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“BRITISH RAINFALL, 1912.”

THE annual volume of *British Rainfall* is published this year somewhat earlier than has been the case lately. In plan and arrangement it is the same as in recent years, the series of changes which have gradually been introduced having now led to a form of treatment which will probably be found suitable for some years to come.

In the Director's Report to the Trustees, Dr. Mill gives an account of the work of the Organization for the year ending July 23rd, and suggests a change in the charge for certificates of accuracy for a rain gauge and measuring glass. This was sanctioned by the Trustees, and the rate fixed at 1s. 6d. when gauge and glass are sent together. The charge for a certificate of accuracy for a rain measuring glass alone, remains as before at 1s.

At the end of his Report, Dr. Mill said “I have with much regret to state that acting on medical advice, I have very reluctantly consented to take a long and complete rest. The continual strain of the work has in particular, seriously affected my eyesight, and for several months I have been unable to read or write, and have had to carry on my work in a tedious and unsatisfactory way, through the eyes of others.” The Trustees sanctioned the appointment of Mr. R. C. Mossman of the Argentine Meteorological Office, as Acting Editor of Publications for one year from October 1st, and of Mr. Carle Salter, Chief Assistant in the British Rainfall Organization office, to the temporary position of Assistant Director for one year from the same date. It is understood that Mr. Mossman and Mr. Salter will carry on between them the whole of the work hitherto done by Dr. Mill, who hopes to return after the greater part of a year spent in travelling.

As Dr. Mill's eyes have prevented him from personal revision of the proof of the volume just issued, the whole of this work has been done by Mr. Salter, whose name appears on the title-page as sharing in the responsibility for the correctness of the work.

Part I. is devoted mainly to two very remarkable phenomena in 1912, viz., the great rain storm of August 25th-26th, which, in East Anglia, reached proportions surpassing those of any previously recorded rain storm in the British Isles, this article being illustrated

by a coloured map of the district most seriously affected; and the rainfall of the summer of 1912 in England and Wales, which, although approached in the summer of 1879, was never exceeded in any summer during the last fifty years. The treatment of the great storm extends the discussion given in Dr. Mill's paper read to the Royal Meteorological Society in November, 1912, from East Anglia to the whole of England and Wales. Part I. also contains the usual section on Evaporation observations, and concludes with an article describing in detail the changes in the Staff of Observers during the year, and an Obituary list with biographical notices of many of the 89 Observers who have died since the publication of *British Rainfall*, 1911. The increase in the number of records printed was 198, equal to the gains in the previous year and the largest ever recorded. The total number of records printed amounts to 5,272.

Amongst the Observers' Notes on the Weather of 1912 is an account of the remarkable glazed frost of January 17th. A photograph of one of the beautiful effects produced by this frost forms the frontispiece of the book.

The number of records of the duration of rainfall has been considerably increased. Two of the months of 1912 were remarkable from the point of view of their rainfall, April, with a general rainfall of .35 in. for the whole of England and Wales, sharing with April, 1893, the distinction of being the driest month of that name in the last 50 years, and August, with a general rainfall of 6.86 in. for England and Wales, having had more than an inch of excess over the previous wettest August on record. The rainfall of the six months from October, 1911, to March, 1912, was also very remarkable, exceeding 150 per cent. of the average in the south of England and Wales, and reaching 180 per cent. in Monmouthshire. The rainfall of the six summer months, April—September, 1912, also reached 180 per cent. of the average in Norfolk.

The section on the relation of the total rainfall of the year to the average, is illustrated by a coloured map showing the rainfall in different parts of the British Isles, expressed as a percentage of the average amount. The most interesting feature is the strip of extremely high rainfall which occupied the south-west, centre and east of England. Within this strip, a large area had more than 30 per cent. above the average rainfall for the year, and three patches had more than 40 per cent. excess. The relation of the general rainfall over the great divisions of the kingdom to the average, was as follows, the rainfall being expressed in the form of a percentage:—England, 123; Wales, 119; England and Wales, 122; Scotland, 111; Ireland, 108; British Isles, 115.

The year as a whole was thus a wet one, and it is an interesting fact that 1910-1912, was the eighth successive three year period, in which the third year had a greater general rainfall in England and Wales than either of the two preceding years, though on this occasion for the first time the two preceding years were not both dry years.

SOUTHERN HEMISPHERE SEASONAL CORRELATIONS.

By R. C. MOSSMAN, F.R.S.E.

(of the Argentine Meteorological Office).

Fourth Article.

A PRONOUNCED feature of many correlations is their temporary character, this applying more particularly to pairs of stations not located in action centres, but situated in intermediate zones, where correlations are set up without any apparent reason, persist with varying degrees of intensity for fluctuating periods, and disappear with the same abruptness that initiated their commencement. An interesting example of this nature is shown by a comparison of the April to September rainfall at Trinidad, West Indies (lat. $10^{\circ} 40' N.$, long. $61^{\circ} 31' W.$), and the rainfall at Azo, Argentine Republic (lat. $36^{\circ} 31' S.$, long. $56^{\circ} 46' W.$) for the six months following.

The data referring to Trinidad are based on a table of monthly and annual rainfall from 1862 to 1910,* kept at the Royal Botanic Gardens, which was included among a large mass of valuable printed data referring to British Colonial stations, recently received from the London Meteorological Office. The data from Azo are from a manuscript record kept at Estancia Linconia kindly furnished by Mr. Herbert Gibson. The observations, which are still continued, cover the period, 1858—1911, thus embracing 54 years (see Table I.) The values up to the year 1884 have already appeared in a paper,† published a quarter of a century ago, from the pen of the late Mr. Thomas Gibson, who initiated the observations.

Whatever may be the causes that determine the general character of the rainy season at Trinidad, *i.e.*, whether the rain will be above or below the normal, the character of the season is usually impressed on the records as early as April and May. If we take the combined rainfall of these two months for the 50 years, 1862—1911, and compare the values with those of the four months following, we find 36 years in which the deviation from the normal was represented by the same sign as the corresponding June to September values, and 14 cases in which they differed. In the 20 years, 1876—1895, during which the pronounced opposition with Azo prevailed, there is only one year (1878) in which the April and May rainfall at Trinidad was not a direct index of that of the four succeeding months.

* I am obliged to Mr. W. G. Freeman, B.Sc., Government Botanist of the St. Clair Experiment Station, Trinidad, for the monthly rainfall there during the years 1911 and 1912. The data are as follows :—

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1911 ...	1·61	1·51	1·36	·74	1·27	7·15	4·73	13·68	4·03	10·22	3·57	3·53	53·90
1912 ...	·62	·20	·74	·03	2·18	7·54	12·16	5·56	5·58	2·73	6·28	5·64	49·26

† *Jour. Scot. Met. Soc.*, 3rd Series, Vol. 7, p. 192.

TABLE I.—*Rainfall at Estancia Linconia, Azo, Province of Buenos Aires.*
 Lat. 36° 31' S. Long. 56° 46' W. Distance from sea 12 miles. Gauge 5 feet above ground.

	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Y. E. A. R.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
1858...	2.39	2.00	3.26	1.01	8.22	2.49	1.47	2.07	7.25	4.22	3.62	2.37	40.37
1859...	.72	1.22	2.00	1.77	3.91	1.24	2.45	1.93	2.57	1.86	3.27	.49	23.43
1860...	.86	5.48	6.74	2.01	6.85	6.20	2.97	2.96	1.34	4.83	2.31	.81	43.36
1861...	.07	3.00	1.15	5.40	.87	.55	.29	3.26	1.10	3.09	.59*	.62	19.99*
1862...	1.18	.64	4.75	1.00	5.67	8.32	2.93	.62	1.09	1.20	3.55	2.59	33.54
1863...	4.04	1.19	1.81	1.10	1.52	5.20	.70	.32	2.56	3.15	1.89	2.27	23.75
1864...	1.54	1.94	.54	6.60	3.85	5.61	2.13	3.71	2.59	3.26	1.80	6.78	40.35
1865...	5.61	2.93	3.42	3.26	3.38	5.42	2.33	2.17	2.26	3.75	1.37	1.63	37.53
1866...	.25	.96	1.55	2.21	6.69	1.77	2.93	3.09	1.97	3.88	2.96	1.52	29.78
1867...	.82	.75	2.00	3.69	2.62	1.15	2.33	2.12	.45	.70	4.17	2.22	22.92
1868...	4.46	1.94	7.65	.20*	.44	3.20	.46	2.05	4.47	4.32	3.19	2.80	35.18
1869...	7.12	2.63	2.69	3.03	.25	.00*	.76	.00*	4.33	2.00	5.07	4.97	32.85
1870...	2.05	4.28	3.60	3.29	3.84	.57	1.32	.25	.00*	2.54	5.24	.56	27.54
1871...	2.10	7.46	7.11	2.41	.74	6.10	.00*	1.70	1.12	2.48	1.48	4.46	37.16
1872...	6.16	2.60	3.15	1.92	1.82	3.37	1.84	5.32	.87	1.12	3.15	3.56	34.88
1873...	4.86	4.47	.00*	2.80	.88	1.83	.00*	2.65	2.29	2.26	3.15	2.07	27.26
1874...	1.49	2.65	2.00	1.20	5.03	1.82	2.96	5.10	4.08	4.77	3.76	.75	35.61
1875...	3.94	2.10	.50	5.11	2.55	.47	2.10	1.07	1.04	1.96	.86	1.32	23.02
1876...	2.64	3.42	5.35	4.61	2.90	3.62	2.82	3.46	.57	3.18	2.06	1.79	36.42
1877...	.00*	1.60	5.78	3.37	5.82	2.59	6.52	2.97	.85	3.33	2.01	4.29	39.13
1878...	4.32	.55	4.23	5.10	2.30	4.42	1.28	1.11	.70	3.80	3.37	3.30	34.48
1879...	1.38	2.42	5.80	.68	4.25	6.12	2.08	.75	1.25	1.00	2.62	.86	29.21
1880...	5.88	2.28	3.57	.59	1.99	4.03	1.80	1.22	1.48	1.83	4.39	3.56	32.62
1881...	2.92	1.48	1.27	2.33	.57	4.85	2.64	1.61	6.92	5.20	2.03	1.20	33.02
1882...	2.67	1.33	2.02	2.15	.87	1.19	1.13	4.65	1.28	2.45	1.63	1.52	22.89
1883...	3.96	.35*	7.92	1.78	2.67	5.07	4.15	2.14	2.24	3.42	2.95	1.45	38.10
1884...	1.18	.77	2.37	5.52	.25	2.37	.65	2.12	12.64	3.02	1.49	2.15	34.53
1885...	3.02	6.40	7.41	3.00	3.00	2.34	1.82	1.69	2.13	4.15	2.90	6.44	44.30
1886...	3.56	.67	6.19	2.94	1.71	2.62	.35	.54	3.05	3.90	.95	3.40	29.88
1887...	1.10	4.18	1.45	2.72	.00*	6.95	1.05	2.88	1.60	3.39	2.02	4.63	31.97

TABLE I.—Rainfall at Estancia Linconia, Azo, Province of Buenos Aires—(continued).

	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Year.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1888...	4.42	2.27	3.50	5.32	.36	2.54	5.47	3.50	2.76	2.67	1.54	4.53	38.88
1889...	12.30	2.59	3.09	3.33	2.43	2.76	3.32	3.88	1.47	.40*	1.49	2.43	40.15
1890...	1.99	2.25	4.02	3.24	1.75	2.20	4.52	2.57	.95	1.13	1.38	2.43	28.43
1891...	2.59	3.39	2.95	.54	3.97	1.24	3.11	4.47	.26	4.77	2.73	4.57	34.59
1892...	1.90	1.59	3.67	.72	2.92	.12	2.57	2.50	5.33	4.74	1.61	1.71	29.38
1893...	2.53	.50	2.96	3.28	.66	.89	3.64	1.67	.33	1.54	2.66	.54	21.20
1894...	3.05	1.75	.97	.22	1.59	.80	1.50	3.43	2.35	6.62	3.67	2.92	28.87
1895...	3.34	2.09	10.91	1.95	.55	1.89	2.48	3.01	3.64	1.40	4.15	4.38	39.79
1896...	2.04	1.49	1.47	2.61	.83	.82	5.59	2.48	4.98	2.77	3.20	.47*	28.75
1897...	.93	2.74	3.37	1.00	3.06	2.28	1.13	.59	3.46	2.45	3.45	2.90	27.36
1898...	4.15	2.03	5.57	3.55	3.33	5.94	1.31	2.37	4.16	2.71	1.71	1.62	38.45
1899...	2.31	3.53	4.51	4.92	5.39	1.85	6.47	10.21	.54	2.62	3.39	5.18	50.92
1900...	2.43	3.89	15.88	.79	5.21	3.40	5.87	5.57	6.28	3.96	5.26	1.24	59.78
1901...	2.21	2.71	2.02	3.07	9.67	1.28	.50	3.78	1.48	2.12	3.48	2.32	34.64
1902...	3.05	1.38	4.33	2.36	3.72	1.10	1.32	1.14	2.49	.93	1.63	2.93	26.38
1903...	2.94	2.42	4.11	3.21	2.20	5.24	1.81	3.92	2.47	1.46	2.59	4.99	37.36
1904...	4.24	6.16	5.08	4.76	.45	1.97	3.90	5.18	.89	5.61	2.28	.53	41.05
1905...	1.54	2.24	2.07	4.17	1.63	3.46	1.99	.00*	2.22	6.98	1.34	4.30	31.94
1906...	.81	1.91	2.26	6.10	3.54	2.46	3.70	3.68	6.70	3.65	1.91	2.94	39.66
1907...	1.09	.40	8.87	6.69	.00*	2.91	2.76	4.11	2.07	3.32	.77	1.99	34.98
1908...	1.47	1.65	2.53	6.90	1.06	2.68	1.29	1.87	.59	2.03	4.28	1.52	27.87
1909...	4.74	2.42	.73	1.18	.22	2.88	3.52	3.14	4.83	2.59	3.09	2.97	32.31
1910...	2.93	2.18	3.02	.75	.39	2.03	2.00	3.11	1.46	1.74	2.06	.68	22.35
1911...	6.62	3.65	.24	2.57	6.22	.65	2.39	1.28	.98	4.20	1.78	6.77	37.35
Mean...	2.93	2.42	3.80	2.89	2.72	2.87	2.38	2.63	2.57	3.01	2.65	2.64	33.51
1912...	5.10	2.17	6.93	2.99	3.47	3.97	1.42	2.15	1.66	3.80	5.89	1.29	40.84
1913...	.07	1.97	8.46	—	—	—	—	—	—	—	—	—	—

Dealing with the 50 years, 1862 to 1911, common to both series of observations (see Table II.) we find that from 1862 to 1877, and from 1895 to 1911, there was no relation between the rainfall at Trinidad from April to September and that at Azo during the six months following. On the other hand during the 17 years, 1878 to 1894, the two curves are the reverse of each other. These results apply to the values referred to the 50 years' means, which are 40·47 in. for Trinidad, and 17·85 in. at Azo.

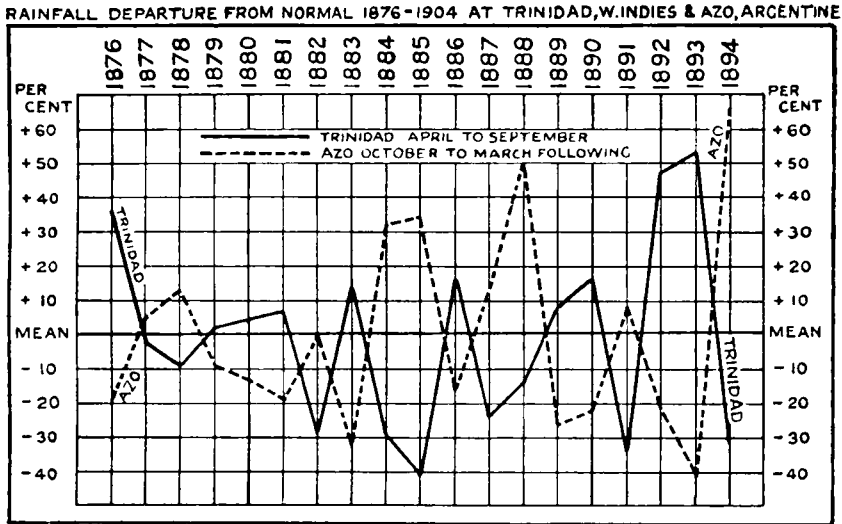
TABLE II.—*Rainfall at Trinidad (Lat. 10° 40' N., Long. 61° 31' W.) and Azo (Lat. 36° 31' S., Long. 56° 46' W.)*

Year.	Trinidad. April to September.	Azo. Oct. to March following.	Departure from Normal.		Year.	Trinidad. April to September.	Azo. Oct. to March following.	Departure from Normal.	
	in.	in.	Trinidad.	Azo.		in.	in.	Trinidad.	Azo.
1862	42·03	14·38	+ 4	—19	1889	46·68	13·24	+15	—26
1863	43·99	11·33	+ 9	—36	1890	50·35	13·87	+24	—22
1864	40·42	23·80	0	+34	1891	33·10	19·23	—18	+ 8
1865	49·36	9·51	+22	—47	1892	63·73	14·05	+57	—21
1866	35·17	11·93	—13	—31	1893	66·48	10·51	+64	—41
1867	46·81	21·14	+16	+19	1894	29·24	29·55	—28	+66
1868	36·13	22·75	—11	+28	1895	22·75	14·93	—44	—16
1869	34·39	21·97	—15	+23	1896	34·71	13·48	—14	—24
1870	46·51	25·01	+15	+40	1897	48·64	20·55	+20	+15
1871	46·30	20·33	+14	+14	1898	42·67	16·39	+ 5	— 8
1872	29·96	17·16	—26	— 4	1899	23·97	33·39	—41	+86
1873	24·05	13·62	—41	—24	1900	45·77	17·40	+13	— 2
1874	52·81	15·82	+30	—12	1901	36·18	16·68	—11	— 6
1875	38·97	15·55	— 4	—13	1902	38·06	14·96	— 6	—16
1876	58·93	14·41	+45	—19	1903	38·80	24·52	— 4	+37
1877	42·68	18·73	+ 5	+ 5	1904	33·05	14·27	—18	—20
1878	39·44	20·07	— 3	+13	1905	43·15	17·60	+ 7	— 1
1879	44·39	16·21	+10	— 9	1906	44·88	18·86	+11	+ 6
1880	45·21	15·45	+12	—13	1907	40·23	11·73	— 1	—34
1881	46·62	14·45	+15	—19	1908	30·53	15·72	—25	—12
1882	30·90	17·33	—24	0	1909	37·92	16·78	— 6	— 6
1883	49·62	12·04	+22	—32	1910	39·67	14·99	— 2	—16
1884	30·70	23·49	—24	+32	1911	31·60	26·95	—22	+51
1885	25·65	23·91	—37	+34					
1886	50·38	14·98	+25	—16	Mean	40·47	17·85	...	...
1887	32·97	20·23	—19	+14					
1888	37·10	26·72	— 8	+50	1912	33·05	21·48	—18	+21

On referring the values to the means of the 19 years, 1876 to 1894, viz., 43·38 in. at Trinidad, and 17·84 in. for Azo, we get an uninterrupted correlation, as will be apparent from the following values showing the percentage of excess or defect referred to the above short average. Under the first year, 1876, is entered the value at Trinidad for April to September of that year, and at Azo for the six months following, i.e., from October, 1876, to March, 1877, and so on.

	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885
Trinidad % ...	+36	—2	— 9	+2	+ 4	+ 7	—29	+14	—29	—41
Azo %	—19	+5	+13	—9	—13	—19	0	—32	+32	+34
	1886	1887	1888	1889	1890	1891	1892	1893	1894	
Trinidad %	+16	—24	—14	+ 8	+16	—34	+47	+53	—33	
Azo %	—16	+14	+50	—26	—22	+ 8	—21	—41	+66	

The correlation co-efficient deduced from the above values reaches the high value of 0·79, with probable error of 0·06. The following diagram shows the data in graphic form.



These results are of considerable interest as they show that the physical processes that produced a given precipitation at Trinidad, 11° N. of the equator, during the period under discussion, were associated during the six months following by an opposite effect at Azo in the south temperate zone, some 2,850 geographical miles distant. The effect so far as shown by available material, which embraces five stations in the Argentine Republic* and two in Brazil, is greatest on the Atlantic seaboard, with a hypothetical maximum out in the ocean some distance to the east of Azo. At Buenos Aires the co-efficient has fallen to —·47, and two stations to the north, situated respectively 190 and 310 miles distant from that city, give values of —·40 and —·52, with probable errors of ·11 and ·13 respectively, that of Buenos Aires being ·12. To the west the relation dies out completely as Cordoba shows a positive correlation of ·17. At Rio de Janeiro (lat. 22° 54' S.) there is a value of —·10, and at Alto da Serra (lat. 23° 40' S., height 2,625 feet), —·38. Had a large number of stations been available for comparison with Trinidad during the 19 years under review it would have been possible to draw, what may in this case be termed *post iso-cohyetal lines*, or lines drawn through points having the same correlation co-efficient. In this way some clue to the precise mechanism governing this correlation might be obtained, since the boundaries of the area covered by the rainfall inversion would be clearly defined for the

* I am indebted to Mr. W. G. Davis, Director, for permission to examine the Argentine data.

land regions of the south temperate zone. As regards the equatorial and tropical regions it would be desirable to utilise data from other stations north and south of the equator which would indicate the area around Trinidad, or perhaps some more potent centre involved in the correlation. An analysis of the winds at littoral stations on the coast of South America from 38° S. to N. of the equator would also help to throw light over the problem in hand.

An attempt to trace a relation between the April to September rainfall at Trinidad and that of the six months following at some places in Europe, the United States, and other regions has failed, but one or two interesting correlations have shown up which may now be disposed of.

It was noted that the rainfall of Java* for the six months, October to March, was in general the reverse of that at Trinidad during the six months following, the correlation co-efficient for the 30 years 1880-1909 was $\cdot 47$ and probable error $\cdot 11$, and during the 18 years 1883-1900, when the variation was more pronounced, as high as $\cdot 37$ with probable error $\cdot 11$. During these 18 years the October to March rainfall at Azo agreed in the main with that recorded at Java for the same period of the *previous* year, the result showing a correlation of $+ \cdot 44$ and a probable error of $\cdot 13$.† It was further observed that the January to March rainfall at Baltimore, U.S.A.,‡ and at San Fernando, near Cadiz,§ on the coast of Spain, for the same months during the period 1851-1880 were in general the reverse of each other, the correlation co-efficient being $- \cdot 57$ and probable error $\cdot 05$. After 1880 until 1904, the last year utilized, there is no agreement, so that the correlation co-efficient for the whole period of 54 years falls to $\cdot 21$. It is of interest to note that the opposition between the rainfall of Stykkisholm and Brussels discovered by Hann, which was well marked during the 21 years 1857-1878, diminished later and completely disappeared in 1900.|| From which it may be inferred that the physical processes at work involved both the Stykkisholm—Brussels and the Baltimore—Cadiz correlations, since a diminution of intensity was noted about the same time, viz. 1880.

* Data from *Regenwaarnemingen in Nederlandsch-Indie*, 1905. Table XV. pp. 510-11. From 1906 to 1909 values computed from data given in subsequent annual volumes.

† For precise value to be assigned to these figures see *Forecasting Weather*, by Dr. W. N. Shaw, F.R.S., p. 362.

‡ Data from Maryland Weather Service, *Climate of Baltimore*, Vol. 2, pp. 186-187.

§ Data from *Schwankungen der Niederschläge*. Von G. Hellmann, Berlin, 1909, p. 1.

|| See Hildebrandsson's fourth paper on "*Centres d'Action de l'Atmosphère*," p. 21.



THAMES VALLEY RAINFALL — JULY, 1913.



ALTITUDE
SCALE

Below 250 feet 250 to 500 feet 500 to 1000 feet Above 1000 feet

SCALE OF MILES

0 5 10 15 20

THE WEATHER OF JULY.

THE British Isles were under the influence of a large anticyclonic system in the beginning of the month, and fair weather prevailed over practically the whole. On the 3rd and 4th a low pressure system over Northern Europe expanded slowly westward, and showers occurred in nearly all parts of Great Britain. Temperature was much below the normal, the maxima being below 60° at many northern and eastern stations, and only reaching 70° or slightly above in the south of England. Weather of a changeable type continued over England generally, but over Scotland and Ireland it was fair and dry. The low temperature persisted, and on the 8th and 9th readings below 40° occurred at Llangammarch Wells, Birr Castle, and many stations in the north-east of England and north of Scotland, and 34° at Balmoral. Frequent local thunderstorms occurred over the south-east of England, those on the 10th and 14th being the most severe. At Lewisham $\cdot 72$ in. of rain fell in 27 minutes during the storm on the 10th. More than an inch of rain fell at many widely distributed stations on the 14th, and more than 3 in. at Mayfield, in the north-east of Sussex. Fine bright weather set in over the western parts of the country and in the extreme north on the 20th, and continued to the end of the month. It was less fine in the east and south-east of England, though hardly any rain fell after the 21st. Temperature rose during the last week, when the maximum readings occurred almost everywhere on 28th or 29th. The highest readings reported were 83° at Milton Bryan, 82° at Marlborough, 81° at Cullompton, and 80° at Salisbury, Bath and Clifton.

The month was dry in all parts of the British Isles, except in the areas shown on the accompanying map, where the severe thunderstorms of the 14th caused irregular patches of heavy rainfall. The total rainfall exceeded 2 inches over a number of scattered areas, reaching 5.81 in. at one station in Sussex, but, otherwise, most of England and Wales had less than an inch of rain during the month. Less than an inch fell also over the east of Scotland including a large area in the centre, and over the southern half of Ireland. The fall reached 3 inches practically nowhere outside the thunderstorm area, and a large part of the normally very wet districts in the west of Scotland had only about 1.50 in. during the month. The south of Ireland and the south-west of England and Wales were relatively the driest parts of the country. The general rainfall expressed as a percentage of the average was: England and Wales, 44; Scotland, 29; Ireland, 33; British Isles, 37.

Sunshine was much more prevalent on the west coast than on the east. Newquay and Turnberry both had rather more than 200 hours, while at Clacton-on-Sea and Nairn less than 135 hours were recorded.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THUNDERSTORM OF JULY 14th—15th.

THE following notes anent a heavy thunderstorm on the night of July 14th—15th, may be of some slight interest. Thunder was heard soon after 1.30 a.m. It gradually approached, and the storm burst on us at almost exactly 2 a.m. Rain began to fall in torrents, the heaviest rain I remember since the storm of May 9th, 1906. When the lightning flashes occurred, the rain appeared like a continuous sheet of falling water, obscuring everything, even a big tree 20 yards from the house. Vivid lightning flashes were comparatively few, and at considerable intervals, but flashes overhead, in or above the clouds, were very frequent. For nearly an hour the thunder was almost continuous, sometimes dying away to a barely audible rumble; but at no time did there seem to be more than a very few seconds without thunder. During this time, it was virtually impossible to associate a lightning flash with any particular clap of thunder for timing purposes. About 2.40 a.m., the storm seemed to be passing away, but it returned, and at 2.50 a.m. seemed again overhead. The rain was now getting less violent, but continued pretty heavy until shortly after 3 a.m., when the storm finally began to move off. By 3.30 it had ceased, and the rain had stopped. As to the amount of rain that fell, I happened to look at the gauge at 6 p.m., when there was .15 in. in it. No rain fell between that and 11 p.m., when it was starlight. Whether any rain fell between then and the beginning of the storm I do not know, but I think probably little or none. My coachman, who is a very early riser, was up about 5 a.m. He tells me there was rain, but not very heavy, for about half an hour between 6 and 7 a.m. At 9 a.m., I found 2.27 in. in the gauge. I think therefore, that one may fairly say that at least 2 inches fell between 1.30 and 3.30 a.m., and most of this must have been between 2 and 3 a.m.

A friend at Stonegate, about $1\frac{1}{2}$ miles west, and about midway between here and The Olives, told me that she had 2.75 in. in her gauge. Miss Luck, of The Olives, tells me that (speaking from memory) she measured 2.30 in. on the morning of the 15th. She added that she was told that at Wadhurst (2 miles N.W. of there), only about 1.30 in. fell.

The storm seems to have been even more severe a little north of us. At Burnt Lodge, a little east of Whiligh, two large oak trees were struck, one in front of the house, and the other behind it.

ERNEST H. CARTWRIGHT.

Myskyns, Ticehurst, Sussex, 20th July, 1913.

It may interest you to have a few particulars of a rather remarkable storm we have just had here. It began yesterday, July 14th, about 2 p.m., when a steady rain commenced, which continued till about 6 p.m. I did not measure the fall up to that hour, but should estimate it at about half an inch. There was no thunder or lightning. No further rain fell until well on in the night. About 11.30 p.m. distant rumblings of thunder began, and it was nearly two hours gradually working up to us, then, about 1.30 a.m., the storm broke with a perfect fury of thunder, lightning and rain. This lasted until about 3 a.m., when the thunder gradually lessened, though the lightning continued until much later. I measured the fall at 10 a.m. and found 3.50 in. in the gauge. Rain, however, still continued all the morning, and I measured again at 2 p.m. to-day, 15th, and found a further .30 in. in the gauge, thus the fall during the twenty-four hours from 2 p.m. on the 14th to 2 p.m. on the 15th was 3.80 in. It has rained slightly at intervals since, and still shows no signs of a definite clearing as I write this at 4 p.m. The two rather unusual features of this storm were, first, the long time the thunderstorm took approaching before it finally broke overhead, and secondly, the fact that the heaviest downpour of rain *preceded* the actual thunderstorm, *i.e.*, this fell between 1.30 and 2.15 a.m., the latter hour being the climax of the storm. Also, I may add, there was practically no wind, not even when the storm broke overhead and the rain came down in solid straight lines. The direction of the storm was apparently from N.W. to S.E. The fall of the barometer was slight. It began to drop at 2 a.m. on Monday, 14th, and fell slowly from 29.85 in. until 4 a.m. on Tuesday, when it reached 29.70 in.; since then it has risen again very slowly. This is the heaviest rainfall I have ever recorded, or my father either, and his records go back over thirty years.

A. G. ROBINS, M.I.M.E.

Bishopstone, Mayfield, Sussex, July 15th, 1913.

I would like to add that our fall for the month of July totalled 5.81 in., which fell on 17 days. Temperature was abnormally low, failing to rise above 60° on four days, and only reaching 70° on four days. The minimum was 43° on the 7th. Altogether it has been an exceptional month.

A. G. R.

August 2nd, 1913.

SUMMER TEMPERATURE.

On the 23rd of July my thermometer registered 58° in the shade at 9 a.m., 54° at noon, 53° at 4 p.m., and 52° at 6 p.m. This morning I have registered 40°, with bright sunshine and cloudless sky. On the 4th January last the minimum temperature was 41°, and on the 5th, 42°.

WILLIAM HALL.

Swerford, Oxford, August 5th, 1913.

FLOODS IN NORTH-WEST WALES.

A GREAT rainfall on June 9th and 10th caused exceptionally high floods in north-west Wales. I have examined the marks made by the flood of December 14th, 1912, on the embankment at Llanrwst, and these showed that it did not reach the top by 5 or 6 inches, but the flood of June 10th overflowed the embankment by at least 3 inches, flooding the meadows and the road.

I went along the rivers Conway and Machno and can confirm the height of the flood as the highest since 1882. In addition to the heavy rain I was told that a big earth slip had taken place at Penmachno, bringing rubbish and one stone of six tons down to the public road. I went to inspect it and found it was the effect of a cloudburst fallen on the lee of the steep hill one mile south-west of Penmachno Church, which occurred, I am informed, when the wind was veering to the west, the marks of the running water in the form of a semi-circle shewing distinctly that it was a cloud burst and not an earth slip as was the local idea.

The following facts relative to the flood may be of interest.

(1) At Cwm Dyli, on Snowdon, some of the rain gauges overflowed. The Llydaw lake rose 3 feet, representing a fall of $4\frac{1}{2}$ inches of rain over the collecting area. This makes no allowance for the water being drawn off for the power station, nor for the water which had still to flow off the ground, and that temporarily stored in the Glaslyn Lake above, perhaps representing another 1.50 in.

(2) A rain gauge at Penmachno, my native place, near Bettws-y-coed, recorded 4 inches. The Machno river suffered the highest flood since 1882. This fact was ascertained from my known marks observed by a friend.

(3) At Llanrwst a house called Bryn Helig was flooded to a depth of 6 inches. This compares with a flood of 1 inch six years ago, but was a little lower than the big flood of 1882. The rainfall at Bettws-y-coed was 2.35 in., at Llanrwst 1.69 in., and at Llandudno only .45 in., thus decreasing greatly towards the lower parts according to the distance from the mountain.

(4) I am informed that the overflow over the Caban Coch dam at the Birmingham waterworks was the greatest since the construction of the dams. Newspapers report very high floods in the Festiniog, Machynlleth and Dolgelly districts.

(5) It rained practically all day in the Snowdon district, but here in the Black Mountains rain did not commence until the evening. I find very often that in ordinary west-east cyclones the rain commences three or four hours earlier at Llanrwst than here, and passes off here three or four hours later than there. Llanrwst lies about 100 miles to the north-west of this place.

J. R. GETHIN JONES.

Capel-y-ffin, Llanthony, Abergavenny, 1st July, 1913.

THE CLIMATE OF TORQUAY.

OUR weather here has been most remarkable. We read of heat waves in London and the Thames Valley, and of temperatures well over 80° . Here we have only touched 70° once this month (on the 16th) and indeed my records show an average maximum for the month up to date of $63^{\circ}3$. Up to May 15th, we had 21.90 in. of rain. Since then there has only been .48 in. and we now need rain badly. I may get a small crop of apples, but pears, plums, and cherries will be a complete failure, and I have no reason to suppose that my neighbours have fared better than myself. This was not due to late frosts, from which indeed we were remarkably free, 6° on the night of April 7th, being the lowest since the middle of March, but to very raw sea fogs, and terrible gales, which between them blackened, and crumpled up bud, blossom, and young shoots as if there had been a really heavy frost. Some of the flowering prunus, pyrus, cerasus, and malus were stripped, and are only now putting out some attempts at foliage.

It seems strange that Torquay should have a reputation for fine bright warm winters and stuffy hot relaxing summers. I have resided here for six years now and my experience has been that the winters are terribly wet, sunless, and windy, and that though one may not get as hard frost as further inland—we had 22° on February 2nd, 1912—yet the damp makes one feel it more; whereas the summers are generally very cool and pleasant.

JOHN EDWARDS-MOSS.

Roby Hall, Torquay, 22nd June, 1913.

HEAVY RAINFALL AT BRIGHTON.

ON Thursday, July 10th, I registered here 1.96 in. of rain for the twenty-four hours ending 7 a.m., then again this morning, the 14th, another 1.06 in. for the past twenty-four hours.

G. B. HAMLIN.

40, East Street, Brighton, 14th July, 1913.~~~~~
INTERNATIONAL BALLOON ASCENTS.

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

November 2nd, 1910.

Starting Point	Country.	A (H _c) miles.	B (T _c) ° F.	C miles.	D ° F.	E miles.	F
Manchester.....	England ..	4.4	—42	11.4	—56	97	S.E.
Brussels	Belgium ..	4.3	—53	6.9	—49	49	E.S.E.
Paris	France ...	6.2	—51	8.4	—62	237	E.S.E.
Hamburg	Germany..	4.8	—65	5.5	?	37	N.E.
Lindenberg.....	„ ..	4.5	—53	9.3	—56	64	N.E.
Strassburg	„ ..	4.4	—51	7.2	—51	86	E.
Munich	„ ..	4.8	—47	9.4	—54	109	N. by E.
Pavia	Italy	6.7	—69	8.4	—69	95	E.
Pavlovsk	Russia	6.6	—84	7.0	—71	39	E.S.E.

November 3rd, 1910.

Starting Point.	Country.	A (H _c) miles.	B (T _c) ° F.	C miles.	D ° F.	E miles.	F
Manchester.....	England ..	5·0	—54	5·6	—45	13	E. by N.
Pyrton Hill.....	„ ..	4·8	—47	10·0	—58	62	E. by N.
Brussels	Belgium ..	4·3	—49	10·8	—65	89	S.E. by E.
Paris	France ..	5·9	—56	10·0	—71	212	S.E. by E.
Hamburg.....	Germany ..	5·1	—67	12·9	—62	44	E.S.E.
Strassburg	„ ..	4·9	—56	8·8	—58	86	E.S.E.
Munich	„ ..	4·8	—56	6·9	—51	48	E. by S.
Vienna.....	Austria ..	4·9	—57	9·6	—65	55	E.
Pavia	Italy	8·1	—74	10·7	—51	129	E.S.E.

November 4th, 1910.

Manchester.....	England ..	6·2	—80	10·0	—76	37	S.E.
Pyrton Hill.....	„ ..	5·1	—51	11·0	—55	60	E.S.E.
Brussels	Belgium ..	5·1	—63	8·8	—65	57	E. by S.
Paris	France ..	*6·2	—46	8·8	—62	236	E.
Hamburg.....	Germany..	4·6	—53	11·3	—62	85	E. by S.
Lindenberg	„ ..	5·2	—54	9·3	—58	30	E. by N.
Strassburg	„ ..	†	—	7·1	—55	145	E.
Manich	„ ..	*9·5	—45	9·8	—71	156	E.
Vienna.....	Austria ..	†	—	12·2	—74	108	E.
Pavia	Italy	7·1	—72	9·9	—78	120	E.
Nizhni Olchedaëff	Russia	5·1	—55	8·1	—53	97	E.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.

* Very indefinite.

† To indefinite to be determined.

The figures are noticeable for the very low values of H_c in column A. Values below 5·0 miles (8 km.) are decidedly rare, and values below 4·4 very rare indeed. The general and continued drift to the eastward over the whole area is also remarkable. The ascents at Manchester and Pyrton Hill on the 4th were not simultaneous, that at Manchester being in the evening and at Pyrton Hill in the morning. The period was one of very general low pressure, and on the evening of the 3rd the centre of a deep depression passed directly over Pyrton Hill, moving from W.N.W. The case is interesting as the detailed figures of the two ascents, before and after, showed no appreciable difference, and I believe that apart from chance variations there is almost perfect symmetry about the centre of a cyclone with regard to the temperature of the upper air and the value of H_c.

REVIEWS.

The Climate and Weather of San Diego, California. Prepared under the direction of Willis L. Moore, Chief United States Weather Bureau, by FORD A. CARPENTER, Local Forecaster. Illustrated. San Diego Chamber of Commerce, 1913. Size 7 × 5, pp. x. + 118.

AN attractively written little book on the most delightful climate in the world. So charmingly are the pleasures of the San Diego climate set forth, and so conscientiously buttressed with official figures that the poor Britisher who reads of this climatic Eden feels like Tantalus when he reflects that he can, at the best, only hope to sample the joys of San Diego as a passing wanderer. Mr. Carpenter writes lovingly of the climate he has studied, which notwithstanding the latitude is cool in summer, and because of the latitude warm in winter, with sunshine on practically every day in the year, with a duration of 211 hours for the least sunny month and 297 for the most sunny. Almost all the conditions of climate are remarkable in showing a small range, the temperature exceeding 90° less frequently than in London, but on the other hand only falling to the freezing point once in more than sixty years. The rainfall, however, is extremely erratic, the average annual fall being 9·62 in., while the driest year had only 3·75 in., and the wettest had 25·97 in.

La Variazione diurna della Temperatura in Italia. [The diurnal variation of temperature in Italy]. FILIPPO EREDIA. (Estratto dagli Annali del R. Ufficio Centrale di Meteorologia e Geodinamica, Vol. 34, Parte I., 1912). Rome, 1912. Size 13½ × 9½, pp. 44.

THIS deals with the mean maximum and minimum daily temperature, and the mean daily variation at 120 Italian stations. At Milan in the heart of the Lombard plain, a region as hot in summer as any in Italy, the mean maxima for April—September, are 66°·2, 73°·4, 82°·7, 87°·9, 85°·6, 77°·1, so that the hottest English summer on record, that of 1911, with the mean daily July maximum of 81°·0 in the south of England, would be exceptionally chilly in Italy. In winter, however, the plain of Lombardy is, with the exception of the mountain regions, the only really cold part of the country, the nightly minimum averaging 30°·3 at Milan and 29°·3 at Turin, somewhat lower, that is to say, than in London. The general character of the weather, notwithstanding, being sunny, dry and calm, is milder than in London, and the cold is of short duration in comparison with higher latitudes. In Rome the mean daily variation of temperature is highest, 21°·2, in July, lowest, 12°·6, in December, and throughout the country the figures show a tendency to be greatest in July, and not in May, as in England, the greatest range occurring just after midsummer, instead of before. The mean daily variation for the year is highest, 21°·2, at Palermo in Sicily, and lowest, 7°·9, at Alassio, near Genoa.

L.C.W.B.

RAINFALL TABLE FOR JULY, 1913.

STATION.	COUNTY.	Lat. N.	Long. W. [°E.]	Height above Sea, ft.	RAINFALL OF MONTH.	
					Aver. 1875— 1909, in.	1913, in.
Camden Square.....	London.....	51 32	0 8	111	2'57	2'31
Tenterden.....	Kent.....	51 4	*0 41	190	2'21	1'64
Arundel (Patching).....	Sussex.....	50 51	0 27	130	2'46	2'47
Fawley (Cadland).....	Hampshire.....	50 50	1 22	52	2'42	1'16
Oxford (Magdalen College).....	Oxfordshire.....	51 45	1 15	186	2'43	'80
Wellingborough (Croyland Abbey).....	Northampton.....	52 18	0 41	174	2'54	1'29
Shoeburyness.....	Essex.....	51 31	*0 48	13	1'73	2'55
Bury St. Edmunds (Westley).....	Suffolk.....	52 15	*0 40	226	2'68	1'16
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	2'37	3'05
Polapit Tamar [Launceston].....	Devon.....	50 40	4 22	315	2'74	'48
Rousdon [Lyme Regis].....	„.....	50 41	3 0	516	2'68	'27
Stroud (Upfield).....	Gloucestershire.....	51 44	2 13	226	2'75	'98
Church Stretton (Wolstaston).....	Shropshire.....	52 35	2 48	800	2'58	'91
Coventry (Kingswood).....	Warwickshire.....	52 24	1 30	340	2'60	'82
Boston.....	Lincolnshire.....	52 58	0 1	11	2'35	'79
Worksop (Hodsock Priory).....	Nottinghamshire.....	53 22	1 5	56	2'35	'99
Macclesfield.....	Cheshire.....	53 15	2 7	501	3'41	1'56
Southport (Hesketh Park).....	Lancashire.....	53 38	2 59	38	2'92	1'33
Arnellife Vicarage.....	Yorkshire, W.R.....	54 8	2 6	732	4'75	'90
Wetherby (Ribston Hall).....	„.....	53 59	1 24	130	2'56	1'17
Hull (Pearson Park).....	„ E.R.....	53 45	0 20	6	2'39	'43
Newcastle (Town Moor).....	Northumberland.....	54 59	1 38	201	2'90	'47
Borrowdale (Seathwaite).....	Cumberland.....	54 30	3 10	423	8'91	1'75
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	3'26	'51
Haverfordwest.....	Pembroke.....	51 48	4 58	90	3'39	'74
Aberystwyth (Gogerddan).....	Cardigan.....	52 26	4 1	83	4'03	2'80
Llandudno.....	Carnarvon.....	53 20	3 50	72	2'52	1'67
Cargen [Dumfries].....	Kirkcudbright.....	55 2	3 37	80	3'20	'63
Marchmont House.....	Berwick.....	55 44	2 24	498	3'30	'79
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	3'73	'75
Glasgow (Queen's Park).....	Renfrew.....	55 53	4 18	144	2'91	1'42
Inveraray (Newtown).....	Argyll.....	56 14	5 4	17	4'72	1'50
Mull (Quinish).....	„.....	56 34	6 13	35	4'12	'96
Dundee (Eastern Necropolis).....	Forfar.....	56 28	2 57	199	2'84	'60
Braemar.....	Aberdeen.....	57 0	3 24	1114	2'65	'27
Aberdeen (Cranford).....	„.....	57 8	2 7	120	3'00	'69
Cawdor.....	Nairn.....	57 31	3 57	250	3'14	1'09
Fort Augustus (S. Benedict's).....	E. Inverness.....	57 9	4 41	68	2'98	1'39
Loch Torridon (Bendamph).....	W. Ross.....	57 32	5 32	20	5'35	1'36
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	2'91	1'32
Wick.....	Caithness.....	58 26	3 6	77	2'67	'95
Killarney (District Asylum).....	Kerry.....	52 4	9 31	178	3'53	'75
Waterford (Brook Lodge).....	Waterford.....	52 15	7 7	104	3'13	'18
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	3'02	'78
Ennistymon House.....	Clare.....	52 57	9 18	37	3'57	1'38
Gorey (Courtown House).....	Wexford.....	52 40	6 13	80	2'90	'32
Abbey Leix (Blandsfort).....	Queen's County.....	52 56	7 17	532	2'99	'93
Dublin (Fitz William Square).....	Dublin.....	53 21	6 14	54	2'60	'63
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	3'16	1'33
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 16	74	3'26	1'50
Cong (The Glebe).....	„.....	53 33	9 16	112	3'72	'82
Collooney (Markree Obsy.).....	Sligo.....	54 11	8 27	127	3'36	1'63
Seaforde.....	Down.....	54 19	5 50	180	3'32	1'45
Bushmills (Dundarave).....	Antrim.....	55 12	6 30	162	3'28	1'52
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	3'34	1'64

RAINFALL TABLE FOR JULY, 1913—*continued.*

RAINFALL OF MONTH (<i>con.</i>)					RAINFALL FROM JAN. 1.				Mean Annual 1875-1909.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.	No. of Days		Aver. 1875-1909.	1913.	Diff. from Aver. in.	% of Av.		
		in.	Date.	Days	in.	in.			in.	
— .26	90	.56	14	12	13.53	12.98	— .55	96	25.11	Camden Square
— .57	74	.41	6	14	13.65	14.06	+ .41	103	27.64	Tenterden
+ .01	100	.52	10	13	14.92	19.79	+4.87	133	30.48	Patching
—1.26	48	.40	6	12	15.75	17.79	+2.06	113	31.87	Cadland
—1.63	33	.17	15	13	13.03	12.19	— .84	94	24.58	Oxford
—1.25	51	.41	10	13	13.68	12.91	— .77	94	25.17	Croyland Abbey
+ .82	147	.80	7	14	9.73	10.51	+ .78	108	19.28	Shoeburyness
—1.52	43	.26	14	13	13.44	12.23	—1.21	91	25.40	Westley
+ .68	129	1.49	14	14	11.98	12.38	+ .40	103	23.73	Geldeston
—2.26	18	.14	9	9	18.62	24.46	+5.84	131	38.27	Polapit Tamar
—2.41	10	.11	22	6	17.01	17.73	+ .72	104	33.54	Rousdon
—1.77	36	.21	6	9	15.83	17.85	+2.02	113	29.81	Stroud
—1.67	35	.35	6	11	16.88	22.32	+5.44	132	32.41	Wolstaston
—1.78	32	.33	5	8	15.35	16.87	+1.52	110	28.98	Coventry
—1.56	34	.23	10	11	12.21	11.57	— .64	95	23.35	Boston
—1.36	42	.38	6	8	13.15	12.12	—1.03	92	24.46	Hodsock Priory
—1.85	46	.57	6	13	18.17	20.15	+1.98	111	34.73	Macclesfield
—1.59	46	.55	6	14	15.88	17.10	+1.22	108	32.70	Southport
—3.85	19	.28	6	8	31.97	37.11	+5.14	116	61.49	Arncliffe
—1.39	46	.57	7	9	14.19	13.21	— .98	93	26.87	Ribston Hall
—1.96	18	.14	5	10	13.47	12.12	—1.35	90	26.42	Hull
—2.43	16	.19	6	10	14.45	14.95	+ .50	103	27.94	Newcastle
—7.16	20	.60	6	14	65.29	77.30	+12.01	118	129.48	Seathwaite
—2.75	16	.13	21	12	20.48	26.44	+5.96	129	42.28	Cardiff
—2.65	22	.30	14	9	22.84	28.64	+5.80	125	46.81	Haverfordwest
—1.23	69	.88	17	14	22.15	34.00	+11.85	154	45.46	Gogerddan
— .85	66	.42	21	13	14.89	17.76	+2.87	119	30.36	Llandudno
—2.57	20	.28	6	8	22.26	29.67	+7.41	133	43.47	Cargen
—2.51	24	.24	3	9	17.68	16.20	—1.48	92	33.76	Marchmont
—2.98	20	.22	17, 21	12	24.83	25.20	+ .37	101	49.77	Girvan
—1.49	49	.47	6	8	18.42	21.40	+2.98	116	35.97	Glasgow
—3.22	32	.39	16	15	34.04	39.28	+5.24	115	68.67	Inveraray
—3.16	23	.26	16	16	27.67	30.04	+2.37	109	56.57	Quinish
—2.24	21	.23	6	6	14.86	15.05	+ .19	101	28.64	Dundee
—2.38	10	.13	5	5	17.80	20.93	+3.13	118	34.93	Braemar
—2.31	23	.30	5	9	17.02	16.39	— .63	96	32.73	Aberdeen
—2.05	35	.50	6	7	15.65	12.35	—3.30	79	29.33	Cawdor
—1.59	47	.47	6	8	23.20	25.87	+2.67	112	44.53	Fort Augustus
—3.99	25	.27	13	9	42.90	45.83	+2.93	107	83.93	Bendarnagh
—1.59	45	1.07	13	4	17.19	12.94	—4.25	75	31.90	Dunrobin Castle
—1.72	36	.15	9	14	15.38	11.76	—3.62	76	29.88	Wick
—2.78	21	.40	8	15	28.40	33.06	+4.66	116	54.81	Killarney
—2.95	6	.09	8	5	20.53	24.28	+3.75	118	39.57	Waterford
—2.24	26	.31	8	10	20.53	25.91	+5.38	126	39.43	Castle Lough
—2.19	39	.54	8	12	23.24	27.50	+4.26	118	46.52	Ennistymon
—2.58	11	.15	18	7	18.32	19.97	+1.65	109	34.99	Courtown Ho.
—2.06	31	.22	18	13	18.83	24.78	+5.95	132	35.92	Abbey Leix
—1.97	24	.16	18	13	14.75	15.73	+ .98	107	27.68	Dublin
—1.83	42	.26	12, 18	12	19.17	23.92	+4.75	125	36.15	Mullingar
—1.76	46	.27	8	19	26.64	34.57	+7.93	130	52.87	Enniscoe
—2.90	22	.42	8	7	25.13	31.95	+6.82	127	48.90	Cong
—1.73	49	.37	8, 18	12	22.19	27.52	+5.33	124	42.71	Markree
—1.87	44	.54	21	11	20.74	21.76	+1.02	105	38.91	Seaforde
—1.76	46	.50	21	9	18.77	16.61	—2.16	89	37.56	Dundarave
—1.70	49	.26	8	14	20.44	24.71	+4.27	121	39.38	Omagh

SUPPLEMENTARY RAINFALL, JULY, 1913.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	1·93	XI.	Lligwy	1·11
„	Ramsgate	1·90	„	Douglas	1·35
„	Hailsham	2·95	XII.	Stoneykirk, Ardwell House...	·59
„	Totland Bay, Aston House...	·72	„	Dalry, The Old Garroch.....	·91
„	Stockbridge, Ashley.....	1·45	„	Beattock, Kinnelhead	·88
„	Grayshott	2·73	„	Langholm, Drove Road	1·08
„	Caversham, Rectory Road ...	·94	XIII.	Meggat Water, Cramilt Lodge	·80
III.	Harrow Weald, Hill House...	1·88	„	North Berwick Reservoir.....	·43
„	Pitsford, Sedgebrook.....	1·32	„	Edinburgh, Royal Observaty.	·46
„	Woburn, Milton Bryant.....	1·39	XIV.	Maybole, Knockdon Farm ...	·68
„	Chatteris, The Priory.....	·77	XV.	Ballachulish House	1·48
IV.	Colchester, Hill Ho., Lexden	1·48	„	Campbeltown, Witchburn ..	1·38
„	Newport, Belmont House ...	1·71	„	Holy Loch, Ardnadam.....	1·37
„	Ipswich, Rookwood, Copdock	2·31	„	Islay, Eallabus	1·32
„	Blakeney	·78	„	Tiree, Cornaigmore	1·37
„	Swaffham	·75	XVI.	Dollar Academy	·83
V.	Bishops Cannings	2·10	„	Balquhider, Stronvar.....	·50
„	Winterbourne Steepleton.....	...	„	Glenlyon, Meggernie Castle..	·70
„	Ashburton, Druid House.....	·48	„	Blair Atholl	·43
„	Cullompton	·68	„	Coupar Angus	·42
„	Lynmouth, Rock House ...	·55	„	Montrose, Sunnyside Asylum.	1·27
„	Okehampton, Oaklands.....	·79	XVII.	Alford, Lynturk Manse	·80
„	Hartland Abbey	·54	„	Fyvie Castle	1·00
„	Probus, Lamellyn.....	·47	„	Keith Station ..	1·05
„	North Cadbury Rectory.....	1·27	XVIII.	Alvey Manse.....	1·19
VI.	Clifton, Pembroke Road.....	·55	„	Loch Quoich, Loan	3·20
„	Ross, The Graig	·73	„	Drumnadrochit	1·78
„	Shifnal, Hatton Grange.....	1·40	„	Skye, Dunvegan	1·14
„	Droitwich	1·20	„	N. Uist, Lochmaddy .....	...
„	Blockley, Upton Wold.....	1·81	„	Glencarron Lodge	1·85
VII.	Market Overton.....	1·46	XIX.	Invershin	1·92
„	Market Rasen	·31	„	Melvich	1·21
„	Bawtry, Hesley Hall	·57	„	Loch Stack, Ardchullin	2·77
„	Derby, Midland Railway.....	·90	XX.	Skibbereen Rectory	·36
„	Buxton	1·39	„	Dunmanway, The Rectory ..	·31
VIII.	Nantwich, Dorfold Hall	1·01	„	Glanmire, Lota Lodge, No. 1	·25
„	Chatburn, Middlewood	1·44	„	Mitchelstown Castle.....	·58
„	Cartmel, Flookburgh	1·04	„	Darrynane Abbey.....	1·74
IX.	Langsett Moor, Up. Midhope	1·49	„	Clonmel, Bruce Villa	·42
„	Scarborough, Scalby	·87	„	Newmarket-on-Fergus, Fenloe	1·09
„	Ingleby Greenhow	1·18	XXI.	Laragh, Glendalough	·42
„	Mickleton	1·18	„	Ballycumber, Moorock Lodge	·81
X.	Bellingham, High Green Manor	·97	„	Balbriggan, Ardgillan	1·16
„	Ilderton, Lilburn Cottage ...	1·08	XXII.	Woodlawn	1·10
„	Keswick, The Bank.....	·93	„	Westport, St. Helens ..	1·29
XI.	Llanfrecfa Grange	·60	„	Dugort, Slievemore Hotel ...	2·69
„	Treherbert, Tyn-y-waun	·86	„	Nohill Rectory ..	1·69
„	Carmarthen, The Friary	·97	XXIII.	Enniskillen, Portora.....	1·50
„	Castle Malgwyn [Llechryd]...	·80	„	Dartrey [Cootehill]	1·75
„	Crickhowell, Tal-y-maes	1·30	„	Warrenpoint, Manor House ..	1·34
„	New Radnor, Ednol	·88	„	Banbridge, Milltown	1·66
„	Birmingham WW., Tyrmynydd	1·34	„	Belfast, Cave Hill Road	1·76
„	Lake Vyrnwy .....	...	„	Glenarm Castle.....	·80
„	Llangynhanal, Plâs Draw.....	1·50	„	Londonderry, Creggan Res...	2·56
„	Dolgelly, Bryntirion.....	2·34	„	Dunfanaghy, Horn Head ...	1·92
„	Bettws-y-Coed, Tyn-y-bryn...	1·27	„	Killybegs	2·41

METEOROLOGICAL NOTES ON JULY, 1913.

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 only one day was entirely sunless, the weather was generally dull and unusually cool. R fell frequently in the first half of the month, but only on 3 days after the 15th, and the last 10 days were all rainless. Mean temp. $60^{\circ}\cdot 2$ or $3^{\circ}\cdot 3$ below the average. Duration of sunshine $100\cdot 6^*$ hours, and of R $35\cdot 4$ hours. Evaporation $2\cdot 15$ in. Shade max. $78^{\circ}\cdot 9$ on 28th; min. $44^{\circ}\cdot 3$ on 8th. F 0, f 0.

TENTERDEN.—A dull month with only $127\cdot 5^{\dagger}$ hours of sunshine and only 5 days with temp. above 70° . Shade max. $73^{\circ}\cdot 5$ on 31st; min. $40^{\circ}\cdot 5$ on 8th. F 0, f 0.

TOTLAND BAY.—Duration of sunshine $161\cdot 1^*$ hours, or $84\cdot 2$ hours below the average, and the least ever recorded here in July. Shade max. $73^{\circ}\cdot 8$ on 31st; min. $50^{\circ}\cdot 0$ on 8th. F 0, f 0.

MILTON BRYANT.—A dull July, hindering haymaking but helpful to the corn. Shade max. $83^{\circ}\cdot 0$ on 12th and 29th; min. $42^{\circ}\cdot 0$ on 7th, 8th and 9th.

IPSWICH, COPDOCK.—A dismal and depressing month though not unfavourable to agriculture. Temp. reached 70° on only 3 days. Duration of sunshine $114\cdot 1^*$ hours. Mean temp. $57^{\circ}\cdot 2$. Shade max. $71^{\circ}\cdot 0$ on 14th; min. $40^{\circ}\cdot 0$ on 8th. F 0, f 0.

POLAPIT, TAMAR.—Very dry month with night temp. low on the whole. Shade max. $77^{\circ}\cdot 6$ on 29th; min. $43^{\circ}\cdot 1$ on 21st. F 0, f 0.

NORTH CADBURY.—Many small falls and provoking drizzles, especially from 15th to 22nd, hindering haymaking. Last 9 days fine and pleasant. Temp. much below average. Shade max. $83^{\circ}\cdot 0$ on 28th; min. $46^{\circ}\cdot 0$ on 9th. F 0, f 0.

HODSOCK PRIORY.—Dry and cool and the dulllest July since 1888. Shade max. $78^{\circ}\cdot 1$ on 29th; min. $42^{\circ}\cdot 5$ on 9th. F 0, f 0.

SOUTHPORT.—Duration of sunshine $186\cdot 4^*$ hours or $29\cdot 0$ hours below the average. Duration of R $33\cdot 1$ hours. Mean temp. $58^{\circ}\cdot 2$. Evaporation $3\cdot 11$ in. Shade max. $73^{\circ}\cdot 0$ on 30th; min. $46^{\circ}\cdot 0$ on 7th. F 0, f 0.

HULL.—Fine and dry but with a great amount of cloud and only $63\cdot 0^*$ hours of sunshine. A fresh gale did damage to trees and property on 23rd. Shade max. $75^{\circ}\cdot 0$ on 13th; min. $45^{\circ}\cdot 0$ on 8th. F 0, f 0.

CARMARTHEN.—The finest and driest July for many years. An excellent hay harvest but water supplies running low.

LLANDUDNO.—Shade max. $71^{\circ}\cdot 0$ on 30th; min. $48^{\circ}\cdot 0$ on 7th.

MARCHMONT.—Duration of sunshine $138\cdot 6$ hours on 28 days.

EDINBURGH.—The driest July since the record began in 1896. Shade max. $74^{\circ}\cdot 4$ on 2nd; min. $42^{\circ}\cdot 2$ on 7th. F 0, f 0.

ARDNADAM.—The first half of month was normal, the latter half very fine. No R after 21st and water supply running short. Shade max. $73^{\circ}\cdot 4$ on 27th; min. $40^{\circ}\cdot 4$ on 8th. F 0, f 0.

COUPAR ANGUS.—R fell sparingly on only 5 days and crops are suffering for want of R. There was much sunshine but an absence of any spell of excessive heat.

LOCH STACK.—Duration of sunshine $116\cdot 9^*$ hours.

WATERFORD.—The driest July for at least 64 years. Light E. winds.

DUBLIN.—The smallest July R since 1870. Mean temp. equal to the average. Shade max. $72^{\circ}\cdot 0$ on 2nd; min. $44^{\circ}\cdot 1$ on 8th. F 0, f 0.

MARKREE.—Slight R fell in the first part of the month, but on the whole the weather was fair generally.

BELFAST.—Beautiful summer weather after 21st, without oppressive heat.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, February, 1913.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
								0-100			inches		
London, Camden Square	55°1	4	24°1	23	46°9	35°3	36°7	85	90°0	21°0	.79	12	8 0
Malta	63°5	2	40°4	14	58°0	50°1	...	82	128°2	..	3°20	15	6 1
Lagos	92°0	6, 14	71°0	15	89°1	75°9	73°7	72	152°2	69°2	2°98	7	5 6
Cape Town	95°1	4	56°2	17	80°4	63°5	60°9	71	...	...	.84	6	3 3
Natal, Durban	84°2	2	66°2	26	80°7	70°2	71°7	83	...	...	4°60	10	4 9
Johannesburg	81°8	27	50°2	21	76°0	55°8	53°9	79	155°8	49°9	3°08	15	4 7
Mauritius	86°9	6	66°6	3	84°2	73°2	72°0	82	157°0	61°9	5°69	21	6 7
Bloemfontein	89°9	1	54°5	24	80°9	60°2	60°2	78	...	...	4°82	11	4 3
Calcutta... ..	88°8	23	54°7	6	81°4	62°3	62°5	74	...	48°0	3°29	4	3 1
Bombay... ..	87°4	23	63°3	26	84°1	69°7	65°1	69	124°8	56°9	.00	0	0 8
Madras	89°3	24	64°6	10	87°0	71°2	70°3	77	138°9	61°9	.00	0	2 7
Kodaikanal	73°7	23, 24	40°6	5	68°2	47°0	43°4	64	146°6	29°0	1°07	5	3 7
Colombo, Ceylon	90°1	3, 21	66°3	9	88°2	71°6	72°2	79	157°0	58°0	2°26	8	4 3
Hongkong	73°9	19	50°8	26	64°6	57°3	54°9	81	...	...	2°39	6	6 8
Sydney	100°5	18	60°9	13	80°5	66°5	60°8	65	154°9	53°0	1°30	16	4 7
Melbourne	105°3	4	47°2	21	78°9	58°3	52°5	55	155°2	42°1	1°19	4	4 9
Adelaide	104°8	25	52°8	2	84°8	61°8	54°2	50	166°4	44°4	2°56	6	...
Perth	99°9	12	49°0	1	86°3	63°4	56°2	53	166°0	40°9	.00	0	2 2
Coolgardie	108°2	24	52°0	5	93°6	62°3	53°8	41	174°0	49°8	.00	0	2 3
Hobart, Tasmania	92°6	24	46°3	21	71°2	52°8	47°3	56	154°8	39°4	.31	7	5 4
Wellington	78°2	20	47°8	24	68°4	56°7	52°8	71	140°2	33°6	1°71	8	6 5
Auckland	79°0	12	52°0	24	72°1	58°7	57°7	77	145°0	48°0	1°38	9	5 9
Jamaica, Kingston	89°3	6	61°1	14	86°0	67°2	65°9	77	...	...	.06	2	3 8
Grenada	83°0	ser.	69°0	15, 18	81°4	71°2	...	73	139°0	...	3°26	16	2 4
Toronto	53°2	20	—1°4	10	28°0	12°7	13°0	81	...	—4°5	1°14	12	5 1
Fredericton	37°5	21	—20°0	25	21°7	1°8	...	82	...	...	2°87	13	4 6
St. John, N.B.	46°2	1	—10°7	10	23°9	8°3	...	70	...	...	2°69	11	4 8
Edmonton, Alberta	50°0	15	—33°0	3	22°9	4°7	...	79	96°6	—37°2	.39	10	6 7
Victoria, B.C.	50°5	16	27°0	25	44°0	32°8	33°0	81	...	...	1°91	8	5 9

MALTA.—Mean temp. of air 54°·1. Average daily sunshine 5·4 hours.

Johannesburg.—Bright sunshine 221·8 hours.

Mauritius.—Mean temp. of air 0°·5 and R 1·34 in. below averages. Mean hourly velocity of wind 10·7 miles or 0·3 miles below average.

KODAIKANAL.—Bright sunshine 227 hours.

COLOMBO.—Mean temp. of air 79°·9 or 0°·2 below, of dew point 1°·8 above, and R ·78 in. above, averages. Mean velocity of wind 4·2 miles per hour. TSS on 9 days.

HONGKONG.—Mean temp. of air 60°·5. Mean hourly velocity of wind 13·1 miles. Bright sunshine 107·7 hours.

Sydney.—R 3·38 in. below, temp. of air 2°·4 above, averages.

Melbourne.—Mean temp. of air 1°·3 above, and R ·55 in. below, averages.

Adelaide.—Mean temp. of air 0°·7 below, and R 1·96 in. above, averages. With one exception the heaviest R in 74 years; 1·88 in. fell in 45 minutes on the 13th.

Perth.—R ·32 in. below, and temp. 0°·6 above, averages.

Hobart.—Mean temp. of air 0°·6 below, and R 1·16 in. below, averages.

Wellington.—R 1·62 in. below average. Bright sunshine 219·4 hours.