy was that of considering whether further changes should be made in the code for international weather telegrams in consequence of the

introduction of the "barometric tendency," in other words, the change of the barometer in the three hours preceding the hour of observation. The majority of telegraphic reporting stations are nowadays equipped with recording barographs, and the observation of this quantity thus presents no difficulty for the Observers. It has been included in the messages from most stations since May 1st, 1911, space having been found for it in the code by omitting the reading of the wet bulb thermometer. This omission set free three figures in the code for continental telegrams, only two of which are actually required for reporting the tendency. One of the first resolutions adopted by the Commission at its recent meeting, recommends that the dry bulb temperature at the hour of morning and evening observation should be reported in continental telegrams to the nearest whole degree Centigrade, instead of, as at present, to decimals of a degree. The omission of the tenths sets free two additional places in the code, and thus the commission found itself in a position to make proposals for utilising three vacant places in the code. It was finally agreed to suggest that one of these be assigned to reporting the "characteristic" of the barometric tendency It not infrequently happens that the barograph curve shows a change of character within the three hours preceding the observation, such as for example a change from a falling to a rising barometer. The mere statement of the amount by which the pressure had varied fails to give notice of such changes, which are of obvious importance in forecasting, and the new code is devised to meet such special cases. The second free place is to be devoted to reporting the direction of motion of upper and intermediate cloud. Hitherto cloud motion has not been included in the international telegrams, and the only information of cloud movements which the various offices have had at their disposal has been derived from reports from a few home stations. The modern development of meteorology is all in the direction of upper air study, and it was felt that the time was ripe for attempting to introduce observations of the upper air into the daily work of forecasting, by taking a step in the direction of providing material for the construction of daily maps of the atmospheric circulation at high levels. The third free place is to be assigned to giving a generalised summary of the weather experienced during the past 24 hours. The changes proposed affect, in the first instance, the code used by countries which work in millimetres and degrees centigrade, but the British representatives agreed to introduce corresponding modifications in their own code in the event of the general acceptance of the recommendations in continental countries.

A question of wide interest arose out of a communication by General Rykatcheff regarding the intentions of the Russian Weather Service. Since the beginning of this year the charts published in the Russian Daily Weather Report have embraced the whole of Siberia in addition to Russia in Europe, but at present the observations are made according to local time. Thus there is a difference of

time of more than 10 hours between the observations plotted on the two extreme ends of the map. From January 1st, 1915, it is proposed that all Russian observations shall be taken at 6 a.m. and 6 p.m. Greenwich mean time, so that we may look forward to having a daily map of the distribution of weather from the frontiers of Russia in Europe to the Pacific coast prepared at St. Petersburg before noon of each day—no mean achievement. General Rykatcheff invited his colleagues from more western countries so to modify their hours of observation that the area of simultaneous observations might be extended westward to Iceland and the Azores. At the present time the majority of western nations have fixed their hour for morning observations at 7 a.m. G.M.T., but there is no uniformity in the hour of evening observations. Several services, however, expressed a wish to extend their evening arrangements in order to be able to meet the ever increasing demands of aeronauts for forecasts based on the most recent observations. Practical considerations make observations at 6 a.m. G.M.T. difficult for the western nations, and finally it was agreed to recommend 7 a.m., 1 p.m. and 6 p.m. G.M.T. as "international" hours of observation for telegraphic purposes for regions between longitudes 30° W. and 30° E., and 6 a.m., noon, 6 p.m. G.M.T. as international hours for regions between longitudes 30° E. and 180° E. It is fortunate that 1 p.m. G.M.T. happens to be the time fixed for the morning observation over the North American Continent, viz., 8 a.m. of the time of 75° W.

Closely associated with the scheme for dealing with the meteorology of the land in a comprehensive manner, was a scheme proposed by Professor Willis Moore, for dealing with the meteorology of the sea by means of observations reported by wireless. This scheme aims at compelling all ships equipped with wireless apparatus to report observations at Greenwich noon to selected centres, and arranges for a suitable exchange of observations between the centres. The organisation of wireless observations on an international basis was welcomed, but as the scheme implies legislation it was decided, as a first step, to invite the opinion of the various Offices upon it. Some doubt was expressed as to whether Greenwich noon would prove the most suitable hour of observation for all parts of the ocean.

The Commission on Maritime Meteorology had its time mainly taken up with the question of the signals to be used at night for storm warnings. At its meeting in 1909 it had succeeded in drawing up a scheme for day signals which most countries have been able to accept in principle, though opportunities have not yet offered for introducing it in all cases. This uniformity in such matters is very desirable; it may obviously lead to difficulties if the same signal has different meanings in different countries. In the case of night signals uniformity is specially difficult to attain, as any change that is proposed may involve risk of confusion with existing harbour lights or other marine signals. The scheme for night signals, proposed by the Commission in 1909, had proved unacceptable on these grounds

in some countries. General agreement in favour of any one simple system of night signals was found to be impossible, and it was necessary to rest content with more modest proposals. The schemes before the Commission grouped themselves into proposals for the use of one, two, or three lanterns, and recommendations were finally made securing that any combination of lamps forming a storm signal shall have the same meaning in all countries.

A proposal regarding a system of day and night signals for notifying the position of atmospheric disturbances, standing in the name of Rev. L. Froc, and one for signalling the position of the centres of tropical revolving storms, brought forward by Captain Hepworth, were discussed, and it was agreed that both be circulated to the institutes for comments.

The proposals made by both Commissions will be circulated to the Meteorological Offices of all countries, and will be considered, in conjunction with the replies which may come in, by the International Meteorological Committee at a meeting which it is proposed to hold in Rome in 1913.

It will be seen from the above account of the proceedings, that the meetings were devoted exclusively to the consideration of what may be called administrative work, but various social functions afforded opportunities for social intercourse, or for the informal discussion of the "scientific" aspect of meteorology. On the Monday preceding the first official meeting, Mrs. Shaw held a reception at 10, Moreton Gardens. On the Thursday they motored through Richmond Park to Kew Observatory, and after taking stock of the work of the Observatory, took tea in Kew Gardens. In the evening they were invited by Dr. Shaw, as President of the International Meteorological Committee, to dinner at Bailey's Hotel, and had opportunities of meeting representatives of our public offices and other institutions. The toast of "International Co-operation" was proposed by Dr. Shaw, and replied to by Professor Mohn, the senior member of the International Committee. Captain Ryder gave "The Highways of the Present and the Future," the responses to which were in the hands of Captain Acton Blake, the Deputy Master of the Trinity House, for the sea; Sir George Gibb, the Chairman of the Road Board, for the land, and M. Angot, the Director of the wireless signals sent out from the Eiffel Tower, for the new highway—the air. General Rykatcheff proposed the toast of the "Meteorological Office," and Professor Hellmann that of "English Science," both being suitably acknowledged by Dr. Shaw. On Friday evening, the delegates had the honour to be entertained at dinner, also at Bailey's Hotel, by His Highness the Raj Rana of Jhalawar, who had throughout shown keen interest in the proceedings. Finally, those members of the Commissions who were able to extend their stay in this country, spent a most enjoyable week-end as the guests of Mr. and Mrs. Cave, at Ditcham Park.

R.G.K.L.

RECENT METEOROLOGICAL OFFICE PUBLICATIONS.

Seventh Annual Report of the Meteorological Office to the Lords Commissioners of His Majesty's Treasury, for the year ended 31st March, 1912. London, H.M. Stationery Office. Size 9½ × 6. Pp. 174. Price 1s. 7d.

Meteorological Office. British Meteorological and Magnetic Year Book, Part III., Section 2. Geophysical Journal, 1911. Daily Values of the Meteorological and Geophysical Elements observed at the Central Observatory (Kew), Magnetic Observatory (Eskdale), and Western Observatory (Valencia), together with wind components at fixed hours at four Anemograph Stations of the Meteorological Office. London, H.M. Stationery Office. To be purchased from the Meteorological Office, Exhibition Road, London, S.W. 1912. Size 12½ × 10. Pp. 4+48. Price 5s.

Meteorological Office. Geophysical Memoirs. Size 12½ × 10.

No. 1.—*The Effect of the Labrador Current upon the surface temperature of the North Atlantic and the latter upon the temperature and pressure over the British Isles.* By M. W. CAMPBELL HEPWORTH, C.B., R.D., Marine Superintendent of the Meteorological Office. Pp. 10+9 plates. Price 9d.

No. 2.—*The Free Atmosphere in the region of the British Isles. Further contributions to the investigation of the Upper Air, comprising the vertical temperature distribution in the atmosphere over England, with some remarks on the general and local circulation; Abstract of a paper printed in* Vol. 211 of the Philosophical Transactions, Series A; *and total and partial correlation coefficients between sundry variables of the upper air,* by W. H. DINES, F.R.S., Meteorologist in charge of investigations of the upper air, for the Meteorological Office, *with a preface by* W. N. SHAW, Sc.D., F.R.S., Director of the Meteorological Office. Pp. (36). Price 1s.

No. 3.—*Graphical Construction for the Epicentre of an Earthquake.* By G. W. WALKER, M.A., A.R.C.Sc., Superintendent of the Observatory, Eskdalemuir. Pp. (4)+1 plate. Price 3d.

No. 4.—*On the Radiation records obtained in 1911 at South Kensington, together with a comparison between them and the corresponding absolute observations of radiation made at Kew Observatory.* By R. CORLESS, M.A., Secretary to the Director of the Meteorological Office. Pp. (8)+1 plate. Price 3d.

Report of the Ninth Meeting of the International Meteorological Committee and of the Sixth Meeting of the Commission for Terrestrial Magnetism and Atmospheric Electricity. Berlin, 1910. London, H.M. Stationery Office, 1912. Size 9½ × 6. Pp. 144. Price 3s.

THE annual report of the Meteorological Committee throws into prominence the immense amount of work in various departments of science which have hitherto been classified under different headings of Physics which is now carried on by the Meteorological Office. Two of the veterans who joined the staff of the Meteorological Office in Admiral Fitzroy's time have retired—Mr. Charles Harding, who was principal assistant in the Marine Branch for 37 years, and Mr. R. H. Curtis, whose work is well known to our readers. The

new Office at South Kensington is already beginning to press upon the demands for the accommodation of the printing machinery for producing the daily, weekly and monthly Reports, and for the workshops and museum space. The immemorial struggle between common sense and the stubborn, hide-bound officialism of the Post Office, which harassed the later years of Mr. Symons in connection with the postage of rainfall returns, is, we are interested to see, still raging with regard to the telegrams of the Meteorological Office. A Postmaster-General with a sense of humour would no doubt solve all the difficulties with a hearty laugh. The joke in this case is that the Postmaster-General, or the high official who discharges the office of turning his parliamentary chief into ridicule, fails to appreciate the difference between another Government Department and a mere member of the public, and is as determined to extract a few pounds from one of the pockets of the Government in order to place them in another pocket, as if he were a business man relentlessly pursuing a defaulting debtor. In any case, Dr Shaw devotes two solid pages of his report to a colourless statement in the most correct official language of the difficulties thrust upon the Meteorological Office by the Post Office. The fact that the Meteorological Office is hampered by the Post Office, both in receiving observations and sending out warnings, has not prevented it from improving the publication of the weather reports, and it is most interesting to know that both the evening and the morning weather forecasts are now distributed by wireless telegraphy to all His Majesty's ships in home waters. The Admiralty has found that these warnings are useful. In order to give an adequate telegraphic distribution on shore, the Postmaster-General demands a payment of £106,234 per annum, no reduction being allowed on taking a quantity. Incidentally in the course of this exposure of the opposition of the Post Office, the fact is mentioned that 343 out of 365 weather forecasts are more nearly right than wrong.

In connection with the publication of climatic data from health resorts, the Meteorological Committee has decided to make a charge of £4 per annum on each health resort sending voluntary records, in order to meet the expense of an annual inspection of the station. This is an eminently reasonable course to take, as the guarantee of inspection raises the value of the reports to some extent in the opinion of the public, and greatly in the estimation of meteorologists. The Meteorological Office has also undertaken the publication of the observations hitherto issued in the *Meteorological Record* of the Royal Meteorological Society; and it has taken over the supervision and collection of data from such of the stations founded by the Society as may send them in. This action will doubtless tend to greater uniformity in the meteorological observations over the country.

A "branch office" has been established at South Farnborough for the investigation of wind-structure for the Advisory Committee for Aeronautics, of which Mr. J. S. Dines is in charge, and he has been

engaged in designing a new recording anemometer and experiments with pilot balloons and tethered balloons in connection with the investigations. While observations on the upper air are being encouraged by the Meteorological Office, the grants to Observatories at Glasgow, Stonyhurst, Falmouth and Armagh have been discontinued. This, it is stated, is the result of a reconsideration of the whole question of the Observatories (First Order stations) consequent on a decision of the Royal Cornwall Polytechnic Society to discontinue the observations at the Falmouth Observatory after 1912. The observations at Kew, Valencia, and Aberdeen continue, and Eskdalemuir will be added to the number of observatories with self-recording instruments.

The periodical publications of the Office now consist of the Daily Weather Report, the Monthly Meteorological Charts of the Atlantic and Indian Oceans, and the British Meteorological and Magnetic Year Book. The last named work differs from other Year Books (which are annual in their appearance) by being composed of Parts issued at different dates. These include four parts, two of which are in two divisions, thus :—

Year Book—Part I.—The Weekly Weather Report, with 8 supplements.

Part II.—The Monthly Weather Report, with a summary for the year.

Part III. (1)—Daily Readings at stations of the First and Second Orders.

Part III. (2)—Geophysical Journal, Daily Readings in Meteorology, Solar Radiation, Seismology, Atmospheric Electricity, and Terrestrial Magnetism.

Part IV. (1)—Hourly Values, Meteorological Section (pressure, temperature, humidity, rainfall and sunshine) for Kew, Eskdalemuir and Valencia.

Part IV. (2)—Hourly Values, Geophysical Section (Terrestrial Magnetism, atmospheric electricity and meteorology) for five observatories.

It is important that the public should know in what manner the observations collected at the public expense are discussed and set forth for their information ; but it is certain that very few members of the public have any idea of what is done.

The Daily Weather Report gives particulars of the weather in the units familiar to English-speaking people at 7 a.m. on the day of publication, with a map of the distribution of pressure, temperature and weather over western Europe and the eastern half of the North Atlantic. On a smaller scale are maps of pressure at 7 a.m. and 6 p.m. for the previous day. The Weekly Weather Report consists

of two parts, the first referring to the British Isles only, and consisting of a comparison of the weather for the week as a unit and for the season in the various divisions of the country with the average and with previous seasons. In this comparison definite meaning is attached to each term employed, the words *moderate*, *unusual*, *etc.*, applying to a certain range of deviation from the average. The second part consists of maps with very short letterpress explanations, and this has been greatly modified. Instead of repeating the maps of the Daily Weather Report as formerly, the Weekly Report has now maps embracing the whole Atlantic north of the tropics, with practically the whole of Canada on the west and the whole of Europe as far as the Black Sea on the east. On these maps the pressure, winds and temperature are shown; but it is only for western Europe that the isobars relate to the same hour, 7 a.m. Greenwich time. To the west and to the east the observations were made at different hours, and the maps, as a whole, consequently fail to represent the instantaneous distribution of pressure. They give, of course, a general view, but we venture to think they would be improved by representing the isobars on the area of simultaneous observation in a distinctive line, so as to distinguish them from those referring to different hours. The charts for the seven days of the week are supplemented by one showing the mean sea surface temperature for the whole week in the North Atlantic, an extremely interesting addition which enables one to study the relation between sea-surface temperature and weather. The Monthly Weather Report gives, also in the familiar units, an account of the weather for the month, and in figures the extremes and means or totals of the observations at about 300 stations in the British Isles. The illustrative maps occupy two pages, the first showing on a small scale, (1) the pressure and winds, (2) the tracks of depressions, (3) the mean temperature, and (4) the duration of bright sunshine. The second page consists of a larger-scale map of the total rainfall for the month prepared by the British Rainfall Organization.

The Weekly and Monthly Weather Reports, forming Parts I. and II. of the Year Book, are adapted for the use of the general public; an interest in the weather and the careful perusal of the explanatory statements being all the preparation required for understanding them. But the remaining parts are addressed to the student or the professional meteorologist, and in them the Meteorological Committee have introduced a new series of units which have at least this advantage over the metric system on which they are founded, that they are as unfamiliar to continental readers as to those at home, and it seems to us unlikely that the example here set will be generally followed at an early date in other countries. Our main objection to the use of the new units is that, for the present at least, they are not the units into which the instruments are graduated; that, in consequence, there is a large amount of mechanical transposition of the readings, introducing new possibilities of error which the observer

himself might not readily detect in glancing over them, as observers usually do when they receive their observations in print; and that when other scientific workers who adhere to the familiar system re-transpose the statistics to their original form, they also are liable to the introduction of errors, the detection of which greatly increases the time expended. We have felt this difficulty as a heavy tax on the limited time of a private institution anxious to utilize all published data, but restricted by an inadequate income from increasing the number of its workers. Such arguments as we have seen for the use of millibars and centigrade-degrees-absolute have not justified the innovation to our judgment. The introduction of the new notation seems to us to be an experiment which would have been more appropriately made by a learned society or a university, than by an Office supported by a grant of public money for the supply of information useful to the public. We rejoice at the happy turn in the tide of affairs which has converted the Meteorological Office into a great agency of scientific research, for we are sure that in the long run the best interests of the public will be served by it; but we feel strongly that the daily and hourly records we, as tax-payers, have helped to pay for, should be presented in a form which any investigator could employ forthwith for comparison with past records and contemporary records in other places. When the metric system becomes more familiar than the old-fashioned clumsy units of our youth, we shall support its universal application, and when it comes easier to the scientific meteorologist to think in millibars than in inches of mercury, we shall support that change also; but we feel that public departments should not run a generation ahead of our habits of thought. To lag behind is a commoner and a far worse fault, and it speaks volumes for the energy and enterprise of the Director of the Meteorological Office that the worst fault that can be found with him is that he does not tarry for those whose minds cannot move so rapidly as his. We trust that the duration of rainfall for the Observatories with automatic recording rain gauges will be stated in future reports of hourly values as well as the amount which falls in each hour.

The Geo-Physical Memoirs, but for the unwieldiness of their titles, are altogether admirable. The discussion of the Labrador Current by Captain Hepworth is singularly timely in view of the attention attracted to ice dangers in the Atlantic by the Titanic disaster. The publication of Mr. Dines's researches in the Upper Air, in a form accessible to the general public, is also a matter of great importance, and the others are welcome in their degree. British men of science and the British public may well be proud of the rapid advance and the present high position of the work of the Meteorological Office.

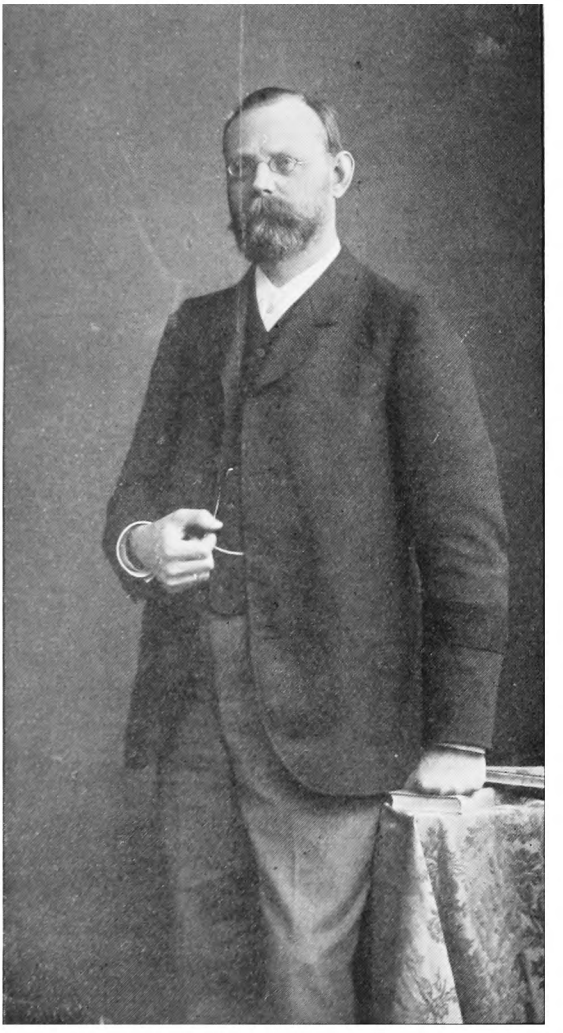
Otto Krümmel.

1854—1912.

JOHANN GOTTFRIED OTTO KRÜMMEL, the leading German oceanographer, was born at Exin in the province of Bromberg, in 1854. He was educated at the Universities of Leipzig, Berlin and Göttingen, graduating with the degree of Doctor of Philosophy at the last named, where he acted as Privat-dozent from 1878 to 1883. In 1883 he was appointed to the Professorship of Geography in the University of Kiel, and after occupying that chair for twenty-eight years he was promoted to the Chair of Geography at Marburg in 1911. Professor Krümmel was a member of the Orders of the Red Eagle and the Prussian Crown, and received the title of Privy Councillor (Geheimer-Regierungsrat) shortly before his death.

His early work was meteorological, and we believe that his first published paper was on the Rainfall of Europe, illustrated by an original rainfall map. Curiously enough he returned to meteorological studies early this year, when compelled on account of his health to stay for some months on the Riviera, and in the last letter I received from him he spoke of a paper on "Riviera Weather" with which he was occupied. The main activity of his life was in Oceanography, which he studied first at the Deutsche Seewarte in Hamburg under Professor von Neumayer, and his appointment at Kiel naturally fixed his attention on the physical geography of the sea. As a teacher he collected an admirable set of oceanographical apparatus and charts, and as an investigator he took part in the cruise of the steamer *National* in the North Atlantic in 1889. He was one of the German Delegates to the International Council for the Study of the Sea, which has its head-quarters at Copenhagen, and there my earlier friendship with him was greatly strengthened. For the first two or three years he and I shared the somewhat exacting task of editing the minutes of the proceedings in two languages, a difficult and sometimes delicate matter, for it was not always easy to secure a form of words which should convey the exact meaning of an English resolution in German, or of a German resolution in English. We also served together on the Committee of the International Geographical Congress for the terminology of sub-oceanic relief, which resulted in the Prince of Monaco's great chart of the depths of the Ocean; and here also the adjustment of an equivalent terminology in different languages brought us closely together. The English word *shelf* (in Continental Shelf), presented a stumbling-block to translation at first, but Professor Krümmel discovered that the word *Schelf* existed in the dialect of Schleswig as the name for a wooden bench outside a fisherman's cottage, and he felt justified in restoring the word to the German language for the purpose of describing the feature of shallow sea-margins. The main occupation of Professor Krümmel's time, outside the routine of his lectures, was, for many years, the compilation of his standard Handbook of Oceanography, a work which

was reviewed in our pages when it appeared (Vol. **46**, 1911, p. 97). It is not too much to say that his knowledge of the literature of oceanography was unrivalled, and the footnotes to his handbook supply an almost complete bibliography of the subject. The great strain of his ceaseless labours, and the raw damp climate of Kiel, undermined his health, and the change to the pleasanter conditions of Marburg unhappily came too late to repair the damage that had been done, and after nearly a year of illness he died suddenly while at Cologne, on 12th October, 1912.



Herz Ihr
O. Krümmel

Professor Krümmel was a constant reader of this Magazine and an occasional contributor. It was he who found in an old bookshop in Kiel the quaint French print of aerial warfare, which appeared as frontispiece to Vol. **43** (1908).

He impressed all who met him with the generous kindliness of his nature. He was always helping his colleagues, smoothing over difficulties and settling differences.

As a member of international committees or conferences he was singularly happy, as, although tenacious of his own views, he was always conciliatory, never aggressive and eminently open to reason. To all with whom he had to work he was not only a valued colleague, but a dear friend whose

companionship will be sorely missed. His letters showed marks of a generous culture born of wide reading in fields of literature with which men of science are seldom expected to be familiar, and he had a singular facility in interpreting the myths of classical geography in the light of modern knowledge. H.R.M.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

RELATION BETWEEN SEASONS IN NEW ZEALAND AND GREAT BRITAIN.

We have had relatives in Auckland, New Zealand, for many years, and during that time have noticed very frequently that the particular weather they have in a season is repeated here six months later. For instance, in their summer, December, 1910—January, 1911, they had exceptional heat and drought. We had the same in our last summer, 1911. Last December and January they complained in New Zealand of one of the coldest and wettest summers they remembered. That is now being repeated here. Their last autumn was very fine; we are now hoping for the same here. Our last letters report very cold, wet weather, and snow in unaccustomed places in the New Zealand winter of 1912.

Of course, this resemblance is by no means invariable, but it has happened so very often that I think it worthy of being mentioned, and you may be able to tell me if there is anything in it.

J. R. ROBERTSON.

6, Mortonhall Road, Edinburgh, 20th August, 1912.

CURIOUS EFFECT OF A LIGHTNING STROKE.

During a heavy thunderstorm which passed over this neighbourhood between 3.45 and 5.0 p.m. on August 7th last, a shed was struck by lightning with somewhat curious effect. The shed is 20 feet long by 10 feet wide and 10 feet high, situate in an open field, and is surrounded by a wire netted enclosure 50 feet square. It is constructed of match-boarding with a galvanised iron roof painted green, the sheets of galvanised iron being 4 feet in width. At 4.23 p.m. a sheet of flame was noticed on the top of the shed, as though the paint had been fired, and for a moment it appeared as if the shed was alight. On examining the roof, no apparent damage was visible, except that

the paint had been scorched off, but on placing one's hand on the strip of sheet iron at the extreme edge a piece about 3 feet wide by 6 feet long crumbled away like tissue paper. The match-boarding on the side of the shed was not even scorched, but the wire-netted enclosure, 15 feet away, for a length of about 10 feet, had entirely disappeared, although the wooden stake supporting it was still in position.

SPENCER C. RUSSELL.

Southwater, Sussex, September 28th, 1912.

THE SUMMER OF 1912.

A GOOD deal has been written on the great contrast between last year's summer and this year's.

If we understand by a "hot summer," at Greenwich, one with 20 or more hot days (or days with 80° or more), we find it comparatively rare for one hot summer to be followed by another. There are five cases in the last 71 years, as follows:—

Hot days,	32 in 1846	.....	26 in 1847
	35 ,, 1857	.....	26 ,, 1858
	26 ,, 1858	.....	34 ,, 1859
	23 ,, 1898	.....	21 ,, 1899
	21 ,, 1899	.....	22 ,, 1900

On the other hand, fourteen cases of a hot summer followed by one not in that category. The former occurrence is thus about one in four. After the three hot summers, 1857–59, we find the very cold summer of 1860, which, as if in protest, yielded no hot days.

It will be seen that a hot summer followed by a hotter is extremely rare—only two cases, 1858–9 and 1899–1900 (26, 34 and 21, 22 hot days respectively). Coming to the recent summer, the probability was against its being hot in the above sense.

Here is another point of view. The highest number of hot days in two contiguous years at Greenwich, in the past, is 61. This was in 1857-58; (35 + 26). Thus the number in 1911-12 was much more likely to be under, than over, 61. But 1911 had 45, hence 1912 was not likely to have more than 16. The actual number appears to be 12; 15 is the average.

ALEX. B. MACDOWELL.

Kennell, Bridge of Allen, 30th September, 1912.

[We should welcome any correspondence on this method of reasoning from any reader who may be interested in it.—ED. *S.M.M.*]

HEAVY RAINFALL FOR SIX MONTHS.

THE rainfall at this station from October to March inclusive, amounted to no less than 36·07 in., or considerably more than the normal for the whole year. The rain was confined to a period of 22 weeks as practically no rain fell before October 20th, and very little after March 25th.

The rain for the first three months of this year was 16·93 in., or more than fell in the whole of last year till the middle of October. As a contrast April of this year gives us only ·19 in., the lowest I have ever taken here. In the last nine months we had three extremes, July with ·29 in. on one day, December with 10·72 in. on 28 days, and April ·19 in. on five days. The three months, July, August and September, give together only 2·66 in. on 16 days, while January, February and March together give 16·95 in. on 66 days, and October, November and December no less than 19·34 in. on 67 days. The rain for the 12 months closing March 31st amounts to 43·43 in., in spite of the very dry summer.

I should doubt if there have been many periods of 12 months with such extremes.

A. C. F. LUTTRELL.

Lea Combe House, Axminster, Devon.

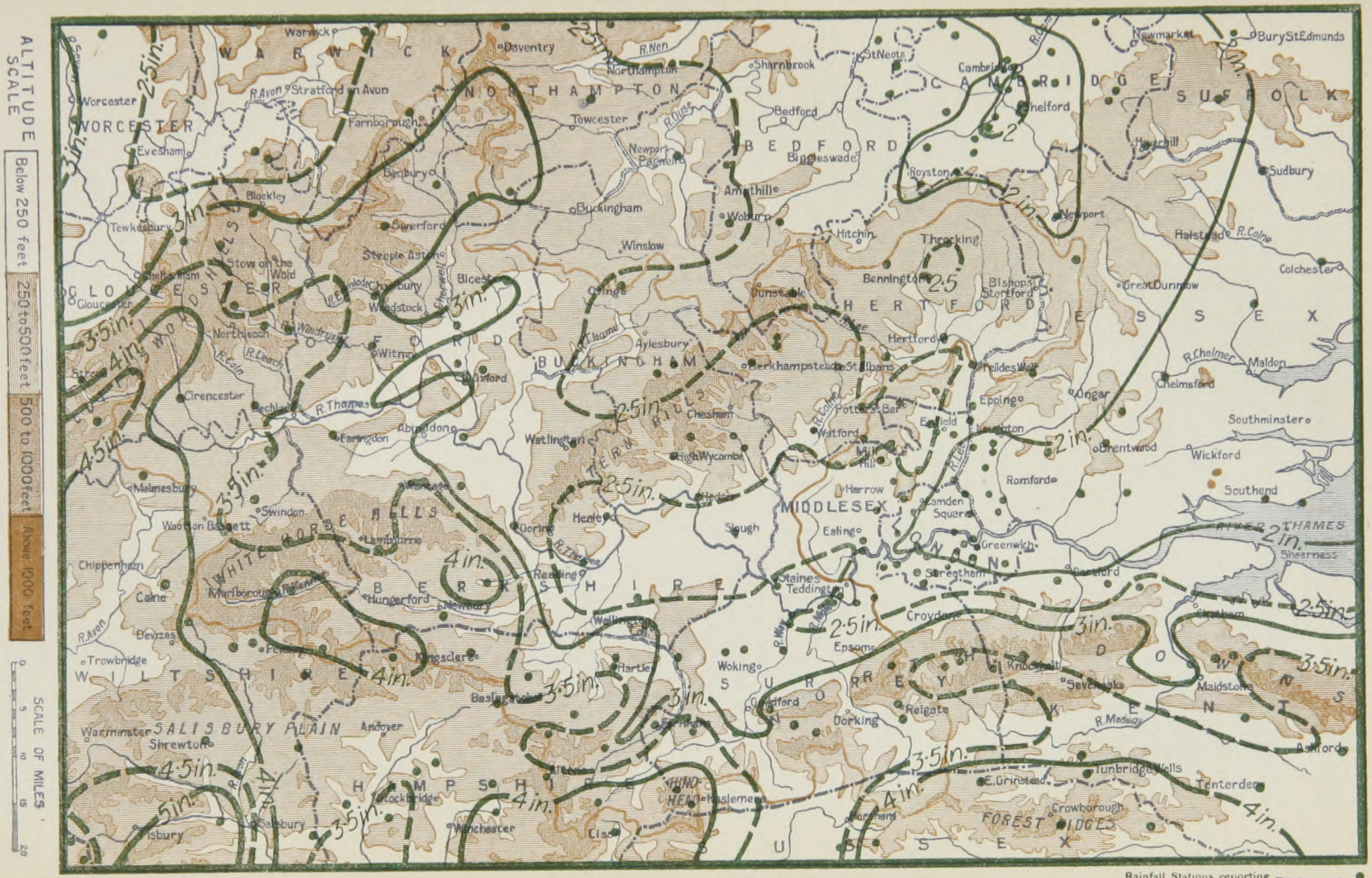
THE WEATHER OF OCTOBER.

By FRED. J. BRODIE.

THE absence of seasonable warmth which formed a leading feature in the weather of August and September was again noticeable, though in a modified degree, in the month under review. A reference to past seasons shows that in October it is no uncommon thing for the shade temperature to rise to 70° or more over a considerable portion of England. In 1886 a record October reading of 80° was registered in London, and also at Cambridge. This year there were very few places in which the thermometer reached 65°; and in the western parts of the United Kingdom there were a number of places in which it failed to touch 60°.

The type of pressure distribution last month underwent considerable modification from time to time, but in the earlier half there was a tendency over England for a recurrence of anticyclonic conditions, and at some places in the south the continued absence of rain narrowly escaped the dimensions of a drought. The warmest weather occurred, as a rule, either between the 9th and 11th, or on the 13th or 14th, the thermometer on each occasion being well above 60° over a large portion of the country. On the 10th, the thermometer rose to 65° at Gordon Castle, and to 66° at Jersey, while on the following day it reached 65° at Plymouth. On the 13th a reading of 65° was recorded at Bath and Guernsey. The nights were, however, often cold, especially between the 6th and 7th, when sharp night frosts were experienced, the sheltered thermometer on the 4th and 5th falling to 25° or less in many districts, and reaching 21° at Llangammarch Wells and 22° at Kilmarnock. On the grass the minima were in some places below 20°; a reading of 16° being recorded at Birmingham, and a reading of 17° at Newton Rigg.

THAMES VALLEY RAINFALL —OCTOBER, 1912.



In the last 10 days of the month, when the conditions were mainly cyclonic, the day temperatures were lower, and the night readings as a rule higher, than in the earlier half of the period. Few places experienced a shade temperature much above 60°, and in the north and west of Scotland the thermometer scarcely reached that level. Sharp night frosts were experienced in many districts on the 20th and 21st, and again on the 26th. Early on the 21st the sheltered thermometer at Balmoral fell to 21°, while on the 25th Cahir reported a reading of 25°. Grass minima below 20° were again observed locally, a reading of 16° being recorded at Crathes on the 21st, and at Newton Rigg on the 26th. Over the United Kingdom generally the mean temperature of the month was below the average, but in the Hebrides there was a slight excess of warmth. The deficiency was greatest in the midland and southern counties of England; at Oxford it amounted to nearly 3°.

Gales were rare and of no great severity, the chief instance occurring on the 20th and 21st, when a fresh south-westerly gale on our south and south-west coasts was followed by somewhat stronger winds from the north-westward in many parts of Ireland and England. Throughout the earlier part of the month, and in fact up to very nearly the close of the third week, the general absence of any definite wind current resulted in an unusual prevalance of fog. In London there are, on an average, only 7 days in October with a record of that phenomenon. Last month there was no fewer than 15, the largest observed since 1888, or with that exception in any October of the past 40 years. In most cases the fog was confined to the night and early morning hours, but in a few instances, and notably on the 11th and 12th, it hung about nearly all day.

Over the southern parts of the country the amount of bright sunshine was in excess of the normal, but in London, where the fog seriously affected the record, the excess was small. At Westminster the total duration, 78 hours, was only 9 above the average. In Scotland and the north and west of Ireland the duration was, as a rule, considerably below the normal.

METEOROLOGICAL NEWS AND NOTES.

NON-INSTRUMEMTAL WEATHER RECORDS have since a recent date been demanded as part of the routine duty of each of the station-masters on the staff of the North British Railway Company. Many of the most valuable rainfall records preserved by the British Rainfall Organization were compiled by the officials on the Highland Railway, but the habit of taking these observations has of late years fallen into disuse. Were the scope of the recent order extended by an almost infinitesmal degree, and a rain gauge added, as a matter of course, to the ordinary equipment of a railway station, the information gained would prove an immense boon to meteorology.

RAINFALL TABLE FOR OCTOBER, 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1912. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·72	2·03
Tenterden	*Kent*	51 4	*0 41	190	3·48	3·88
Arundel (Patching)	*Sussex*	50 51	0 27	130	4·01	4·06
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	4·07	...
Oxford (Magdalen College).	*Oxfordshire*	51 45	1 15	186	2·82	3·02
Wellingborough (Croyland Abbey).	*Northampton*	52 18	0 41	174	2·61	2·05
Shoeburyness	*Essex*	51 31	*0 48	13	2·31	1·85
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·72	1·87
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·84	1·50
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	4·84	4·56
Rousdon [Lyme Regis]	,,	50 41	3 0	516	3·81	4·51
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	3·21	3·77
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	3·77	3·29
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	3·20	2·58
Boston	*Lincolnshire*	52 58	0 1	25	2·75	1·97
Worksop (Hodsock Priory).	*Nottinghamshire*	53 22	1 5	56	2·77	2·30
Macclesfield	*Cheshire*	53 15	2 7	501	3·53	3·31
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	3·74	4·12
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·48	5·52
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	3·18	2·72
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	3·19	2·70
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	3·20	3·45
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	12·71	14·53
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·87	5·44
Haverfordwest	*Pembroke*	51 48	4 58	95	5·51	7·24
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	5·38	6·84
Llandudno	*Carnarvon*	53 20	3 50	72	3·78	3·48
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·45	4·52
Marchmont House	*Berwick*	55 44	2 24	498	3·83	3·42
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·38	4·79
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·36	3·40
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	6·50	8·39
Mull (Quinish)	,,	56 34	6 13	35	5·87	6·52
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·81	3·36
Braemar	*Aberdeen*	57 0	3 24	1114	3·88	3·95
Aberdeen (Cranford)	,,	57 8	2 7	120	3·23	5·04
Cawdor	*Nairn*	57 31	3 57	250	2·95	2·10
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·14	4·85
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	8·38	9·51
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·15	2·28
Wick	*Caithness*	58 26	3 6	77	3·14	2·39
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·59	4·14
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	4·00	3·57
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·48	3·29
Miltown Malbay	*Clare*	52 52	9 26	400	4·31	...
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·75	2·88
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·53	2·41
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·88	1·67
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·19	2·94
Cong (The Glebe)	*Mayo*	53 33	9 16	112	4·60	3·76
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	5·27	3·91
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·21	4·33
Seaforde	*Down*	54 19	5 50	180	3·65	3·64
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·60	4·32
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·76	4·42

RAINFALL TABLE FOR OCTOBER, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
— ·69	75	·46	26	15	20·64	23·48	+2·84	114	25·11	Camden Square
+ ·40	112	·92	20	16	21·80	27·29	+5·49	125	27·64	Tenterden
+ ·05	101	·93	1	14	24·03	33·08	+9·05	137	30·48	Patching
...	...	...	...	...	25·25	...	...	...	31·87	Cadland
+ ·20	107	·60	1	13	20·27	26·06	+5·79	128	24·58	Oxford
— ·56	79	·50	26	16	20·81	25·80	+4·99	124	25·17	Croyland Abbey
— ·46	80	·42	20	19	15·48	16·84	+1·36	109	19·28	Shoeburyness
— ·85	69	·33	26	15	20·86	26·25	+5·39	126	25·40	Westley
—1·34	53	·23	20, 26	20	19·17	24·28	+5·11	127	23·73	Geldeston
— ·28	94	1·02	27	20	29·74	39·99	+10·25	134	38·27	Polapit Tamar
+ ·70	118	·87	27	15	26·35	34·90	+8·55	132	33·54	Rousdon
+ ·56	117	·70	27	16	24·33	37·77	+13·44	155	29·81	Stroud
— ·48	87	·86	26	13	26·48	32·26	+5·78	122	32·41	Wolstaston
— ·62	81	·71	26	10	23·71	32·18	+8·47	136	28·98	Coventry
— ·78	72	·44	26	16	19·42	25·48	+6·06	131	23·35	Boston
— ·47	83	·72	26	12	20·31	28·61	+8·30	141	24·46	Hodsock Priory
— ·22	94	·60	27	17	28·38	30·71	+2·33	108	34·73	Macclesfield
+ ·38	110	1·37	26	16	26·44	31·82	+5·38	120	32·70	Southport
— ·96	85	1·60	26	14	48·62	55·33	+6·71	114	61·49	Arncliffe
— ·46	85	1·00	26	13	22·26	31·67	+9·41	142	26·87	Ribston Hall
— ·49	85	·71	27	15	21·76	27·95	+6·19	128	26·42	Hull
+ ·25	108	·74	26	17	22·85	28·64	+5·79	125	27·94	Newcastle
+1·82	114	2·13	26	19	100·75	104·09	+3·34	103	129·48	Seathwaite
+ ·57	112	1·25	27	19	33·50	45·20	+11·70	135	42·28	Cardiff
+1·73	131	1·19	25	25	36·47	46·01	+9·54	126	46·81	Haverfordwest
+1·46	127	1·35	20	20	36·30	44·02	+7·72	121	45·46	Gogerddan
— ·30	92	1·05	26	13	24·33	27·11	+2·78	111	30·36	Llandudno
+ ·07	102	1·02	26	19	34·28	42·03	+7·75	123	43·47	Cargen
— ·41	89	·48	24	19	27·72	27·51	— ·21	99	33·76	Marchmont
— ·59	89	·98	15	21	39·05	41·10	+2·05	105	49·77	Girvan
+ ·04	101	·43	15	18	28·39	27·07	—1·32	95	35·97	Glasgow
+1·89	129	1·95	15	24	52·71	52·54	— ·17	100	68·67	Inveraray
+ ·65	111	·91	27	22	43·74	40·80	—2·94	93	56·57	Quinish
+ ·55	120	1·00	30	19	23·35	24·14	+ ·79	103	28·64	Dundee
+ ·07	102	·81	31	22	28·04	29·70	+1·66	106	34·93	Braemar
+1·81	156	1·54	30	19	26·01	28·45	+2·44	109	32·73	Aberdeen
— ·85	71	·58	29	11	24·20	20·56	—3·64	85	29·33	Cawdor
+ ·71	117	·76	6	21	34·40	31·87	—2·53	93	44·53	Fort Augustus
+1·13	114	1·50	6	24	65·17	57·75	—7·42	89	83·93	Bendamph
— ·87	72	·34	13	17	25·56	25·63	+ ·07	100	31·90	Dunrobin Castle
— ·75	76	·35	23	27	23·82	24·13	+ ·31	101	29·88	Wick
—1·45	74	·50	8	23	42·35	43·22	+ ·87	102	54·81	Killarney
— ·43	89	·88	26	14	31·45	36·68	+5·23	117	39·57	Waterford
— ·19	95	·66	29	18	31·21	31·48	+ ·27	101	39·43	Castle Lough
...	...	...	...	...	35·77	...	...	...	45·11	Miltown Malbay
— ·87	77	1·00	26	15	28·16	37·79	+9·63	134	34·99	Courtown Ho.
—1·12	68	·29	26	21	29·23	31·34	+2·11	107	35·92	Abbey Leix
—1·21	58	·42	26	13	22·77	24·34	+1·57	107	27·68	Dublin
— ·25	92	·35	29	18	29·38	33·70	+4·32	115	36·15	Mullingar
— ·84	82	·52	27	22	38·48	34·48	—4·01	90	48·90	Cong
—1·36	74	·45	20	24	41·01	...	...	...	52·87	Enniscoe
+ ·12	103	·61	27	20	34·35	37·42	+3·07	109	42·71	Markree
— ·01	100	·55	28	16	31·28	39·24	+7·96	125	38·91	Seaforde
+ ·72	120	·65	21	19	29·92	32·08	+2·16	107	37·56	Dundarave
+ ·66	117	·88	20	20	31·81	36·59	+4·78	115	39·38	Omagh

SUPPLEMENTARY RAINFALL, OCTOBER, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	3·46	XI.	Lligwy	4·94
,,	Ramsgate	3·00	,,	Douglas	4·67
,,	Hailsham	5·05	XII.	Stoneykirk, Ardwell House...	4·82
,,	Totland Bay, Aston House...	3·45	,,	Dalry, The Old Garroch.....	6·07
,,	Stockbridge, Ashley..	3·45	,,	Langholm, Drove Road	7·55
,,	Grayshott	4·58	,,	Beattock, Kinnelhead	5·27
,,	Caversham, Rectory Road ...	1·97	XIII.	St. Mary's Loch, Cramilt Ldge	4·50
III.	Harrow Weald, Hill House...	2·52	,,	North Berwick Reservoir.....	2·90
,,	Pitsford, Sedgebrook.....	2·30	,,	Edinburgh, Royal Observaty.	2·49
,,	Woburn, Milton Bryant.....	2·61	XIV.	Maybole, Knockdon Farm ...	3·78
,,	Chatteris, The Priory.....	1·94	XV.	Campbeltown, Witchburn ..	5·73
IV.	Colchester, Lexden	1·54	,,	Holy Loch, Ardnadam.....	9·10
,,	Newport.....	1·91	,,	Ballachulish House	7·55
,,	Ipswich, Copdock	1·53	,,	Islay, Eallabus	6·94
,,	Blakeney.....	1·71	,,	Tiree, Cornaigmore	7·19
,,	Swaffham	2·41	XVI.	Dollar Academy	4·45
V.	Bishops Cannings	3·94	,,	Balquhidder, Stronvar.....	8·20
,,	Winterbourne Steepleton.....	5·35	,,	Coupar Angus	3·73
,,	Ashburton, Druid House.....	8·38	,,	Glenlyon, Meggernie Castle..	5·93
,,	Cullompton	5·24	,,	Blair Athol	1·85
,,	Lynmouth, Rock House	6·33	,,	Montrose, Sunnyside Asylum.	4·32
,,	Okehampton, Oaklands.....	6·15	XVII.	Alford, Lynturk Manse	4·63
,,	Hartland Abbey.....	4·96	,,	Fyvie Castle	3·77
,,	Probus, Lamellyn.....	4·07	,,	Keith Station	4·05
,,	North Cadbury Rectory.....	3·91	XVIII.	Skye, Dunvegan	10·26
VI.	Clifton, Pembroke Road.....	4·57	,,	N. Uist, Lochmaddy	6·10
,,	Ross, The Graig	3·32	,,	Glenquoich, Loan.....	19·80
,,	Shifnal, Hatton Grange.....	2·74	,,	Alvey Manse.....	2·26
,,	Droitwich.....	2·71	,,	Loch Ness, Drumnadrochit...	3·46
,,	Blockley, Upton Wold.....	3·02	,,	Glencarron Lodge	8·84
VII.	Market Overton.....	2·81	XIX.	Invershin	2·07
,,	Market Rasen.....	2·62	,,	Loch Stack, Ardchullin	6·77
,,	Bawtry, Hesley Hall	2·44	,,	Melvich	3·54
,,	Derby, Midland Railway.....	2·99	XX.	Skibbereen Rectory.....	6·03
,,	Buxton	4·51	,,	Dunmanway, The Rectory ..	6·61
VIII.	Nantwich, Dorfold Hall	2·49	,,	Glanmire, Lota Lodge.....	3·01
,,	Chatburn, Middlewood	5·01	,,	Mitchelstown Castle.....	3·27
,,	Cartmel, Flookburgh	6·30	,,	Darrynane Abbey.....	6·31
IX.	Langsett Moor, Up. Midhope	3·70	,,	Clonmel, Bruce Villa	1·82
,,	Scarborough, Scalby	4·10	,,	Newmarket-on-Fergus, Fenloe	3·59
,,	Ingleby Greenhow	3·24	XXI.	Laragh, Glendalough	4·37
,,	Mickleton	3·10	,,	Ballycumber, Moorock Lodge	2·10
X.	Bellingham, High Green Manor	3·61	,,	Balbriggan, Ardgillan	1·88
,,	Ilderton, Lilburn Cottage ...	3·65	XXII.	Woodlawn	3·19
,,	Keswick, The Bank.....	6·26	,,	Westport, St. Helens	3·63
XI.	Llanfrechfa Grange	6·08	,,	Achill Island, Dugort	5·96
,,	Treherbert, Tyn-y-waun	9·57	,,	Mohill, The Rectory	2·82
,,	Carmarthen, The Friary	5·62	XXIII.	Enniskillen, Portora.....	3·62
,,	Castle Malgwyn [Llechryd]...	4·90	,,	Dartrey [Cootehill]	2·47
,,	Crickhowell, Tal-y-maes.....	5·30	,,	Warrenpoint, Manor House ..	3·34
,,	New Radnor, Ednol	5·30	,,	Banbridge, Milltown	1·93
,,	Rhayader, Tyrmynydd	6·87	,,	Belfast, Cave Hill Road	4·44
,,	Lake Vyrnwy	6·29	,,	Glenarm Castle.....	4·14
,,	Llangyhanfal, Plâs Draw.....	3·24	,,	Londonderry, Creggan Res...	3·53
,,	Dolgelly, Bryntirion.....	6·14	,,	Killybegs	6·04
,,	Bettws-y-Coed, Tyn-y-bryn...	7·60	,,	Horn Head	3·57

METEOROLOGICAL NOTES ON OCTOBER, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—The conditions throughout were of a dull, cold and showery character, with frequent fogs at night and in the early morning hours. Mean temp. 47°·1, or 3°·0 below the average. Duration of sunshine 88·5* hours, and of R 32·1 hours. Evaporation ·39 in. Shade max. 64°·8 on 1st; min. 30°·8 on 5th. F 3, f 6.

TENTERDEN.—Duration of sunshine 171·0† hours. Shade max. 63°·0 on 13th; min. 31°·0 on 11th and 12th. F 5, f 14.

TOTLAND BAY.—Springs were running at more than double the rate of October, 1911, and 68 per cent. stronger than the average. Duration of sunshine 142·3* hours. Shade max., 60°·0 on 10th; min., 35°·7 on 4th. F 0, f 13.

PITSFORD.—Mean temp. 45°·9. Shade max. 62°·5 on 14th; min. 24°·4 on 5th. F 11.

IPSWICH, COPDOCK.—A brilliant and dry month until the last 6 days, when cyclonic conditions prevailed. The duration of sunshine, 154·3† hours, was the largest amount ever recorded here in October. Mean temp. 46°·8. Shade max. 61°·0 on 14th; min. 29°·0 on 25th. F 5, f 20.

POLAPIT TAMAR.—On the whole a seasonable month, though the latter half was decidedly wet and rather stormy. Shade max. 63°·0 on 11th; min. 25°·8 on 4th. F 8, f 14.

NORTH CADBURY.—Excepting October, 1905, it was the coldest October in 16 years, but with no extremes of temp. Shade max. 64°·8 on 11th; min. 29°·0 on 4th. F 2, f 18.

ROSS.—Shade max. 62°·5 on 14th; min. 27°·3 on 5th. F 7.

HODSOCK PRIORY.—Fine up to 25th with unusually cold nights, but not much sunshine. Most of the R fell from 26th to 28th. Shade max. 65°·4 on 14th; min. 29°·2 on 5th. F 8, f 19.

SOUTHPORT.—Duration of sunshine 102·2* hours, and of R 62·7 hours. Evaporation ·88 in. Mean temp. 48°·1, or 0°·9 below the average. Shade max. 62°·0 on 12th; min. 31°·0 on 25th. F 2, f 16.

HULL.—Fine generally to 13th, then R on most days to the end. Dense fogs on 12th, 25th, and 26th. Duration of sunshine 72·0 hours. Shade max. 62°·1 on 8th; min. 31°·0 on 4th. F 1, f 13.

HAVERFORDWEST.—Duration of sunshine 106·7* hours. Shade max. 59°·8 on 1st; min. 31°·8 on 4th.

BETTWS-Y-COED.—Very fine in the first half and very wet in the last half. Shade max. 64°·0 on 12th; min. 29°·0 on 1st. F 4, f 8.

CARGEN.—Fine dry weather until 12th, wet and unsettled after. The fine weather in the commencement of the month, succeeding an ideal September, permitted the close of the best harvest for many years. Shade max. 62°·0 on 7th; min. 26°·5 on 4th. F 6.

EDINBURGH.—Shade max. 64°·4 on 10th; min. 33°·0 on 21st. F 0, f 6.

COUPAR ANGUS.—The weather was all that could be desired in the first half, but the second half was continuous R and cloudy skies. R fell on 17 days, terminating in a flood on 30th. Mean temp. 45°·9. Shade max. 59°·0 on 8th; min. 27°·0 on 21st.

LOCH STACK.—Duration of sunshine 60·0* hours.

DUNMANWAY.—A mild month. Many bright warm days alternated with heavy R, chiefly at night.

WATERFORD.—Shade max. 60°·5 on 10th; min. 26°·0 on 25th. F 3.

DUBLIN.—First half was dry anticyclonic weather and the second half very unsettled and cyclonic conditions of atmospheric pressure. Mean temp. 48°·9. Shade max. 62°·6 on 13th; min. 32°·1 on 4th. F 2, f 4.

OMAGH.—With the exception of the first 10 days, which were fine and bright, the month was wet and cold.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, May, 1912.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	d	°	inches		
London, Camden Square	81·2	11	38·5	25	68·0	48·2	48·9	74	125·7	33·4	1·08	9	6·4
Malta	82·0	16	51·8	3	71·2	60·9	57·1	75	145·0	.	1·66	3	3·8
Lagos	91·6	19	71·0	29	88·6	76·9	74·7	72	156·0	69·0	7·54	11	...
Natal, Durban ...	96·4	21	53·8	9	76·8	61·3	58·7	69	141·3	...	4·03	6	3·1
Johannesburg	73·5	18*	36·2	4	66·2	47·9	44·1	70	129·9	35·5	·60	3	3·2
Mauritius	81·5	25	62·3	30	79·0	68·8	66·8	81	144·4	55·3	6·41	17	5·6
Bloemfontein	75·9	18	31·8	10	67·1	43·3	42·3	72	...	...	·58	3	3·7
Calcutta...	102·2	6	70·8	15	95·1	78·1	75·9	75	...	69·5	4·84	7	4·8
Bombay...	95·0	5	78·1	29	92·2	81·1	76·3	72	134·0	73·7	·43	1	3·4
Madras	111·6	19	76·4	1	100·2	82·5	77·1	72	148·3	75·5	·00	0	2·6
Kodaikanal	77·3	19	52·8	28	70·8	55·3	53·3	75	148·8	45·1	5·95	18	5·8
Colombo, Ceylon ...	90·3	2	73·6	24	87·6	77·2	75·2	79	154·8	68·2	12·30	29	7·4
Hongkong	89·5	25	70·1	5	83·2	75·8	73·8	84	142·1	...	3·94	18	7·9
Sydney	69·0	18	45·2	30	64·0	50·7	48·3	78	120·9	36·2	3·22	29	4·6
Melbourne	75·0	8	34·6	20	62·6	43·8	42·4	64	115·1	...	1·35	15	4·7
Adelaide	86·3	8	40·9	24	69·7	50·7	44·1	52	136·5	29·6	·84	7	3·9
Perth	87·8	1	40·0	28	69·8	53·0	50·6	67	132·0	31·8	2·67	12	4·9
Coolgardie	84·1	21	35·0	29	70·6	49·9	42·8	48	142·5	30·6	1·45	7	4·5
Hobart, Tasmania ...	72·0	8	35·0	23+	57·7	43·1	40·7	67	118·4	28·8	1·11	16	5·8
Wellington	62·0	29	38·2	25	56·1	46·4	43·4	73	104·0	29·0	3·40	17	7·7
Auckland	65·0	20	41·5	24	60·8	48·6	49·4	82	125·0	38·0	1·56	16	5·3
Jamaica, Kingston ...	89·9	2	70·4	1	87·9	72·9	70·8	71	...	...	·27	3	4·5
Grenada	87·0	sev.	75·0	sev.	84·8	77·1	...	75	139·0	...	3·64	12	6·0
Toronto	82·0	23	31·7	14	64·9	45·6	...	...	138·0	25·3	5·92	16	6·0
Fredericton	83·0	27	28·0	1, 6	64·7	39·8	...	67	...	...	2·60	6	5·8
St. John, N.B. ...	67·6	19	34·3	6	55·4	42·4	...	...	...	...	7·49	13	6·4
Edmonton, Alta. ...	87·5	14	28·5	5, 12	65·5	40·3	...	51	142·0	18·5	2·01	14	4·8
Victoria, B.C.	84·2	13	37·9	1	64·9	47·1	...	68	...	...	1·56	6	5·0
Dawson	76·0	22	24·0	4	62·4	35·1	...	...	...	...	·38	3	3·9

* And 23. † And 29.

MALTA.—Mean temp. of air 65°·8. Average bright sunshine 10·6 hours per day.

Johannesburg.—Bright sunshine 272·7 hours.

Mauritius.—R 3·14 in. above average. Mean hourly velocity of wind 11·9 miles.

KODAIKANAL.—Bright sunshine 202 hours ; TSS on 24 days.

COLOMBO.—Mean temp. of air 82°·4, or 0°·2 above, of dewpoint 0°·1 below, and R 1·34 in. above, averages. Mean hourly velocity of wind 6·4 miles. TSS on 17 days.

HONGKONG.—Mean temp. of air 78°·9. Bright sunshine 178·0 hours. Mean hourly velocity of wind 12·7 miles.

Sydney.—Mean temp. of air 1°·1 above, and R 1·70 in. below, averages.

Adelaide.—Mean temp. of air 2°·5 above, and R 1·96 in. below, averages.

Perth—Mean temp. of air 0°·8 above, and R 2·27 in. below, averages.

Coolgardie.—Mean temp. of air 2°·7 above, and R normal.

Hobart.—Mean temp. of air about the average, and R ·81 below average.

Wellington.—R 1·45 below average. Bright sunshine 117·8 hours.

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PHENOLOGICAL OBSERVATIONS.

By R. H. Hooker, M.A., F.R.Met.Soc.

Observations of the dates of flowering of plants, of the appearance of insects, and of the arrival of migratory birds, have been collected for many years under the auspices of the Royal Meteorological Society. The aim in collecting such observations is to endeavour to form some idea of the effects upon the animal and vegetable kingdoms of variations in climatic conditions from year to year. To ascertain precisely the laws which govern the date of occurrence of events in the life-history of animals and plants is a matter of extreme difficulty, but an interesting, and often material, contribution towards this result can be obtained from a knowledge of the average dates, and of the limits between which such dates vary. As an example of the practical use to which observations of a similar character have been put, we may quote the recent work of Dr. Unstead, who utilized the dates of sowing and harvesting wheat in different localities: calculations based on these, in combination with data as to temperature, have enabled him to form an estimate of the probable northern limit of profitable wheat cultivation in Canada, and to indicate regions where any attempt at wheat growing is foredoomed to failure by reason of the climate.

The phenological records of the Royal Meteorological Society are, however, of a simpler character, and aim more directly at a knowledge of the effect of the weather upon the commonest plants, birds and insects, and at obtaining some measure of the lateness or earliness of the season. Their reports also include various particulars of cultivated crops, based largely upon the data collected in recent years by the Board of Agriculture and Fisheries, as to the epoch and duration of harvest and quality of the crop.

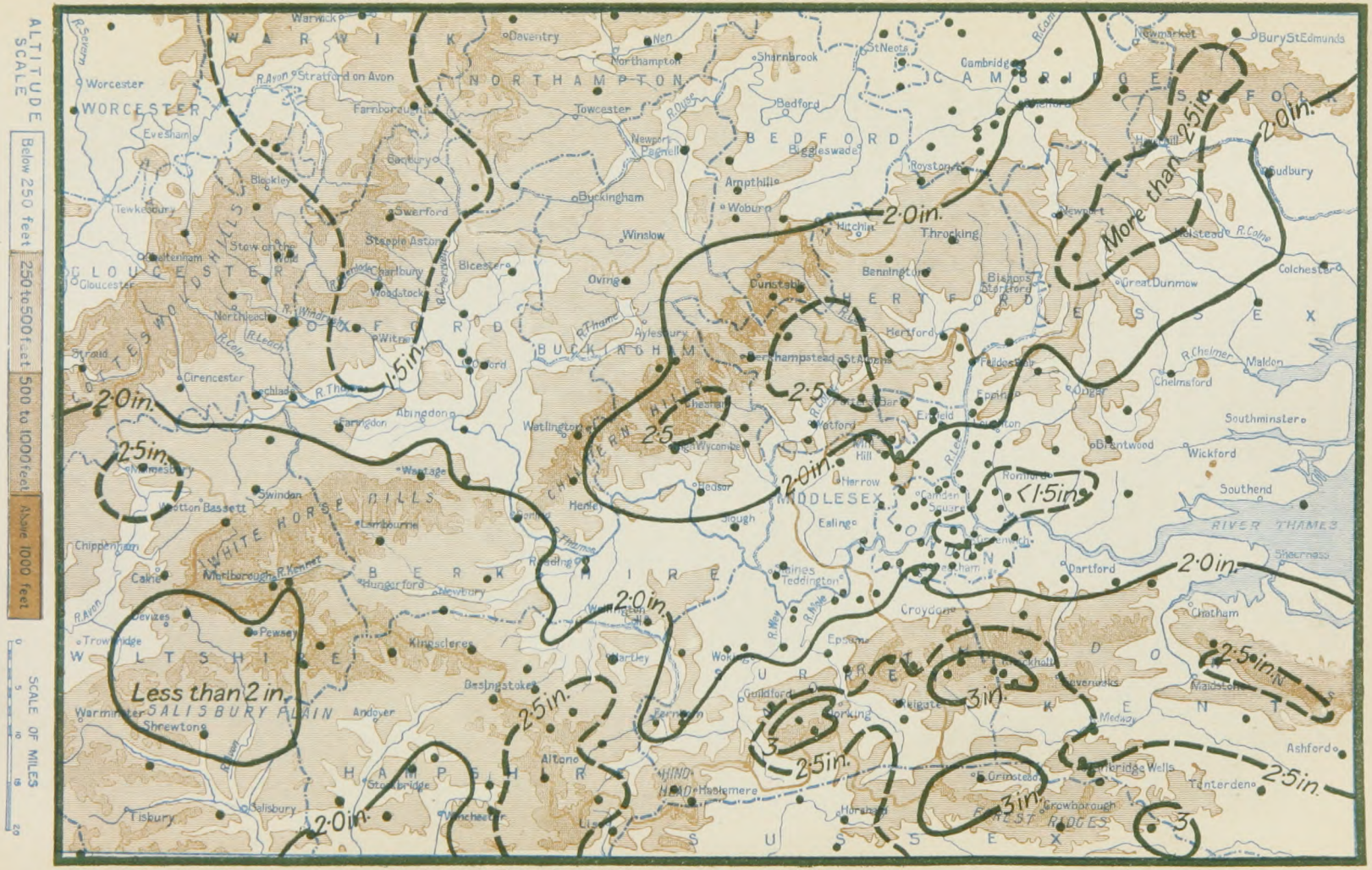
For many years such observations were collected and analysed by the Rev. T. A. Preston, of Marlborough. In those days the list of objects was a large one: 79 species of plants, 11 of insects, and 21 of birds. This total was far too many, as the number of observers familiar with all these species was very small. When, in 1891, Mr. Edward Mawley, the well-known authority on horticulture, and for many years Secretary of the Royal Meteorological Society, took over

the conduct of the work, the number of species of plants and birds was very materially reduced, the aim being to retain only the commonest, so as to admit of the co-operation of any country resident taking an interest in what is now termed "nature-study." Records are accordingly now received from observers of (*a*) the date of flowering of 13 plants—hazel, coltsfoot, wood-anemone, blackthorn, hedge-mustard, horse-chestnut, hawthorn, ox-eye, dog-rose, knapweed, harebell, greater bindweed and ivy; (*b*) observations relating to 5 birds—the date on which the song-thrush and cuckoo are first heard, first and last appearances of the swallow, first appearance of the nightingale and flycatcher; (*c*) first appearance of 5 insects—honey bee, wasp, small white, orange-tip and meadow-brown butterflies. It is obvious that such generally recognised phenomena are within the powers of any observant person living in the country.

With regard to the flowers, it is to be remarked that the first flowering of the *earliest* plant is *not* what is wanted. The aim is not to create "fresh records," but to learn something of the effect of the season upon the normal plant—on vegetation generally, in fact. Thus it is essential for observers to select a particular tree, situated in a position which is as nearly as possible average in respect of exposure, &c., and observe the date of opening of its first flower every year. Similarly, in the case of herbaceous plants, an average position should be selected, not one unduly favoured or the reverse in the matter of sunshine, &c.; and the first primroses, blue-bells, ox-eyes, &c., noted at the same spot year after year.

For twenty years, from 1891 to 1910, Mr. Mawley not only diligently analysed the returns received, but, by keeping in personal touch with the observers, fully maintained their numbers and efficiency. Now, however, he has found the claims of other work to be so pressing as to demand the whole of his leisure, and the Royal Meteorological Society have been obliged to find a successor. Two members of the Society have undertaken the preparation of the annual report, namely, Mr. J. E. Clark and the writer of the present article—the latter being responsible for the statistical tabulation involved. But the duty of collecting the reports now devolves directly upon the staff of the Society; and they are anxious not merely to secure a succession of observers to fill the places of those who fall out by death, ill-health, or removal, and thus to maintain the numbers, but also to increase them. The phenological observers have for many years past numbered about 100, and it is due very largely to Mr. Mawley that there has been no diminution in their ranks. It is clear, however, that the accuracy of the averages calculated from the observations increases with the number of the records, and it is felt that these should be very largely increased. So far as the means for the whole country are concerned, the results show that these are reliable, but it is only certain districts of the south of England that can be said to be fairly represented. More observers are very urgently wanted, especially in Scotland, the north of England, and Ireland, where indeed, recorders

THAMES VALLEY RAINFALL – NOVEMBER, 1912.



are so sparse that we cannot judge with any certainty whether their dates are typical of the district or of the immediate locality only.

The Royal Meteorological Society will accordingly welcome any new observers, particularly in the districts specified above; and the Assistant Secretary (70, Victoria Street, London, S.W.) will be glad to send schedules and instructions to anyone who is willing to assist the work by undertaking the very simple observations required. No one need be deterred by the fear of missing two or three plants while absent on holidays, &c.: the records of the remaining phenomena can always be utilized, and their value is not in the least impaired. Observers who note only insects, or only birds, or plants, would also be useful. The schedules contain a blank page for remarks; and data regarding objects other than those specified are always interesting. Most observers already utilize this space, and, with more records, it would probably be possible to form average dates for other phenomena, particularly the flowering of the lesser celandine, the first appearance of the sand-martin, swift, chiff-chaff, corncrake, and others.

THE WEATHER OF NOVEMBER.

By FRED. J. BRODIE.

THE weather of last month was of a very varied character, no well defined type of pressure distribution remaining in force for more than three or four days at a time. At the commencement, when the conditions were mainly anticyclonic, the wind was light and variable, and the temperature was rather low, with sharp night frosts in all districts. In the western parts of the kingdom the lowest readings were observed early on the 1st or 2nd, the sheltered thermometer falling below 25° in many places, and reaching 23° at Kilmarnock and 21° at Birr Castle; on the grass it sank to 15° at Blackpool and 21° at Newton Rigg, in Cumberland. Over the eastern and central parts of Great Britain the sharpest frosts occurred on the 3rd or 4th, the thermometer on the latter day falling to 22° at Balmoral. The extension of a shallow depression from the northward on the 4th and 5th was followed by a temporary renewal of anticyclonic conditions, and on the 7th and 8th, when a mild southerly or south-westerly breeze sprang up, the thermometer rose above the normal, shade readings of 60° and upwards being recorded in several parts of England and Ireland. On the 7th the thermometer touched 66° at Dublin (Trinity College) and 67° at Newcastle, Co. Wicklow. Between the 10th and 12th, the passage of a deep cyclonic disturbance from Iceland to Central Europe resulted in strong gales from between west and north, on all our coasts, the polar current being accompanied at many northern stations by showers of hail or sleet. Sharp ground frosts occurred in many places between the 12th and 14th, the exposed thermometer falling to 22° at West Linton and to 20° at Crathes and Newton Rigg. On the 15th and 16th, an

anticyclone extended temporarily over Western Europe from the Atlantic, the central portion of the system afterwards receding slowly southwards. With the latter change a light westerly breeze set in over the United Kingdom, and sharp night frosts were again experienced in many parts of Great Britain. Early on the 18th, the thermometer at Balmoral sank to 22° in the screen, and to 19° on the grass; the exposed thermometer falling on the same day to 18° at Crathes and to 17° at Newton Rigg.

After the 18th, large cyclonic systems began to spread down from the Icelandic region, and between the 22nd and 27th the weather gradually fell into a very rough and unsettled state. For some little time the barometric minima passed along in tracks lying well to the northward of the United Kingdom, and the gales experienced on our coasts were of no great severity. On the 26th, however, when the centre of an exceptionally deep depression travelled north-eastwards directly across the west and north of Scotland, a violent storm from S.W. and W. was experienced, while in the rear of the depression an almost equally severe gale from N.W. and N. prevailed in the north of Scotland. At Aberdeen the wind reached, in squalls, a velocity of 75 miles per hour, and at Pendennis Castle (Falmouth), a velocity of 83 miles. During the progress of the disturbance the barometer at Wick fell, at 8 p.m. on the 26th to the unusually low level of 27·93 in., the lowest point reached in these islands since March 15th, 1905, when the mercury at Malin Head sank to 27·91 in.

The disappearance of the great storm system over northern Europe wae followed by the passage across our southern districts of other depressions from the westward, and over the major part of England and Ireland the weather remained in a very unsettled state. Temperature now fell steadily, and at the end of the month a frost of great severity was experienced over the entire northern half of the Kingdom, the sheltered thermometer falling on the 29th and 30th to 10° or less in many places. At Cally, Gatehouse, the minimum reading on the early morning of the last day was as low as 7°; at Balmoral, Kilmarnock, Ruthwell and Newton Rigg, 6°, and at Scaleby 3°, while at West Linton the thermometer sank to within 1° of zero. Over England the shade minima were not, as a rule, much below 20°, but at Bellingham, Northumberland, the thermometer fell to 14°. Over the greater part of north Britain severe frost continued throughout the opening days of December, and in many places it was accompanied by heavy falls of snow.

In the north of Scotland, the very low readings observed at the end of November, resulted in a mean monthly temperature a trifle below the average, but over the United Kingdom generally, the mean was high for the time of year. The total amount of bright sunshine was nearly everywhere below the normal. In London (at Westminster) the aggregate of 15 hours showed a deficiency of as many as 12 hours, and was the smallest recorded in November since 1901, when the month produced a miserable total of less than 7¼ hours.

ROYAL METEOROLOGICAL SOCIETY.

THE opening Meeting of this Society for the session was held on Wednesday evening, November 20th, at the Surveyors' Institution, Great George Street, Westminster, Dr. H. N. Dickson, President, in in the Chair.

Dr. H. R. Mill read a paper on the "Unprecedented Rainfall in East Anglia on August 26th last." He based his discussion on the records of 265 rainfall-observers in the Eastern Counties, from which he constructed a series of maps showing the hour of commencement, and of cessation, of rain, and the total rainfall of the 24 hours in question. The rain commenced in London between 1 and 2 a.m. on August 26th, but the hour of commencement grew later towards the north-west, rain not beginning to fall in Lincolnshire until after 7 a.m. The intensity of the fall increased rapidly over the whole area, the maximum being reached in a fall of 4 inches in four hours, from 11 a.m. to 3 p.m., in the neighbourhood of Norwich. The rain afterwards diminished in intensity and gradually ceased, the hour of cessation being 6 p.m. round the outside of the area affected, from Orford Ness to Grantham, but later toward the centre, where, over nearly the whole of Norfolk and a large wedge of Suffolk, it did not cease until after midnight on the 26th, and at some places not until 4 or 5 a.m. on the 27th. In this central area the rain fell without intermission, for more than 20 hours, and at some points probably for 24. The distribution of the rain was somewhat remarkable. There were two foci of maximum fall, both in Norfolk, the northern central, south of Cromer, with more than 7·50 inches, the larger central, east of Norwich, culminating in about 20 square miles, with more than 8 inches of rain in the 24 hours. About 1940 square miles in Norfolk and Suffolk had more than 4 inches of rain, the most curious feature being a triangle of much lower rainfall running through the west of Norfolk south-eastward from the Wash. The area with more than 2 inches of rain was at least 5800 square miles. The general rainfall of each of the counties was calculated for this day, and also that for the various river basins, which are given on the following page.

Former flood rains in the same area were considered and shown to have been quite insignificant in comparison; and only two instances could be found, July, 1875, and November, 1878, when the rainfall of a whole month surpassed that of these 24 hours. The cause of the prolonged torrential downpour was not to be found in the physical geography of the district affected, but in the meteorological conditions, for the full elucidation of which the data were insufficient. Considering the unprecedented magnitude of the volume of rain precipitated, the floods, of which a series of photographs was shown, were remarkable rather for their moderation than for the destruction wrought.

	Area. sq. miles.	Mean Rainfall in.	Volume. sq. mi. x inches.	Million gallons.	Weight Tons.
Huntingdonshire	366	2·27	830	12,012	53,630,000
Cambridgeshire	859	2·66	2,288	33,134	147,920,000
Suffolk	1,489	3·66	5,442	78,805	351,810,000
Norfolk:	2,044	5·08	10,376	150,242	670,720,000
Total	4,758	3·98	18,936	274,193	1,224,080,009

	Area. sq. miles.	Mean Rainfall. in.	Volume. sq. mi. x inches.	Million gallons.	Weight Tons.
Yare watershed-above junction of Wensum.	443	5·68	2,517	36,450	162,720,000
Yare watershed-below junction of Wensum.	430	5·54	2,384	34,523	154,120,000
Bure watershed	321	6·84	2,195	31,779	141,870,000
Total Area of Discharge at Yarmouth	1,194	5·94	7·096	102,752	458,710,000

Mr. A. W. Preston gave an account of the severity of the weather from his own observations at Norwich during the period dealt with by Dr. Mill in the paper. The rain fell in a fine steady downpour, not like thunderstorm rain, but later on, when the wind backed to the north-west and increased to a gale, it resembled in effect a driving snowstorm, and reminded him in many ways of the heavy snowstorm of January 18th, 1881. Some of the houses facing the wind were thoroughly washed and scoured as though with soap and water, and in many instances the mortar was removed.

Mr. G. L. Courthope, M.P., in a letter to the Secretary, said that at the sugar factory of the Anglo-Netherland Sugar Corporation, at Cantley, over 8 inches fell during the 29 hours of rain, and although there was no hail every particle of glass in the factory was broken, and the skylights were chipped out close to the frames, as if they had been carefully destroyed with a hammer.

Mr. A. P. Jenkin read a paper on "A 3-year Period in Rainfall." He first called attention to the subject in *Symons's Meteorological Magazine*, vol. **39** (1904), p. 81, and vol. **40** (1905), p. 179, and in this paper he has brought the information more up-to-date, and has included a number of records of rainfall from stations in various parts of Europe. He finds that in most of these there is a well marked 3-year period, but in many of them, during the later years, there is a distinct reversal.

Mr. C. Salter, Mr. W. W. Bryant, Mr. R. Strachan, Mr. W. B. Tripp and Mr. R. Inwards took part in the discussion.

The following new Fellows were elected:—Mr. H. B. Adames, Capt. F. Archer, Mr. F. E. Beavan, Mr. J. R. Brunton, Mr. L. Carpenter, Capt. B. L. Coats, Mr. F. Fairley, Rev. E. Frith, Mr. J. W. Gordon, B.Sc., Mr. P. de Jersey-Grut, Mr. J. J. P. Langton, Mr. L. Morgan, B.A., Mr. H. G. Robins, F.R.G.S., Mr. S. F. Simms, Mr. C. M. Stewart, Mr. H. E. I. Taylor and Mr. F. J. W. Whipple, M.A.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE STORM OF AUGUST 26th, 1912.

THE magnitude of the great rain storm of August 26th, 1912, in East Anglia was so great that the imagination loses itself in the contemplation of the vast numbers required to express the volume and weight of the water which fell. It may possibly help readers to form some idea of the meaning of these numbers if they are stated in a slightly different form. Thus, if we consider, for convenience, the area of 5,862 square miles over which more than 2·00 in. of rain fell, and suppose that the whole of the precipitation, viz., 1,392,120,000 tons, which came down in the 24 hours of Black Monday could have been stored for purposes of water supply, we find that, allowing the unusually liberal quantity of 30 gallons per head per day, the volume of water would have been sufficient for the requirements of the whole population of Great Britain for a period of more than seven months. Another simple calculation shows that the whole population of the globe could have been supplied for about one week with the 200 gallons per head which would have fallen to the share of each person from the rain of that one day. It must be remembered that the area upon which these amounts of water fell forms less than one-twentieth part of the area of the British Isles and only $\frac{1}{83500}$ of the area of the globe.

CARLE SALTER.

SOME METEOROLOGICAL QUERIES.

I SHALL be much obliged if any of the readers of this Magazine would give me their views as to the following matters, on which I should like to arrive at definite opinions.

1. What is the standard for what we call a "shower"? We call a heavy rain of ·10 in. falling in 10 minutes a "shower," but ·10 in. falling in 100 minutes—a medium rate—a long shower, or a "rather wetday," and ·10 in. falling in drizzle of say ·01 in. an hour would be called a "damp and miserable wet day"—all of sufficient intensity to open an umbrella. We have a standard for a Rain Spell and a Rain Day, but as far as I know none for a "shower."

2. As the height of the mist line or the saturation point varies considerably on a mountain, is there a greater tendency—on the average—for it to appear at the line of the freezing point? My experience is that it does. If so—Why? And is mist occurring above the freezing line more opaque to light and denser than below?

3. Suppose that moisture is carried up a mountain slope of 1 in 5 to a height of 1000, 2000, 3000, 4000 or 5000 feet, at the rate of

20 miles an hour, the humidity of the same being 100 per cent., and temperature 60° at the sea level, what percentage of the moisture would be condensed at the varied heights, or amount of rain deposited per hour on the sheltered side of the hill assuming that all the condensed vapour would fall vertically into the rain gauge, and would the amount differ if the wind rate was 10 miles an hour?

J. R. G. J.

WATER SPOUTS OR CLOUD FORMS?

I SHALL be grateful if you or one of your contributors will enlighten me as to the nature of the remarkable cloud phenomenon described below. My impression was that I was witnessing a waterspout, but on referring to the *Encyclopedia Britannica* I find this described as "a vorticular storm occurring over a *water surface*, and in origin and form similar to a tornado over the land." I presume, however, the phenomenon was at least analogous.

On Sunday afternoon, August 24th, I was motoring with some friends from Sheffield to Buxton and about 1.25 p.m., as we were descending the hill from the head of the Winnats towards Buxton, about 1000 feet above sea level, we were delayed through a slight defect. While walking slowly on we saw a well-defined finger-shaped projection from the edge of a heavy rain-cloud right in front of us, that is towards the south-west. This projection quickly lengthened, at first tapering to a sharp point, then, after further lengthening, the end bending sharply downwards in a thin wavy "tail." In this form the main body of the object made an angle of about 40 degrees with the horizon, while the tail was about vertical, and did not appear to reach the ground. As soon as it had reached its complete form the object began to disintegrate. The outside, at first as sharply defined as the edge of a cumulus cloud, became "fuzzy," while at the same time an inner tube could be clearly made out. The whole then soon dissolved, and in little more than five minutes nothing was left but the heavy rain-cloud from which it had issued.

Wirksworth, Derby, 6th September, 1912. THOMAS GIBBS.

[In connection with the foregoing letter we may quote the description of undoubted waterspouts, observed from Seaforth Sands and West Kirby, between the estuaries of the Mersey and the Dee. The West Kirby observer, whose experience was communicated to us by Mr. J. F. Leigh Clare, of Heathfield, was wakened "one morning with a terrific peal of thunder at five o'clock," and on looking out saw "a great black cloud right over the sea with a long drooping tail to it." The Seaforth observer was standing at the local railway station on the morning of August 13th, and though Mr. Clare considers that both descriptions refer to the same phenomenon we think that if it had been at 5 a.m. the traveller would have mentioned the fact of his being astir at so unusual an hour.

The description of the phenomenon seen at Seaforth Sands is thus given in the *Liverpool Echo*, an evening paper of August 13th, 1912. We do not think it necessary to share the observer's belief that water poured from the spout into the sea.

A resident of Hoylake, who occupies a prominent position in the Bank of Liverpool, was an eye-witness this morning of an uncommon phenomenon in this district—a water spout—of which he gives an interesting and minute description.

"I was standing," he says, "on the platform of the Overhead Railway at Seaforth Sands this morning when, looking towards West Kirby, I observed a singular object in the sky. It seemed at first like a long heavy tail or spout descending from a mass of dark clouds. My attention was rivetted to the object, and I watched eagerly its developments.

"It quickly assumed the form of a water spout, in the shape in which these phenomena are commonly pictorially depicted. The root, so to speak, of the spout was very heavy and dropping, and as the point reached down towards the sea it tapered off somewhat at the side and bent in one direction, evidently owing to the pressure of the wind current then prevailing. As I scanned it, the mouth or outlet of the spout came into sudden contact with the sea, and immediately there ensued a great splashing.

"The sea seemed to dance at the point where the spout struck, the water rising around it, much after the manner in which a submarine explosion makes itself visible. The water from above continued to pour into the sea in great volume, and, quite emptying itself, the spout disappeared with the suddenness which characterised its advent."

"Rain was falling beneath the high and dark bank of cloud, but there was light enough along a large patch of the horizon beneath to show off the length and breadth and general features of the spout, which disappeared entirely after only about five minutes' duration."

INTERNATIONAL BALLOON ASCENTS.

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

May 18th, 1910. 7 a.m.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Pyrton Hill....	England	6·4	—60	10·9	—47	55	N.W.byW.
Petersfield	,, ...	6·3	—62	11·8	—49	45	N.W.
Brussels	Belgium	7·6	—79	12·6	—63	49	N. by W.
Puy de Dome..	France	6·6	—72	6·8	—69	?	?
Hamburg.....	Germany....	7·0	—81	11·9	—70	17	E.N.E.
Lindenberg ...	,, ...	7·0	—82	11·5	—60	36	E.S.E.
Strassburg	,, ...	7·4	—83	11·1	—54	56	N. by E.
Munich	,, ...	7·6	—80	?	?	22	N.E.

May 18th, 1910. 9.30 p.m.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Manchester....	England	6·9	—71	10·0	—71	64	N.
Pyrton Hill....	„	6·4	—71	9·4	—62	50	N. by W.
Petersfield	„	6·3	—74	8·7	—62	63	N. by W.
Lindenberg ..	Germany ..	8·1	—87	9·7	—65	26	E.
Ekaterinberg ..	„ ..	5·1	—54	9·6	—52	149	E.

May 19th, 1910. 2.30 a.m.

Manchester....	England	6·3	—77	7·8	—67	61	N. by W.
Pyrton Hill....	„	6·7	—72	8·8	—65	350	N.N.W.
Petersfield	„	6·3	—80	10·1	—67	42	N.W.
Brussels	Belgium	7·1	—78	10·0	—65	64	N. by W.
Paris.....	France	6·3	—60	8·3	—56	106	N. by E.
Lindenberg....	Germany ..	7·9	—85	10·8	—67	19	E.
Strassburg	„	7·5	—92	7·9	—78	72	N.E. by N.
Munich.....	„	7·6	—89	8·8	—72	34	N.E. by E.
Vienna.....	Austria	7·7	—85	11·1	—62	17	E.
Pavia.....	Italy.....	7·3	—94	7·4	—94	54	N. by E.
Pavlovsk	Russia	6·0	—64	9·9	—56	77	S.E. by S.

May 19th, 1910. 7 a.m.

Pyrton Hill....	England	6·8	—63	10·7	—49	50	N.N.W.
Brussels	Belgium	6·9	—85	8·8	—67	59	N.N.E.
Paris.....	France	7·1	—74	7·9	?	114	N.
Hamburg.....	Germany....			9·3	—67	19	N.
Lindenberg....	„	7·3	—80	8·8	—82	11	E.N.E.
Strassburg	„	7·5	—84	9·8	—64	29	N. by E.
Munich.....	„	7·7	—86	8·4	—74	22	N.E.
Zurich	Switzerland..	7·3	—88	12·5	—61	28	N.
Vienna.....	Austria	7·5	—86	11·4	—56	17	E.
Pavia.....	Italy.....	7·9	—89	10·0	—71	33	N. by E.
Omsk.....	Russia	6·8	—71	10·0	—51	115	E. by N.
Ekaterinberg ..	„	6·0	—56	10·8	—54	78	E.

May 19th, 1910. About 8 p.m.

Manchester....	England	6·9	—80	9·4	—69	113	N. by W.
Pyrton Hill....	„	7·3	—80	10·6	—65	97	N. by W.
Petersfield	„	6·9	—80	9·5	—69	119	N.N.W.

May 20th, 1910. 7 a.m.

Pyrton Hill....	England	7·4	—65	10·6	—49	125	N.W.
Brussels	Belgium	8·2	—89	9·3	—68	39	N.W.
Zurich	Switzerland..	7·6	—83	?		33	W.N.W.
Strassburg	Germany....	7·7	—84	9·7	—65	49	N.W.
Pavia	Italy.....	7·7	—85	8·6	—83	32	N.W.byW.
Pavlovsk	Russia	6·1	—63	7·9	—50	72	S.E.byE.

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.

These ascents were made on the occasion of the passage of the Earth through the tail of Halley's comet, which is supposed to have occurred during the night of the 18th of May. It was not expected that the results would show any unusual characteristics, neither do they do so. The most noticeable point is the prevalence of an air current from between south and east, whereas the usual drift of a balloon reaching a height of 10 miles is towards the south-east.

The pressure distribution was irregular and many thunderstorms occurred in west and mid-Europe. A cyclone moved northwards from the Bay of Biscay, another shallow depression moved westwards from the Adriatic, and an anticyclone over Scandinavia was increasing in strength. The times shown at the headings are approximate only.

REVIEWS.

Tripolitania e Cirenaica. Climatologia di Tripoli e Bengasi. Studio eseguito nel R. Ufficio Central di Meteorologia e Geodinamica per cura di. [Tripoli and the Cyrenaica. Climatology of Tripoli and Bengazi. Study carried out at the Royal Central Office for Meteorology and Geodynamics by] FILIPPO EREDIA. Rome. 1912. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 82.

THIS is one of the Colonial Monographs issued by the Italian Foreign Office, and in a preface Professor Luigi Palazzo, the Director of the Italian Meteorological Office, explains that the glorious event of the Italian occupation of the Turkish African provinces had caused many enquiries to be made as to the climate of the newly conquered territory. Meterological observations had been taken since 1892 at the Italian School in Tripoli, and from 1886, with some gaps, to 1905 in Bengazi. These observations are set out in monthly means, or totals, for each element of climate for the two stations and summed up in a comparison with the conditions at various towns in southern Italy. In July and August the mean monthly temperature of Tripoli and Bengazi is less than 2° F. above that of the southern Italian towns; but in the winter months there is a much greater difference, the annual range being considerably less on the African than on the Italian side of the Mediterranean. The rainfall is very much less at the African stations, where the months June to August are rainless, and December and January between them account for more than half the annual fall which is 16·80 in. at Tripoli and 11·00 in. at Bengazi, compared with 30·00 in. at Palermo.

Cinquanta anni di Storia Italiana (1860—1910) Pubblicazione fatta sotto gli auspicii del Governo e della R. Accademia del Lincei. [Fifty years of Italian History, 1860—1910; published under the anspices of the Government and of the Royal Academy of the Lincei.] LIUGI PALAZZO, *Meteorologia e Geodinamica.* Roma. 1911. Size 11 × 8. Pp. 56.

ON the occasion of the Jubilee of the kingdom of Italy the progress made in the various departments of public life was reported on by the authorities best informed on the subject, and Professor Palazzo here gives a concise history of the development of meteorology in Italy before and after the establishment of the national Meteorological Office in 1870.

Föhnuntersuchungen im Ballon von [Investigation of the Föhn by means of a balloon by] DR. H. v. FICKER. From *Sitzungsbericht* k Akad. Wiss. in Wien. Math—Naturwiss. Klasse. Bd. cxxi. Abt. 2a Mai, 1912. Size 10 × 6½. Pp. 46.

DR. VON FICKER has succeeded in supplementing his admirable studies of the Föhn wind by making two successful ascents in a balloon from Innsbruck while the Föhn was beginning to assert itself in the valley, and one when it was dying away. Several attempts were made to ascend during the full development of the Föhn, but it was found impossible to do so on account of the vehemence of the wind and the violent vertical currents which prevailed. Some data were, however, obtained from the free balloons sent up at intervals from Munich. The results are summarised as follows. Before the Föhn current reaches the bottom of the Inn valley or the northern plain it is flowing above the colder air masses which fill the valley and cover the plain to the same height, the disturbance layer (*Störungsschichte*), the upper boundary of which is often made visible by a sheet of cumulo-stratus. Before the outbreak of the Föhn the disturbance layer usually streams away to the north-west, becomes shallower and draws the air out of the mountain valleys, the direction of this wind being determined by the valleys, while that of the Föhn, even below the mountain crests, is not markedly influenced by the valleys. The Föhn blowing across the mountains descends the lee side into the valley, ascends on the weather side and descends again on the lee slopes into the plain, partially dissolving the clouds of the disturbance layer. The origin of these clouds is not due to the cooling by enforced ascents of previously warm air; but is due to changes in the intruding mass of cold air itself. The adiabatic gradient of descending air is not found in the free atmosphere, but only by comparison of observations undertaken in such positions as the ascending and descending currents on the valley sides.

Die täglichen Aenderungen der Windstärke auf dem Gipfel des Ben Nevis (und des Tsukubasan im Anhrang) von [The daily changes in wind-force on the summit of Ben Nevis (and on Tsukubasan, in an appendix) by] J. v. HANN. Wien, 1912. Aus den Sitzungsberichten k. Akad. Wiss. Math.-naturw. Kl. Bd. cxxxi. II.a. Februar, 1912. Size $10 \times 6\frac{1}{2}$, pp. 36.

THIS study of the daily variation of wind-force on Ben Nevis is the result of a request to Dr. Hann by the Royal Meteorological Society for a review of the five volumes of *Transactions* of the Royal Society of Edinburgh containing the observations made at the Ben Nevis Observatory. The opportunity was taken to go much more closely into the observations of wind-force, and the daily period of the wind-force and of the frequency of storms is worked out in detail. The regularity of the changes at all seasons is surprising, considering the high latitude and great cloudiness of the station.

Ergebnisse aus Dr. G. Glaser's meteorologischen Beobachtungen in San'â (el-Jeman) von [Results of Dr. E. Glaser's meteorological observations in Sana, Yemen, by] J. v. HANN. Aus den Sitzungsberichten k. Akad. Wiss., Math.-naturw. Kl. Bd. cxx. Abt. II.a. Dezember, 1911. Wien, 1912. Size, $10 \times 6\frac{1}{2}$, pp. 64.

THIS is surely the crowning work of Dr. Hann's genius, for the 64 closely printed pages of this memoir are occupied with the record and discussion of observations made at Sana, in southern Arabia, for the period extending from January 20th to October 15th, 1883, only 269 days altogether. Dr. Glaser's meteorological journal for this period consisted of 92 closely written octavo pages. The observations of pressure (by Aneroid), temperature (wet and dry bulb), and wind, were made at 7 a.m., 2 p.m. and 9 p.m. daily, and on 17 special days observations were made hourly from 7 a.m. on one day to 6 a.m. on the next. Such strenuous work undoubtedly merited the full discussion it has received.

Report of the Ninth Meeting of the International Meteorological Committee, and of the Sixth Meeting of the Commission for Terrestrial Magnetism and Atmospheric Electricity. Berlin, 1910. Published by Authority of the Meteorological Committee. London, H.M. Stationery Office, 1912. Size, $9\frac{1}{2} \times 6$, pp. 144. Price 3s.

THIS Report resembles the lady's letter of the ancient joke, in that its most important part is the postscript or series of appendices. Of these perhaps the most interesting is No. IVa, the list of stations compiled for the Solar Commission, with meteorological data for January, 1905. The list of stations differs from ordinary lists by

being extremely systematic, the aim being to give two stations for each "ten-degree square" (we use the quaintly unscientific phrase employed in the report to designate a figure which varies from something nearly a square to something like an acute angled triangle, according to its position on the surface of the land of the globe). Under the charge of Mr. Lempfert this list has been utilized to give for the first time a conspectus of the meteorological conditions of the whole of the land of the globe for a given month, the data being pressure, mean and absolute maximum temperatures, mean and absolute minimum temperatures, and rainfall, all in the units (millimetres, inches, degrees centigrade or Fahrenheit) in which the observations were taken. Other appendices deal with *Réseau Mondial*, which is not translated and will puzzle some readers. It would surely not be impossible to devise an English phrase for a network of stations representing the whole globe. Amongst the other interesting matters dealt with in the thirty appendices are many proposals for improving meteorological observations (we note the very important question of the uniform treatment of snow), and it is abundantly evident that the International Committee is a live body, keenly set on advancing the science of meteorology as well as the art of weather forecasting.

Regenkarten der Provinz Schlesien mit erlauternden Text und Tabellen (Ditto, *Provinzen Westpreussen und Posen*) *von.* [Map of the Province of Silesia, with explanatory text and tables (Ditto for the Provinces of West Prussia and Posen) by] G. Hellmann. Berlin, 1912. Dietrich Reimer (Ernst Vohsen). Size 11 × 7½. Pp. 26. Price 2 marks each.

Although described merely as second and enlarged editions, these memoirs are entirely new, being based on the 20 years' observations in Silesia, 1888-1907, and in West Prussia and Posen, 1890-1909, for which the full system of rain gauge records were available at the time of compilation. The 20 year means are given for each station, and an annual rainfall map compiled from them for each Province. In addition, a map of the mean rainfall of each month for the 20 years is given on a smaller scale. The stations at which a similar distribution of monthly rainfall prevailed were grouped together, and by taking account of minor differences twelve of these groups were obtained, the areas occupied by the stations forming each group varying widely. The mean monthly rainfall of each group is plotted in a series of curves, which show an extremely well-marked annual period with a winter minimum and summer maximum. Over the greater part of Silesia the maximum occurred in July and the minimum in February, thuogh in some of the groups in the south-east the rainfall of June and August nearly equals that of July; and

in some of the groups of West Prussia and Posen the maximum is shifted to August. There is a slight indication on some of the curves of a check, and sometimes a slight increase of rainfall in October; but no hint of the great maximum in that month which dominates the rainfall curve in England as a transition towards the winter maximum and summer minimum of the Atlantic borders of Ireland and Scotland. The north-east German rain curves are, in fact, almost the inverse of the rain curves of the Atlantic coasts of the British Isles.

While the chief value of the new work lies in the mapping of the mean rainfall for 20 years (a period, by the way, that would be quite inadequate for mapping the mean rainfall of the British Isles), there are interesting tables of heavy falls of rain in short periods, of the extremes of monthly rainfall, and of the frequency of rain. The whole work bears the impress of the author in the clear statement of the facts dealt with, the ample size of the page, and the quality of the typography and cartography.

Der Einfluss geringer Geländeverschiedenheiten auf de meteorologischen Elemente im norddeutschen Flachlande, von [The influence of small differences in the configuration of the land on the meteorological elements in the North German Plain, by] K. KNOCH. No. 3, vol. 4 of the publications of the Royal Prussian Meteorological Institute. Berlin, 1911. Behrend & Co. Size $13\frac{1}{2} \times 10\frac{1}{2}$. Pp. 54.

THIS research deals with a small part of a very important problem. It deals with observations of temperature and precipitation at several stations differing in their geographical surroundings; but the absence of either map or views makes it somewhat difficult to follow. At the Potsdam Observatory there are two stations, one on a tower of the Observatory building about 100 feet above the ground, the other in a clearing in the wood which completely covers the hilly ridge rising to the height of about 160 feet above the plain of the Havel. There was also a station in the flat valley of the Nuthe about a mile from the Observatory, and two others more distant. The final result of the comparison was that the station in the clearing gave a fair representation of the mean conditions in the North German Plain; but that individual elements, and especially the duirnal and annual range, exhibit the peculiarities of a station surrounded by forest, and that these are so marked in some cases as to conceal the influence of the more elevated position.

RAINFALL TABLE FOR NOVEMBER 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1912. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·34	1·59
Tenterden	*Kent*	51 4	*0 41	190	3·07	2·63
Arundel (Patching)	*Sussex*	50 51	0 27	130	3·54	2·02
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	3·39	...
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·25	1·66
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·23	1·80
Shoeburyness	*Essex*	51 31	*0 48	13	2·09	1·54
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·40	2·44
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·49	3·04
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	4·07	3·82
Rousdon [Lyme Regis]	,,	50 41	3 0	516	3·51	1·31
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·77	1·70
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·94	2·69
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·61	1·64
Boston	*Lincolnshire*	52 58	0 1	25	2·05	2·37
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·98	2·41
Macclesfield	*Cheshire*	53 15	2 7	501	3·00	2·71
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	3·16	2·48
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·12	5·98
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·34	2·23
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·34	3·18
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·63	1·62
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	13·59	15·64
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·08	3·41
Haverfordwest	*Pembroke*	51 48	4 58	95	5·16	5·41
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·50	5·61
Llandudno	*Carnarvon*	53 20	3 50	72	3·19	3·01
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·35	3·96
Marchmont House	*Berwick*	55 44	2 24	498	3·21	1·90
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·24	5·20
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·63	3·85
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	7·39	9·77
Mull (Quinish)	,,	56 34	6 13	35	6·24	4·62
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·62	1·91
Braemar	*Aberdeen*	57 0	3 24	1114	3·76	3·97
Aberdeen (Cranford)	,,	57 8	2 7	120	3·29	3·20
Cawdor	*Nairn*	57 31	3 57	250	2·60	2·89
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·51	6·23
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	8·90	13·70
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·25	4·35
Wick	*Caithness*	58 26	3 6	77	2·95	4·20
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·54	...
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·80	1·83
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·88	2·83
Miltown Malbay	*Clare*	52 52	9 26	400	4·50	...
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·41	1·78
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·28	2·00
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·64	1·44
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·38	2·97
Cong (The Glebe)	*Mayo*	53 33	9 16	112	5·00	5·59
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	5·75	6·07
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·02	4·97
Seaforde	*Down*	54 19	5 50	180	3·86	2·20
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·77	4·75
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·66	4·96

RAINFALL TABLE FOR NOVEMBER, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
— ·75	68	·32	26, 28	16	22·98	25·07	+2·09	109	25·11	Camden Square
— ·44	86	·62	26	17	24·87	29·92	+5·05	120	27·64	Tenterden
—1·52	57	·45	26	14	27·57	35·10	+7·53	127	30·48	Patching
...	...	...	...	...	28·64	...	...	...	31·87	Cadland
— ·59	74	·40	28	12	22·52	27·72	+5·20	123	24·58	Oxford
— ·43	81	·37	26	16	23·04	27·60	+4·56	120	25·17	Croyland Abbey
— ·55	74	·26	26	15	17·57	18·38	+ ·81	105	19·28	Shoeburyness
+ ·04	102	·47	12	16	23·26	28·69	+5·43	123	25·40	Westley
+ ·55	122	·62	12	21	21·66	27·32	+5·66	126	23·73	Geldeston
— ·25	94	·75	28	19	33·81	43·81	+10·00	130	38·27	Polapit Tamar
—2·20	37	·34	26	9	29·86	36·21	+6·35	121	33·54	Rousdon
—1·07	61	·36	11	15	27·10	39·47	+12·37	145	29·81	Stroud
— ·25	92	·37	10	15	29·42	34·95	+5·53	119	32·41	Wolstaston
— ·97	63	·26	4, 28	15	26·32	33·82	+7·50	128	28·98	Coventry
+ ·32	116	·37	4	17	21·47	27·85	+6·38	130	23·35	Boston
+ ·43	122	·86	28	14	22·29	31·02	+8·73	139	24·46	Hodsock Priory
— ·29	90	·55	4	16	31·38	33·42	+2·04	106	34·73	Macclesfield
— ·68	78	·53	4	20	29·60	34·30	+4·70	116	32·70	Southport
— ·14	98	1·12	4	16	54·74	61·31	+6·57	112	61·49	Arncliffe
— ·11	95	·38	14, 29	13	24·60	33·90	+9·36	138	26·87	Ribston Hall
+ ·84	136	·93	28	16	24·10	31·13	+7·03	129	26·42	Hull
—1·01	62	·43	12	19	25·48	30·26	+4·78	119	27·94	Newcastle
+2·05	115	3·73	4	20	114·34	119·73	+5·39	105	129·48	Seathwaite
— ·67	84	·81	26	19	37·58	48·61	+11·03	129	42·28	Cardiff
+ ·25	105	1·10	28	21	41·63	51·42	+9·79	124	46·81	Haverfordwest
+1·11	125	·88	28	23	40·80	49·63	+8·83	122	45·46	Gogerddan
— ·18	94	·61	25	20	27·52	30·12	+2·60	109	30·36	Llandudno
— ·39	91	·73	25	19	38·63	45·99	+7·36	119	43·47	Cargen
—1·31	59	·35	24	15	30·93	29·41	—1·52	95	33·76	Marchmont
— ·04	99	·65	24	24	44·29	46·30	+2·01	105	49·77	Girvan
+ ·22	106	1·31	24	13	32·02	30·92	—1·10	97	35·97	Glasgow
+2·38	132	1·88	24	23	60·10	62·31	+2·21	104	68·67	Inveraray
—1·62	74	·60	25	27	49·98	45·42	—4·56	91	56·57	Quinish
— ·71	73	·91	24	13	25·97	26·05	+ ·08	100	28·64	Dundee
+ ·21	105	...	...	...	31·80	33·67	+1·87	106	34·93	Braemar
— ·09	97	·60	30	17	29·30	31·65	+2·35	108	32·73	Aberdeen
+ ·29	111	·94	26	13	26·80	23·45	—3·35	88	29·33	Cawdor
+1·72	138	1·08	24	27	38·91	38·10	— ·81	98	44·53	Fort Augustus
+4·80	154	1·72	26	28	74·07	71·45	—2·62	96	83·93	Bendamph
+1·10	134	·70	26	21	28·81	29·98	+1·17	104	31·90	Dunrobin Castle
+1·25	142	·46	26	29	26·77	28·33	+1·56	106	29·88	Wick
...	...	...	...	...	47·89	...	...	...	54·81	Killarney
—1·97	48	·46	28	12	35·25	38·51	+3·26	109	39·57	Waterford
—1·05	73	·54	25	18	35·09	34·31	— ·78	98	39·43	Castle Lough
...	...	...	...	...	40·27	...	...	...	45·11	Miltown Malbay
—1·63	52	·44	25	15	31·57	39·57	+8·00	125	34·99	Courtown Ho.
—1·28	61	·44	4	17	32·51	33·34	+ ·83	103	35·92	Abbey Leix
—1·20	55	·37	24	14	25·41	25·78	+ ·37	101	27·68	Dublin
— ·41	88	1·05	4	21	32·76	36·67	+3·91	112	36·15	Mullingar
+ ·59	112	·99	4	22	43·48	40·07	—3·42	92	48·90	Cong
+ ·32	106	·87	7	23	46·76	...	...	...	52·87	Enniscoe
+ ·95	124	·85	8	21	38·37	42·39	+4·02	110	42·71	Markree
—1·66	57	·58	4	16	35·14	41·44	+6·30	118	38·91	Seaforde
+ ·98	126	·60	24	25	33·69	36·83	+3·14	109	37·56	Dundarave
+1·30	136	·75	4	22	35·47	41·55	+6·08	117	39·38	Omagh

SUPPLEMENTARY RAINFALL, NOVEMBER, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	2·75	XI.	Lligwy	3·32
,,	Ramsgate.....	1.81	,,	Douglas	4·67
,,	Hailsham	2·12	XII.	Stoneykirk, Ardwell House...	3·32
,,	Totland Bay, Aston House...	2·67	,,	Dalry, The Old Garroch.....	5·52
,,	Stockbridge, Ashley..	1·97	,,	Langholm, Drove Road	3·99
,,	Grayshott	2·28	,,	Beattock, Kinnelhead	8·11
,,	Caversham, Rectory Road ...	1·81	XIII.	St. Mary's Loch, Cramilt Ldge	4·17
III.	Harrow Weald, Hill House...	1·97	,,	North Berwick Reservoir.....	1·41
,,	Pitsford, Sedgebrook.....	1·75	,,	Edinburgh, Royal Observaty.	1·62
,,	Woburn, Milton Bryant.....	1·82	XIV.	Maybole, Knockdon Farm ...	4·78
,,	Chatteris, The Priory.....	1·77	XV.	Campbeltown, Witchburn ..	5·16
IV.	Colchester, Lexden	1·93	,,	Holy Loch, Ardnadam.....	8·58
,,	Newport.....	2·15	,,	Ballachulish House	10·03
,,	Ipswich, Copdock	2·22	,,	Islay, Eallabus	4·90
,,	Blakeney.....	3·10	,,	Tiree, Cornaigmore	4·03
,,	Swaffham	2·81	XVI.	Dollar Academy	3·54
V.	Bishops Cannings	1·85	,,	Balquhidder, Stronvar.....	7·43
,,	Winterbourne Steepleton.....	2·27	,,	Coupar Angus	1·82
,,	Ashburton, Druid House.....	3·46	,,	Glenlyon, Meggernie Castle..	6·33
,,	Cullompton	1·48	,,	Blair Athol	4·07
,,	Lynmouth, Rock House	3·48	,,	Montrose, Sunnyside Asylum.	2·37
,,	Okehampton, Oaklands.....	3·78	XVII.	Alford, Lynturk Manse	...
,,	Hartland Abbey.....	2·77	,,	Fyvie Castle	3·69
,,	Probus, Lamellyn.....	3·11	,,	Keith Station	2·87
,,	North Cadbury Rectory.....	2·02	XVIII.	Skye, Dunvegan	9·00
VI.	Clifton, Pembroke Road.....	2·44	,,	N. Uist, Lochmaddy	7·26
,,	Ross, The Graig	1·29	,,	Glenquoich, Loan.....	26·10
,,	Shifnal, Hatton Grange.....	2·65	,,	Alvey Manse.....	3·65
,,	Droitwich.....	1·74	,,	Loch Ness, Drumnadrochit...	4·10
,,	Blockley, Upton Wold.....	1·93	,,	Glencarron Lodge	14·71
VII.	Market Overton.....	2·23	XIX.	Invershin	4·00
,,	Market Rasen.....	3·66	,,	Loch Stack, Ardchullin	10·50
,,	Bawtry, Hesley Hall	1·97	,,	Melvich	4·99
,,	Derby, Midland Railway.....	1·93	XX.	Skibbereen Rectory.....	3·64
,,	Buxton	4·03	,,	Dunmanway, The Rectory ..	4·86
VIII.	Nantwich, Dorfold Hall	3·16	,,	Glanmire, Lota Lodge.....	2·05
,,	Chatburn, Middlewood	4·75	,,	Mitchelstown Castle.....	3·43
,,	Cartmel, Flookburgh	5·75	,,	Darrynane Abbey.....	3·87
IX.	Langsett Moor, Up. Midhope	3·01	,,	Clonmel, Bruce Villa	2·01
,,	Scarborough, Scalby	3·07	,,	Newmarket-on-Fergus, Fenloe	2·63
,,	Ingleby Greenhow	3·19	XXI.	Laragh, Glendalough	3·99
,,	Mickleton	3·20	,,	Ballycumber, Moorock Lodge	2·47
X.	Bellingham, High Green Manor	3·05	,,	Balbriggan, Ardgillan	1·49
,,	Ilderton, Lilburn Cottage ...	1·94	XXII.	Woodlawn	3·40
,,	Keswick, The Bank.....	5·55	,,	Westport, St. Helens	4·74
XI.	Llanfrechfa Grange	3·16	,,	Achill Island, Dugort	8·52
,,	Treherbert, Tyn-y-waun	6·35	,,	Mohill, The Rectory	3·46
,,	Carmarthen, The Friary	4·66	XXIII.	Enniskillen, Portora.....	4·03
,,	Castle Malgwyn [Llechryd]...	4·45	,,	Dartrey [Cootehill]	2·90
,,	Crickhowell, Tal-y-maes.....	3·10	,,	Warrenpoint, Manor House ..	2·82
,,	New Radnor, Ednol	2·18	,,	Banbridge, Milltown	2·40
,,	Rhayader, Tyrmynydd	6·26	,,	Belfast, Cave Hill Road	3·05
,,	Lake Vyrnwy	...	,,	Glenarm Castle.....	4·00
,,	Llangyhanfal, Plâs Draw.....	3·24	,,	Londonderry, Creggan Res...	5·18
,,	Dolgelly, Bryntirion.....	7·55	,,	Killybegs	8·57
,,	Bettws-y-Coed, Tyn-y-bryn...	7·27	,,	Horn Head	5·46

METEOROLOGICAL NOTES ON NOVEMBER, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Dull, gloomy weather with frequent though not heavy R continued throughout the month. Mean temp. 43°·7, or 0°·2 above the average. Duration of sunshine 23·8* hours, and of R 37·2 hours. Evaporation ·33 in. Shade max. 56°·3 on 9th; min. 27°·7 on 3rd. F 6, f 12.

TENTERDEN.—A dull month. Cold at beginning and end. Duration of sunshine 46·0† hours. Shade max. 55°·5 on 8th; min. 28°·0 on 28th. F 5, f 11.

TOTLAND BAY.—Duration of sunshine 48·1* hours, and the least sunny November in the record. The R on 28th, 1·01 in., fell in less than 3 hours. Shade max., 57°·8 on 7th; min., 33°·1 on 28th. F 0, f 15.

PITSFORD.—Mean temp. 42°·3. R ·67 in. below the average. Shade max. 58°·6 on 10th; min. 26°·7 on 30th. F 8.

IPSWICH, COPDOCK.—After a brilliant opening it turned mild about 4th and was dull with a good deal of R thenceforward. Duration of sunshine 54·9† hours. Mean temp. 42°·1. Shade max. 58°·0 on 8th; min. 25°·0 on 30th. F 5, f 12.

WINTERBOURNE STEEPLETON.—Shade max. 56°·8 on 9th; min. 25°·0 on 28th. F 7, f 14.

NORTH CADBURY.—S fell on the Mendip Hills on 27th and lay for 2 days. Shade max. 59°·0 on 7th; min. 28°·0 on 28th. F 4, f 13.

WOLSTASTON.—Heavy S on 29th, with severe frost. Mild from 16th to 23rd. Shade max. 59°·0 on 7th; min. 19°·0 on 30th. F 6.

HODSOCK PRIORY.—Less sunshine than in any previous November in the record. Shade max. 57°·7 on 7th; min. 19°·8 on 30th. F 7, f 18.

SOUTHPORT.—Duration of sunshine 48·2* hours, and of R 56·1 hours. Mean temp. 44°·5, or 1°·2 above the average. The grass min. temp., 7° on 30th, is believed to be unprecedented here in November. Shade max. 59°·0 on 7th; min. 22°·0 on 30th. F 4, f 11.

HULL.—The first few days were fine, then cloudy and dull with frequent R and mist. Stormy with R and H on 25th and 26th, then cold and winterly. S fell in night of 28th and morning of 29th, lying on the ground to the end of the month. Duration of sunshine 29·3* hours.

HAVERFORDWEST.—Duration of sunshine 33·8* hours. Shade max. 57°·8 on 13th; min. 27°·7 on 30th.

LLANGYHANFAL.—Dull, mild and rainy. Stormy on 26th and following days, with 4½ inches of S on 3th. Mean temp. 43°·9. Shade max. 60°·1 on 7th; min. 18°·9 on 30th. F 5, f 14.

CARGEN.—The sharpest frost experienced here in November since observations commenced occurred 29th–30th. On both days temp. never rose above 32°, and on 30th 26° of frost were registered. S 6 inches deep on 28th. Shade max. 58°·0 on 4th; min. 6°·0 on 30th. F 9.

EDINBURGH.—Shade max. 58°·4 on 7th; min. 21°·0 on 30th. F 4, f 9.

INVERARAY.—A gale on 26th with high tide flooded houses, &c.

DUNDEE.—Shade max. 55°·4 on 8th; min. 17°·5 on 29th. F 9.

LOCH STACK.—Duration of sunshine 7·2* hours.

DUNMANWAY.—Mild and dry up to 22nd, after which it was unsettled and cold. On morning of 27th 3 inches of S fell.

DUBLIN.—Alternate cold and warm spells, a moderate R and a great preponderance of W. winds. Mean temp., 45°·3, was exactly the average. Shade max. 64°·2 on 7th; min. 27°·0 on 30th. F 5, f 7.

MARKREE.—Duration of sunshine 22·7 hours. Shade max. 57°·0 on 7th and 26th; min. 18°·0 on 30th. F 6, f 7.

WARRENPOINT.—A month of frequent though not heavy R. A good deal of high winds, and towards the end severe frosts.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, June, 1912.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	83·4	19	44·7	3	69·6	51·1	52·3	77	131·9	41·6	3·23	19	7·3
Malta	81·9	30	62·4	17	76·0	65·7	63·0	78	143·0	.	...	...	3·2
Lagos	89·5	7	69·0	18	84·9	74·1	73·6	80	152·0	67·5	11·74	21	5·4
Cape Town	86·3	2	39·8	21	67·4	53·4	51·5	77	...	...	2·38	9	4·3
Johannesburg	69·6	27	31·8	19	60·3	39·8	32·8	62	116·0	29·0	·04	1	1·7
Mauritius	77·8	1, 16	53·9	27	75·6	62·3	60·4	75	139·0	46·3	·90	14	4·9
Bloemfontein	67·1	28	25·5	9	59·1	32·9	31·0	74	...	...	·33	2	2·0
Calcutta...	100·3	17	73·0	9	92·8	79·2	77·7	80	...	70·8	9·53	11	6·4
Bombay...	95·3	11	75·4	29	89·9	81·0	77·8	79	134·0	74·5	10·79	15	6·1
Madras	108·2	2	74·9	20	101·2	83·2	74·7	66	147·6	74·9	1·78	4	4·1
Kodaikanal	73·5	2	51·2	5	65·4	54·1	52·4	80	145·9	45·4	3·76	20	7·9
Colombo, Ceylon ...	88·0	3	72·3	5	85·3	76·5	74·4	81	148·0	66·2	12·70	27	8·0
Hongkong	89·3	17	74·0	5	85·4	78·6	76·8	85	141·2	...	14·16	27	8·8
Sydney	64·7	1	42·9	20	61·1	48·3	45·3	76	108·3	31·9	2·68	26	4·1
Melbourne	65·7	5	32·1	22	57·3	44·3	44·1	77	98·7	29·9	1·27	18	6·9
Adelaide	67·0	5	38·2	19	60·6	47·1	46·6	78	129·4	29·0	3·80	15	6·5
Perth	74·9	2	42·3	26	64·8	49·8	48·0	70	125·1	30·4	4·06	11	5·8
Coolgardie	75·2	4	35·0	25	62·8	43·1	40·9	60	130·4	30·4	·27	4	1·9
Hobart, Tasmania ..	63·1	5	34·3	23	54·1	42·3	40·9	74	108·9	29·5	2·82	18	6·4
Wellington	58·0	6	36·0	25	53·7	43·9	38·5	68	95·0	29·0	6·33	22	7·7
Auckland	64·0	2	36·5	25	57·5	47·2	46·3	81	86·0	33·0	5·46	25	5·6
Jamaica, Kingston ..	92·0	30	72·1	19	89·8	75·2	71·2	74	...	...	·08	1	4·7
Grenada	86·0	4, 20	72·0	22	83·3	76·2	...	77	138·0	...	7·20	27	5·0
Toronto	88·7	29	37·0	8	73·2	51·2	...	...	139·4	31·2	1·75	10	3·8
Fredericton	90·0	25	35·0	8	70·0	46·3	...	70	...	...	7·57	12	5·0
St. John, N.B. ...	76·3	24	39·8	11	63·0	48·2	...	...	...	...	2·65	12	5·6
Edmonton, Alta. ...	89·7	21	32·7	4	74·3	50·2	...	59	138·0	23·5	3·72	15	3·3
Victoria, B.C.	85·9	6	41·2	3	68·7	49·5	...	68	...	...	·99	6	5·0
Dawson	79·0	30	31·0	28	64·7	41·0	...	...	...	...	·75	11	6·3

MALTA.—Mean temp. of air 70°·4. Average bright sunshine 10·4 hours per day.

Johannesburg.—Bright sunshine 285·5 hours.

Mauritius.—Mean. temp. of air 0°·2, of dew point 0°·6, and R 1·68 in. below averages. Mean hourly velocity of wind 10·4 miles or 0·4 miles above average.

KODAIKANAL.—Bright sunshine 90 hours; T8S on 7 days.

COLOMBO.—Mean temp. of air 80°·9 or 0°·1 above, of dew point 0°·2 above, and R 5·09 in. above, averages. Mean hourly velocity of wind 8·4 miles. T8S on 7 days.

HONGKONG.—Mean temp. of air 81°·6. Bright sunshine 126·0 hours. Mean hourly velocity of wind 12·1 miles.

Sydney.—Mean temp. of air 0°·4 above, and R 2·45 in. below, averages.

Melbourne.—Mean temp. of air 0°·5 above, and R ·86 in. below, averages.

Perth—Mean temp. of air 0°·9 above, and R 2·52 in. below, averages.

Coolgardie.—Mean temp. of air 0°·7 above, and R ·96 in. below, averages.

Hobart.—Mean temp. of air 1°·1 above, and R ·60 in. above, averages.

Wellington.—Mean temp. of air 0°·5 below, and R 1·25 above, averages. Bright sunshine 77·4 hours.

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THE RAINFALL OF 1912.

The year 1912 proved, and we imagine that few of our readers resident in the British Isles will have failed to anticipate the fact, one of considerable excess of rainfall. At the moment of writing, some 3500 returns have been received at 62, Camden Square, and although it has not been possible to study more than a small proportion of that vast mass of data with any detail, the preliminary examination which has been made, shows without doubt that the rainfall over the whole of the country was in excess of the average amount with the exception of very limited areas, which so far as we are able to judge are confined to the south-east of Scotland. Generally speaking, the least excess of rainfall lay round the coast. All of Ireland, except the north-east and the county of Wexford, had less than 10 per cent. excess. In the west, north and east of Scotland, the rainfall was equally moderate, but in England, the county of Essex alone seems to have received so little as 110 per cent. of the average. There were four axes of high fall, exceeding 20 per cent. above the average, running parallel to one another across the United

General Rainfall of 1912 *expressed as a percentage of the Average.*

MONTH.	England and Wales.	Scotland.	Ireland.	British Isles.
January	138	91	107	115
February	96	97	126	104
March	199	114	164	163
April	21	90	57	49
May	91	81	63	81
June	186	156	194	181
July	123	78	126	112
August	198	119	129	158
September	63	66	23	54
October	99	106	88	98
November	92	113	86	97
December	131	159	143	143
Year 1912	121	107	109	114

Kingdom in a direction from south-west to north-east. The first appeared only in the outer Hebrides; the second culminated in Ulster and in Perthshire; the third stretched from the south-east of Ireland through south west Wales to Westmorland. The fourth and most important wet axis occupied the centre of England from Cornwall

to Yorkshire and reached the south coast, also in Sussex. Within it, the rainfall exceeded 130 per cent. of the average over a broad and apparently unbroken strip stretching from Lands End to Norfolk, and culminating in two areas where the excess was as much as 40 per cent., one of which was caused by the extraordinary East Anglian deluge of August 25th-26th, and the other by the persistently wet summer in Gloucestershire.

The above table gives a summary of the general rainfall of each month in each of the great divisions of the country, the rainfall being expressed as a percentage of the average value. It will be noticed that the excess in all parts of the country may be attributed in no small measure to the wetness of the summer months, though both March and December were also very wet on the whole. April was in the South of England one of the driest months ever known; and September, but for the rainfall of the last two days, would have equalled it in this respect.

For the whole year, England and Wales proved relatively the wettest part of the kingdom, having an excess of 21 per cent. or more than one-fifth of the average. Scotland and Ireland had a moderate excess, and the whole country an excess of 14 per cent., showing it to have been the wettest year since 1903, and with that exception the wettest since 1882.

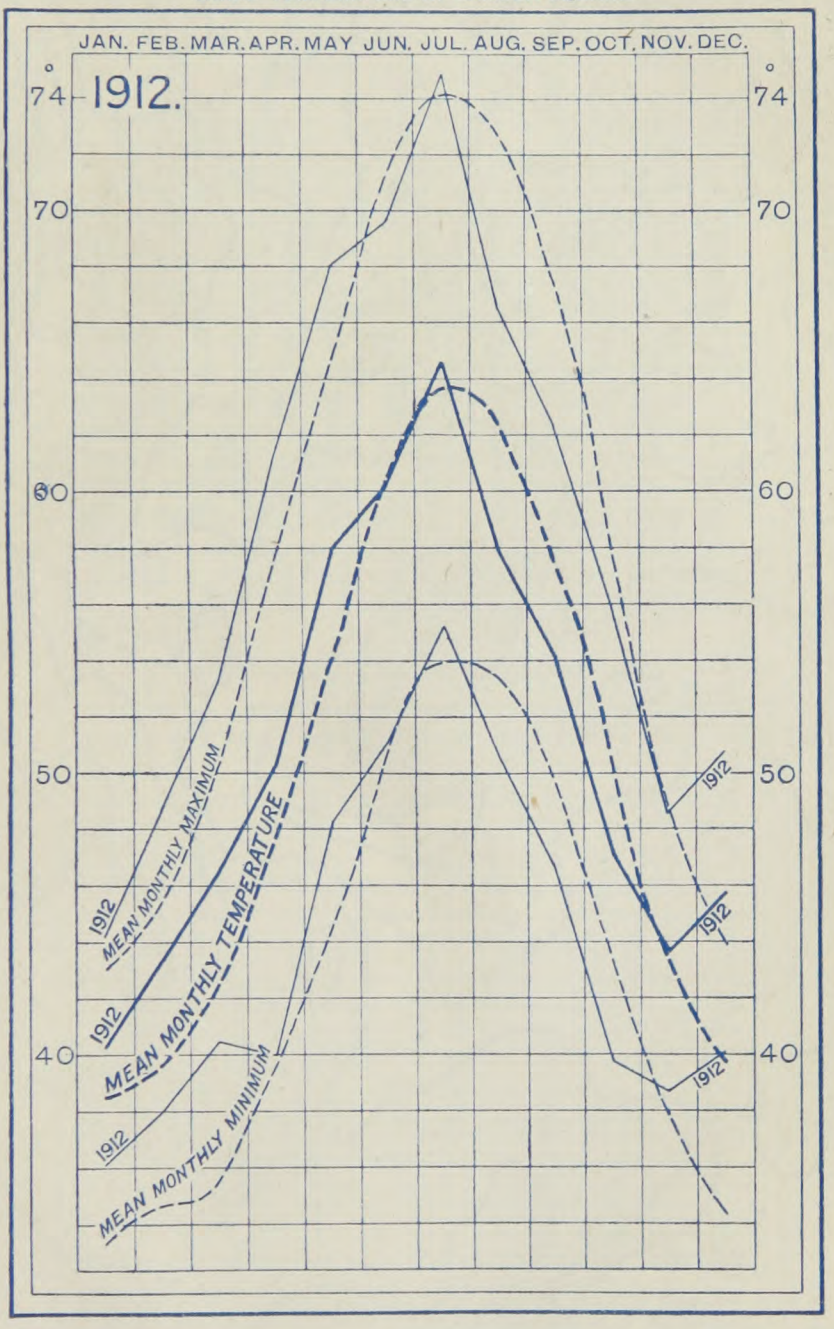
TEMPERATURE OF 1912 IN LONDON.

An unprecedented period of thirteen consecutive months with mean temperature about the average came to an end with July, and was followed by the coldest August and September of the last 55 years. October also was a cool month, and November was about normal. December, however, was unusually mild, the mean temperature being 45°·8 or 6°·1 above the average, and the highest for December in the record, with the single exception of December, 1868, when the mean was 46°·0. In spite of the great fluctuations, the mean temperature of the year differed from the average by only 0°·9.

Temperature at Camden Square in 1912.

1912.	Mean. 1912.	Mean. Difference from Aver.	Mean Maximum. 1912.	Mean Maximum. Difference from Aver.	Mean Minimum. 1912.	Mean Minimum. Difference from Aver.
	°	°	°	°	°	°
January	40·2	+ 1·7	44·2	+ 0·9	36·1	+ 2·3
February	43·3	+ 3·6	48·7	+ 3·2	38·0	+ 3·3
March	46·5	+ 4·4	53·3	+ 3·3	40·5	+ 5·1
April	50·2	+ 2·1	61·1	+ 3·2	40·0	+ 0·3
May	57·8	+ 3·8	68·0	+ 3·4	48·2	+ 3·6
June	60·2	+ 0·1	69·6	— 1·2	51·1	+ 0·4
July	64·5	+ 1·0	74·9	+ 0·6	55·3	+ 1·1
August	57·9	— 4·4	66·6	— 6·1	50·5	— 2·9
September	54·1	— 3·6	62·4	— 5·0	46·6	— 2·1
October	47·1	— 3·0	55·9	— 1·8	39·8	— 3·9
November	43·7	+ 0·2	48·0	— 0·5	38·7	+ 0·5
December	45·8	+ 6·1	50·8	+ 6·5	40·1	+ 5·1
Year	50·9	+ 0·9	58·5	+ 0·4	43·7	+ 1·0

SHADE TEMPERATURE AT CAMDEN SQUARE



THAMES VALLEY RAINFALL — DECEMBER, 1912.

Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildas Weir

RAINFALL ON THE RIVER BANN, COUNTY DOWN, IRELAND, AT BANBRIDGE AND LOUGH ISLAND REAVY RESERVOIR, FOR 50 YEARS, FROM 1862 to 1911.

By JOHN SMYTH, M.A., Mem.Inst.C.E.I., F.R.Met.Soc., F.C.S.

IN the year 1857, as engineer of the Bann Reservoir Company, I was engaged in an arbitration between that Company and the riparian proprietors or occupiers of the lands adjoining the River Muddock, which were alleged to be flooded by an excessive amount of water sent down from the reservoir through that river (an affluent of the Bann) to supply the mills on the River Bann.

In trying to show the arbitrators that the damage done was principally due to heavy rainfalls, too great for the capacity of the several streams passing through the lands, I was met by the difficulty of making calculations of the amount of water to be provided for when I found no rain gauges had been kept in that neighbourhood or even near it. I therefore, in the meantime having well studied the subject, commenced, in the year 1861, to take rainfall observations. Amongst others I established the guages at Milltown, Banbridge and Lough Island Reavy, and now proceed to give an account of the observations taken by means of these gauges and the results obtained from them.

MILLTOWN, BANBRIDGE.

I have prepared a summary of the 50 years' observations to accompany this paper, giving the total rainfall for each year, and for each month of the year. The mean values of all these are given for periods of 10, 20, 30, 40 and 50 years, so that by comparing these results with any year or portion of a year it will be seen whether the rainfall is below or above the average. The average rainfall for the whole period was 31·99 in. The greatest 10 years' average was 33·3 in. from 1872 to 1881. The least 10 years' average was 29·10 in. from 1862 to 1871. The wettest year was 1872, when 46·60 in. was registered. The driest, 1887, with 23·10 in. registered. The greatest fall in 24 hours was 2·30 in. on October 12th, 1865.

On July 4th, 1883, in one hour 1·60 in. fell. This is an important point to record as a guide to the capacity required for traps, grates and drains.

A copper gauge was used, 8 inches in diameter, the funnel 1 foot above the ground level, placed in a box.

The three consecutive driest years at Banbridge were 1888, 1886 and 1887, averaging 28·60 in.

BANN RESERVOIR AT LOUGH ISLAND REAVY.

I give also a summary of the 50 years' observations at this station, giving the same elements as in the case of Milltown, Banbridge.

The average rainfall for the whole period was 44·49 in. The

greatest 10 years' average was 46·61 in., from 1863 to 1872. The least 10 years' average was 40·81 in., from 1873 to 1882. The wettest year was 1872 when 61·20 in. was registered. The driest was 1887 with a fall of 26·50 in. The three driest consecutive years were 1878 to 1880, when the average fall was 35·20 in. The greatest fall in 24 hours was 3·90 in., on November 29th, 1868.

Bateman's mountain gauge was used for nearly all these observations up to 1892, when an ordinary copper 5-inch gauge was substituted. Bateman's gauge was of 8 inches diameter, read by means of a rod resting on a float, the reading being facilitated by a vernier carried in a temporary cover placed in the gauge for that purpose.

Rainfall at Foffanny, near Lough Island Reavy, for the years 1875, 1876 and 1877.

Lat. 54° 12′ N. ; Lon., 6° 2′ 30″ W. Above sea level, 920 ft., on the Butter Mountain, 2½ miles on the Muddock River. Above intake to Lough Island Reavy Reservoir, by mountain rain gauge 8-in. in diameter, 3 feet above surface of ground.

Month.	1875.	1876.	1877.
	in.	in.	in.
January	17·73	5·00	16·15
February	1·93	7·50	2·60
March	3·04	2·63	3·90
April	·90	5·20	10·10
May	4·25	·60	6·50
June	6·25	3·90	4·15
July	6·00	1·74	6·00
August	5·86	7·82	5·50
September	11·60	8·72	3·75
October	12·25	9·15	7·00
November	9·30	11·37	10·00
December	4·75	19·05	8·50
	83·86	82·68	84·15

Ten Years' Averages.

Milltown, Banbridge.	in.	Bann Reservoir.	in.
1862-1871	29·13	1863-1872	46·61
1872-1881	33·27	1873-1882	40·81
1882-1891	31·25	1883-1892	42·82
1892-1901	30·63	1893-1902	46·34
1902-1911	30·70	1903-1912	46·56
40 years' average	31·07	40 years' average	44·15
50 ,, ,,	31·99	50 ,, ,,	44·49

FOFFANY, near LOUGH ISLAND REAVY.

At the Belfast meeting of the British Association for the Advancement of Science, 1874, I read a paper on the "Rainfall of Ulster;" and in the discussion it was seen and felt that there was a great want of gauges over the country, so the Rainfall Committee of the

Rainfall at Milltown, Banbridge, Co. Down.

Years.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Total.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1862 to 1901	105·50	82·30	82·00	80·8	90·2	92·5	123·60	129·9	112·1	121·60	111·20	111·20	
1902	1·94	2·45	1·58	2·64	3·46	2·25	3·58	2·43	3·70	1·32	3·31	2·35	31·01
1903	4·29	1·84	3·87	·88	2·30	1·22	5·95	5·08	3·89	4·63	2·07	2·26	38·29
1904	2·80	2·92	1·70	1·70	2·19	1·41	2·96	5·77	3·21	·67	2·04	1·84	29·21
1905	1·97	1·34	3·56	2·30	1·31	2·83	1·93	5·98	1·34	1·17	2·68	1·61	28·02
1906	2·58	2·42	1·76	2·28	4·28	1·02	1·91	4·09	·93	5·21	2·62	2·77	31·88
1907	1·01	1·45	2·87	2·62	3·47	4·31	3·12	2·68	·99	4·08	2·36	2·65	31·61
1908	2·09	1·66	3·30	3·00	1·55	2·04	3·94	2·13	3·27	2·70	2·45	2·44	30·57
1909	1·87	1·43	3·72	2·78	1·23	1·88	3·03	1·90	1·79	5·53	1·11	2·69	29·11
1910	1·79	3·69	1·37	2·54	1·89	4·32	3·98	3·80	1·16	1·43	2·18	3·53	31·68
1911	·60	2·13	1·24	1·75	1·84	2·29	3·44	1·04	1·41	2·71	2·89	4·29	25·63
	126·44	103·63	106·97	103·29	113·74	116·07	157·44	164·80	133·79	151·05	134·91	137·63	
	2·53	2·07	2·14	2·06	2·275	2·321	3·149	3·296	2·676	3 021	2·698	2·752	31·99

Rainfall at Bann Reservoir, Lough Island, Reavy.

Years.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Total.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1862 to 1901	176·20	137·60	125·90	120·70	106·7	106·2	117·5	142·2	143·1	205·8	199·1	179·3	
1902	3·26	5·61	2·24	5·11	7·06	4·12	5·19	4·50	4·77	2·66	9·77	4·93	59·22
1903	7·41	5·01	7·61	1·83	2·82	1·19	5·68	5·87	5·24	8·53	2·16	6·80	60·15
1904	5·55	5·62	3·68	2·10	2·47	4·38	3·00	5·88	4·34	·48	7·17	2·30	40·97
1905	2·99	2·19	6·80	3·93	·59	3·23	1·37	9·12	1·77	1·73	5·99	4·56	44·27
1906	4·90	2·10	1·64	2·09	5·42	1·05	2·84	3·04	·73	6·91	2·79	2·31	35·82
1907	1·12	2·91	2·86	4·76	5·59	5·30	2·85	2·73	1·12	6·94	4·24	4·09	44·51
1908	3·25	1·80	7·46	4·81	2·65	2·27	2·93	4·03	4·86	3·40	3·74	4·94	46·14
1909	2·25	1·59	6·35	5·53	1·25	2·72	3·32	1·68	2·21	6·10	1·19	6·09	40·28
1910	2·82	10·02	3·09	2·92	2·10	3·46	3·79	6·26	·87	1·47	2·18	9·35	48·33
1911	1·89	2·72	1·69	3·95	2·76	2·97	2·76	1·89	1·49	5·75	5·79	12·43	46·00
Average of 50 years.....	211·64	177·17	169·32	157·73	139·41	136·89	151·23	187·20	170·50	249·77	238·03	237·10	46·569
	4·233	3·54	3·38	3·15	2·79	2·74	3·02	3·74	3·41	4·99	4·76	4·74	44·49

Summary of Rainfall at Milltown, Banbridge, Co. Down, 10 years, from 1902 to 1911.

Years.	Jan.	First 2 months.	First 3 months.	First 4 months.	First 5 months.	First 6 months.	First 7 months.	First 8 months.	First 9 months.	First 10 months	First 11 months	12 months
	in.	in.	In.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1902	1·94	4·39	5·97	8·62	12·76	14·32	17·90	20·33	24·04	25·35	28·67	31·02
1903	4·29	6·13	10·00	10·88	13·19	14·41	20·36	25·45	29·33	33·96	36·03	38·29
1904	2·80	5·72	7·42	9·13	11·31	12·72	15·68	21·45	24·66	25·33	27·36	29·21
1905	1·97	3·31	6·88	9·17	10·48	12·31	15·24	21·23	22·56	23·73	26·42	28·02
1906	2·58	5·00	6·76	9·04	13·32	14·34	16·25	20·34	21·28	26·49	29·11	31·89
1907	1·01	2·46	5·34	7·95	11·43	15·73	18·85	21·53	22·52	26·61	28·96	31·61
1908	2·09	3·75	7·05	10·05	11·60	13·64	17·58	19·72	22·98	25·68	28·14	30·57
1909	1·87	3·30	7·03	9·80	11·03	13·07	16·09	18·00	19·78	25·32	26·42	29·11
1910	1·79	5·48	6·85	9·39	11·28	15·60	19·58	23·38	24·54	25·97	28·15	31·68
1911	·60	2·73	3·97	5·71	7·56	9·85	13·30	14·33	15·75	18·46	21·34	25·63
	2·094	4·227	6·727	8·974	11·396	13·590	17·083	20·576	22·744	25·690	28·060	30·703

Summary of Rainfall at Bann Reservoir, Longh Island, Reavy, 10 years, from 1902 to 1911.

Years.	Jan.	First 2 months.	First 3 months.	First 4 months.	First 5 months.	First 6 months.	First 7 months.	First 8 months.	First 9 months.	First 10 months	First 11 months	12 months
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1902	3·26	8·87	11·11	16·22	23·28	27·40	32·59	37·09	41·86	44·52	54·29	59·22
1903	7·41	12·42	20·03	21·86	24·68	25·87	31·55	37·42	42·66	51·19	53·35	60·15
1904	5·55	11·17	14·85	16·95	19·42	23·80	26·80	32·68	37·02	37·50	38·67	40·97
1905	2·99	5·18	11·98	15·91	16·50	19·73	21·10	30·22	31·99	33·72	39·71	44·27
1906	4·90	7·00	8·64	10·73	16·15	17·20	20·04	23·08	23·81	30·72	33·51	35·82
1907	1·12	4·03	6·89	11·65	17·24	22·54	25·39	28·02	29·14	36·08	40·32	44·41
1908	3·25	5·05	12·51	12·32	19·97	22·24	25·17	29·20	34·06	37·46	41·20	46·14
1909	2·25	3·84	10·19	15·72	16·97	19·69	23·01	24·69	26·90	33·00	34·19	40·28
1910	2·82	12·84	15·93	18·85	20·95	24·41	28·20	34·46	35·33	36·80	38·98	48·33
1911	1·89	4·61	6·30	10·25	13·01	15·98	18·74	20·63	22·12	27·87	33·57	46·00
	35·44	7·501	12·043	15·546	18·817	21·886	25·259	29·749	32·489	36·886	40·779	46·559

Association supplied gauges to a number of suitable applicants, whom I was enabled to induce to undertake the work. I was particularly anxious to get observations on the highest point possible near the Reservoir, so employed a man called Patrick McAlinden, who then lived in the highest inhabited house, to take the three years' observations which I herewith supply. It will be seen that the average at this high elevation (920 feet) is nearly double that at the Reservoir; such, however, was to be expected from its position close to the higher range of mountains (rising from 2,000 to nearly 3,000 ft.) which intercept the southerly water-laden currents, and cooling them cause them to precipitate their moisture as they pass over. I would have been glad, however, to have had a longer series, but McAlinden left the place and went to live near the Deers Meadow Mountain, where the river Bann rises. I induced him to try a gauge there, at an elevation of 1,300 feet above sea level, but 2 miles from his house. It was soon, however, interfered with, so I removed it to Divis Mountain, near Belfast, where the late Mr. Lavens Euart employed a gamekeeper to observe, but the arrangement did not succeed as it was interfered with there also.

The detailed annual figures for the forty years, 1862-1901, were published in *Symons's Meteorological Magazine* for December, 1903, and February, 1904 (vol. **38**, pp. 198-201; **39**, pp. 13-15). The figures for the fifth decade completing the half-century are given in the foregoing Tables.

AWARD OF PRIZE BY THE GERMAN METEOROLOGICAL SOCIETY.

At the Eleventh General Meeting of the German Meteorological Society at Hamburg, in September, 1908, when the Society celebrated its 25th anniversary, it was decided to offer a prize of 3000 marks for the best discussion of the meteorological results obtained in the International Investigation of the Upper Air. The conditions were published in this Magazine in October, 1908 (p. 179). Briefly, they were: (1) the judges were free to divide the prize; (2) the competition was open to persons of any nationality; (3) the essays were to be in German, English or French, and had to be sent in before December 31st, 1911. At the meeting of the German Meteorological Society at Munich, in October, 1911, it was resolved that if no essay could be awarded the prize, the adjudicators could extend the period by one year, and take into account works already published. The five adjudicators were Professors Hellmann and Hergesell and Drs. Assmann, Köppen and Schmauss. Information has recently been received that the adjudicators have given their decision, and have awarded the first prize of 2000 marks (£100) to Mr. E. Gold, Superintendent of Statistics at the Meteorological Office, London, for his discussion entitled, "The International Kite and Balloon Ascents."

THE WEATHER OF DECEMBER.

By FRED. J. BRODIE.

IN a meteorological sense December, 1912, was quite an eventful month. The opening days witnessed a continuation of the frost which had set in towards the close of November. Early on the 1st the sheltered thermometer fell at least 10° below the freezing point in many of the English and Irish districts, and at least 20° below it in several parts of Scotland and the neighbouring English counties. On the same night, and on the morning of the 2nd, the minima in the screen were as low as 2° at Balmoral, 8° at Nairn, and 9° at Aberdeen, while on the morning of the 3rd a reading of 8° was recorded at West Linton. On the surface of the grass readings as low as 5° were registered in many parts of North Britain, the thermometer sinking to zero at Crathes and Balmoral, and to 4° below zero at Worksop.

Early on the 3rd, when a large cyclonic disturbance appeared over the northern part of the Atlantic, a mild southerly breeze set in over all our more western districts, and in the course of the ensuing 24 hours a rapid thaw took place, the temperatures recorded in eastern and central Scotland on the morning of the 4th being from 20° to 25° higher than those of the previous day. Throughout the remainder of the month a southerly to south-westerly type of weather continued, with scarcely any intermission, and over the southern half of the Kingdom frost was rare and of the slightest possible character. In Scotland some rather sharp touches were experienced on the 27th and 28th, the thermometer in the screen falling to 23° at Balmoral and to 24° at Fort Augustus. On the nights of the 13th and 14th the minima were exceedingly high, the thermometer at many southern stations failing to sink below 50°. The midday temperatures were nearly always well in excess of the average, the warmest weather occurring about the 13th and 14th, the 20th and the 27th and 28th. On each of these occasions the thermometer over a large portion of the United Kingdom rose well above 55°, and at Newton Rigg on the 14th it reached 60°. Owing to the marked prevalence of equatorial breezes the mean temperature of the month was everywhere in excess of the average. In Ireland and Scotland the excess was not very large, but over central and southern England it amounted to between 5° and 7°; in London the month was the mildest December for at least 40 years past. Gales from points between south and west were of frequent occurrence, but in the earlier half of the month the only one of much importance was that of the 13th—15th, when the wind blew with considerable violence on nearly all parts of our coasts.

Christmas week was distinguished by a spell of the worst weather it had seen for many years past. The day of the great festival was allowed to pass in comparative peace, but on Christmas Eve, and again on Boxing Day, the country was visited by storms of unusual

severity. In the earlier instance the bad weather was due to a cyclonic system whose centre moved in a north-north-easterly direction outside our western and northern coasts. Strong gales from south, veering to south-west, were experienced over nearly the whole kingdom, the extreme velocity of the wind in gusts being as high as 74 miles per hour at Pendennis Castle (Falmouth), 76 miles at Holyhead, and 88 miles at Quilty (Co. Clare). The Boxing Day storm was caused by a depression, originally of great depth, which advanced over our south-west coasts from the westward quite early in the morning. The centre afterwards moved eastwards across England, but in the course of its passage the disturbance rapidly diminished in intensity, and by the morning of the 27th its presence somewhere over Germany or the Baltic was scarcely revealed by the synoptic weather map. During its progress a violent gale from south-west and west was experienced on all our south and south-west coasts and in the Bay of Biscay, the wind rising in squalls to a velocity of 88 miles per hour at Scilly and no less than 98 miles at Pendennis Castle, where many gusts exceeding 80 miles were registered. The gale was accompanied by unusually heavy seas, resulting in several maritime casualties, and the return to port of the outward bound P. and O. steamer *Narrung*, which was all but engulfed by a huge wave encountered off Ushant. Heavy rains were experienced at the same time in most districts; in London the total fall on Christmas Day and Boxing Day was the heaviest recorded at such a time for at least 40 years past.

The total duration of bright sunshine in December was almost everywhere below the average. At Stornoway and Pembroke, and probably at other places in the western parts of the Kingdom, considerably less than half the normal amount was recorded.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, December 18th, at the Surveyors' Institute, Great George Street, Westminster, Dr. H. N. Dickson, President, in the Chair.

Reference was made to the loss which the Society had sustained by the death of Dr. C. Theodore Williams, who had held the office of President in 1892 and 1893, and of Treasurer from 1898 until the time of his death, except in 1900, the year of the Society's Jubilee, when he was appointed President for the second time. A vote of condolence with Mrs. Williams was passed by the meeting.

Professor H. Bassett read a paper on the "Probable Utility of Salinity Observations in the Irish Sea for long-date Weather Forecasting." He pointed out that it is generally recognised that atmospheric disturbances are largely due to inequalities in the distribution of temperature on land or sea. The cyclones which reach the British Isles nearly all arrive from the Atlantic, con

sequently any alteration in the distribution of temperature in the Atlantic may be expected to affect their number and character. The oceanographic investigations which have been carried out in the North Atlantic and in European waters during the past fifteen years have shown that they are affected by a periodic change in salinity and temperature, the period of which is about one year. This change is of such a nature that the water is salter and relatively warmer in the winter and spring months and fresher and relatively cooler in the summer and autumn, the time of maximum salinity depending somewhat on the geographical position. Professor Bassett described the result of a series of salinity observations which he had carried out in the Irish Sea, and stated that he found that the salinity changes and the time of their occurrence preceded certain seasonal types of weather. He was, therefore, of opinion that if monthly observations of the salinities were made at certain stations on the line of the Calf of Man to Holyhead, these would enable forecasts of the general character of the weather to be given four or five months ahead.

Mr. C. Harding referred to the charts of sea temperature published by the Meteorological Office, and said that he would like to see some clue to the aid of weather forecasting in the ocean currents as suggested by Prof. Bassett, but he feared it would not help much.

Dr. H. R. Mill thought better results might be obtained by observations made off the west of Ireland rather than in the Irish Sea.

The President, after referring to the investigations which he and Dr. Mill had carried out nearly thirty years ago, said that in connection with Prof. Bassett's remarks about the spread of Mediterranean water in the Atlantic, he would like to draw attention to the importance of the estimations of gas contents in tracing water from different sources.

Mr. R. Strachan and Mr. W. B. Tripp also spoke.

Mr. J. Edmund Clark read a paper on "Air Currents at a Height of 50 miles, as indicated by the Bolide, February 22nd, 1909." This meteor was at least four times as bright as Venus, and when first seen by the author at Purley, at 7.34 p.m., it was distant some 80 miles, and disappeared about 210 miles away. The meteor left a remarkably bright streak in the sky which was watched by observers in the south of England and north-west of France for the long period of 104 minutes. Mr. Clark collected the various observations on the form and drift of the streak, and after plotting them on charts he came to the conclusion that at the elevation of between 49½ and 51 miles the streak lay in a west wind of great velocity, and that at 51½ miles the current was almost from the east with a velocity of about 100 miles an hour. Above this the current changed to south-east and ultimately to south-west; the adopted positions indicating a maximum velocity of 135 miles per hour at the height of 54 miles.

A note on a suggested "New Form of Standard Barometer," by M. C. Anthony, M.Inst.C.E., was also read.

New Fellows elected: Mr. H. W. Braby, B.A., Mr. G. M. B. Dobson, B.A., Mr. H. Montgomery, Dr. A. B. Northcote, and Mr. A. Zammar.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE WEATHER OF CHRISTMAS, 1912.

THE weather conditions of the past Christmas in and about London were so bad that a few notes on them may be interesting. The Meteorological Office Daily Weather Reports show that a S. to S.W. current of air was blowing over the country generally, barometric pressure being high to the S. and S.W. and low to the N.W.

Dec. 24th.—A depression off the Irish coast moved N.E. Rain fell from about 1.15 p.m. to 3.45 p.m.

Dec. 25th.—This was a day of secondaries. One which moved across England from the W. is shewn on the 6 p.m. chart over the south part of the North Sea. Rain fell from 10.15 a.m. to 4.30 p.m. There was little wind, S. (S.E. for a time) to S.W. The lower clouds for a time moved from the W.N.W. in the late afternoon. The evening was fine.

Dec. 26th.—An important depression moved eastward across England. It is shewn over the eastern counties at 6 p.m. Was this a primary or a very intense secondary? Rain began to fall at about 7.50 a.m. There was a finer and drier interval between 10.30 and 11.30 a.m., but rain fell most of the rest of the day. Strong winds and gales were caused by this depression.

Dec. 27th.—Conditions were very similar to those of Christmas Eve, but the depression spread rather than moved over the country, and the barometric fall was less and slower than on the preceding days, and unsteady in the evening hours.

The depressions of the 24th, 25th and 26th were each different in conditions and behaviour. The first was a primary, and the barometric fall ceased abruptly. The second (and perhaps the third) was a secondary. Neither of the first two developed any great wind energy; the third did. The amplitude and rate of fall of the barometer increased successively in the three. In the system of the 26th rain did not begin until about 8 hours after the barometer gave signs of its approach; in the two former, the intervals were about three hours and four hours. In the two former there were no breaks in the barometric fall or in the rainfall; in the last (as has been said) there was about an hour's break in the rain in the morning, and this seems to have been associated with a complete cessation of about the same duration in the fall of the barometer. The depression filled up to some extent during the day, but when the break occurred, the centre was still to the westward of London, and it would be interesting to know whether the temporary cessation was due to a check in the rate of advance, or whether this was at any rate one of its causes.

The weather of the 27th was not very wet until after 4 p.m. ; and on the 28th there was no rain until after 7 p.m., between which hour and 11.30 p.m. rain fell, again due to the passage of a secondary depression. There seem to have been many secondaries during these few days.

F. DRUCE.

65, Cadogan Square, S.W., Jan. 4th, 1913.

WATERSPOUTS.

I SEE that you have in the last number of the *Meteorological Magazine* a letter and some notes on waterspouts, and the enclosed extract from my diary may be of interest in connection with it.

"June 24th, 1869. About 7 p.m., while we were running (in a steamer from Hull) across the mouth of the Selbö Fjord (between Stavanger and Bergen), a waterspout was seen in the west, curling down from a mass of cirro-stratus cloud: the end seemed to melt away and not to reach the sea. Further to the south were two groups of them, which apparently were smaller in size and only descended a little way. The sky at the time was covered with cirro-stratus and cirro-cumulus cloud."

Printed in "The Coast of Norway," chromolithographs of sketches by the late Elijah Walton, with text by T. G. Bonney.

T. G. BONNEY.

9, Scroope Terrace, Cambridge, 17th December, 1912.

THE ASPECT OF THE SKY IN 1912.

EXCESS of cloud has often been noted this year, but I have not seen any mention of, what has appeared to me very remarkable, the want of blueness in the sky, especially during the summer. With this seems to be connected a phenomenon of the nature of "Bishop's Ring." It may be remembered that after the eruption of Krakatoa in 1883, there appeared a large corona round the sun, the outer part of which was pink or salmon-coloured, and was called "Bishop's Ring;" the interior was light blue or green ; it was best seen near sunrise and sunset. In the course of many years this gradually faded, and ultimately no trace of it remained ; whether there was any feeble manifestation of the kind before the eruption, I am unable to say, as one's attention was naturally not directed particularly to the point. Since then, however, there has at times been a re-crudescence of a large corona, which no doubt is capable of being formed by other kinds of dust; and this year it has been more marked, though of very feeble colours, the reddish being replaced by a dull brownish hue, and the interior being bluish or greenish white, the result being an excessive glare round the sun. The corona is rather larger than in the case of the Krakatoa dust, the distance of the brownest part being perhaps 40° from the sun.

It would appear from these observations that there must be some kind of film high up in the atmosphere—not so high up as the Krakatoa dust was—and that this film still remains, as the corona continues, though the sky is sometimes fairly blue.

It is not only at Sunderland that these remarks apply, but also in other places where I have travelled.

There has been, however, a singular scarcity of true cirrus, and also of halos.

T. W. BACKHOUSE.

West Hendon House, Sunderland, 21st December, 1912.

IMPORTANCE OF SETTING RAIN GAUGE LEVEL.

I HAVE had for many years on my lawn a Symons's Copper Rain Gauge of 5 inches diameter. I subsequently placed within 5 feet of it a Snowdon Copper Rain Gauge of the same diameter. When comparing the readings I noticed variations sometimes of as much as two hundredths of an inch, if the total rainfall approached an inch, and on making experiments, in order to account for these variations, I found that when the rims of both funnels were perfectly level the variations in the readings occur very seldom, and are then due to storms of rain accompanied by driving winds. Since satisfying myself as to this I have tested the setting of the funnels every day with a small spirit level in two directions at right angles to each other, and other observers may be glad to follow this practice.

STANLEY F. DEWEY, F.R.Met.Soc.

The Rectory, Moretonhampstead, Devon, November 22nd, 1912.

[It is always satisfactory to find precautions embodied in the Rules for Rainfall Observers confirmed by independent observations; and it may be said that the statement in Rule 4, "the funnel of a rain gauge should be set exactly level," embodies a generation of experience as to the result of erroneous setting, similar to that of Mr. Dewey.—ED., *S.M.M.*]

REVIEWS.

GIOVANNI MAGRINI. *Terza relazione annuale del Direttore dell' Ufficio Idrografico.* [Third annual Report of the Director of the Hydrographic Office] Venezia, 1912. Size $10 \times 6\frac{1}{2}$. Pp. 72 and plates.

THIS report describes the work of the new Hydrographic service of the province of Venetia, which takes account of the whole water system, from the rain falling in the Alpine valleys to the languid tides of the Adriatic. The organization includes a network of rainfall stations, a number of stations for recording the flow of rivers, the fluctuations in the level of lakes and the tides along the coast. It also makes provision for a geological survey dealing with the

permeability of rocks, an experimental department for studying the conditions of the flow of water in channels, a telephonic system designed to give timely warning of floods, and a library of works relating to the scientific study of water in nature which is designed on very comprehensive lines. The institution of this Service in an Italian province illustrates the gradual awakening to a sense of the importance of gaining some exact knowledge regarding the water resources of the land, which a recent statement in Parliament leads us to hope is extending to the authorities of our own country also.

The South Pole: An account of the Norwegian Antarctic Expedition in the "Fram," 1910-1912, by ROALD AMUNDSEN, *translated from the Norwegian by A. G. Chater, with maps and numerous illustrations, in two volumes.* London, John Murray, 1912. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. xxxvi. + 392, x. + 450, plates. Price 42s.

THE main interest in these fascinating volumes is, of course, the wonderful story of the journey of Captain Amundsen with his four companions to the South Pole and back, and the story is uncommonly well-told and admirably translated and illustrated. To the "man in the street" the attainment of the Pole wipes out all interest in the Antarctic regions. To him they are done with, their purpose is served and he will wait for a new sensation in what appears to him the no less possible feat of an airman reaching the upper limit of the atmosphere. To students of meteorology, on the other hand, the attainment of the Pole means little, it does not diminish the problem of the Antarctic or abate in the least the interest with which we look forward to fresh information as to the climatic conditions of the great ice-covered continent. The uniqueness of the Antarctic region consists in the fact that practically the whole area within the Antarctic circle—more than eight million square miles—is uniformly covered with a snow surface and has an atmospheric temperature below the freezing point all the year round. The only diversity in this great area is due to the sea round its outer edge and the mountains and plateaux which fill a large part of the interior.

Amundsen's expedition was not intended to be much concerned with scientific matters and the scientific equipment was neither extensive nor carefully chosen; whereas everything directly conducing to the main aim of the expedition, such as clothing, ski, sledges, food and dogs, were probably a few degrees nearer perfection than in any previous Polar journey. When we remember that the *Fram* in which Captain Amundsen sailed was equipped ostensibly for a drift across the North Polar regions, probably lasting from three to five years, and the sole use of such a drift would lie in the meteorological and oceanographical observations to be made, we are at a loss to understand the casual way in which the meteorological apparatus was brought together. The maximum thermometers would not work,

and there were no minimum thermometers on the expedition; a curious contrast to the foresight which caused all the spirit thermometers of Captain Scott's expedition on the *Discovery* to be provided with minimum indices. The thermograph and hygrograph taken were old and not satisfactory, but there was at least one good barograph and the mercurial barometers, if not read with very high precision, were, at any rate, of the best pattern and of good construction.

A brief discussion of the meteorological results is given in an Appendix by Mr. B. J. Birkeland, the general impression created by which is that a little more care before leaving home would have secured a better equipment at no greater cost, and the labour of the three readings daily would not have been so nearly thrown away as in fact it was. The readings three times daily, at 8 a.m., 2 p.m. and 8 p.m., at the base station, in latitude 78° 38′ S., are given in full during the period April 1st, 1911, to January 29th, 1912, for the following instruments:—barometer, dry bulb thermometer, hair hygrometer and Robinson anemometer. There are no maxima or minima to record, but the lowest temperature observed was −73°·3 F. on August 13th, and the highest +31°·7 F. on December 5th. The highest corrected barometer reading was 31·14 in., and the lowest was 28·02 in.; the mean for the whole period was 29·07 in. Perhaps the most valuable of the meteorological observations concerned the direction of the wind, and we give below in line A the percentage of cases of wind from each of the directions named, and in line B the percentage of cases on days of high wind which numbered 5·6 per cent. of the total wind observations.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
(A)	1·9	7·8	31·9	6·9	12·3	14·3	2·6	1·1	21·3
(B)	7	12	51	10	4	10	2	4	

It will be observed that 46·6 per cent. of all wind, and 73 per cent. of strong winds, had a more or less easterly direction, while only 28 per cent. of all winds, and 16 per cent. of strong, had a westerly direction. The position was a favourable one for wind observations as the Barrier surface was fairly level and there was no land to deflect the wind currents.

During the winter the nine men who formed the expedition amused themselves by guessing the temperature in the morning before breakfast, each guess being made independently and the results entered in a book which was afterwards compared with the observations. As for the result:—"It proved that the winner's mean temperature agreed within a few tenths of a degree with the actual mean temperature of the month, and if one took the mean of all the competitors' mean temperatures it gave a result which, practically speaking, agreed with the reality. It was especially with this object in view that this guessing was instituted. If, later on, we should be so unlucky as to lose all our thermometers we should not be entirely at a loss."

RAINFALL TABLE FOR DECEMBER 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1912. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·13	2·80
Tenterden	*Kent*	51 4	*0 41	190	2·77	3·38
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·91	3·71
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	3·23	...
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·06	3·14
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·13	2·96
Shoeburyness	*Essex*	51 31	*0 48	13	1·71	1·81
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·14	2·42
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·07	1·93
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	4·46	6·18
Rousdon [Lyme Regis]	,,	50 41	3 0	516	3·68	5·25
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·71	4·34
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·99	4·05
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·66	3·87
Boston	*Lincolnshire*	52 58	0 1	25	1·88	3·18
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·17	2·43
Macclesfield	*Cheshire*	53 15	2 7	501	3·35	3·81
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	3·10	2·83
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·75	7·84
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·27	1·91
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·32	2·10
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·46	1·28
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	15·14	23·42
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·70	7·77
Haverfordwest	*Pembroke*	51 48	4 58	95	5·18	6·55
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·66	7·12
Llandudno	*Carnarvon*	53 20	3 50	72	2·84	2·93
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·84	8·38
Marchmont House	*Berwick*	55 44	2 24	498	2·83	2·52
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·48	7·29
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·95	7·09
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	8·57	19·70
Mull (Quinish)	,,	56 34	6 13	35	6·59	11·04
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·67	2·04
Braemar	*Aberdeen*	57 0	3 24	1114	3·13	5·49
Aberdeen (Cranford)	,,	57 8	2 7	120	3·43	1·29
Cawdor	*Nairn*	57 31	3 57	250	2·53	3·58
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	5·62	12·16
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	9·86	16·43
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·09	3·92
Wick	*Caithness*	58 26	3 6	77	3·11	3·57
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	6·92	9·59
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	4·32	4·05
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	4·34	5·91
Miltown Malbay	*Clare*	52 52	9 26	400	4·84	...
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·42	2·62
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·41	3·89
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·27	1·89
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·39	5·19
Cong (The Glebe)	*Mayo*	53 33	9 16	112	5·42	10·70
Crossmolina (Enniscoe)	,,	54 4	9 16	74	6·11	13·29
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·34	6·66
Seaforde	*Down*	54 19	5 50	180	3·77	4·12
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·87	4·50
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·91	6·76

RAINFALL TABLE FOR DECEMBER, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875—1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875-1909. in.	STATION.
+ ·67	131	·45	25	18	25·11	27·88	+2·77	111	25·11	Camden Square
+ ·61	122	·58	26	21	27·64	33·30	+5·66	120	27·64	Tenterden
+ ·80	127	·60	27	20	30·48	38·81	+8·33	127	30·48	Patching
...	...	...	...	...	31·87	...	...	...	31·87	Cadland
+1·08	152	·63	28	22	24·58	30·86	+6·28	125	24·58	Oxford
+ ·83	139	·74	28	19	25·17	30·56	+5·39	121	25·17	Croyland Abbey
+ ·10	106	·41	25	16	19·28	20·19	+ ·91	105	19·28	Shoeburyness
+ ·28	113	·38	28	18	25·40	31·11	+5·71	123	25·40	Westley
— ·14	93	·27	1, 9	19	23·73	29·25	+5·52	123	23·73	Geldeston
+1·72	139	·62	26	27	38·27	49·99	+11·72	131	38·27	Polapit Tamar
+1·57	143	·61	9	24	33·54	41·46	+7·92	124	33·54	Rousdon
+1·63	160	·51	28	24	29·81	43·81	+14·00	147	29·81	Stroud
+1·06	135	1·31	17	25	32·41	39·00	+6·59	120	32·41	Wolstaston
+1·21	145	·61	11	19	28·98	37·69	+8·71	130	28·98	Coventry
+1·30	169	·55	11	25	23·35	31·03	+7·68	133	23·35	Boston
+ ·26	112	·78	11	16	24·46	33·45	+8·99	137	24·46	Hodsock Priory
+ ·46	114	·75	11	20	34·73	37·23	+2·50	110	34·73	Macclesfield
— ·27	91	·40	17	27	32·70	37·13	+4·43	113	32·70	Southport
+1·09	116	1·06	13	25	61·49	69·15	+7·66	112	61·49	Arncliffe
— ·36	84	·31	17	12	26·87	35·81	+8·94	133	26·87	Ribston Hall
— ·22	91	·73	11	18	26·42	33·23	+6·81	126	26·42	Hull
—1·18	52	·40	15	17	27·94	31·54	+3·60	113	27·94	Newcastle
+8·28	154	5·70	13	30	129·48	143·15	+13·67	111	129·48	Seathwaite
+3·07	165	·86	27	27	42·28	56·38	+14·10	133	42·28	Cardiff
+1·37	126	·79	10	22	46·81	57·97	+11·16	124	46·81	Haverfordwest
+2·46	153	1·08	11	28	45·46	56·75	+11·29	125	45·46	Gogerddan
+ ·09	103	·61	11	22	30·36	33·05	+2·69	109	30·36	Llandudno
+3·54	173	1·09	30	28	43·47	54·37	+10·90	125	43·47	Cargen
— ·31	89	·40	27	20	33·76	31·93	—1·83	95	33·76	Marchmont
+1·81	133	·90	3	29	49·77	53·59	+3·82	108	49·77	Girvan
+3·14	179	1·00	13	27	35·97	38·01	+2·04	106	35·97	Glasgow
+11·13	230	2·21	30	30	68·67	82·01	+13·34	119	68·67	Inveraray
+4·45	168	·96	27	29	56·57	56·46	— ·11	100	56·57	Quinish
— ·63	76	·33	13	24	28·64	28·09	— ·55	98	28·64	Dundee
+2·36	175	·78	24	21	34·93	39·16	+4·23	112	34·93	Braemar
—2·14	38	·30	27	15	32·73	32·94	+ ·21	101	32·73	Aberdeen
+1·05	141	·70	19	16	29·33	27·03	—2·30	92	29·33	Cawdor
+6·54	216	1·55	13	27	44·53	50·26	+5·73	113	44·53	Fort Augustus
+6·57	167	1·42	30	27	83·93	87·88	+3·95	105	83·93	Bendamph
+ ·83	127	·48	4	16	31·90	33·90	+2·00	106	31·90	Dunrobin Castle
+ ·46	115	·55	24	25	29·88	31·90	+2·02	107	29·88	Wick
+2·67	138	1·11	9	31	54·81	56·17	+1·36	102	54·81	Killarney
— ·27	94	·57	25	27	39·57	42·56	+2·99	108	39·57	Waterford
+1·57	136	·55	20	31	39·43	40·22	+ ·79	102	39·43	Castle Lough
...	...	...	...	...	45·11	...	...	...	45·11	Miltown Malbay
— ·80	77	·36	25	27	34·99	42·19	+7·20	121	34·99	Courtown Ho.
+ ·48	114	·38	17	30	35·92	37·23	+1·31	104	35·92	Abbey Leix
— ·38	83	·42	25	23	27·68	27·65	— ·03	100	27·68	Dublin
+1·80	153	·75	20	28	36·15	41·86	+5·71	116	36·15	Mullingar
+5·28	197	1·15	13	21	48·90	50·77	+1·86	104	48·90	Cong
+7·18	217	1·08	30	31	52·87	...	...	...	52·87	Enniscoe
+2·32	153	·52	12	28	42·71	49·05	+6·34	115	42·71	Markree
+ ·35	109	·48	1	28	38·91	45·56	+6·65	117	38·91	Seaforde
+ ·63	116	·42	12	29	37·56	41·33	+3·77	110	37·56	Dundarave
+2·85	173	·55	15	30	39·38	48·31	+8·93	123	39·38	Omagh

SUPPLEMENTARY RAINFALL, DECEMBER, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	3·98	XI.	Lligwy	3·83
,,	Ramsgate	2·05	,,	Douglas	...
,,	Hailsham	4·55	XII.	Stoneykirk, Ardwell House...	4·42
,,	Totland Bay, Aston House...	3·70	,,	Dalry, The Old Garroch.....	11·84
,,	Stockbridge, Ashley..	5·04	,,	Langholm, Drove Road	6·54
,,	Grayshott	5·26	,,	Beattock, Kinnelhead	12·55
,,	Caversham, Rectory Road ...	2·99	XIII.	St. Mary's Loch, Cramilt Ldge	9·28
III.	Harrow Weald, Hill House...	2·90	,,	North Berwick Reservoir.....	1·77
,,	Pitsford, Sedgebrook.....	3·04	,,	Edinburgh, Royal Observaty.	3·11
,,	Woburn, Milton Bryant.....	3·07	XIV.	Maybole, Knockdon Farm ...	6·60
,,	Chatteris, The Priory.....	2·28	XV.	Campbeltown, Witchburn ..	8·67
IV.	Colchester, Lexden	2·06	,,	Holy Loch, Ardnadam.....	21·58
,,	Newport.....	2·61	,,	Ballachulish House	25·20
,,	Ipswich, Copdock	1·92	,,	Islay, Eallabus	8·57
,,	Blakeney.....	2·33	,,	Tiree, Cornaigmore	8·91
,,	Swaffham	2·91	XVI.	Dollar Academy	5·77
V.	Bishops Cannings	4·95	,,	Balquhidder, Stronvar.....	24·98
,,	Winterbourne Steepleton.....	6·71	,,	Coupar Angus	4·37
,,	Ashburton, Druid House.....	8·57	,,	Glenlyon, Meggernie Castle..	16·70
,,	Cullompton	5·31	,,	Blair Athol	7·85
,,	Lynmouth, Rock House	7·70	,,	Montrose, Sunnyside Asylum.	1·65
,,	Okehampton, Oaklands.....	7·65	XVII.	Alford, Lynturk Manse	1·25
,,	Hartland Abbey.....	6·02	,,	Fyvie Castle	1·53
,,	Probus, Lamellyn.....	5·19	,,	Keith Station	2·45
,,	North Cadbury Rectory.....	4·78	XVIII.	Skye, Dunvegan	16·39
VI.	Clifton, Pembroke Road.....	6·57	,,	N. Uist, Lochmaddy	10·32
,,	Ross, The Graig	3·33	,,	Glenquoich, Loan.....	29·90
,,	Shifnal, Hatton Grange.....	2·73	,,	Alvey Manse.....	6·50
,,	Droitwich.....	3·72	,,	Loch Ness, Drumnadrochit ..	7·26
,,	Blockley, Upton Wold.....	4·12	,,	Glencarron Lodge	16·92
VII.	Market Overton.....	3·61	XIX.	Invershin	3·25
,,	Market Rasen.....	3·02	,,	Loch Stack, Ardchullin	10·29
,,	Bawtry, Hesley Hall	2·22	,,	Melvich	4·18
,,	Derby, Midland Railway.....	3·36	XX.	Skibbereen Rectory	7·53
,,	Buxton	6·52	,,	Dunmanway, The Rectory ..	10·43
VIII.	Nantwich, Dorfold Hall	2·36	,,	Glanmire, Lota Lodge.....	4·14
,,	Chatburn, Middlewood	4·86	,,	Mitchelstown Castle.....	5·12
,,	Cartmel, Flookburgh	5·79	,,	Darrynane Abbey.....	6·07
IX.	Langsett Moor, Up. Midhope	6·21	,,	Clonmel, Bruce Villa	4·00
,,	Scarborough, Scalby	1·58	,,	Newmarket-on-Fergus, Fenloe	5·28
,,	Ingleby Greenhow	1·46	XXI.	Laragh, Glendalough	4·70
,,	Mickleton	5·80	,,	Ballycumber, Moorock Lodge	3·24
X.	Bellingham, High Green Manor	3·98	,,	Balbriggan, Ardgillan	2·33
,,	Ilderton, Lilburn Cottage ...	1·48	XXII.	Woodlawn	4·57
,,	Keswick, The Bank.....	9·07	,,	Westport, St. Helens	9·23
XI.	Llanfrechfa Grange	7·81	,,	Achill Island, Dugort	11·91
,,	Treherbert, Tyn-y-waun	16·76	,,	Mohill, The Rectory	4·95
,,	Carmarthen, The Friary	7·28	XXIII.	Enniskillen, Portora.....	6·52
,,	Castle Malgwyn [Llechryd]...	6·08	,,	Dartrey [Cootehill]	5·10
,,	Crickhowell, Tal-y-maes.....	6·10	,,	Warrenpoint, Manor House ..	5·46
,,	New Radnor, Ednol	5·85	,,	Banbridge, Milltown	2·80
,,	Rhayader, Tyrmynydd	9·65	,,	Belfast, Cave Hill Road	4·93
,,	Lake Vyrnwy	8·65	,,	Glenarm Castle.....	6·39
,,	Llangyhanfal, Plâs Draw.....	2·50	,,	Londonderry, Creggan Res...	5·32
,,	Dolgelly, Bryntirion.....	7·08	,,	Killybegs	8·86
,,	Bettws-y-Coed, Tyn-y-bryn...	11·15	,,	Horn Head	6.68

METEOROLOGICAL NOTES ON DECEMBER, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Cloudy and unsettled weather generally with a few bright sunny days. Temp. throughout was unusually high, the mean temp., 45°·8, being 6°·1 above the average, and the highest for December in the 55 years' record, excepting only December, 1868, when the mean was 46°·0. The mean max. temp., 50°·8, was the highest ever recorded in December. Duration of sunshine 20·5* hours, and of R 57·9 hours. Evaporation ·12 in. Shade max. 56°·8 on 14th; min. 23°·4 on 1st. F 2, f 8.

TENTERDEN.—A warm month. Mean temp. 45°·0. Duration of sunshine 41·0† hours. Shade max. 55°·0 on 24th; min. 25°·0 on 1st. F 2, f 9.

TOTLAND BAY.—Mean temp. 47°·2, the highest for December in the record, excepting December, 1898. Duration of sunshine 33·4* hours. Shade max., 53°·1 on 27th; min., 30°·6 on 1st. F 1, f 3.

PITSFORD.—Shade max. 56°·5 on 14th; min. 24°·6 on 1st. F 3.

IPSWICH, COPDOCK.—Mean temp. 43°·4, and the warmest December recorded here. Duration of sunshine 25·7† hours. Shade max. 56°·6 on 14th; min. 28°·0 on 1st. F 1, f 11.

POLAPIT TAMAR.—A mild, wet and rather stormy month. Shade max. 55°·0 on 27th; min. 24°·0 on 1st. F 2, f 5.

NORTH CADBURY.—A mild December, temp. reaching 50° or above on 20 days. Shade max. 55°·5 on 14th; min. 25°·0 on 1st. F 2, f 12.

ROSS.—The warmest December since 1868. Shade max. 56°·8 on 14th; min. 24°·8 on 1st. F 4.

HODSOCK PRIORY.—Only 12·5* hours of sunshine, the least in December since 1890. Shade max. 58°·3 on 14th; min. 15°·9 on 1st. F 5, f 20.

SOUTHPORT.—Duration of sunshine 16·3* hours, and of R 68·7 hours. Evaporation ·27 in. Mean temp. 44°·2, or 4°·7 above the average. Shade max. 55°·0 on 11th; min. 25°·0 on 1st. F 3, f 14.

LILBURN COTTAGE.—Very mild and showery. Much wind, strong gales at times and very variable.

HAVERFORDWEST.—Wet, stormy and very mild. Spring flowers in bloom. Duration of sunshine 38·2* hours. Shade max. 57°·2 on 26th; min. 31°·0 on 1st. F 3.

BETTWS-Y-COED.—The wettest month since the record commenced here, and the least amount of sunshine, the total being only 10·9 hours. Shade max. 58°·0 on 24th; min. 32°·0 on 3rd. F 1, f 3.

CARGEN.—Severe S.W. gale on 24th. Pastures green and fresh. Shade max. 54°·8 on 14th; min. 9°·0 on 1st. F 5.

EDINBURGH.—Frequent S.W. gales. Shade max. 54°·5 on 13th; min. 23°·4 on 1st. F 4, f 13.

INVERARAY.—The greatest R registered here in any one month, the nearest being December, 1898, when 16·24 in. was measured.

LYNTURK MANSE.—R markedly below the average. Shade max. 53°·5 on 11th; min. 0°·0 on 1st.

DRUMNADROCHIT.—R 3·38 in. above the average. Destructive floods and great gales. In many cases corn still in the fields.

LOCH STACK.—Duration of sunshine 5·1* hours.

DUNMANWAY.—Very unsettled month. Some bright sunny days, especially in last week. Stormy at intervals from 22nd to 29th.

DUBLIN.—Almost constant S.W. winds, open, wet and stormy weather. Mean temp. 46°·1, or 4°·1 above the average. Shade max. 57°·2 on 11th and 13th; min. 28°·7 on 1st. F 1, f 6.

ENNISCOE.—The heaviest R for any month in 38 years' record.

OMAGH.—Comparatively mild and excessively wet. Shade max. 54°·0 on 3rd and 4th; min. 16°·0 on 1st. F 7.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, July, 1912.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	d	°	inches		
London, Camden Square	91·4	12	47·1	9	74·9	55·3	56·1	77	132·7	44·2	1·44	12	6·9
Malta	...	...	...	...	...	...	...	...	...	..	...	...	...
Lagos	87·5	18	71·0	11	83·3	74·2	72·1	79	153·5	69·0	7·47	23	8·0
Cape Town	80·0	19	38·0	29	64·4	46·1	49·7	81	...	...	2·17	13	4·7
Durban, Natal ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Johannesburg	67·1	8	29·8	29	59·8	40·2	34·1	66	122·0	30·3	·01	1	1·2
Mauritius	77·3	2	57·4	11	74·5	61·9	58·5	73	142·1	50·9	1·95	13	4·9
Bloemfontein	69·6	24	30·5	1,4,8	61·9	34·9	31·7	66	...	...	·42	2	2·5
Calcutta...	92·9	14	74·6	2	89·1	76·8	78·2	87	...	73·5	11·48	20	8·7
Bombay...	89·1	1	74·4	30	85·1	78·8	77·1	85	128·0	72·0	25·77	29	8·6
Madras	102·8	30	75·2	20	96·8	79·7	73·7	71	145·4	74·5	2·22	17	7·5
Kodaikanal	67·8	3	50·2	23	62·5	53·1	51·1	82	144·9	43·9	3·29	18	8·1
Colombo, Ceylon ...	88·1	6	73·2	26	86·3	78·2	73·8	76	148·0	68·1	2·50	13	6·7
Hongkong	91·3	20	76·8	18,24	88·0	79·5	76·2	80	140·4	...	7·56	19	6·4
Sydney	68·6	12	41·9	21	58·6	47·1	45·5	81	115·1	31·0	10·72	28	6·3
Melbourne	63·2	1	30·8	16	55·7	41·6	40·6	73	101·5	23·9	2·01	19	6·0
Adelaide	64·4	5	38·7	19	59·0	44·8	44·7	71	123·5	28·5	2·60	16	5·8
Perth	70·2	28	37·0	25	62·1	48·5	47·7	75	116·8	27·9	8·72	21	6·6
Coolgardie	71·6	4	34·8	1,25	60·4	42·7	41·1	65	134·0	31·3	1·28	14	5·9
Hobart, Tasmania ..	58·5	2	29·8	16	50·8	39·8	38·4	74	102·6	23·0	1·51	19	6·5
Wellington	59·8	12	35·0	22	52·0	43·6	43·8	85	108·8	28·0	9·46	21	7·4
Auckland	62·0	18	38·5	31	55·7	45·2	45·5	84	86·0	35·0	4·97	19	6·3
Jamaica, Kingston ..	93·2	29	72·7	24	90·9	70·8	71·3	74	...	...	·02	1	...
Grenada	87·0	15	75·0	Sev.	83·3	76·3	...	78	...	...	11·39	26	5·0
Toronto	92·0	8	46·0	1,20	79·8	59·5	...	...	144·3	41·0	1·95	11	4·2
Fredericton	95·8	8	41·5	1	77·6	54·9	...	75	...	...	4·85	14	5·4
St. John, N.B. ...	77·5	2	45·0	1	66·1	54·5	...	83	...	...	4·00	12	6·5
Edmonton, Alta. ...	81·0	31	34·1	14	67·8	48·2	...	77	133·2	26·5	4·12	15	5·4
Victoria, B.C.	89·8	17	45·5	8	71·5	52·2	...	71	...	...	1·15	7	4·0

Johannesburg.—Bright sunshine 292·3 hours.

Mauritius.—Mean. temp. of air normal. Dew point 1°·2, and R ·69 in. below averages. Mean hourly velocity of wind 13·4 miles or 2·8 miles above average.

KODAIKANAL.—Bright sunshine 78 hours.

COLOMBO.—Mean temp. of air 82°·3 or 1°·8 above, of dew point 0°·4 above, and R 1·94 in. below, averages. Mean hourly velocity of wind 7·7 miles. TS8 on 2 days.

HONGKONG.—Mean temp. of air 83°·0. Bright sunshine 262·7 hours. Mean hourly velocity of wind 10·6 miles.

Sydney.—Mean temp. of air 0°·6 above, and R 5·97 in. above, averages.

Melbourne.—Mean temp. of air 0°·1 above, and R ·16 in. above, averages.

Adelaide.—Mean temp. of air 0°·4 above, and R ·02 in. above, averages.

Perth.—R 2·34 in. above average.

Coolgardie.—Mean temp. of air 0°·8 above average.

Hobart.—Mean temp. of air 0°·4 below, and R ·59 in. below, averages.

Wellington.—Mean temp. of air 0°·4, and R 3·65 in., above averages. Bright sunshine 56·5 hours. The wettest July since 1892.