

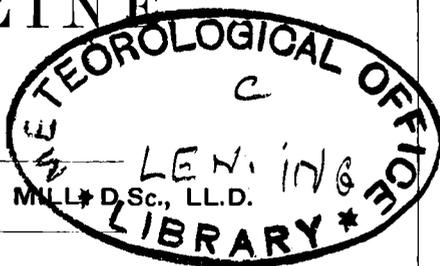
with my kindest regards

*To
Mr. M. M. M. M. M.*

*Newport Island
April 1909*

SYMONS'S
METEOROLOGICAL
MAGAZINE

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



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RAINFALL OF THAMES VALLEY, JANUARY, 1909.



ALTITUDE SCALE

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

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

Symons's Meteorological Magazine.

No. 517. FEBRUARY, 1909. VOL. XLIV.

THE COLD PERIOD OF MAY IN ARCTIC AND ANTARCTIC REGIONS, WITH SPECIAL REFERENCE TO 1903.

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

LONG before the days of thermometers it was well known that there occurred marked interruptions in the seasonal rise or fall of temperature. Year after year, at periods when the temperature should normally have been steadily rising, a blast of winter cold would make itself felt, while on the other hand, when the advent of winter might normally have been expected, a period of unseasonable warmth would intervene. Among such interruptions of temperature change the cold period which occurs on the 11th, 12th, and 13th of May, is one of the best known. References to this period, known on the continent as the Ice Saints' Festival, are freely incorporated in popular weather lore. Explanations of these interruptions of temperature, based on an examination of European data, were given many years ago by Dr. Buchan and others.

It has of late been more and more recognised that for the intelligent comprehension of meteorological phenomena in any specific area, we require maps dealing with the whole globe. We may take, as a practical illustration of this principle, the way in which information is obtained from widely separated localities, in connection with the preparation of Indian monsoon forecasts. From regions as far distant as Argentina and Siberia monthly cables of barometric pressure are dispatched, which information is profitably turned to account by those whose business it is to estimate the probable intensity of the monsoon current, on which depends the well-being of that country. It hardly comes as a surprise, therefore, to find that there is a most intimate and well marked relation between the meteorological conditions over the Antarctic continent, and those prevailing in Europe and regions in higher northern latitudes up to the limit of observation: this I shall endeavour to show for that

curious interruption in the normal seasonal rise of temperature known as the cold period of May.

The recent publication of the meteorological results of the British and Scottish Antarctic Expeditions places a rich mine of information regarding the climatic features of Antarctica at our disposal, which will be greatly enhanced by the further results obtained by the German, Swedish, French, and Argentine expeditions, detailed reports of which will appear in the immediate future. Many interesting facts, some of the most unexpected character, have already come to light, and that further novel developments may be expected, directly bearing on fundamental problems of atmospheric circulation, will be seen from the manner in which the observations of the *Discovery* and *Scotia* throw light on a phenomenon hitherto exclusively associated with a portion of the northern hemisphere, namely, the cold period of May.

This cold period, as is apparent from the following tables, was well marked at the winter quarters of the *Discovery* both in 1902 and 1903 as well as at Cape Adare in 1899. The following are 5 day means of pressure and temperature :—

<i>Temperature.</i>					<i>Pressure.</i>			
<i>DISCOVERY.</i>			<i>CAPE ADARE.</i>	At 32° and Sea Level.				
Lat. 77° 51' S.			Lat. 71° 18' S.					
Long. 166° 45' E.			Long. 170° 10' E.					
May.	1902.	1903.	1899.	Mean.	1902.	1903.	1899.	Mean.
					in.	in.	in.	in.
1—5	— 0·2	— 7·3	3·6	— 1·3	29·043	29·139	29·025	29·076
6—10	— 5·6	—16·5	6·2	— 5·3	28·990	·318	·164	·157
11—15	—21·0	—34·5	—13·9	—23·0	29·546	·270	·325	·380
16—20	—23·4	—10·3	— 1·9	—11·9	·761	·121	·037	·306
21—25	—19·2	—13·0	— 4·4	—12·2	·184	28·946	28·994	·041
26—31	— 8·4	—18·0	—13·0	—13·1	·131	29·147	·613	28·964

It will be observed that, although temperature should be falling in this, a late autumn month of the Southern hemisphere, the mean temperature of the five days ending with the 15th is markedly lower than at the end of the month. This low temperature is associated with a decided rise of pressure, while the relatively high temperature which follows is accompanied by a low pressure.

The cold period of May comes out very clearly at a large number of places in the Argentine Republic north of Lat. 40° S. as well as at the S. Orkneys in 61°. In this connection I have tabulated mean daily values of pressure and temperature based on long periods of years for 15 stations in the Republic. The following temperature values for a few of these stations as well as data from 16 years observations in the Greenland Sea, and during the drift of the *Fram*, may be of interest.

While, as will be seen from the table, the cold period is well marked at the South Orkneys, other information shows that it does

not appear in the vicinity of Cape Horn nor on the Atlantic and Pacific coasts of S. America up to about 40° N. latitude, this being

Mean Temperature of 5-day periods in May.

	SOUTH ORKNEYS.	BUENOS AIRES.	CORDOBA.	GREENLAND SEA.	FRAM.
	Lat. 60° 44' S. Long. 44° 50' W.	Lat. 34° 37' S. Long. 58° 22' W.	Lat. 31° 25' S. Long. 64° 12' W.	Lat. 77° N. Long. 7° E.	Lat 83° N. Long. 76° E.
May.	5 years.	50 years.	20 years.	16 years.	3 years.
1—5	22·9	59·1	57·9	20·8	—0·8
6—10	16·8	58·0	56·6	19·8	6·1
11—15	16·7	54·9	53·0	19·4	6·7
16—20	18·2	56·3	53·1	22·8	11·2
21—25	13·8	54·4	52·4	25·4	23·1
26—31	14·6	54·6	53·8	29·5	24·3

due to the development of a cyclonic area over that region, whereas in the northern part of Argentina and Chile well marked anti-cyclonic conditions prevail. In the Greenland Sea it is also associated with a high barometer. As regards Europe, where the cold spell shows itself more in the form of a retardation of the seasonal rise than of a fall of temperature, I do not propose to enter into detail, but it may be of interest to point out that the anticyclone which normally covers Scotland about the middle of May is responsible for a remarkable rise of temperature on the summit of Ben Nevis which is under the influence of a descending current of air warmed dynamically by compression.

The cold period of May is thus a bi-polar phenomenon experienced from 78° S. to at least 84° N. over the region discussed. It is specially marked in Argentina and Chile in the southern, and over the greater part of Europe in the northern hemisphere. It is absent or but feebly developed in S. America south of 40° S. At all places where it occurs it is associated with high pressure, and the anti-cyclonic conditions relative to the normal are most pronounced in Antarctica. At places where it does not occur cyclonic conditions prevail. This cold period is followed by a great rise of temperature in the northern, and a slight rise in the southern hemisphere which is most abnormal, occurring, as it does, within four weeks of the winter solstice in the southern hemisphere.

So regular a feature is the cold period of May at the South Orkneys that in only one year (1906) since the station was established in March, 1903, has it failed to make its appearance, and one is induced to ask why it failed on that occasion. The explanation is obvious when we look at a map showing the pressure distribution over the globe from 80° W. to 30° E. Over the north polar regions, north of latitude 60°, in the month under review, there was an unwonted development of anti-cyclonic conditions, while the British Islands and middle and eastern Europe were the theatre of cyclonic activity. The same conditions prevailed in the southern hemisphere at least south of 25° S. The mean barometric pressure in Buenos Aires was the lowest in

May since 1858, and there was an almost complete absence of anti-cyclonic conditions. Further south, up to at least the latitude of the South Orkneys, pressure was abnormally low, and the temperature consistently high. The cold spell was felt in the Arctic, in Iceland, in the British Islands, and possibly in other places, but at St. Petersburg the temperature rose to 86° on the 18th, while the mean, from the 1st to the 10th, was $20^{\circ}\cdot 4$ above the normal.* At Buenos Aires temperature fell and pressure rose about the middle of the month, but owing to the increased southern extension of the normal low pressure area, the temperature did not fall at the South Orkneys. This was probably associated with a great development of the Antarctic anticyclone, but we have no data in this connection. For the supply of a large mass of material from Iceland and the Arctic dealing with the meteorology of this abnormal month, I am much indebted to Captain Ryder, Director of the Danish Meteorological Institute.

THE COLD PERIOD OF MAY, 1903.

In the following table will be found five day means of temperature for a large number of places, for the month of May, 1903. Similar means of barometric pressure have been computed for all the stations, but in view of the early publication, by the Meteorological Office, of the international synoptic charts for the years 1902 and 1903, embracing the whole southern hemisphere south of 30° S., it does not appear necessary to print the data, which I shall briefly summarise. By combining the existing daily weather charts, issued by the various meteorological organizations in the northern hemisphere, with the southern charts, and plotting sea and other observations for the regions north and south of the Equator not cartographically represented, we shall be able to have a picture of the general conditions over the whole globe. In this way much light will be thrown on the approximate cause of this cold period, and subsequent rise of temperature in the Antarctic and the south temperate zone.

The following condensed abstract of the conditions in 1903, taken in connection with what I have already said regarding the normal conditions, may meet the exigencies of space.

(1) That the cold period of May, 1903, was most marked in Antarctica, where it was accompanied by a considerable increase of pressure. As the pressure increase was very large at the South Orkneys it is not unlikely that the focus of anticyclonic activity was located to the south of the Weddell Sea in 78° S., 60° to 20° W., another centre being located in the north of Argentina.

(2) That between the 11th and the 15th a low pressure area was formed, probably round the globe, between latitudes 40° and 59° south, and that in those regions the cold spell did not occur. This is supported by data from the Cape Horn region and Kerguelen. Temperature, however, fell at the Falkland Islands.

(3) That over the greater part of South America and Europe

* See "The Rainfall of Scotland in May, 1906," by A. Watt. *Jour. Scot. Met. Soc.*, 3rd Series, No. XXIII.

MEAN TEMPERATURES FOR 5-DAY PERIODS DURING MAY, 1903.

NOTE.—The means for the British Islands are the average of the 20 stations given in returns from "Meteorological Observations at Stations of the Second Order." M signifies that the mean is the average of the daily maxima and minima.

STATION.	Lat.	Long.	Height, feet.	Hours.	1—5.	6—10.	11—15.	16—20.	21—25.	26—31.	M.F.A.S.
<i>Discovery</i> ...	77 51 S.	166 44 E.	4	2 hourly	—13.0	—16.5	—34.2	—10.3	—13.0	—18.0	—16.0
South Orkneys, Cape Pembroke	60 44	44 39 W.	17	hourly	11.5	12.0	5.3	20.4	27.7	24.2	17.1
Falkland Islands...	51 41	57 42	20	4 hourly	41.1	42.0	38.4	42.9	41.9	40.8	41.2
<i>Atlantic Coast—</i>											
Dunqueness...	52 24 N.	68 25	10	8, 2, 9	42.7	42.3	43.4	41.9	42.0	41.4	42.1
Port Coyle...	51 00	69 20	50	M	43.9	40.6	42.6	39.6	44.6	44.2	41.2
Port Madryn ...	42 46	65 01	76	M	56.3	51.4	47.7	49.8	51.4	48.0	50.6
Buenos Ayres ...	34 37 S.	58 22	72	7, 2, 9	60.6	62.3	52.2	56.5	59.0	58.6	57.9
Cordoba ...	31 25	64 12	1437	M	58.3	65.8	54.3	49.1	57.0	57.9	57.1
Rio de Janeiro ...	22 54	43 10	203	M	76.6	76.6	71.8	65.3	68.7	68.4	71.2
<i>Pacific Coast—</i>											
Evangelists Island	52 24	76 06	174	8, 2, 9	42.9	41.6	45.3	44.1	41.4	43.5	43.0
Point Zarara ...	40 01	73 44	125	"	52.7	51.6	50.1	49.8	51.2	49.3	50.7
Juan Fernandez ...	33 37	78 50	33	"	60.6	59.6	58.7	58.2	59.1	58.2	58.9
Chanaral Island ...	29 01	71 37	157	"	58.2	58.5	54.9	54.4	55.5	57.1	56.4
Iquique ...	20 12	70 11	30	"	62.5	62.6	62.6	62.0	61.8	61.5	62.1
Sacre (Bolivia) ...	19 02	65 17	9331	"	58.3	56.8	54.5	54.1	57.2	56.8	56.1
Batavia ...	6 11 N.	106 50 E.	23	hourly	79.5	78.0	80.6	79.3	80.7	79.2	79.4
Mexico ...	19 26	99 08 W.	7480	"	61.9	64.8	64.9	69.4	69.8	68.8	66.6
Honolulu ...	21 18	157 50	50	6, 2, 9	70.0	70.2	71.8	69.8	73.2	72.6	71.3
Turin ...	45 04	7 42 E.	906	9, 3, 9	50.8	54.5	52.7	58.7	66.4	62.2	57.7
Stäntis ...	47 15	9 20	8202	hourly	28.7	27.8	25.2	25.8	37.9	38.4	30.9
Zurich ...	47 23	8 33	1617	"	51.5	52.6	51.1	50.8	63.3	63.7	55.6
Bremen ...	53 08	8 48	52	"	51.6	49.5	47.4	46.4	54.4	64.8	52.3
Potsdam ...	52 23	13 04	279	"	62.3	53.3	50.8	48.0	58.7	64.0	56.4
Vienna ...	48 15	16 21	666	"	59.6	57.9	56.3	52.8	59.1	62.7	57.7
Karlsruhe ...	49 01	8 25	415	M	54.8	55.7	52.3	51.5	62.4	66.0	57.4
England (10 Stations)	52 45	2 07 W.	189	M	50.1	48.7	48.0	48.6	55.3	57.7	51.5
Scotland (6 ")	57 06	3 50	277	M	45.6	44.5	46.0	46.4	52.5	54.4	48.3
Ireland (4 ")	53 45	7 20	165	M	49.0	47.3	47.9	48.8	52.4	56.3	50.5
Stockholm ...	59 21	18 03 E.	146	hourly	41.9	41.5	45.9	47.8	54.9	61.0	49.3
Christiania ...	59 55	10 43	82	"	49.2	43.0	47.0	47.8	55.3	65.6	51.8
Skudenæs ...	59 09	5 16	12	8, 2, 8	49.4	45.9	44.7	45.9	51.5	56.9	49.1
Bodö ...	67 17	14 24	67	"	39.0	39.6	40.2	45.2	48.8	48.9	43.7
Vardö ...	70 22	31 08	33	"	22.9	29.2	38.1	37.7	39.2	42.6	36.2

pressure rose with a sharp drop in temperature, but that Ireland, Scotland, Norway and Sweden were under the influence of a low pressure area and did not experience the marked fall of temperature which occurred in England and Southern Europe.

(4) That the abnormally warm period over Antarctica and South America, from the 21st to the 25th, was accompanied by a general fall of pressure, while in Europe temperature rose sharply with an increase of pressure most pronounced north of 50° N.

While I have been dealing with one specific cold period experienced, as we have seen, in both hemispheres, an examination of a large mass of data published in the *Annals of the Argentine Meteorological Office* as well as daily mean temperatures for each day in the year, at the South Orkneys for 5 years, at Buenos Aires for 50 years and at Cordoba for 20 years, enables me to affirm that warm and cold periods are synchronous in both hemispheres. This is especially the case over the Atlantic area and adjacent continents from about 70° W. to 30° E. If, for example, one plots the mean daily temperature at the winter quarters of the *Discovery* in 78° S. and of the *Scotia* in 61° S., for the year 1903, and compares them with similar curves of daily temperature in Europe (see, for example, the chart of mean daily temperature at 4 stations, appended to Professor Schultheiss' report on the meteorology of Baden, *Deutsches Meteorologisches Jahrbuch für 1903. Baden*), the inter-relation between these remote regions can be seen at a glance. Not only so, but the dominating influence of the conditions in Antarctica proper, on the climate of the S. Orkneys, the Falkland Islands, and Argentina are also very pronounced.

Further, the curve of mean barometric pressure at the South Orkneys for each day in the year, during the last five years, bears so close a resemblance to that which I prepared for Edinburgh, based on 50 years' data, that it would appear that the two barometers are moving in unison. The explanation of this is yet to be discovered, but that there is such unison seems to me indisputable in view of the data before me. That there are such intimate inter-relations between that portion of the globe covered by the north and south Atlantic seems to be due to the regular sequence of the atmospheric "centres of action," which are, the north polar anticyclone, the Icelandic low, the north Atlantic high, the south Atlantic high, the Weddell Sea low, and the Antarctic anticyclone, the centres of which, meteorologically speaking, are approximately in the same meridians. The simplicity of this arrangement is obviously due to the absence of disturbing land masses.

In conclusion, I can only reiterate what I emphasized at the International Polar Congress held at Brussels in 1906, namely, that the next Polar campaign for meteorological purposes must be directed simultaneously to both Arctic and Antarctic regions, since it is only in this way that we shall be able to throw light on the inter-relations that would appear to exist between the north and south polar circulations.

SUNSHINE FOR JANUARY IN LONDON.

THE comparatively small number of sunshine recorders in use makes it impossible to prepare anything approaching to a correct map of the distribution of duration of sunshine in London and its immediate neighbourhood. This being so, we think it is not without interest to compare the sunshine of January, 1909, as observed at three characteristic stations, (1) the tower of the Wesleyan Training College at Westminster, the record for which is taken from the *Daily Weather Report* of the Meteorological Office, this record being taken 80 feet above the level of the ground; (2) the roof of the rainfall office at Camden Square, the instrument being 14 feet above the ground, and the position three miles north of Westminster; and (3) Mill Hill, where the recorder is 4 feet above the ground, and its position 6 miles north-west of Camden Square or 9 miles north-north-west of Westminster. From the elevated position of the Westminster instrument it undoubtedly records much more sunshine than could be registered at the ground level, even with an equally free horizon. At Camden Square surrounding trees and houses cut off an appreciable amount of direct sunshine in summer; but in winter the rays of the sun reach the recorder as soon as the sun is high enough to give a record in clear air. At Mill Hill the exposure is almost perfect from horizon to horizon. The pattern of sunshine recorder is the same at all three, being that known as the Campbell-Stokes.

Daily Sunshine for January, 1909.

	West- minster. 107 ft.	Camden Square. 125 ft.	Mill Hill. 390 ft.	West- minster. 107 ft.	Camden Square. 125 ft.	Mill Hill. 390 ft.	
1....	—	—	—	17....	1·1	0·9	2·2
2....	—	—	—	18....	2·6	1·4	2·3
3....	—	—	—	19....	—	0·6	1·0
4....	—	—	—	20....	0·5	4·6	6·0
5....	—	—	—	21....	—	0·7	0·3
6....	0·2	—	0·7	22....	—	—	—
7....	2·5	2·6	2·9	23....	—	—	—
8....	3·5	3·9	4·0	24....	—	—	3·0
9....	0·7	2·6	1·8	25....	—	2·2	5·7
10....	—	—	—	26....	0·3	3·5	5·0
11....	1·3	1·3	2·5	27....	—	—	4·7
12....	2·9	3·7	5·0	28....	—	—	—
13....	—	—	—	29....	0·1	—	—
14....	2·8	2·2	3·6	30....	3·8	5·0	5·0
15....	5·9	5·0	6·1	31....	—	—	—
16....	4·8	4·4	5·6				
				Total.....	33·0	44·6	67·4

The Table shows that the total duration of sunshine for the month was 33 hours at Westminster, 44½ hours at Camden Square, and 67½ hours at Mill Hill; in other figures, taking the Westminster sunshine as 100, that at Camden Square was 135 and at Mill Hill 204, or more than double. Unfortunately the wealthy dwellers on

the margin of Hampstead Heath have succeeded in preventing the establishment of a meteorological station there, so it is impossible to say whether the sunshine for the month there was proportional to its distance from Westminster, or to its height above the sea. During the four days from the 24th to the 27th, the sun shone brightly for 20 minutes at Westminster, for $5\frac{3}{4}$ hours at Camden Square, and for $18\frac{1}{2}$ hours at Mill Hill. The contrast was most marked on the 27th, when the prevalence of fog prevented any record at Westminster or Camden Square; but, as the fog ceased about the level of 320 feet on the slopes of Mill Hill, the record there showed a duration of $4\frac{3}{4}$ hours. On the 28th, however, the fog rose higher, and no sunshine was recorded at any of the three stations.

We call attention to these striking differences between places lying within the London postal district, and within 10 miles of Charing Cross, in order to show how much interest attaches to differences in climate due to local differences in configuration; and how misleading it is to compare, say, "London" as a whole on the strength of the reading at one station with, say, Brighton or the Isle of Wight. The variability of duration of sunshine is perhaps greater than that of any other meteorological element, and also more important; but very substantial differences in temperature and rainfall also occur within a very few miles when the surface of the ground is undulated to the extent of a few hundred feet.

THE WEATHER OF JANUARY, 1909.

By FRED. J. BRODIE.

THROUGHOUT the earlier half of January, and in fact up to about the 18th of the month, the weather over the United Kingdom was influenced by large cyclonic disturbances, whose centres moved from Iceland to the north of Scandinavia. The prevailing winds were therefore from the westward, and the weather was of a very changeable character; but in the southern districts the rains were usually light, and were interspersed with long intervals of bright sunshine. The passage of the various northern disturbances was accompanied by frequent slight variations of wind, between south-west and north-west, and by considerable fluctuations in temperature. During the first six days, when the air came mostly from the south-westward, the weather was mild and open, especially about the 2nd and 3rd, when the thermometer rose to between 50° and 55° in all districts excepting the south-east of England, and touched 56° at one of the most northern stations, Wick. Thunderstorms occurred in various parts of Great Britain on the 6th and 7th, and again about a week later.

A temporary break in the spell of mild weather was brought about

on the 7th and 8th by a change in the movement of one of the northern low-pressure systems, the centre passing in this case in a southerly direction across Scandinavia and Denmark to the Baltic. The wind in these islands consequently shifted for a time to north-west and north, and blew with the force of a gale, with a decided fall of temperature, and squalls of hail or snow in many northern and eastern districts. Sharp frosts were experienced on the nights of the 7th and 8th, the sheltered thermometer sinking to 25° at Cromer and West Linton, and to 26° at Buxton and Llangammarch Wells, while the thermometer on the grass fell to 20° , or slightly below it, at several stations in the northern and central parts of the country.

On the 9th the wind returned to the southward of west, and the weather again became mild, the open conditions lasting in the southern districts until after the middle of the month. In Scotland and the north of Ireland there was, however, after the 10th a considerable admixture of cold breezes from north-west, with heavy falls of snow between the 14th and 16th. Sharp frost occurred in the north on the 12th and 13th, when the thermometer in the screen fell to 18° at Balmoral and 24° at Strathpeffer and West Linton, the readings on the grass being as low as 9° at Crathes, 12° at Balmoral, 16° at West Linton, and 19° at Morpeth (Cockle Park). After the 16th a strong south-westerly wind set in over the entire kingdom and occasioned a rapid melting of the snow in the north, which, together with a heavy fall of rain on the 17th, led to floods of considerable severity.

After the 19th, the conditions were almost persistently anti-cyclonic, and the wind therefore fell light, while thick fogs appeared in the closing week in many inland parts of the country, the weather in surrounding places being at the time exceedingly fine and bright. Temperature now fell decidedly, and between the 25th and 28th a very sharp frost was experienced over nearly the whole of England and Wales. In the screen the thermometer fell below 20° in many places, and slightly below 15° at some of the more central stations; while on the surface of the grass the readings were as low as 2° at Llangammarch Wells, 10° at Harrogate, and 11° at Morpeth, Sheffield, Birmingham and Portsmouth. In Ireland and Scotland the weather was less severe than in England, a similar feature being observed in connexion with the December frost, which, by way, occurred at almost precisely the same time in the month. At the close of January a north-westerly breeze sprang up, and the thermometer rose somewhat decidedly, but over the country generally it remained below its normal level for the time of year.

Over England the mean temperature of the month differed but little from the average. In Ireland there was a general excess of warmth, while in Scotland the results were very discordant, some stations showing an excess and others a slight deficiency.



Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE LOW TEMPERATURE OF DECEMBER IN LONDON.

I SEE by a note in the last number, that the maximum temperature of $23^{\circ}7$ in December 29th last is the lowest maximum recorded at Camden Square, with one exception, in 51 years. It is interesting to observe the effect of dense white fog such as we get in a low-lying station like this (16 ft. above sea level), situated practically in a river valley. I have registered two maxima lower than the one you quote, and one equal to it in 25 years here, viz. : January 4th, 1893, $22^{\circ}1$; January 1st, 1887, $22^{\circ}5$; December 14th, 1890, $23^{\circ}8$. The maximum here on December 29th last was $24^{\circ}8$.

I am responsible for the maximum of $19^{\circ}5$ during the day of December 22nd, 1890, quoted in Mr. Hawke's letter, but emphasis must be laid on *day*, i.e., up to 9 p.m., as by 9 a.m. next day the temperature had risen to $29^{\circ}5$. Similarly on January 5th, 1894, the maximum up to 9 p.m. was only 21° .

On January 25th this year the maximum here was $34^{\circ}3$, while at St. James' Park it was 41° , again owing to thick white fog just here.

G. SEARLE.

30, Edith Road, West Kensington, W., January 27th, 1909.

THE QUESTION OF SUNSPOT INFLUENCE.

It occurred to me lately to treat the subject in this way :—

From the series of annual sunspot numbers (1841–1907, Wolf & Wolfer's), pick out the 12 highest and the 12 lowest, noting the years. Call those year groups A and B. Next, find the averages of various temperature items, at Greenwich, in the years of Group A, and in those of B, and compare those averages.

The group A contains (in descending order), '70, '48, '71, '72, '47, '49, '60, '59, '93, '94, '61, '92. Group B (in ascending order), '01, '78, '56, '02, '79, '89, '55, '88, '90, '67, '00, '43.

The items dealt with in the table below are these :—*a*, number of frost days in the year ; *b*, frost days in first half ; *c*, frost days in second half ; *d*, frost days in December—February (following year) ; *e*, days with 70° or more ; *f*, days with 80° or more ; *g*, mean temperature of spring ; *h*, mean temperature of autumn ; *i*, warm months in year.

	Averages.								
	<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>	<i>e.</i>	<i>f.</i>	<i>g.</i>	<i>h.</i>	<i>i.</i>
Group A	53·9	36·1	17·8	33·6	80·5	16·7	48°3	50°1	6·5
„ B	63·2	41·3	21·8	40·1	66·2	9·9	46·5	50·0	5·1
A—B	−9·3	−5·2	−4·0	−6·5	+14·3	+6·8	+1·8	+1	+1·4

These data seem to agree in indicating more warmth, on the

whole, when sunspots are numerous than when they are few. Of the seasons, (mean temp.) I have given only spring and autumn (the others being dealt with otherwise), but it could be shown that *any three contiguous months* present the same relation. In autumn the difference is least of all; in February-April greatest (+2°·1).

While most of those differences are considerable, it is doubtful, I think, if the *maximum* contrasts are brought out by this method, at least in the case of winter cold, where some tendency to "lag" may be perceived.

ALEX. B. MACDOWALL.

A PECULIAR RAINBOW.

BETWEEN 9.30 a.m. and 9.45 a.m. to-day a peculiar rainbow was observed here. Opposite the sun there was a bow, similar in form to that of an ordinary rainbow, the highest point of which I should judge to be about 40° above the horizon. The bow, however, was nearly colourless, the brightest portion appearing quite white, with a darker reddish tinge on the outside, and perhaps just a trace of violet inside. The most peculiar thing, however, was that the bow appeared not to be associated with falling rain in the usual way, but to be formed in the clouds; for the white illuminated part showed up, very distinctly, small cirro-stratus clouds which were continually passing by from the N.W., whilst the bow remained stationary. The lower side portions of the bow, and at times the whole, were obscured by passing scud. The sun was not shining *here* at the time. There had been a good deal of rain in the night, and the weather was unsettled and showery.

ARTHUR PEARSE JENKIN, F.R.Met.Soc.

Treawirgie, Redruth, January 8th, 1909.

THUNDER SQUALL ON JANUARY 7th.

A VERY short, but violent thunder squall passed over this district on the night of January 7th. The weather previous to the disturbance had been overcast and squally, with a falling barometer. Towards 11.45 p.m. a dense black cloud (cu-nim.) moved up rapidly from the W., the wind increasing suddenly to almost gale force, and accompanied by a marked moaning sound. There was a loud rolling clap of thunder at 11.50 p.m. at zenith, very heavy rain commencing at 11.52 p.m., the wind-force being estimated as 7. The falling rain had a distinctly rotatory motion (as seen against an arc lamp), and was dashed to the ground with great force. A second thunder clap occurred at 11.54 p.m., followed one second afterwards by fork lightning of a red colour. The rain ceased at 11.58 p.m., and at 12 p.m. the wind had dropped to a light breeze from N.W.; sheet lightning was seen to S. There was a sudden increase in pressure amounting to .03 in., and a fall in temperature of 6°; rainfall, .10 in. No hail fell, the path lying to the northward.

Epsom, January 9th, 1909.

SPENCER C. RUSSELL

METEOROLOGICAL OBSERVATIONS AT PEMBA.

By THEODORE BURTT.

FROM time to time accounts of the observations taken at the Friends' Industrial Mission, Banani, Pemba, have been given in the Magazine.

I now enclose a summary of observations as regards temperature and rainfall for the past nine years, and feel sure it will interest some of your readers. The variation in temperature is seen to be very small, whereas that in rainfall is very considerable: 1906 showing an excess of 45·34 in. above 1903.

Summary of Meteorological Observations taken at Banani, Pemba, East Africa, for 9 years, 1899-1907.

Year.	Mean Max.	Mean Min.	Absolute Max.	Absolute Min.	Extreme Range.	Rainfall. in.	Rain Days.
1899.....	83·3	70°·2	92°·0	65°·0	27°·0	105·24	149
1900.....	83·5	71·3	95·0	66·0	29·0	90·35	160
1901.....	81·8	70·4	90·5	65·0	25·5	92·78	166
1902.....	82·8	71·4	91·0	67·0	24·0	68·72	132
1903.....	82·3	71·3	91·5	66·0	25·5	63·24	136
1904.....	81·0	70·4	90·5	65·0	25·5	86·23	156
1905.....	81·6	71·3	90·5	64·0	26·5	101·28	153
1906.....	81·4	70·5	92·0	64·0	28·0	108·58	175
1907.....	81·5	70·2	89·0	63·0	26·0	76·23	177
For 9 years	82·1	70·8	95·0	63·0	32·0	88·07	156

The question suggests itself whether there is any connection between the amount of rain at Pemba and in India. The monsoon blows from the African coast in the direction of India, and it seems possible that a light rainfall here might indicate a light rainfall there: or, on the other hand, might it be that because we get less rain than usual they will get more in India?

During the first six months of 1908 we had a rainfall of 47·41 in., so we shall probably have rather less than the average of the past nine years.

REVIEW.

The Judgment of Paris and some other legends astronomically considered.

By the HON. EMMELINE M. PLUNKET. With illustrations. London, John Murray, 1908. Size 8 x 6. Pp. vi. + 200.

AN interesting and suggestive discussion of Homeric legends on the hypothesis that the various heroes and heroines represent astronomical bodies or events, and the incidents of their history refer to the relative positions of the sun, moon and planets to the stars at various seasons of the year. The ingenuity of the chain of hypothesis is worthy of the highest praise, and the authoress writes with a restraint and caution which command respect; but for our part we cannot see that the result is more than an indication of what may possibly be the case, and does not amount to a proof that it probably was.

ROYAL METEOROLOGICAL SOCIETY.

THE Annual General Meeting of this Society was held on January 20th, at the Institution of Civil Engineers, Westminster, Dr. H. R. Mill, President, in the chair.

The Council, in presenting their Report, referred to the increasing interest in meteorology which is apparent throughout the country, and they believe that this is, in some measure, due to the scheme of lectures inaugurated by the Society. Particulars were given of the investigation into the meteorological conditions of the free atmosphere by means of kites and balloons, of the prize competition for teachers, of the lectures and other work carried on by the Society during the past year. The number of Fellows now on the roll is 746.

The Report having been adopted, and certain alterations made in the by-laws to ensure a definite amount of fresh blood in the Council each year, and to remove some restrictions on the rights of authors in their papers, the thanks of the Society were given to the Council and to the Auditors, and also to the President and Council of the Institution of Civil Engineers for permitting the Society to hold its meetings at the Institution.

The President then delivered an address on "Some Aims and Efforts of the Society in Relation to the Public and to Meteorological Science." He pointed out that the Fellows of the Society belonged to at least three orders, *viz.* :—Meteorologists by profession or special study, observers, and persons interested in meteorology though not themselves actively engaged in meteorological work. The last order was representatives of the more intelligent part of the public. The careless public were notoriously impatient of scientific methods and singularly credulous regarding the pretensions of paradoxers, and a certain section of the press reflected the views of the careless public with great fidelity. The Society, although mainly concerned with the advancement of the science of meteorology, owed something to the public, and one of its aims was to correct popular misconceptions and endeavour to diffuse sound views. While there was no room in a scientific society for the discussion of paradoxical views which were in conflict with the proved principles of physics, there was no reason why the aims of the paradoxers, to arrive at long-distance forecasts of weather, to establish climatic cycles or even to control the weather, should not be followed out by scientific methods.

With regard to the failure of the public to understand the purpose or realize the importance of meteorological work, the history of the efforts of the Hampstead Scientific Society to establish a second-order station on Hampstead Heath, and of the popular opposition which thwarted them, was referred to. Another aspect of popular ignorance was revealed in the exaggerated importance assigned to small differences in instrumental readings as indicating differences of climate between one place and another, and in the curious fear of low temperature and high rainfall which sometimes even led to the suppression of observations for fear of creating misconceptions. The public

seemed to have difficulty in realizing that dust, which is an accompaniment of dry weather, and not rain, is the greatest danger to health. The fear of conveying false impressions by publishing correct statistics had a very bad effect on the observer, disturbing that equanimity of mind which is necessary for the best work.

The President said that the present time was a very interesting period in the history of Meteorology, as the exploration of the free air was leading to great scientific advances. It was noticeable that other sciences had made gigantic strides when they were utilized for practical purposes, and it seemed to him that the advent of aerial navigation would do for meteorology what the introduction of submarine cables did for the allied science of oceanography. Aviation would make it more important to have an exact knowledge of atmospheric circulation, and of the disturbances due to changes in sun-heating as clouds passed, and especially of the nature of cyclones and squalls. Reference was made to the steps which had been taken towards co-operation between the various meteorological agencies of the country, and the hope was expressed that this might yet go further with good results.

A vote of thanks was given to Dr. Mill for his services as President, and also for his address, on the motion of Mr. Druce, seconded by Dr. Shaw.

The following were elected the Council for 1909 :—

President. Lt.-Col. H. Mellish ; *Vice-Presidents*, Mr. W. W. Bryant, Mr. W. H. Dines, F.R.S., Commander M. W. C. Hepworth, C.B., R.N.R., and Dr. H. R. Mill ; *Treasurer*, Dr. C. Theodore Williams ; *Secretaries*, Mr. F. C. Bayard and Commander W. F. Caborne, C.B., R.N.R. ; *Foreign Secretary*, Dr. R. H. Scott, F.R.S. ; *Councillors*, Mr. R. Bentley, Mr. F. J. Brodie, Mr. C. J. P. Cave, Dr. H. N. Dickson, Mr. F. Druce, Mr. E. Gold, Mr. R. Inwards, Mr. B. Latham, Mr. R. G. K. Lempfert, Colonel H. E. Rawson, C.B., Capt. R. C. Warden, and Commander D. Wilson-Barker, R.N.R.

During the evening the following were elected Fellows of the Society :—Lieut. W. de M. Baynham, R.N.R., Dr. J. Knight, Capt. P. N. Layton, Mr. W. P. J. Le Brocq, M.A., Mr. R. E. Nicholas, F.L.S., and Mr. W. Sedgwick.

METEOROLOGICAL NEWS AND NOTES.

IN THE DECEMBER NUMBER of this Magazine, pp. 249–250 were missing from a few copies. Readers are requested to refer to their copies, and on letting the editor know that they are incomplete, they will receive the missing leaf for insertion. Application should be made to 62, Camden Square, London, N.W.

DR. H. R. MILL WILL LECTURE for the Gilchrist Educational Trust on "Rain," at the following places in the north of England during the first week of March :—at Broomhill on March 1st, at Seaton-Delavel on the 2nd, at Usworth and Washington on the 3rd, at New Herrington on the 4th, and at Loftus-in-Cleveland on the 5th. He

hopes to be able to inspect a number of rain gauges in the district in the course of his visit.

THE PORT ELIZABETH FLOOD ON NOVEMBER 16th, 1908, was due to one of the very local, but intense, downpours which occur especially along the coast districts of South Africa. Cape Town had such a visitation shortly before the visit of the British Association, in 1905. The damage at Port Elizabeth, at first perhaps over-estimated at more than £200,000, was due to the utter inability of the small creek, Baaken's River, to accommodate the abnormal down-rush, although the gathering-ground of the stream goes back only some 10 or 15 miles, with an average width of 3 or 4 miles. The fact, however, that much of the mischief occurred on "reclaimed" ground, is significant. The fall in the city area was $3\frac{1}{4}$ inches, by no means enough to account for the change in two hours of a rivulet into a raging torrent 200 yards wide, and 20 to 30 feet deep. A short way back the floods overtopped a gorge some 150 feet wide and 40 to 50 feet deep. The rise was too sudden for people to do more than rush for their lives. Some had to swim to safety. Many buildings collapsed. A mule was saved by being washed on to the municipal stables roof, its comrades perishing. At the climax the waters rose six feet in five minutes, and *débris* from an upper bridge blocked the main bridge, diverting more water through the town. The centre of the downpour may have been on the farms of a Mr. Parkins and a Mr. Lovemore, lasting from 3 a.m. to 10.30 a.m. Both considered that a foot of rain fell. The mealie lands were stripped to the depth of the ploughing; all trees and bushes were swept away over a space of a mile along the river. By 2 o'clock the weather had changed to a glorious summer afternoon. So a few years back (1904 or 1905) at Durban, a few hours after a continuous fall of over 12 inches in about 30 hours, the water carts were again busy. The catchment area is only 36 square miles. A local estimate averages the fall over this at 10 inches, enough to account for a flood 50 feet deep, 150 feet wide, and over 15 miles in length.

HEAVY RAINFALL IN BARBADOS forms the subject of a note in the *West India Committee Circular* of January 5th, 1909, illustrated by two photographs of raging torrents, where, a couple of hours before, there was not a drop of water. The note runs:—"Mr. E. C. Jackman calls our attention to the remarkable partiality which has characterised the rainfall of Barbados during 1908. As an example he points out that between 11 a.m. and 1 p.m. on November 29th, no less than 4.25 ins. fell over an area of six or eight square miles. He happened, he writes, to be in the centre of the display. This heavy downfall in so short a time caused streams to appear where usually no water is to be found. Across the "Pine" Plantation, St. Michael, a river about 20 ft. broad rushed along to pour itself, with a resounding roar, into the culvert at the head of Bishop's Court Hill." One photograph shows the torrent passing into the culvert, where, a couple of hours before there was not a drop of moisture, and the other illustrates the river flowing across the "Pine."

RAINFALL TABLE FOR JANUARY, 1909.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99. in.	1909. in.
Camden Square.....	London.....	51 32	0 8	111	1·89	·71
Tenterden.....	Kent.....	51 4	*0 41	190	2·36	·88
West Dean.....	Hampshire.....	51 3	1 38	137	2·68	·88
Hartley Wintney.....	".....	51 18	0 53	222	2·39	·94
Hitchin.....	Hertfordshire.....	51 57	0 17	238	1·81	·78
Winslow (Addington).....	Buckinghamsh.	51 58	0 53	309	2·05	·92
Bury St. Edmunds(Westley)	Suffolk.....	52 15	*0 40	226	1·70	·95
Brundall.....	Norfolk.....	52 37	*1 26	66	1·67	·64
Winterbourne Steepleton...	Dorset.....	50 42	2 31	316	3·90	1·48
Torquay (Cary Green).....	Devon.....	50 28	3 32	12	3·19	1·57
Polapit Tamar [Launceston]	".....	50 40	4 22	315	3·87	2·76
Bath.....	Somerset.....	51 23	2 21	67	2·52	1·17
Stroud (Upfield).....	Gloucestershire.....	51 44	2 13	226	2·46	1·10
Church Stretton (Wolstaston)..	Shropshire.....	52 35	2 48	800	2·81	1·63
Coventry (Kingswood).....	Warwickshire.....	52 24	1 30	340	2·34	1·16
Boston.....	Lincolnshire.....	52 58	0 1	25	1·59	·90
Worksop (Hodsock Priory)..	Nottinghamshire.....	53 22	1 5	56	1·74	1·12
Derby (Midland Railway)...	Derbyshire.....	52 55	1 28	156	1·95	1·28
Bolton (Queen's Park).....	Lancashire.....	53 35	2 28	390	3·38	2·28
Wetherby (Ribston Hall)...	Yorkshire, W.R.	53 59	1 24	130	1·89	·80
Arnccliffe Vicarage.....	".....	54 8	2 6	732	6·33	4·82
Hull (Pearson Park).....	"..... E.R.	53 45	0 20	6	1·80	·65
Newcastle (Town Moor)...	Northumberland.....	54 59	1 38	201	1·96	·93
Borrowdale (Seathwaite)...	Cumberland.....	54 30	3 10	423	14·71	10·63
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	3·85	2·06
Haverford west(High Street)	Pembroke.....	51 48	4 58	95	5·13	2·34
Aberystwyth (Gogerddan)..	Cardigan.....	52 26	4 1	83	3·87	3·22
Llandudno.....	Carnarvon.....	53 20	3 50	72	2·57	2·16
Cargen [Dumfries].....	Kirkcudbright.....	55 2	3 37	80	4·54	5·71
Hawick (Branxholm).....	Roxburgh.....	55 24	2 51	457	3·19	3·43
Edinburgh (Royal Observy.)	Midlothian.....	55 55	3 11	442	...	2·61
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	4·92	5·05
Glasgow (Queen's Park)...	Renfrew.....	55 53	4 18	144	3·25	5·36
Inveraray, (Newtown).....	Argyll.....	55 14	5 4	17	6·63	9·35
Mull (Quinish).....	".....	56 36	6 13	35	5·85	6·50
Dundee (Eastern Necropolis)	Forfar.....	56 28	2 57	199	2·10	1·47
Braemar.....	Aberdeen.....	57 0	3 24	1114	2·91	3·30
Aberdeen (Cranford).....	".....	57 8	2 7	120	2·32	1·95
Cawdor.....	Nairn.....	57 31	3 57	250	2·14	2·43
Fort Augustus(S. Benedict's)	E. Inverness.....	57 9	4 41	68	5·10	6·18
Loch Torridon (Bendamph)	W. Ross.....	57 32	5 32	20	8·75	12·00
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	2·62	3·36
Castletown.....	Caitness.....	58 35	3 23	100	...	3·71
Killarney (District Asylum)	Kerry.....	52 4	9 31	178	6·57	4·58
Waterford (Brook Lodge)...	Waterford.....	52 15	7 7	104	4·06	1·97
Broadford (Hurdlestown)...	Clare.....	52 48	8 38	167	2·98	3·33
Abbey Leix (Blandsfort)....	Queen's County.....	52 56	7 17	532	3·14	2·69
Dublin(Fitz William Square)	Dublin.....	53 21	6 14	54	2·16	1·26
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	3·06	2·72
Ballinasloe.....	Galway.....	53 20	8 15	160	3·49	2·55
Crossmolina (Enniscoo).....	Mayo.....	54 4	9 18	74	5·00	5·12
Collooney (Markree Obsy.)..	Sligo.....	54 11	8 27	127	3·61	4·97
Seaforde.....	Down.....	54 19	5 50	180	3·63	2·30
Londonderry (Creggan Res.)	Londonderry.....	54 59	7 19	320	3·56	5·43
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	3·34	3·79

RAINFALL TABLE FOR JANUARY, 1909—*continued.*

RAINFALL OF MONTH (<i>con.</i>)				RAINFALL FROM JAN. 1.				Mean Annual 1870-1899.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.	No. of Days	Aver. 1870-99.	1909.	Diff. from Aver. in.	% of Av.		
		in. Date.		in.	in.			in.	
-1.18	38	.16 10	13	...	...	...	...	25.16	Camden Square
-1.48	37	.22 14	17	...	...	...	...	28.36	Tenterden
-1.80	33	.29 14	14	...	...	...	...	29.93	West Dean
-1.45	39	.15 10	16	...	...	...	...	27.10	Hartley Wintney
-1.03	43	.19 7	11	...	...	...	...	24.66	Hitchin
-1.13	45	.15 10	14	...	...	...	...	26.75	Addington
- .75	56	.17 8, 9	11	...	...	...	...	25.39	Westley
-1.03	38	.14 8, 29	11	...	...	...	...	25.40	Brundall
-2.42	38	.30 14	16	...	...	...	...	39.00	Winterbourne Stpltn
-1.62	49	.56 12	15	...	...	...	...	35.00	Torquay
-1.11	71	.45 10	17	...	...	...	...	38.85	Polapit Tamar
-1.35	46	.24 18	15	...	...	...	...	30.75	Bath
-1.36	45	.44 15	13	...	...	...	...	29.85	Stroud
-1.18	58	.38 7	15	...	...	...	...	33.04	Wolstaston
-1.18	50	.37 7	10	...	...	...	...	29.21	Coventry
- .69	57	.18 7, 9	12	...	...	...	...	23.30	Boston
- .62	64	.25 13	13	...	...	...	...	24.70	Hodsock Priory
- .67	66	.27 7	15	...	...	...	...	26.18	Derby
-1.10	67	.52 14	19	...	...	...	...	42.43	Bolton
-1.09	42	.23 13, 14	8	...	...	...	...	26.96	Ribston Hall
-1.51	76	1.26 14	20	...	...	...	...	60.96	Arncliffe Vic.
-1.15	36	.11 13, 14	14	...	...	...	...	27.02	Hull
-1.03	47	.20 15	13	...	...	...	...	27.99	Newcastle
-4.08	72	2.00 17	19	...	...	...	...	132.68	Seathwaite
-1.79	54	.75 15	16	...	...	...	...	42.81	Cardiff
-2.79	46	.44 10	17	...	...	...	...	47.88	Haverfordwest
- .65	83	.65 10	18	...	...	...	...	45.41	Gogerddan
- .41	84	.59 14	18	...	...	...	...	30.98	Llandudno
+1.17	126	1.30 18	14	...	...	...	...	43.43	Cargen
+ .24	108	.66 13	16	...	...	...	...	34.80	Branxholm
...	...	.45 14	14	...	...	...	...	...	Edinburgh
+ .13	103	.72 14	23	...	...	...	...	48.87	Girvan
+2.11	165	1.04 17	19	...	...	...	...	35.80	Glasgow
+2.72	141	1.77 17	26	...	...	...	...	57.90	Inveraray.
+ .65	111	.81 17	26	...	...	...	...	57.53	Quinish
- .63	70	.38 14	13	...	...	...	...	28.95	Dundee
+ .39	113	...	...	...	...	...	...	36.07	Braemar
- .37	84	.70 14	15	...	...	...	...	33.01	Aberdeen
+ .29	114	.70 13	12	...	...	...	...	29.37	Cawdor
+1.08	121	1.60 17	24	...	...	...	...	43.71	Fort Augustus
+3.25	137	1.82 12	30	...	...	...	...	86.50	Bendamp
+ .74	128	.48 13	15	...	...	...	...	31.60	Dunrobin Castle
...	...	.46 10	24	...	...	...	...	...	Castletown
-1.99	70	1.15 17	25	...	...	...	...	58.11	Killarney
-2.09	48	.44 14	15	...	...	...	...	39.30	Waterford
+ .35	112	.60 17	22	...	...	...	...	33.47	Hurdlestown
- .45	86	.50 15	17	...	...	...	...	35.19	Abbey Leix
- .90	58	.22 10	14	...	...	...	...	27.75	Dublin
- .34	89	.65 15	16	...	...	...	...	36.48	Mullingar.
- .94	73	.55 17	22	...	...	...	...	37.04	Ballinasloe
+ .12	102	1.20 17	22	...	...	...	...	50.50	Enniscooe
+1.36	138	1.36 17	24	...	...	...	...	41.83	Markree Obsy.
-1.33	63	.46 13	21	...	...	...	...	38.61	Seaford
+1.87	153	1.15 17	24	...	...	...	...	41.20	Londonderry
+ .45	113	1.38 17	25	...	...	...	...	37.85	Omagh

SUPPLEMENTARY RAINFALL, JANUARY, 1909.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches
II.	Warlingham, Redvers Road	1·35	XI.	Rhayader, Tyrmynydd	4·97
„	Ramsgate	·65	„	Lake Vyrnwy	4·82
„	Steyning.....	1·24	„	Llangyhanfal, Plâs Draw....	1·92
„	Hailsham	1·18	„	Llwdiarth Esgob.....	2·30
„	Totland Bay, Aston House ..	·91	„	Snowdon, Cwm Dyli	6·56
„	Emsworth, Redlands.....	·98	„	Llwyg	2·17
„	Stockbridge, Ashley	1·02	„	Douglas, Woodville	1·85
„	Reading, Calcot Place.....	·76	XII.	Stoneykirk, Ardwell House ..	1·75
III.	Harrow Weald, Hill House ..	·81	„	Dalry, The Old Garroch ...	7·77
„	Oxford, Magdalen College....	·75	„	Langholm, Drove Road.....	4·71
„	Pitsford, Sedgebrook	1·08	„	Moniaive, Maxwelton House ..	6·56
„	Huntingdon, Brampton.....	·84	XIII.	N. Esk Reservoir [Penicuick]	4·45
„	Woburn, Milton Bryant.....	·69	XIV.	Maybole, Knockdon Farm..	4·10
„	Wisbech, Monica Road.....	·75	XV.	Campbeltown, Witchburn...	4·31
IV.	Southend Water Works.....	·89	„	Glenreadell Mains.....	4·57
„	Colchester, Lexden.....	·71	„	Ballachulish House.....	11·05
„	Newport, The Vicarage.....	·86	„	Islay, Eallabus	6·10
„	Rendlesham	·43	XVI.	Dollar Academy	4·94
„	Swaffham	·75	„	Loch Leven Sluice	3·72
„	Blakeney	·89	„	Balquhidder, Stronvar	10·24
V.	Bishops Cannings	·76	„	Perth, The Museum	2·64
„	Ashburton, Druid House	2·68	„	Coupar Angus	2·19
„	Honiton, Combe Raleigh ...	1·80	„	Blair Atholl.....	4·48
„	Okehampton, Oaklands.....	3·13	„	Montrose, Sunnyside Asylum	1·22
„	Hartland Abbey	1·78	XVII.	Alford, Lynturk Manse ...	1·61
„	Lynmouth, Rock House	3·00	„	Keith Station	·93
„	Probus, Lamellyn	2·96	XVIII.	N. Uist, Lochmaddy	3·52
„	North Cadbury Rectory	1·50	„	Alvey Manse	5·15
VI.	Clifton, Pembroke Road ...	1·58	„	Loch Ness, Drumnadrochit.	8·92
„	Ross, The Graig	1·06	„	Gleencarron Lodge	3·13
„	Shifnal, Hatton Grange.....	1·03	„	Fearn, Lower Pitkerrie.....	5·76
„	Blockley, Upton Wold	1·33	XIX.	Invershin	4·49
„	Worcester, Boughton Park ..	1·00	„	Altnaharra	3·50
VII.	Market Overton	1·05	„	Bettyhill	2·09
„	Market Rasen	·90	XX.	Dunmanway, The Rectory..	2·61
„	Bawtry, Hesley Hall.....	·83	„	Cork	3·68
„	Buxton.....	2·54	„	Mitchelstown Castle	2·17
VIII.	Neston, Hinderton Lodge....	1·72	„	Darrynane Abbey	3·02
„	Southport, Hesketh Park...	2·09	„	Glenam [Clonmel]	4·34
„	Chatburn, Middlewood	2·60	„	Ballingarry, Gurteen	1·43
„	Cartmel, Flookburgh	2·70	„	Miltown Malbay.....	2·42
IX.	Langsett Moor, Up. Midhope	3·38	XXI.	Gorey, Courtown House	2·65
„	Scarborough, Scalby	1·06	„	Moynalty, Westland	4·05
„	Ingleby Greenhow	·88	„	Athlone, Twyford	5·06
„	Mickleton.....	1·62	XXII.	Woodlawn	3·15
X.	Bardon Mill, Beltingham ...	2·39	„	Westport, St. Helens	4·17
„	Ewesley, Font Reservoir ...	1·33	„	Mohill	2·85
„	Ilderton, Lilburn Cottage...	1·86	XXIII.	Enniskillen, Portora	2·26
„	Keswick, The Bank	6·65	„	Dartrey [Cootehill].....	1·87
XI.	Llanfrechfa Grange.....	1·30	„	Warrenpoint, Manor House ..	2·55
„	Treherbert, Tyn-y-waun ...	4·30	„	Banbridge, Milltown	4·01
„	Carmarthen, The Friary.....	2·43	„	Belfast, Springfield	4·39
„	Castle Malgwyn [Llechryd].	2·76	„	Bushmills, Dundarave	7·28
„	Plynlimon.....	7·70	„	Sion House	5·46
„	Crickhowell, Ffordlas.....	2·70	„	Killybegs	
„	New Radnor, Ednol	2·54	„	Horn Head	

METEOROLOGICAL NOTES ON JANUARY, 1909.

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, sunless conditions characterized the first week, but the following fortnight was fair or fine with much wind between 13th and 18th. Severe frosts occurred in the last week with unusually dense fog throughout 27th, 28th, and to noon on 29th. Duration of sunshine 44·6* hours, and of R 19·0 hours. Mean temp. 38°·5, or 0°·4 above the average. Shade max. 51°·0 on 14th; min. 24°·6 on 25th. F 10, f 23.

TENTERDEN.—Duration of sunshine 73·0† hours. Shade max. 50°·0 on 11th; min. 19°·0 on 29th. F 10, f 21.

TOTLAND BAY.—Duration of sunshine 78·1* hours. Mean temp. 41°·0. Shade max. 52°·3 on 1st; min. 25°·1 on 28th. F 8, f 15.

PITSFORD.—R ·58 in. below the average. Mean temp. 36°·3. Shade max. 49°·1 on 10th; min. 20°·4 on 26th and 28th. F 15.

TORQUAY.—Duration of sunshine 76·1* hours, or 11·2 hours above the average. Mean temp. 42°·2, or 0°·2 below the average. Shade max. 54°·2 on 10th; min. 28°·1 on 28th. F 7, f 15.

NORTH CADBURY.—The first week and last 13 days were fine and very still, but the weather was boisterous from 13th to 18th. Shade max. 52°·5 on 1st; min. 25°·5 on 27th and 28th. F 13, f 20.

ROSS.—Shade max. 50°·2 on 18th; min. 22°·5 on 28th. F 13, f 21.

HODSOCK PRIORY.—Shade max. 53°·0 on 3rd; min. 15°·5 on 26th. F 14, f 26.

SOUTHPORT.—R ·61 in. below the average of 35 years. Duration of sunshine 52·2* hours, or 7·0 hours above the average. Duration of R 42·4 hours. Mean temp. 38°·9, or 0°·3 above the average. Shade max. 52°·2 on 18th; min. 24°·0 on 28th. F 8, f 16.

HULL.—Duration of sunshine 18·5* hours. Shade max. 50°·0 on 18th; min. 19°·0 on 27th. F 14, f 24.

HAVERFORDWEST.—Mild and stormy to 18th, and then much colder to 27th; very little fog. Duration of sunshine 56·8* hours. Shade max. 58°·5 on 19th; min. 20°·6 on 23rd. F 8, f 11.

CARMARTHEN.—Wet and dull in the first half, and cold and frosty later. Bad weather for the roads which were much cut up.

LLANDUDNO.—Shade max. 52°·5 on 17th; min. 25°·5 on 24th. F 5.

DOUGLAS.—Fine and mild at first, but from 11th to 18th it was bitterly cold, and there were violent gales with heavy R and H. The weather then became somewhat milder with damp fogs.

DUMFRIES.—Shade max. 52°·0 on 3rd; min. 21°·0 on 25th. F 16.

EDINBURGH.—Shade max. 51°·5 on 2nd; min. 28°·4 on 25th. F 11, f 18.

DUNDEE.—Shade max. 49°·9 on 18th; min. 25°·0 on 28th. F 15.

FORT AUGUSTUS.—Shade max. 49°·9 on 2nd; min. 25°·7 on 13th. F 15.

WATERFORD.—Shade max. 54°·0 on 3rd and 4th; min. 26°·0 on 19th and 24th. F 10.

DUBLIN.—Open, rather damp and cloudy conditions with W. and S.W. winds. Mean temp. 42°·3. Shade max. 53°·2 on 1st and 18th; min. 31°·7 on 16th. F 1, f 14.

MARKREE.—Shade max. 54°·0 on 17th; min. 26°·0 on 29th. F 6, f 21.

WARRENPOINT.—Shade max. 55°·0 on 2nd; min. 30°·0 on 19th. F 4, f 15.

* Campbell-Stokes

† Jordan

Climatological Table for the British Empire, August, 1908.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	85.9	3	45.4	12	71.0	52.5	54.3	82	125.6	40.5	2.94	16	5.3
Malta	90.1	7	69.5	20	84.1	72.5	68.2	77	157.2	...	.00	0	2.2
Lagos	86.0	29	70.0	11	82.9	73.5	72.4	79	161.0	65.0	2.60	10	8.2
<i>Cape Town</i>	71.7	26	37.7	1	61.8	47.9	48.0	77	...	...	3.03	13	6.4
<i>Durban, Natal</i>	99.9	30	47.7	6	74.4	56.2	...	...	148.3	...	1.80	13	4.1
<i>Johannesburg</i>	76.8	31	31.3	3	66.0	44.9	42.6	70	123.6	30.6	.16	3	1.7
<i>Mauritius</i>	79.5	24	55.8	30	75.9	63.3	61.2	76	137.1	48.0	2.71	16	5.8
Calcutta... ..	90.8	9, 25	76.5	30	88.3	78.8	77.9	87	161.1	74.9	14.43	22	8.3
Bombay... ..	85.1	29	75.4	16	83.3	76.8	75.4	86	127.4	71.8	9.67	27	9.3
Madras	98.9	17	71.6	25	95.2	77.7	73.9	75	145.0	71.0	4.70	13	6.6
Kodaikanal	66.6	23*	50.8	3	63.3	52.4	51.6	83	137.6	42.8	5.08	21	6.5
Colombo, Ceylon	88.7	28	73.2	5	86.3	76.8	73.8	78	158.8	73.0	2.14	12	6.1
Hongkong	92.3	7	74.9	21	87.3	78.5	76.4	83	143.2	...	12.07	17	6.6
<i>Melbourne</i>	61.7	13	31.0	1	56.0	41.2	39.7	72	109.2	26.4	1.26	16	6.0
<i>Adelaide</i>	70.8	15	36.1	26	60.3	44.8	43.4	74	125.3	26.5	2.35	18	6.2
<i>Coalgardie</i>	72.0	14	32.0	31	60.5	39.9	38.4	64	137.4	29.4	.87	9	5.2
<i>Perth</i>	70.1	28	35.4	31	63.9	46.0	44.6	69	131.6	29.9	4.41	16	4.9
<i>Sydney</i>	72.2	22	40.9	26	61.1	46.8	45.8	80	103.1	33.0	9.68	20	...
<i>Wellington</i>	58.0	18	33.0	1, 2	51.3	40.4	38.4	75	98.0	26.0	3.39	14	6.4
<i>Auckland</i>	62.0	24	38.0	8	56.4	45.1	43.5	77	120.0	32.0	3.78	13	5.0
Jamaica, Kingston	93.1	4	71.9	17	90.7	74.1	71.0	75	...	...	1.41	9	4.3
Trinidad ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	88.2	7	72.6	14	84.7	75.6	72.6	77	148.4	...	6.86	27	5.2
Toronto	92.0	4	43.0	23	77.8	56.1	...	...	128.3	40.8	2.83	6	3.5
Fredericton	83.0	11	38.0	29	73.1	51.8	...	73	...	...	3.62	7	4.4
St. John's, N.B.	76.2	14	51.5	21	67.3	55.0	...	...	...	...	5.21	14	5.2
Victoria, B.C.	83.7	18	47.4	2	70.5	51.4	...	70	...	...	.67	4	3.0

* and 27.

MALTA.—Mean temp. of air 77°·9. Mean daily bright sunshine 12·4 hours, and mean hourly velocity of wind 6·8 miles.

Johannesburg.—Bright sunshine 298 hours.

Mauritius.—Mean temp. of air 1°·1, of dew point 1°·8, and R .47 in., above averages. Mean hourly velocity of wind 11·3 miles, or 1·0 below average.

KODAIKANAL.—Bright sunshine 153 hours.

COLOMBO.—Mean temp. of air 79°·2, or 1°·5 below, of dew point 0°·5 above, and R 1·42 in. below, averages. Mean hourly velocity of wind, 6·4 miles.

HONGKONG.—Mean temp. of air 82°·1. Bright sunshine 219·9 hours. R 2·10 in. below average. Mean hourly velocity of wind 7·1 miles.

Melbourne.—Mean temp. of air 2°·4 below, and R .55 in. below, averages.

Adelaide.—Mean temp. of air 1°·2 below the average. R normal.

Sydney.—Mean temp. of air 0°·8 below, and R 6·39 in. above, averages.

Wellington.—Mean temp. of air 2°·6 below, and R 1·54 in. below, averages. Bright sunshine 152·5.

RAINFALL OF THAMES VALLEY, FEBRUARY, 1909.



Water-level of River Thames above Teddington, and River Lee above Faldes Weir.

Symons's Meteorological Magazine

ALTITUDE SCALE
 Below 250 feet 250 to 530 feet 500 to 1000 feet over 1000 feet

SCALE OF MILES
 0 5 10 15 20

Symons's Meteorological Magazine.

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MARCH, 1909.

VOL. XLIV.

THE SNOWFALL OF FEBRUARY-MARCH, 1909.

THE long spell of dry, cold and sunny weather which had continued over the greater part of the British Isles since the beginning of 1909, gave way in the closing days of February, under the influence of irregular changes of the pressure conditions over Europe, to a period of intermittent snowfall of more or less severity. It is not possible at so early a date to obtain a digest of the information collected by the army of observers in all parts of the country; but a few facts bearing on the general features of the snowy spell may be set down. On February 26th, with a high pressure system in the neighbourhood of Iceland and lower barometer readings in the south, conditions were favourable for northerly and north-easterly winds over this country, and sleet or snow fell at several places in England during the evening, nearly 2 inches of snow lying in the north of London by 11 p.m. The northerly type of weather was aggravated during the following days by depressions travelling generally from the south-west over the continent, and further falls of snow were experienced, but the amount appears to have been slight, probably being greatest in the lowlands of Scotland, where it lay in places to a depth of several inches, and caused trouble among the flocks which were in the middle of the lambing season. On the morning of March 2nd a well defined low-pressure system had formed, having its centre over the North Sea, and during the day this moved in a south-westerly direction over England, locating itself on the following morning on the south coast. Heavy snow was in the meantime general over the country. It appears to have reached its greatest severity in the English Midlands and in Wales. In Warwickshire and the Peak District drifts of several feet in depth were frequent; but, generally speaking, owing to the absence of wind there was no great tendency to drift, and railway traffic was not interfered with. In Huntingdonshire ten to twelve inches was the depth on the level. In London about five inches yielded an equivalent of $\cdot 36$ in. as rain for the 24 hours ending at 9 a.m. on the 3rd. On the following day the centre of the depression on the south coast had moved eastward, and lay over the south-east corner of England. As a consequence, the snowfall in Kent was of a remarkable nature. Several stations in that county reported depths of twelve inches or more, of which

probably about five had been the result of the previous day's fall. Mr. Mace, of Tenterden, writes that the snow lay on the level deeper than at any time since December, 1875, though the measured yield had been exceeded both in December, 1886, and in March, 1898. At Dungeness the measured equivalent was returned as 1·90 in., equal at a moderate estimate to eighteen inches of snow. Several instances of the snowing-up of motor mail vans were mentioned in the newspapers, and in some localities country lanes were said to be filled to the tops of the hedges with drifted snow. No heavy falls took place in other parts of the country on the 3rd, so far as we have been able to ascertain, but much drifting is said to have occurred on the Yorkshire moors. In London the fall on the 3rd was not great, amounting to about two-and-a-half inches, but the unpleasant conditions always attendant on any fall of snow in town were enhanced by the occurrence during the morning of a peculiarly dense high fog, plunging the streets into darkness, and rendering more complete the already serious dislocation of traffic.

Indeed, throughout the whole snowy period the contrast between the effects of the snow in the streets of the metropolis and in the country immediately surrounding London was almost beyond the possibility of exaggeration. Whilst in town streets were rendered almost impassable by accumulations of half-melted brown slush, which for a time defied the efforts of the authorities to remove it, a few miles outside the congested area, the suburbs so far from being disfigured were transformed for the time into a fairyland of surpassing beauty. The snow was of a peculiarly light and clinging consistency, and lodged more than is usually the case on the branches of trees and adhered to gabled roofs in a manner extremely fantastic.

A temporary cessation of snowfall, except possibly in Ireland, where six inches fell at Nenagh on the 5th, was general on the two following days; but towards the evening of the 5th a deep depression appeared off the south-west coast of Ireland, and moved over Great Britain on the next day. A large quantity of snow or sleet fell on the 6th, turning to rain in London, but producing probably the heaviest fall of the whole period in Derbyshire, Yorkshire, north-east Lancashire and the south of Scotland. Warwickshire and the upper Thames valley also suffered severely, snow lying to a depth of about a foot on the Cotteswold Hills; the yield at Stow-on-the-Wold was 1·28 in. (one foot of snow) at Upton Wold, a high farm near Blockley 1·50 in., and at Swerford in Oxfordshire 1·45 in., while at Kennick in South Devon it was more than 2·50 in. The depth was given as six to eight inches at West Linton in Peebleshire, and six in Moffat, but drifts of five feet in depth occurred in country roads in the lowlands.

We add a few extracts from observers' notes:—

Ulcombe, near Maidstone.—The snow lay from twelve to fifteen inches deep on the level this morning. No drifts.

March 4th, 1909.

A. O. WALKER.

Tonbridge.—In the early hours of Friday last, March 5th, my thermometer registered -5° on the snow, and another thermometer hanging on a wall 4 ft. above ground showed 4° (28° of frost). The ground was covered with snow to the depth of eleven inches, and this in *March!*—GEO. J. KIMMINS.

March 8th, 1909.

Swerford, Oxon.—March 2nd. Snow fell very fast from 4 to 7 o'clock, followed by sharp frost and fog. Average depth of snow on the ground $2\frac{1}{2}$ inches.

March 3rd. Sunless, with a little snow falling in the morning. At 4 o'clock in the afternoon (exactly the same time as the day before) snow began to fall heavily and continued to about 6.30, average depth 3 inches. No fall since.

March 6th. Sunless; snow fell heavily from 6.40 a.m. to 12.30 p.m.; drizzling rain for half an hour, then heavy snow again until 3.30 p.m., then steady rain to 5 p.m., after which snow fell fast, very large flakes at times, for about an hour and a half, followed by a steady rain which continued all the evening. On Sunday morning the trees and bushes were again heavily laden with snow, with between 2 and 3 inches on the ground, which melted very fast during the day. Wind S.W., and much bright sunshine. The water in the rain gauge registered at 9 o'clock on Sunday morning was 1.45 in. for the 24 hours, depth of snow about 10 inches.

March 8th, 1909.

WILLIAM HALL.

Codford St. Mary, Wilts.—After a bright day on Friday, March 5th, about an inch of snow fell some time between 8 and 9 p.m., then there was no fall of snow or rain till after midnight. At 7 o'clock yesterday morning (the 6th) the snow was nearly all gone, and it was raining fast. About 8 the rain turned to heavy snow, and it lasted till about 9.30, when the ground was again covered to the depth of about $1\frac{1}{2}$ inches; then it rained steadily till about 11 p.m., when it came on to snow heavily again, and this lasted till about 1 a.m. to-day, when it cleared, and there was a bright frost this morning. Rather more than 2 inches of snow fell in the last snowfall. The rain and melted snow and rain measured yesterday morning was .68 in., and this morning 1.59 in., or 2.27 in. in about 30 hours. During the last few days, when there has been so much snow elsewhere, we have never had more than 2 inches on the ground.

March 7th, 1909.

GEORGE KNOWLES.

Stow-on-the-Wold, Glos.—The lowest temperature for the first 8 days of March was 16° on the 3rd; the greatest snowfall on the 6th, when the average depth was about 1 foot; where it was drifted it varied from 1 ft. 5 in. to 2 ft. The snow in the Snowdon gauge when melted yielded 1.28 in. The temperature during the storm was, maximum 31° , minimum 28° , 9 a.m. 31° . The weather during the 8 days may be summed up thus: snow on 5 days yielding rainfall as follows:—

	in.
2nd	·13
3rd	·19
5th	·34
6th	1·28
7th	·02
	<hr/>
Total	1·96

On the days when there was no snow hard frost was experienced, so one fall accumulated on the top of the other. Now with a temperature of 45°, the 8th day has brought a thaw.

March 8th, 1909.

D. W. HORNER, F.R.Met.Soc.

Kington, Herefordshire.—The snowstorm of yesterday certainly merits some notice, as it is the heaviest fall of snow within 12 hours of which I have any record since I came into this country in 1884. Snow began to fall between 5 and 6 a.m., and when I got up at 7 a.m. it was falling heavily, but absolutely like powder—so fine was it. At 9 a.m. ·16 in. of melted snow was recorded. Soon after this hour, however, the character of the snow changed entirely, and it fell in heavy flakes, and continued to do so till about 2.30 p.m. without any intermission. After that hour the snow became very moist, falling in big blobs rather than flakes, while the temperature became much higher. It eased off, and ceased practically about 4.30 p.m., after falling for eleven hours. The snow was from the south-east, but there was practically no wind, and it fell perpendicularly. The barometer, which at daybreak stood at 29·5 inches (corrected to sea level), fell during the day to 28·9 inches, and has only risen very slightly since then. At 5 p.m., my man and I carefully measured the snow in the gauge, which my man had been watching all day, and the result gave 1·16 in. of melted snow, to which must be added ·16 in. registered at 9 a.m. and ·02 in. which fell after 5 p.m., giving a total of 1·34 inches of melted snow. The depth measured on my croquet lawn, which is quite flat, was 8½ ins. ; but this is no indication of the amount of snow that fell, as the first four hours was very fine snow and lay very close, while the last two hours the snow was moist and lay very close also on the top.

March 7th, 1909.

G. T. PEARSON.

West Linton, Peeblesshire.—We have just had a very bad snowstorm. North-easterly gale last night with heavy drifting. Continuous snow for the last 24 hours. Only ·32 in. of melted snow was found in the gauge, however, but snow lay to an average depth of about 6 or 8 inches. Screen minimum on 5th 1°·0, grass—4°·8.

March 7th, 1909.

J. S. BEGG.



THE RAINFALL OF JANUARY AND FEBRUARY.

IN his article on the weather of February, Mr. Brodie calls attention to the influence of the anticyclonic conditions which prevailed during that month in producing a low rainfall and great duration of sunshine in all parts of the country. The month was indeed very dry, and though not so dry as September, 1907, nor coming within sight of the extraordinary drought of February, 1891, when large tracts of country received no rain at all, it followed a dry January, and so deserves some special consideration.

The rainfall of February is always lower in comparison with other months, as the length of the month is practically 10 per cent. less than the long months, such as January or March, so that it is more common for the rainfall to be less than one inch over a large area in February than in other months, and on this occasion more than 26,000 square miles of the centre and south of England received less than an inch of precipitation. The map of the Thames valley and its surroundings published this month, shows only a small area on the east coast with more than an inch of rain, and the greater part of the surface had less than half an inch, while a considerable area near Cambridge had less than a quarter of an inch.

The percentage of the average rainfall which fell for the month is stated as usual in the Table on p. 39, and it will be noticed that three stations, one in the north of Ireland, and two in the north of England, had more than the average; but the area with more than the average was very small. Less than half the average rainfall occurred in the east of Scotland, between the Moray Firth and the Firth of Forth, in the south-east of Ireland, and over practically the whole of England and Wales, south of the Mersey and Humber. The driest parts of the country relatively to the average were the extreme south-east of Ireland, the south-westerly half of Wales, the counties of Devon, Somerset, Dorset, Wiltshire, Hampshire, Berkshire, Buckinghamshire, Oxfordshire, and most of Bedfordshire and Cambridgeshire, in all of which less than one quarter of the normal supply of rainfall was received. Taking the two months, January and February, together it is seen that the rainfall was somewhat above the average in the north-west of Ireland and the west of Scotland, and that the rainfall was less than half the average in the south-east of Ireland, and everywhere south of a line drawn from St. Davids to Leicester and thence to Middlesbrough; while it was less than one-third of the average along the middle of the south coast of England.

Taking the mean for large areas, we find the following percentages of the average general rainfall:—

	England & Wales.	Scotland.	Ireland.	British Isles.
January.....	53 ...	117 ...	92 ...	77
February	41 ...	62 ...	64 ...	52
January & February	48 ...	92 ...	80 ...	66

It is rare to find the rainfall of two months less than half the average over so great an extent of country as the whole of England and Wales ; and it will be interesting to follow the effect of this low winter rainfall on springs and wells during the coming summer. Before the snowfall of the last days of February and the beginning of March, distress for want of water had begun to make itself felt in several parts of the east of England, and our correspondence shows that the low rainfall was giving rise to alarm in different parts of the country

The letters from correspondents published this month (see p. 34) are representative not of the driest parts of the country, but of England and Wales as a whole, and it would have been easy to fill many pages with similar statements had only space admitted ; but although we have enlarged the present number in order to find room for several articles dealing with the abnormal Spring, the line must be drawn somewhere. We venture to seize a few lines of the space, keen though the competition for it is, in order to assure our numerous correspondents that while all their letters cannot be published, or even summarized here, we are none the less indebted to them for their communications, and preserve everything for subsequent utilization in the volume of *British Rainfall* for the year, in which the matter will be dealt with in adequate detail.



THE WEATHER OF FEBRUARY, 1909.

By FRED. J. BRODIE.

OWING to a frequent recurrence of anticyclonic conditions, lasting in some cases for many days, the weather of February was distinguished by a general deficiency of rain, by an absence of gales of any serious importance, and over England and Wales by a considerable excess in the amount of bright sunshine. The finest weather was, however, usually accompanied by winds blowing from the eastward or southward, the flow of air from the cold regions of the continent being accompanied by great dryness and harshness.

At the beginning of the month, when an anticyclone extended in from the Atlantic, a cool breeze from the north-westward prevailed in these islands, and sharp night frosts were experienced in many districts. On the 2nd, however, the high pressure system moved southwards, and for the next two or three days mild winds from the west and south-west were experienced ; the thermometer on the 3rd and 4th rising above 55° in many parts of England and Ireland, and reaching a maximum of 59° at Killarney. In the rear of a small cyclonic disturbance, which travelled rapidly across Ireland and

England on the night of the 4th, a stiff gale from the north-westward sprang up next day along the east coast of England, but this soon subsided, and on the 5th and 6th, when a large anticyclone drifted over the country from the westward, the weather became fair and quiet, with sharp night frosts in west inland districts. Early on the 7th, the sheltered thermometer fell at least 10° below the freezing-point in many parts of England, while on the surface of the grass it sank much lower, a reading of 14° being recorded at Newton Rigg, and a reading of 12° at Birmingham (Edgbaston) and Llangammarch Wells. Between the 9th and 11th an interruption to the anticyclonic conditions was caused by a large "V-shaped" depression, which spread in from the Atlantic, and ultimately developed into a clearly defined cyclonic system over the centre of England. On the night of the 10th, however, the disturbance passed away to the southward, and for the next few days the weather was influenced by a new anticyclone, which moved steadily in a south-westerly direction from northern Europe across the United Kingdom to the Atlantic. On the nights of the 12th and 13th, when the highest pressures lay directly over this country, the sheltered thermometer fell slightly below 20° in many districts; the readings on the surface of the ground being as low as 13° even as far south as Kew, and as low as 3° at Llangammarch Wells. After the 15th the anticyclone, which had receded temporarily to the westward of these islands, advanced in an easterly direction, its central area passing on to Central Europe, in which position it remained until nearly the end of the month. The borders of the system continued in the meantime to envelope a large portion of the United Kingdom, where the weather remained fair and dry. In spite of much bright sunshine, the thermometer never rose to a high level, and at night it often fell below the freezing-point; the sharpest frosts occurring, as a rule, between the 23rd and 25th, and in the English and Welsh districts. In the screen, readings below 15° were recorded in several parts of our midland and southern counties, while on the grass the thermometer fell below 10° in isolated places, and to 3° at Llangammarch Wells. Towards the close of the month the anticyclone gradually gave way; the extension of a large shallow area of low pressure from southern Europe and the Mediterranean being accompanied by cold winds from the north-eastward, and falls of snow or sleet over a large portion of the country.

In the north of Ireland, and the west and north of Scotland, the mean temperature of February was above the average. All other districts reported a deficiency of warmth, and in the central and southern parts of England the mean readings were from two and a half to three degrees below the normal.



THE SEASONS AND THEIR DEFINITION.

By L. C. W. BONACINA.

ONE of the intractable questions which the interest and beauty of many of the phenomena of nature tempt us to investigate and acquire orderly notions about is that involved in the endeavour to make a systematic and satisfactory division of the year into those some four more or less well-defined periods which we call the seasons. To attempt to define rigidly the four natural seasons—winter, spring, summer and autumn—by certain fixed dates is, for several reasons, impossible; for not only do the different seasons merge insensibly into one another, but also each season defined with reference to some conditional phenomena is not coincident with the same season defined with reference to other conditional phenomena, and so on. Thus, the seasons arranged according to the length of the day and the declination of the sun are not entirely coincident with those arranged according to the average mean temperature of the air or other meteorological elements, and these in turn do not always fit in very well with those recurrent seasonal changes in animal and vegetable life which constitute the subject known as phenology. The generally adopted arrangement of summer to include the three months of June, July and August, and of winter those of December, January and February, is not altogether satisfactory, because it is based primarily on the consideration of air temperature. From the point of view of the total quantity of solar light and heat received by a given place,* or the atmosphere over it, the month of May in the northern hemisphere usurps the place of August as a summer month, and November the place of February among the three months of winter. If we choose to strike a compromise between the merits of the length of the day and the temperature of the earth and air, doubtless the arrangement June, July, August,† . . . December, January, February, is the best possible. But such a compromise is not justifiable. We cannot do what we should like, namely, arrange the seasons according to the power and duration of direct sunlight and heat, and according to the actual amount of heat in the ground and air, as well as according to other specific conditions, in such a way that each arrangement may coincide with each of the others. In other words, the question is intractable. The constructors of the almanac, not to be daunted, have displayed a love of mathematical precision which would appear to be proof to the difficulties in question, for they have decreed that spring shall *begin* on a certain day in March when the sun crosses the line and enters a certain constellation in the heavens; summer at a certain time in June (generally regarded as *midsummer*)

* This depends on the declination of the sun and the length of the day—two rigorously interdependent functions.

† The first week only of August has longer days than the first week of May; so that taking the months as a whole, the days are much longer in May, similarly as regards November and February (see any almanac).

when the sun is vertical over the tropic of Cancer; autumn, in September on a certain date when the sun is again vertical over the equator, and winter when our luminary has attained its greatest southerly declination about Christmas time, and is vertical over the tropic of Capricorn. This scheme is, of course, eminently absurd, because it is devised in the interests of mathematical symmetry instead of in those of the particular phenomena of nature of which it is supposed to take account. The symmetry observed is this: spring, regarded as the period when the days are longer than the nights and always increasing in length; summer, when the days are also longer than the nights but decreasing in length; autumn, when the days are shorter than the nights and decreasing; winter, when the days are still shorter than the nights but increasing. It need scarcely be observed that this division does not agree very well with the meteorological seasons, especially in some climates. Putting symmetry then on one side, there are three main sets of conditions involved in the discussion of the seasons: (1) astronomical, involving the length of the day and the declination of the sun controlling the quantity of direct solar light and heat; (2) meteorological, involving air and ground temperature, windiness, rainfall, &c.; (3) phenological, involving the leafing, flowering, fruiting, &c., of plants, and associated events in the economy of animal life. It has been said above that these three classifications are not altogether coincident or simultaneous, and there the matter stops. There is nothing for it but to think of the astronomical, meteorological and phenological seasons individually. It happens, moreover, that our terminology is unfortunate, and does not render easier our attempt to form a clear conception of the time of incidence of each of the four recognised seasons. The words spring, summer, autumn and winter are scarcely systematic in their signification. *Spring* and *autumn* (literally the "increase"), or *fall*, as the latter season is well named by the Americans as well as by the English peasantry in antithesis to the former, are clearly terms of phenological import. The etymology of the words summer and winter is uncertain. "Winter," perhaps, originally referred to the wet and windy season more especially than to the time of cold weather and short days. Be that, however, as it may, the terms winter and summer may, in the absence of obvious literary import or reliable etymology, be used in the modern habitual sense respectively of the cold period of the year with short days and the warm period with long days. To return to the terms spring and autumn, if the phenological seasons denoted by these terms were coincident with the astronomical "spring" and "autumn" so to speak, and if they were the same length as what we commonly regard as the meteorological "spring" and "autumn," associated respectively with the rapid rise and fall of air temperature and other less important conditions, there would be no harm in making these two terms do justice for the three-fold seasons; but, as this is not the fact, it is very important (there being nothing so destructive of

the purity of our beautiful language than the careless habit, doubtless rooted in the rush of modern life, of misusing words) that the word spring should be primarily associated in our minds with the idea of the spring or rise of life, and the word autumn with the fall or ebb of life, so far as such rise and fall are periodically governed by the physical changes due to the revolution of the Earth round the sun. For the astronomical "spring"—February, March and April comprising the days of more medium length surrounding the vernal equinox—or season following the astronomical winter, November December and January, we do not possess an adequate word, nor likewise for the astronomical "autumn"—August, September and October, comprising the days of more medium length surrounding the autumnal equinox.

Now, if we then regard the spring and autumn as phenological seasons, and winter and summer as independent astronomical seasons—each pair, of course, in association with definite meteorological or climatic conditions—a new conception of the seasonal division of the year suggests itself: this is to divide the year *simultaneously* in two dimensions—into summer-winter half-years and spring-autumn half-years. The summer-winter half-years are to be bounded by the equinoctial dates; the summer half-year when the days are longer than the nights to extend from March 20th to September 23rd, or, in order to avoid splitting months, say from April 1st to September 30th, whilst the winter half-year with the days shorter than the nights will include the six months October to March. Simultaneously with this division, the spring and autumn half-years are to be defined by the solstitial periods; the spring half-year to be the six months January to June, the autumn half-year July to December.

Now I will endeavour to justify this novel two-fold scheme. To take spring and autumn first; regarding the spring six months as extending from the solstitial period of midwinter through the March equinox to the solstitial period of midsummer, and the autumn half-year from midsummer in June through the September equinox to midwinter at Christmas, the question arises—is this device thoroughly in accordance with the phenological idea of the words spring and autumn insisted upon above? No sooner do the days begin materially to lengthen, and the amount of direct light and heat from the sun perceptibly to increase, than the phenological year begins to move with a rapidity which depends upon latitude, altitude and other factors which render a locality warmer or colder—to move despite the fact that from the point of view of air and soil temperature, the months of January, February and even March are colder than November and December. The high tide of spring, however, or what is generally known as the spring season, embraces more or less three months only out of the spring half-year, which are in northern Africa and the extreme south of Europe February, March and April; in the more central parts of Europe, including on the whole the southern counties of England, March, April, May; in northern

Europe from, say, the latitude of Scotland to the arctic regions, or to where there is anything beyond stunted birch and willow to manifest the spring at all, April, May and June. On the other hand, immediately after midsummer, the tide is on the turn. Every little leakage of terrestrial heat which the slowly retreating sun after mid-July insidiously permits—every chilly draught from the northern regions that shivers the forest leaves, moves the swallow tribe one stage southward, daubs the full green trees here and there with a small patch of gold, and damps the fervour of insect life. Autumn, with the bounty of the Earth in her advance guard, and the forces of destruction in her rear, has proclaimed her dominion even amid the height of summer's luxuriance, although her inroads may long be withstood by the sultry heat of the later summer months. In the far north of Europe full autumn is in evidence by the end of August, when she is mustering her forces to carry the campaign southwards. It is not, however, till late in October that she has fully invaded the woods and hedges of the southern English shires with her coloured pageant, whilst her career of victory is probably not completed till the leaves are falling on the ultra shores of the Mediterranean upon the very verge of Christmas—only to be renewed again in February. I believe I am right in saying that in Algeria is to be found the southern limit of many of our British forest trees, and that the species of deciduous trees which with us are bare for half the year, tend in the warm countries of northern Africa to become evergreen.

The rise and fall, the flow and ebb of the tide of wild life which constitute spring and autumn, was charmingly figured by the Greeks in the story of Persephone.

Of the winter-summer division of the year little need be said other than that it is proper to regard winter as the whole period when the days are shorter than the nights and the sun feeble, summer when the days are longer than the nights and solar light and heat powerful. It should be remembered that it is direct solar light and heat that is of primary importance, and of which the living world takes most cognisance; not mere air temperature, provided, of course, that the latter is not monstrously at variance with the amount and intensity of direct sunshine. Hence, the month of April although in our insular climate distinctly colder as regards mean air temperature than October, is placed in preference to October among the summer six months—in other words, as being in the more liberal sense of the word the hotter month; the sun's declination and the length of the day being little inferior to what they are in the hot month of August.

The two-fold division of the year here proposed has at least the merit of being able to define the seasons with something like precision: spring to co-exist with the second half of the winter half-year and the first half of the summer half-year; autumn to co-exist with the second half of the summer half-year and the first half of the winter half-year. It is therefore to be preferred to the single-phased division into four successive seasons.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, February 17th, at the Institute of Civil Engineers, Great George Street, Westminster, Mr. H. Mellish, President, in the chair.

Before proceeding with the ordinary business, the President referred to the recent death of Mr. H. S. Eaton, who had been for some years the senior Fellow of the Society. He was elected in 1857, and filled the office of President in the years 1876-77.

Mr. E. Mawley read his "Report on the Phenological Observations for 1908." The most noteworthy features of the weather of the phenological year ending November, 1908, were the severe frosts early in January, the exceptionally heavy fall of snow and remarkably low temperatures in the latter part of April, and the marked periods of unusually wet and dry weather during the summer. In February and March wild plants came into blossom in advance of their usual time, but throughout the rest of the flowering season were more or less behind their average dates. Such early spring migrants as the swallow, cuckoo and nightingale made their appearance very late. The only deficient farm crop was that of barley. The yield of wheat, oats and beans, was rather above the average, that of peas and hay very good, while the crops of turnips, mangolds and potatoes, taken together, were the most abundant for many years. The yield of apples was under average, and that of pears and plums much under average. On the other hand the crops of currants, gooseberries and strawberries were almost everywhere unusually good. As regards the farm crops this was the third good year in succession, although compared with 1906 and 1907 the yields in 1908, except in the case of turnips, mangolds and potatoes, were inferior to those of the other two years.

Mr. J. E. Clark, Mr. T. L. K. Edge, Mr. R. Inwards, Mr. F. J. Brodie and Mr. F. C. Bayard took part in the discussion, and Mr. Mawley replied.

Mr. W. Marriott read a paper on "The Cold Spell at the end of December, 1908." The weather during December was generally mild until Christmas day, when a considerable change took place in the distribution of barometric pressure, and the weather assumed a wintry character. Gales occurred in many places, and snow fell more or less over the British Isles during the following week. The most remarkable feature, however, was the intense cold which prevailed over the central and south-eastern portion of England from the 28th to the 31st. The temperature on the 28th did not rise above 25° over a considerable portion of the Midlands, while on the 29th it remained below 25° over practically the whole of England (except the south-western counties) up to within about 20 miles of the coast. On the 28th, 29th and 30th, over the greater part of the country, the minimum thermometer fell below 20° , while over a considerable area it fell below 10° on the 29th and 30th. At several places the lowest

temperature recorded was about zero. At Berkhamsted the thermograph showed that the temperature remained below 25° for a period of 58 hours—a most unusual occurrence. Mr. Marriott stated that the isobaric charts indicated that during this period there was a ridge or wedge of high pressure between two cyclonic systems, and that the conditions were thus favourable for the production of great cold. For the month of December the cold was very exceptional, as the only instances in the neighbourhood of London, or at Greenwich, in which the maximum temperature was below $25^{\circ}\cdot5$ for the day were the following:—1796, 25th, $19^{\circ}\cdot5$; 1798, 28th, $19^{\circ}\cdot5$; 1816, 22nd, $24^{\circ}\cdot0$; 1830, 24th, $22^{\circ}\cdot0$; 1855, 21st, $23^{\circ}\cdot2$; 1874, 31st, $24^{\circ}\cdot5$; 1890, 22nd, $23^{\circ}\cdot7$ and 1908, 29th, $25^{\circ}\cdot4$, and 30th, $23^{\circ}\cdot3$. Mr. Marriott said it was desirable that observers should have their minimum thermometers graduated down to -20° , and their dry and wet bulb thermometers graduated down to zero. There were several instances where the thermometers could not be read, either because they were not graduated low enough, or else because the top of the column of mercury was hidden by the wooden bar supporting the tubes.

Mr. W. W. Bryant, Mr. C. J. P. Cave, Mr. F. Druce and the President took part in the discussion, and Mr. Marriott replied.

The following gentlemen were elected Fellows of the Society:—Mr. F. Feather, Mr. F. H. French, Mr. R. Harper and Mr. Quah Beng Kee.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

TEMPERATURE BELOW ZERO IN MARCH.

I THINK the very remarkable temperatures recorded here for Tuesday night, March 2nd, and early Wednesday morning, March 3rd, should be noticed in your journal, especially as the weather report printed in *The Times* on Thursday, March 4th, has no reference to anything so remarkable. On Tuesday, March 2nd, there was a fall of snow for about half an hour, commencing shortly after 5.30 p.m., which lay nearly 3 inches and measured when melted $\cdot18$ in. Soon after the temperature fell rapidly, and before midnight was at 19° F. on the east side of the house. At 9 a.m. on Wednesday morning, March 3rd, in the screen, the actual temperature was 21° F. The minimum during the night had been 5° F., and the exposed thermometer on the grass, which was half buried in the snow, had been as low as -3° F. I hear that at Landford, about 6 miles east of this, there was an observation of -2° F. on the grass.

I have no means at hand of comparing the temperatures with those of previous years, but I am sure for the thermometer on the grass to go below 0° F. in March is so remarkable as to be worthy of record.

FRANK PENROSE.

Wick House, Downton, Salisbury, March 5th, 1909.

ON the night of March 2nd—3rd, Tuesday, my thermometer (Kew certificated, in screen) went down to 5° F. Lady Jenkyns's, at Botley Hill (also with Kew certificate and in screen), only to 10°; at the Rectory they had it 2°, and Exton says zero; but neither of those are screened, and are probably laid on their backs on a garden frame. The thermometer against my room window was only 8° at 7.15 in the morning. We were thankful for 2½ inches of snow to protect the plants. My trees looked like a forest of white coral. I never saw anything so beautiful.

L. PASLEY.

Beechcroft, Botley, Hants, March 4th, 1909.

THE DRY WINTER.

THE following statement as to the shortness of our rain-water supply may interest your readers. Springs and ponds are now very low.

Rainfall Measured at Scaldwell.

	HIGHEST. 1903—4. in.		LOWEST. 1904—5. in.		2ND LOWEST. 1908—9. in.
October	6·38	.....	·57	.....	1·04
November	1·54	.....	1·23	.....	·97
December	1·09	.....	1·57	.....	1·63
January	2·22	.....	·85	.....	1·03
February	3·04	.....	·62	.....	·51
	<hr/>		<hr/>		<hr/>
	14·27		4·84		5·18

Average last 20 years 10·23 in.

These months are the most important ones for filling up our springs.

R. SOAMES.

Scaldwell, Northampton, March 3rd, 1909.

THE rainfall here as measured by a Snowdon rain gauge for the five winter months, during which the springs in this district usually fill up, has been as follows, compared with the average :—

	1908—09. in.		Average of 27 years. in.
October	1·48	.....	3·40
November	1·17	.....	3·05
December	3·06	.....	2·64
January	1·07	.....	2·37
February	·46	.....	2·17
	<hr/>		<hr/>
	7·24		13·63

Deficiency... 6·39 = 46 %.

The deficiency below the average is so great, I fear there will be a serious shortage of water during the ensuing season.

FREDERICK WILKIN.

Lower Cousley Wood, Wadhurst, 1st March, 1909.

EXTRAORDINARY METEOR AND ITS STREAK.

ON February 22nd, at 7.30 p.m., a fine meteor passed with a rather slow flight from east to west over the English Channel. Its light was very intermittent, but it burst out several times near the end of its course, with a lustre exceeding that of Venus. A fiery tail followed the nucleus, but this quickly dissolved to give place to a silvery streak which soon glared out and intensified all along the track of the meteor. This streak exhibited bends at the terminal points and the whole appearance changed rapidly in its aspect and position. The drift was towards north-west. For more than 2 hours the streak continued visible to the naked eye moving from the stars of Monoceros, Canis Minor and Major, and Orion to over Polaris and Cassiopeia, where it was ultimately lost amid the Milky Way. The long duration of this after glow is remarkable, for the luminous residue from consumed meteors seldom remains in sight for 10 minutes, though the Madrid meteorite of February 10th, 1896, left a cosmic cloud visible to the eye for $5\frac{1}{2}$ hours.

Through the kindness of the Astronomer Royal, the Director of the Meteorological Office, and many observers of the phenomenon, I have received a great number of descriptions of its leading features. The radiant of the meteor seems to have been near the star Beta Leonis, and its height decreased from about 60 to 26 miles, and probably less, along a path exceeding 135 miles.

W. F. DENNING.

44, Egerton Road, Bristol, March 3rd, 1909.

CROSSING this park, which is at an elevation of, I think, about 300 ft., with an unobstructed view of the heavens to the south and south-west, I saw the meteor of February 22nd, at about 7.45 p.m. Its course was almost straight with hardly any curve. It was very brilliant, the head being of the richest blue, and was visible nearly half a minute as it seemed to me. When the explosion or disappearance took place it had left a strongly marked trail—almost horizontal—from above Sirius, through Lepus and then further westward. Where the head had been there was, as it were, a shower of sparks. Presently it seemed as though this shower was being thrown back and the track assumed the shape of a shepherd's crook. The crook gradually crept eastward and the shoulder of the crook seemed a little jointed, rather like a finger pointing. The outline was quite distinct and not merely a blur of light. About 8.15 the upper outline was passing through the belt of Orion. About 8.30 it was passing above and quite clear of Orion, and the angle was becoming more and more obtuse. About 9.10 the lower outline had disappeared—apparently for the most part below the horizon—the upper outline was nearly vertical, pointing upwards towards the Pleiades.

MACKWOOD STEVENS.

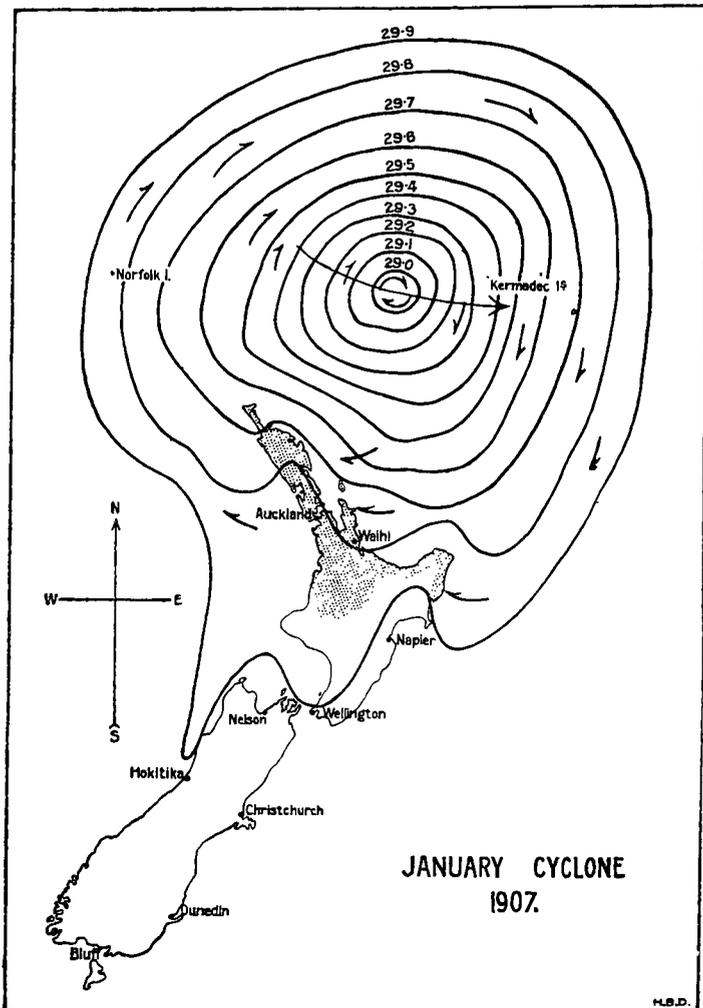
Addington Rectory, Winslow, Bucks.

THE CYCLONE AND FLOODS OF JANUARY, 1907, IN NEW ZEALAND.

By H. B. DEVEREUX, F.R. Met. Soc.

THE month of January, 1907, was remarkable for the passage of a cyclone from tropical regions which was productive of an excessively heavy rainfall in the northern portions of the North Island of the Dominion, and the writer pens this account of a cyclone in high latitudes in the southern hemisphere in the hopes that it will interest readers "on the other side," as we say here.

By way of preface, it will be, perhaps, necessary to state that cyclones approach this country from the north-westward, and the one with which we are concerned approached from near Norfolk Island. These disturbances have always increased considerably in area after leaving tropical latitudes, and have lost the extreme wind velocity



they had when nearer to their point of origin, but some that arrive here have winds of nearly hurricane force.

The disturbance was far-reaching in its effects, and the area of excessive rainfall is shown in the shaded portion of the accompanying map. The mountainous nature of this portion is largely responsible for the heavy rainfall during the passage of cyclones from the N.W. There is usually a packing of the isobars at and near such positions, the result being an increase of both wind and rain within such areas. The map also shows the cyclone in its progression to the eastward. The details were supplied by the Director of the Meteorological Office. The cyclone was of great area, and instead of pursuing a S.E. route appears to have taken an easterly one. It had two minima, and this fact, no doubt, accounts for the intenser nature of the rain at one period. The following observations of rainfall were taken by the author at Waihi, which station recorded the heaviest fall during the floods, although abnormal rains were experienced elsewhere.

Jan. 7	.....	in.	Jan. 12	.....	in.
		·05			·14
„ 8	.....	2·15	„ 13	.....	5·06
„ 9	.....	4·44	„ 14	.....	2·79
„ 10	.....	·32	„ 15	.....	2·27
„ 11	.....	4·28			

or 21·50 in. in 9 days.

Two rain gauges were used—an ordinary funnel and bottle pattern and a Lander & Smith automatic recording—both of 5 in. diameter. Owing to the fact that the whole surrounding surface was “spongy,” and a spring having arisen in the supporting cylinder, the latter gauge was soon out of action, and what would have been valuable charts were lost.

The attendant atmospheric conditions were almost insufferable, the air being continually at saturation point, and the mean temperature high. The mean daily temperature was 67°·6 F. (screen), and the mean daily range, 8°·5 only. Thunder and lightning were frequent. The wind was steadily north-east, of the force of a gale generally, the backing movement on the 15th bringing a welcome drop of the thermometer. The damage caused by the floods and rain was almost unprecedented, coming at the height of harvesting operations. Where standing the crops were flattened to the ground, and where cut the grain began to shoot, and blight appeared in the potato fields over a very large area of country. Some hundreds of miles of railway line were disorganised, and on one section there were 40 miles of “washouts.” Traffic on the main arterial line of the Auckland Province was blocked for over a week.

The Waikato River, the main inland waterway of the Province, rose at one time at the rate of an inch every 10 minutes, overflowed its banks, and submerged a considerable area of country.

The fact of the very warm rains falling on the snow on the volcanoes in the interior, where the Waikato has its source, was no doubt a contributing factor to the rapid rise of the river.

RAINFALL TABLE FOR FEBRUARY, 1909.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99. in.	1909. in.
Camden Square.....	London.....	51 32	0 8	111	1'62	'50
Tenterden.....	Kent.....	51 4	*0 41	190	1'85	'64
West Dean.....	Hampshire.....	51 3	1 38	137	2'27	...
Hartley Wintney.....	".....	51 18	0 53	222	2'06	'40
Hitchin.....	Hertfordshire.....	51 57	0 17	238	1'54	'43
Winslow (Addington).....	Buckinghamsh.	51 58	0 53	309	1'73	'43
Bury St. Edmunds (Westley).....	Suffolk.....	52 15	*0 40	226	1'55	'51
Brundall.....	Norfolk.....	52 37	*1 26	66	1'49	'60
Winterbourne Steepleton.....	Dorset.....	50 42	2 31	316	3'11	'59
Torquay (Cary Green).....	Devon.....	50 28	3 32	12	2'87	'44
Polapit Tamar [Launceston].....	".....	50 40	4 22	315	2'84	'87
Bath.....	Somerset.....	51 23	2 21	67	2'12	'66
Stroud (Upfield).....	Gloucestershire.....	51 44	2 13	226	2'13	'71
Church Stretton (Wolstaston).....	Shropshire.....	52 35	2 48	800	2'27	1'06
Coventry (Kingswood).....	Warwickshire.....	52 24	1 30	340	1'99	'69
Boston.....	Lincolnshire.....	52 58	0 1	25	1'55	'48
Worksop (Hodsock Priory).....	Nottinghamshire.....	53 22	1 5	56	1'58	'55
Derby (Midland Railway).....	Derbyshire.....	52 55	1 28	156	1'66	'65
Bolton (Queen's Park).....	Lancashire.....	53 35	2 28	390	2'67	1'85
Wetherby (Ribston Hall).....	Yorkshire, W.R.	53 59	1 24	130	1'63	'65
Arncliffe Vicarage.....	".....	54 8	2 6	732	4'74	4'90
Hull (Pearson Park).....	"..... E.R.	53 45	0 20	6	1'86	1'05
Newcastle (Town Moor).....	Northumberland.....	54 59	1 38	201	1'58	1'72
Borrowdale (Seathwaite).....	Cumberland.....	54 30	3 10	423	1'64	11'45
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	3'13	'68
Haverfordwest (High Street).....	Pembroke.....	51 48	4 58	95	3'70	'53
Aberystwyth (Gogerddan).....	Cardigan.....	52 26	4 1	83	3'03	'64
Llandudno.....	Carnarvon.....	53 20	3 50	72	1'97	1'08
Cargen [Dumtries].....	Kirkcudbright.....	55 2	3 37	80	3'62	2'02
Hawick (Branxholm).....	Roxburgh.....	55 24	2 51	457	2'62	1'50
Edinburgh (Royal Observy.).....	Midlothian.....	55 55	3 11	442	...	1'23
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	4'00	3'74
Glasgow (Queen's Park).....	Renfrew.....	55 53	4 18	144	2'53	1'78
Inveraray (Newtown).....	Argyll.....	56 14	5 4	17	4'90	4'32
Mull (Quinish).....	".....	56 36	6 13	35	4'50	3'62
Dundee (Eastern Necropolis).....	Forfar.....	56 28	2 57	199	2'10	'82
Braemar.....	Aberdeen.....	57 0	3 24	1114	2'70	'53
Aberdeen (Cranford).....	".....	57 8	2 7	120	2'43	'79
Cawdor.....	Nairn.....	57 31	3 57	250	1'86	1'16
Fort Augustus (S. Benedict's).....	E. Inverness.....	57 9	4 41	68	3'88	1'84
Loch Torridon (Bendamph).....	W. Ross.....	57 32	5 32	20	6'77	6'36
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	2'39	1'54
Castletown.....	Caithness.....	58 35	3 23	100	...	1'64
Killarney (District Asylum).....	Kerry.....	52 4	9 31	178	5'44	4'08
Waterford (Brook Lodge).....	Waterford.....	52 15	7 7	104	3'30	'81
Broadford (Hurdlestown).....	Clare.....	52 48	8 38	167	2'19	1'61
Abbey Leix (Blandsfort).....	Queen's County.....	52 56	7 17	532	2'58	'79
Dublin (Fitz William Square).....	Dublin.....	53 21	6 14	54	1'98	'59
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	2'51	1'65
Ballinasloe.....	Galway.....	53 20	8 15	160	2'48	1'35
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 18	74	4'01	3'17
Collooney (Markree Obsy.).....	Sligo.....	54 11	8 27	127	2'84	2'17
Seaforde.....	Down.....	54 19	5 50	180	2'97	1'51
Londonderry (Creggan Res.).....	Londonderry.....	54 59	7 19	320	2'73	3'41
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	2'49	1'88

RAINFALL TABLE FOR FEBRUARY, 1909—continued.

RAINFALL OF MONTH (con.)					RAINFALL FROM JAN. 1.				Mean Annual 1870-1899.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.		No. of Days	Aver. 1870-99.	1909.	Diff. from Aver. in.	% of Av.		
		in.	Date.							
-1.12	31	.13	9, 28	8	3.51	1.21	-2.30	34	25.16	Camden Square
-1.21	35	.20	26	10	4.21	1.52	-2.69	36	28.36	Tenterden
...	...	...	...	...	4.95	...	...	...	29.93	West Dean
-1.66	19	.13	10	7	4.45	1.34	-3.11	30	27.10	Hartley Wintney
-1.11	28	.19	9	7	3.35	1.21	-2.14	36	24.66	Hitchin
-1.30	25	.14	10	8	3.78	1.35	-2.43	36	26.75	Addington
-1.04	33	.17	9	7	3.25	1.46	-1.79	45	25.39	Westley
-.89	40	.10	27	13	3.16	1.24	-1.92	39	25.40	Brundall
-2.52	19	.37	9	8	7.01	2.07	-4.94	30	39.00	Winterbourne Stpltn
-2.43	15	.37	9	3	6.06	2.01	-4.05	33	35.00	Torquay
-1.97	31	.64	9	6	6.71	3.63	-3.08	54	38.85	Polapit Tamar
-1.46	31	.45	10	4	4.64	1.83	-2.81	39	30.75	Bath
-1.42	33	.34	10	9	4.59	1.81	-2.78	39	29.85	Stroud
-1.21	47	.35	10	8	5.08	2.69	-2.39	53	33.04	Wolstaston
-1.30	35	.30	10	5	4.33	1.85	-2.48	43	29.21	Coventry
-1.07	31	.11	27	9	3.14	1.38	-1.76	44	23.30	Boston
-1.03	35	.31	10	7	3.32	1.67	-1.65	50	24.70	Hodsock Priory
-1.01	39	.32	10	9	3.61	1.93	-1.68	53	26.18	Derby
-.82	69	.65	9	9	6.05	4.13	-1.92	68	42.43	Bolton
-.98	40	.20	10	7	3.52	1.45	-2.07	41	26.96	Ribston Hall
+ .16	103	1.53	4	12	11.07	9.72	-1.35	88	60.96	Arneliffe Vic.
-.81	56	.68	4	10	3.66	1.70	-1.96	46	27.02	Hull
+ .14	109	.64	4	9	3.54	2.65	-.89	75	27.99	Newcastle
-.19	98	3.78	2	11	26.35	22.08	-4.27	84	132.68	Seathwaite
-2.45	22	.45	9	6	6.98	2.74	-4.24	39	42.81	Cardiff
-3.17	14	.27	8	7	8.83	2.87	-5.96	33	47.88	Haverfordwest
-2.39	21	.30	9	10	6.90	3.86	-3.04	56	45.41	Gogerddan
-.89	55	.57	9	10	4.54	3.24	-1.30	71	30.98	Llandudno
-1.60	56	.76	4	5	8.16	7.73	-.43	95	43.43	Cargen
-1.12	57	.56	4	12	5.81	4.93	-.88	85	34.80	Branxholm
...	...	.71	4	7	...	3.84	...	...	...	Edinburgh
-.26	93	1.12	5	13	8.92	8.79	-.13	99	48.87	Girvan
-.75	70	.89	2	7	5.78	7.14	+1.36	123	35.80	Glasgow
-.58	88	2.50	2	15	11.53	13.67	+2.14	119	57.90	Inveraray
-.88	80	1.18	2	15	10.35	10.12	-.23	98	57.53	Quinish
-1.28	39	.26	4	9	4.20	2.29	-1.91	55	28.95	Dundee
-2.17	20	...	...	...	5.61	3.83	-1.78	68	36.07	Braemar
-1.64	33	.20	9	13	4.75	2.74	-2.01	58	33.01	Aberdeen
-.70	62	.57	2	8	4.00	3.59	-.41	90	29.37	Cawdor
-2.04	47	1.06	2	10	8.98	8.02	-.96	89	43.71	Fort Augustus
-.41	94	1.45	3	14	15.52	18.36	+2.84	118	86.50	Bendamph
-.85	64	.34	3	12	5.01	4.90	-.11	98	31.60	Dunrobin Castle
...	...	.26	3	18	...	5.35	...	...	...	Castletown
-1.36	75	.81	8	15	12.01	8.66	-3.35	72	58.11	Killarney
-2.49	25	.40	8	10	7.36	2.78	-4.58	38	39.30	Waterford
-.58	74	.36	22	13	5.17	4.94	-.23	96	33.47	Hurdlestown
-1.79	31	.20	8	12	5.72	3.48	-2.24	61	35.19	Abbey Leix
-1.39	30	.25	28	8	4.14	1.85	-2.29	45	27.75	Dublin
-.86	66	.32	8, 10	11	5.57	4.37	-1.20	78	36.48	Mullingar.
-1.13	54	.23	27	17	5.97	3.90	-2.07	65	37.04	Ballinasloe
-.84	79	.63	8	15	9.01	8.29	-.72	92	50.50	Enniscooe
-.67	76	.44	7	17	6.45	7.14	+ .69	111	41.83	Markree Obsy.
-1.46	51	.65	3	12	6.60	3.81	-2.79	58	38.61	Seaforde
+ .68	125	.86	4	17	6.29	8.84	+2.55	141	41.20	Londonderry
-.61	76	.39	3	15	5.83	5.67	-.16	97	37.85	Omagh

SUPPLEMENTARY RAINFALL, FEBRUARY, 1909.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	·76	XI.	Rhayader, Tyrmynydd	1·57
„	Ramsgate	1·26	„	Lake Vyrnwy	1·73
„	Steyning	·52	„	Llanghanfal, Plás Draw....	1·62
„	Hailsham	·42	„	Llwdiarth Esgob.....	·88
„	Totland Bay, Aston House.	·32	„	Snowdon, Cwm Dyli	4·33
„	Emsworth, Redlands .....	...	„	Lligwy	·76
„	Stockbridge, Ashley	·41	„	Douglas, Woodville	2·19
„	Reading, Calcot Place.....	·44	XII.	Stoneykirk, Ardwell House	2·51
III.	Harrow Weald, Hill House.	·48	„	Dalry, The Old Garroch ...	4·63
„	Oxford, Magdalen College...	·45	„	Langholm, Drove Road	2·77
„	Pitsford, Sedgebrook	·50	„	Moniaive, Maxwelton House	2·03
„	Huntingdon, Brampton.....	·32	XIII.	N. Esk Reservoir [Penicuick]	2·35
„	Woburn, Milton Bryant.....	·44	XIV.	Maybole, Knockdon Farm..	3·60
„	Wisbech, Monica Road.....	·45	XV.	Campbeltown, Witchburn...	2·95
IV.	Southend Water Works.....	1·03	„	Glentrasdell Mains.....	2·89
„	Colchester, Lexden.....	1·31	„	Ballachulish House.....	5·53
„	Newport, The Vicarage.....	·39	„	Islay, Fallabus	3·03
„	Rendlesham	·90	XVI.	Dollar Academy	2·36
„	Swaffham	·28	„	Loch Leven Sluice	1·23
„	Blakeney	·35	„	Balquhiddier, Stronvar	3·65
V.	Bishops Cannings	·44	„	Perth, The Museum	·87
„	Ashburton, Druid House ...	·69	„	Coupar Angus	·66
„	Honiton, Combe Kaleigh ...	·50	„	Blair Atholl.....	·57
„	Okehampton, Oaklands.....	·71	„	Montrose, Sunnyside Asylum	·78
„	Hartland Abbey	·45	XVII.	Alford, Lynturk Manse ...	1·08
„	Lynmouth, Rock House ...	·57	„	Keith Station	1·85
„	Probus, Lamellyn	·53	XVIII.	N. Uist, Lochmaddy	1·83
„	North Cadbury Rectory ...	·96	„	Alvey Manse	1·06
VI.	Clifton, Pembroke Road ...	·63	„	Loch Ness, Drumnadrochit.	1·74
„	Ross, The Graig	·44	„	Glencarron Lodge	5·89
„	Shifnal, Hatton Grange.....	·66	„	Fearn, Lower Pitkerrie.....	·52
„	Blockley, Upton Wold	·67	XIX.	Invershin	2·08
„	Worcester, Boughton Park.	·44	„	Altnaharra .....	...
VII.	Market Overton	·65	„	Bettyhill	1·79
„	Market Rasen	1·20	XX.	Dunmanway, The Rectory..	4·91
„	Bawtry, Hesley Hall.....	·44	„	Cork	2·35
„	Buxton.....	2·33	„	Mitchelstown Castle	2·11
VIII.	Neston, Hinderton Lodge...	·68	„	Darrynane Abbey	3·05
„	Southport, Hesketh Park...	·98	„	Glenam [Clonmel]	1·89
„	Chatburn, Middlewood	4·90	„	Ballingarry, Gurteen	1·10
„	Cartmel, Flookburgh	2·82	„	Miltown Malbay.....	2·44
IX.	Langsett Moor, Up. Midhope	3·09	XXI.	Gorey, Courtown House ...	·75
„	Scarborough, Scalby	1·70	„	Moynalty, Westland	1·08
„	Ingleby Greenhow	1·57	„	Athlone, Twyford	1·07
„	Mickleton.....	2·36	XXII.	Woodlawn	1·62
X.	Bardon Mill, Beltingham ...	2·87	„	Westport, St. Helens	2·43
„	Ewesley, Font Reservoir ...	2·74	„	Mohill	1·70
„	Ilderton, Lilburn Cottage...	3·22	XXIII.	Enniskillen, Portora	2·31
„	Keswick, The Bank	4·39	„	Dartrey [Cootehill].....	1·41
XI.	Llanfrechfa Grange.....	·65	„	Warrenpoint, Manor House	1·64
„	Treherbert, Tyn-y-waun ...	1·45	„	Banbridge, Milltown	1·44
„	Carmarthen, The Friary....	·58	„	Belfast, Springfield	3·35
„	Castle Malgwyn [Llechryd].	·76	„	Bushmills, Dundarave	2·39
„	Plynlimon.....	3·00	„	Sion House	3·21
„	Crickhowell, Ffordlas.....	1·40	„	Killybegs	6·69
„	New Radnor, Ednol	1·30	„	Horn Head ...	3·57

METEOROLOGICAL NOTES ON FEBRUARY, 1909.

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 greater part of the month was fair or fine and unusually dry, but the closing days were very wintry and S fell on every day from 25th to 28th. A feature of the month was the consistently low min. temp., the mean, $30^{\circ}\cdot3$, being the lowest February value since the memorable frosts of 1895. Duration of sunshine, 66·9* hours, and of R, 32·1 hours. Mean temp. $36^{\circ}\cdot6$, or $3^{\circ}\cdot2$ below the average. Shade max. $55^{\circ}\cdot9$ on 4th; min. $20^{\circ}\cdot6$ on 23rd. F 22, f 26.

TENTERDEN.—Duration of sunshine 118·0† hours. Mean temp. $37^{\circ}\cdot0$. Shade max. $54^{\circ}\cdot0$ on 4th; min. $23^{\circ}\cdot0$ on 20th. F 21, f 25.

TOTLAND BAY.—Duration of sunshine 126·8* hours, or 40·7 hours above the average. Shade max. $51^{\circ}\cdot1$ on 4th; min. $24^{\circ}\cdot7$ on 23rd. F 14, f 24.

PITSFORD.—R 1·49 in. below the average. Mean temp. $36^{\circ}\cdot5$. Shade max. $54^{\circ}\cdot6$ on 4th; min. $18^{\circ}\cdot1$ on 23rd. F 21.

TORQUAY.—Duration of sunshine 123·6* hours, or 39·6 hours above the average, and a record amount for February. Mean temp. $41^{\circ}\cdot1$, or $2^{\circ}\cdot0$ below the average. Shade max. $54^{\circ}\cdot7$ on 4th; min. $26^{\circ}\cdot0$ on 14th. F 8, f 19.

NORTH CADBURY.—The first half was mostly boisterous, and the second half calm, with dry and generally sunny weather. It was the driest February since 1895, and the shortage of water was becoming very serious. Shade max. $54^{\circ}\cdot2$ on 4th; min. $22^{\circ}\cdot0$ on 14th. F 17, f 22.

ROSS.—Shade max. $55^{\circ}\cdot8$ on 4th; min. $20^{\circ}\cdot0$ on 5 days. F 19, f 23.

HODSOCK PRIORY.—Shade max. $55^{\circ}\cdot8$ on 3rd; min. $19^{\circ}\cdot7$ on 23rd. F 17, f 24.

SOUTHPORT.—R 1·08 in. below the average of 35 years. Duration of sunshine 90·9* hours, or 20·9 hours above the average. Duration of R 35·2 hours. Mean temp. $38^{\circ}\cdot2$, or $1^{\circ}\cdot4$ below the average. Shade max. $51^{\circ}\cdot7$ on 22nd; min. $24^{\circ}\cdot8$ on 25th. F 11, f 21.

HULL.—Shade max. $54^{\circ}\cdot0$ on 3rd and 4th; min. $26^{\circ}\cdot0$ on 14th, 22nd, and 23rd. F 18, f 26.

CARMARTHEN.—Cold and remarkably dry weather. Water supplies were low everywhere and vegetation was retarded by the cold.

HAVERFORDWEST.—Duration of sunshine 109·8* hours. Shade max. $52^{\circ}\cdot4$ on 4th; min. $23^{\circ}\cdot2$ on 14th. F 10, f 18.

LLANDUDNO.—Shade max. $52^{\circ}\cdot2$ on 4th; min. $27^{\circ}\cdot4$ on 25th. F 4.

DOUGLAS.—More than 2 inches of R, H or S fell during the first 10 days, but the rest of the month was unusually dry and calm with a fair amount of sunshine.

CARGEN.—Most of the R fell on 2nd, 3rd and 4th, and caused heavy floods, but at the close the rivers were exceptionally low. Shade max. $53^{\circ}\cdot0$ on 4th and 21st; min. $25^{\circ}\cdot0$ on 7th and 25th. F 12.

EDINBURGH.—Shade max. $53^{\circ}\cdot9$ on 21st; min. $26^{\circ}\cdot6$ on 25th. F 7, f 18.

DUNDEE.—Shade max. $54^{\circ}\cdot6$ on 3rd; min. $26^{\circ}\cdot7$ on 7th. F 14.

FORT AUGUSTUS.—Shade max. $51^{\circ}\cdot2$ on 21st; min. $19^{\circ}\cdot0$ on 13th. F 10.

WATERFORD.—Shade max. $56^{\circ}\cdot0$ on 3rd; min. $24^{\circ}\cdot0$ on 14th. F 9.

DUBLIN.—Cloudy and dry. An anticyclone lying to the E. caused high mean atmospheric pressure and fresh S.S.E. winds. Mean temp. $42^{\circ}\cdot7$, or $0^{\circ}\cdot3$ above the average. Shade max. $55^{\circ}\cdot2$ on 4th; min. $28^{\circ}\cdot0$ on 14th. F 3, f 8.

MARKREE.—Duration of sunshine, 29·7* hours. Shade max. $53^{\circ}\cdot2$ on 21st; min. $22^{\circ}\cdot3$ on 13th. F 6, f 13.

WARRENPOINT.—Shade max. $54^{\circ}\cdot0$ on 3rd, 5th and 6th; min. $24^{\circ}\cdot0$ on 13th. F 5, f 12.

* Campbell-Stokes

† Jordan

Climatological Table for the British Empire, September, 1908.

STATIONS. (Those in <i>italics</i> are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	79·0	30	38·5	13	66·4	49·0	52·1	0-100 86	113·6	34·5	inches 1·27	13	6·1
Malta	89·1	12	64·7	27	78·9	70·0	63·5	70	148·7	...	·64	4	3·1
Lagos	91·2	18	70·0	12†	83·1	73·6	73·5	83	160·0	62·0	15·87	24	8·9
Cape Town	72·0	13	40·7	28	63·8	50·5	49·3	71	...	...	1·77	5	3·4
Durban, Natal	82·9	18	55·6	22	74·9	61·5	...	...	138·8	...	1·62	14	1·2
Johannesburg	81·2	28	42·9	13	71·9	51·8	43·0	56	141·0	40·8	·84	5	2·8
Mauritius	80·5	25	58·9	9	77·4	63·4	60·0	70	143·7	50·4	·61	13	5·8
Calcutta	93·6	23	74·7	6	89·4	78·3	77·8	85	160·7	73·7	7·89	14	7·7
Bombay	90·3	28	75·4	9	85·9	77·4	76·0	85	134·0	71·8	6·71	20	7·2
Madras	98·2	2	73·9	22	90·8	76·5	76·5	86	146·0	70·2	9·51	19	5·7
Kodaikanal	67·5	30	50·4	19	63·2	52·9	52·5	85	139·2	43·4	8·91	21	7·2
Colombo, Ceylon	89·6	19	73·6	27	85·8	77·2	73·6	78	159·0	73·2	2·57	21	7·2
Hongkong	90·3	17	71·6	30	85·7	77·3	75·4	84	149·8	...	13·72	15	6·7
Melbourne	73·0	24	31·1	16	60·0	45·6	42·0	67	...	25·7	2·42	15	6·1
Adelaide	79·5	11	34·4	15	62·3	45·7	45·3	73	134·3	26·2	2·90	17	6·2
Coolgardie	84·0	29	33·0	1	69·9	42·1	37·8	51	145·4	28·0	·24	4	2·2
Perth	81·1	23	41·6	1,13	66·4	48·5	41·2	54	134·8	36·4	2·45	13	4·7
Sydney	81·9	25	42·1	15	65·6	49·9	45·7	68	124·0	35·9	3·03	19	4·3
Wellington	65·0	29	40·8	24	56·9	48·4	44·0	72	112·0	31·0	1·11	9	6·9
Auckland	64·0	29*	44·5	5	60·3	48·9	46·6	75	128·0	40·0	2·19	13	5·1
Jamaica, Kingston	93·9	9	71·6	4	91·2	74·2	71·4	75	...	...	·64	9	6·0
Trinidad	92·0	25	68·0	12‡	88·0	71·2	73·2	82	167·0	62·0	4·01	12	...
Grenada	89·0	8	73·1	6	85·8	76·2	72·7	76	145·4	...	6·71	19	5·8
Toronto	89·6	10	36·7	30	75·4	52·0	...	...	116·5	33·8	1·29	3	3·7
Fredericton	84·4	26	30·0	20	72·6	45·4	...	73	...	...	1·34	4	3·5
St. John's, N.B.	77·0	11	39·2	20	64·6	51·6	...	...	...	...	1·20	6	4·3
Victoria, B.C.	75·2	4	34·9	25	61·9	45·3	...	75	...	...	·62	7	4·0
Dawson	61·0	17	10·0	26	47·4	29·9	...	...	...	...	1·25	6	...

* and 30. † and 13, 14, 30. ‡ and 13.

MALTA.—Mean temp. of air 74°·3. Average hours of bright sunshine 9·8.

Johannesburg.—Bright sunshine 268 hours.

Mauritius.—Mean temp. of air 0°·5 above, dew point 0°·2, and R ·75 in., below averages. Mean hourly velocity of wind 11·7 miles, or 0·3 below average.

KODAIKANAL.—Bright sunshine 114 hours. A very wet month.

COLOMBO.—Mean temp. of air 78°·6, or 2°·2 below, of dew point 0°·3 above, and R 2·38 in. below, averages. Mean hourly velocity of wind, 8·6 miles.

HONGKONG.—Mean temp. of air 80°·9. R 4·08 in. above, and sunshine 179·8 hours, or 17 hours below, averages. Mean hourly velocity of wind 9·0 miles.

Melbourne.—Mean temp. of air 1°·1 below, and R ·11 in. above, averages.

Adelaide.—Mean temp. of air 3°·1 below, and R 1·17 in. above, averages.

Sydney.—Mean temp. of air 1°·1 below, humidity 1·9 below, and R ·16 in. above, averages.

Wellington.—Mean temp. of air 1°·1 above, and R 3·29 in. below, averages. Bright sunshine 158 hours.

TRINIDAD.—R 1·88 in. below the 43 years' average.

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VOL. XLIV.

THE DAYLIGHT SAVING BILL.

It is a fact which must have caused regret to every lover of nature, that most people sleep through many hours of summer sunlight in the early morning, and live by artificial light for several hours in the evening. The ancient adage,

“Early to bed and early to rise
Makes a man healthy, wealthy and wise,”

expresses the ideal of daylight saving; and we agree with the promoters of the Summer Season Time Bill now before Parliament in believing that almost anything would be justified to make the nation earlier risers in summer were it even to the extent of a single hour. But we except the tampering with time standards from the category of almost anything.

Last year the Daylight Saving Bill proposed to ensure the fuller utilization of daylight by setting the clock forward by twenty minutes at a time on several occasions in spring, and restoring it to Greenwich time by equal stages in autumn. Many practical men applauded the scheme, and some men of science approved it; but the Bill was opposed by the Post Office, by the Astronomer Royal, the Director of the Meteorological Office and the President of the Royal Meteorological Society, with the result that it was modified by the Committee to which it had been referred, and has been introduced this year simplified to the extent that it is now proposed to set the clock forward by one hour on the third Sunday of April, and to set it back to Greenwich or Dublin time, as the case may be, on the third Sunday of September. Until one thinks it out the device appears charmingly simple. By adopting Central European time as proposed in the Bill (the time kept in Germany, Austria-Hungary and Italy), we in Great Britain should rise in summer at 7 by the clock, though at 6 by the sun, and find that tradesmen, railways, offices and shops had all unconsciously commenced for the day simultaneously early, so that a delighted people would be presented with an hour of extra daylight after working hours.

We think that Parliament might very justly decree that all Government Offices should open an hour earlier and close an hour earlier in the summer half-year, and that legislative pressure might be brought to bear on banks and railways to do the same, leaving it to the self-interest of the community to follow the good example and

grow in health and wealth accordingly. But we do not think that the expedient of enforcing Central European time on the Greenwich meridian is characterised by the wisdom which together with health and wealth we have been taught to associate with early rising. Being crafty, the promoters of the Bill would catch us by guile and cheat us into the possession of such health and wealth as the extra hour of daily daylight—frequently, let us hope, an hour of sunshine—might bring. We have no sentimental regard for local time; we would gladly abolish the anomaly of the use of Dublin time in Ireland while Greenwich time is used in the Hebrides, and we feel that the standardization of time by successive hourly intervals round the world is a magnificent conception, now happily nearly carried into effect. We go farther, and say that if international agreement could be obtained for the adoption of one standard time for the whole world we should welcome the innovation, though local noon would find itself in curious positions on the dial. What we object to is the periodical change of standard on the same meridian.

We find no difficulty in using either the centigrade or the Fahrenheit thermometer scale, though the one starts from the freezing point of water and the other from the temperature of snow melted by salt; but we should be sorely plagued if our thermometers were hitched up by ten degrees in winter so as to make us less afraid of the cold, and in summer dropped to their original values again.

To the Summer Season Time Bill as now proposed, there are two serious objections—one moral, the other scientific. The moral objection is to calling the same thing by different names at different seasons, the hours passing under an alias for five months; the scientific objection is in our case concentrated in the confusion which would be introduced into meteorological observations. It is true that the Meteorological Office has, for the sake of uniformity, adopted 8 a.m. of Central European time for the morning observations from which the *Daily Weather Report* is compiled; but that hour is honestly referred to as 7 a.m. Greenwich time, and it is adhered to in winter as well as in summer, so that 7 a.m. is always 24 hours removed from the preceding and the succeeding 7 a.m. If the Daylight Saving Bill should by any unhappy accident become law, 7 a.m. would be really 7 a.m. for seven months and called 8 a.m. for the other five, and the time between one nominal 7 a.m. and the next would on one day in the year be 25 hours, on another day in the year 23 hours, though for the rest it would be 24 hours. It would be practically impossible to know with certainty to which system an observer referred when he mentioned an hour, the problem of tracing such phenomena as thunderstorms, line-squalls and whirlwinds in their passage over the country would be seriously complicated, and the discussion of maximum falls on rainfall days would be subject to the qualification that two of the "days" in the year were of unequal length. These misfits of days being dependent on the day of the week, would range through seven possible dates in April and

September, sometimes as early as the 15th, sometimes as late as the 21st, so that each year a different pair of dates would have to be kept in mind as the days the rainfall of which could not be compared fairly with that of other days. It will no doubt be conceded that Greenwich time should be used consistently for scientific purposes, and so of course it would be by scientific men. But a vast majority of the 4,500 rainfall observers are not scientific specialists, and for them 9 a.m. of the clock as used for the purposes of common life is by far the most convenient hour.

It has been pointed out that some employments could not be commenced an hour earlier than at present, especially fruit-picking, which begins now at the earliest hour at which the dew is off the fruit, and no juggling with the clock will set forward the shadow on the dial. We strongly approve the virtuous intentions of the Bill, but protest against the fiction which is relied upon to bring them into force.

THE RAINFALL OF MARCH, AND OF THE WINTER HALF YEAR.

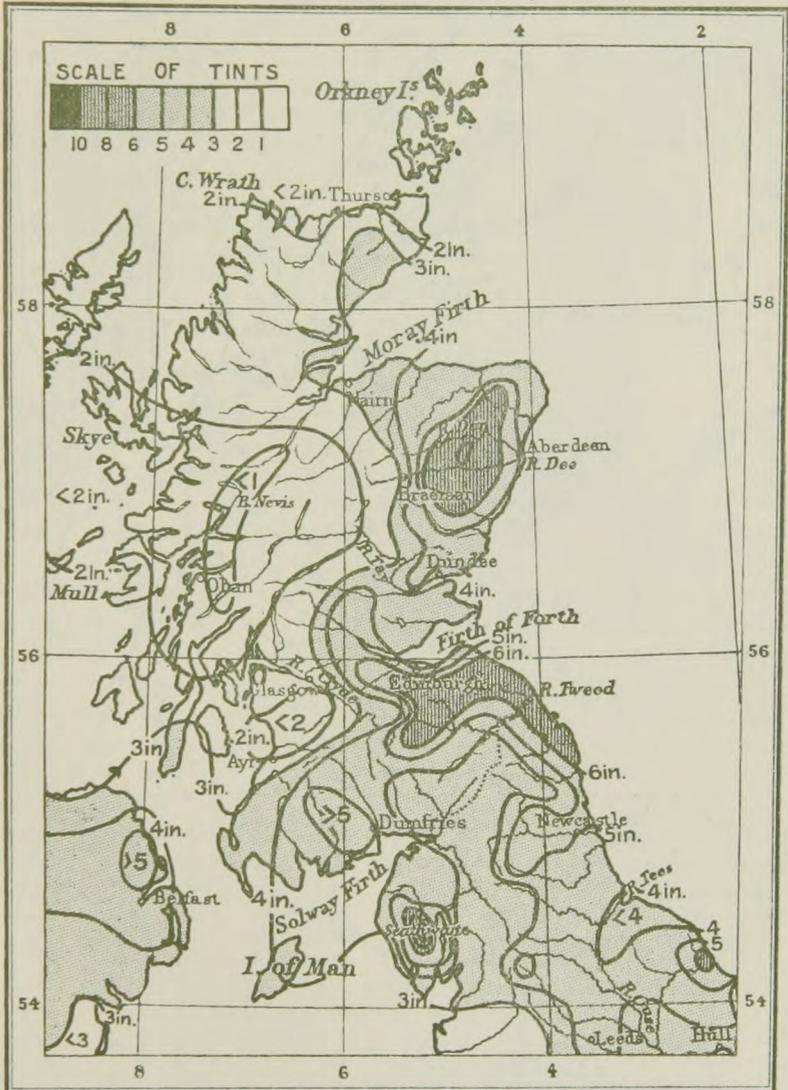
THE Table on p. 59 shows that the two dry months with which the year 1909 began were succeeded by a wet March, wet that is to say over the greater part of the British Isles, but extraordinarily dry in the west of Scotland, where the earlier months had been wet. A broad belt of the south of England, including Cornwall, Devon, Somerset, Wiltshire, Dorset, Hampshire, Berkshire, Sussex, Surrey and Kent, had more than twice the average rainfall, and so had a broad belt along the east of Great Britain from Cambridgeshire to Aberdeenshire; and also a little patch in the north-east of Ireland. The west of Ireland, the north-west of England, and the whole west of Scotland had less than the average rainfall, most of the west of Scotland had less than half, and a considerable portion less than a quarter of the average fall. The distribution of rain for March in Scotland and the north of England was so remarkable that we reproduce, along with the usual map of the Thames Valley, the special map showing how completely inverted was the usual order of a high rainfall in the west and a low rainfall in the east. The greater part of the west Highlands had less than two inches of rain, and at Fort William less than half an inch; the greater part of the north-east had more than six inches, and at one station more than eight. Inversions of this sort are usually associated with the prevalence of easterly winds which have the effect of giving the east coast the benefit of the first call on the atmospheric moisture passing across the British Isles, temporarily transferring the centre of action as regards rain from the Atlantic to the North Sea seaboard.

The effect of this distribution of rain in March has been to raise the rainfall of the winter six months to within 75 per cent. of the

RAINFALL, OCTOBER, 1908—MARCH, 1909.

STATIONS.	Per cent. of Average.					
	Oct., —Dec., 1908.	Jan. —Mar., 1909.	Oct., 1908 —Mar., 1909.	Oct., —Dec., 1908.	Jan., —Mar., 1909.	Oct., —Mar., 1908, 1909.
	m.	in.	in.			
London (Camden Square)	4.53	4.05	8.58	61	79	68
Tenterden	5.98	5.87	11.85	63	96	76
West Dean	5.24	5.07	10.31	55	76	63
Hartley Wintney	5.62	5.34	10.96	65	86	74
Hitchin	4.39	4.46	8.85	60	91	72
Winslow (Addington)	3.86	3.40	7.26	49	63	55
Bury St. Edmunds (Westley) ...	4.37	4.03	8.40	60	82	69
Brundall	4.57	3.89	8.46	58	81	67
Winterbourne Steepleton	12.12	7.67	19.79	91	81	87
Torquay (Cary Green)	6.79	7.54	14.33	60	89	72
Polapit Tamar [Launceston]	7.06	8.81	15.87	52	97	70
Bath	5.41	5.06	10.47	60	77	66
Stroud (Uplfield)	4.91	5.46	10.37	57	85	69
Church Stretton (Wolstaston) ...	6.49	5.57	12.06	64	78	70
Coventry (Kingswood)	4.62	4.99	9.61	55	82	66
Boston	3.24	4.57	7.81	50	102	71
Worksop (Hodsock Priory)	3.23	4.90	8.13	47	101	69
Derby (Midland Railway)	4.16	5.00	9.16	57	98	74
Bolton (Queen's Park)	9.44	7.73	17.17	74	87	79
Wetherby (Ribston Hall)	4.11	5.66	9.77	54	105	75
Arneliffe Vicarage	15.61	13.94	29.55	82	87	84
Hull (Pearson Park)	3.54	5.28	8.82	44	97	65
Newcastle (Town Moor)	4.08	8.00	12.08	50	142	87
Borrowdale (Seathwaite)	29.29	31.16	60.45	70	85	77
Cardiff (Ely)	9.45	6.99	16.44	70	72	71
Haverfordwest (High Street)	13.83	9.15	22.98	85	77	82
Aberystwyth (Gogerddan)	9.29	7.09	16.38	63	72	67
Llandudno	6.74	5.76	12.50	65	88	74
Cargen [Dumfries]	9.35	13.32	22.67	69	119	92
Hawick (Branxholm)	4.79	9.14	13.93	45	109	73
Girvan (Pinmore)	13.50	12.26	25.76	84	99	91
Glasgow (Queen's Park)	7.80	9.60	17.40	75	118	94
Inveraray (Newtown)	16.51	14.60	31.11	82	88	85
Mull (Quinish)	14.39	11.74	26.13	76	81	78
Dundee (Eastern Necropolis)	6.10	5.54	11.64	74	91	81
Braemar	5.81	6.63	12.44	52	82	65
Aberdeen (Cranford)	9.76	8.39	18.15	97	117	105
Cawdor	3.55	6.55	10.10	44	106	71
Fort Augustus (S. Benedict's) ...	9.82	8.79	18.61	70	69	70
Loch Torridon (Bendamph)	26.36	21.27	47.63	92	97	94
Dunrobin Castle	6.25	8.01	14.26	63	107	82
Killarney (District Asylum)	11.80	12.36	24.16	64	77	70
Waterford (Brook Lodge)	11.49	6.79	18.28	94	68	83
Broadford (Hurdlestown)	10.63	7.84	18.47	110	107	109
Abbey Leix (Blandsfort)	9.03	6.20	15.23	89	77	83
Dublin (FitzWilliam Square) ...	4.20	4.54	8.74	52	76	62
Mullingar (Belvedere)	7.00	6.96	13.96	68	87	76
Ballinasloe	9.22	6.53	15.75	86	78	82
Crossmolina (Enniscoe)	12.56	12.11	24.67	76	93	84
Collooney (Markree Obsy.)	9.27	9.77	19.04	73	104	86
Seaforde	12.91	9.57	22.48	113	104	109
Londonderry (Creggan Res.)	8.82	12.79	21.61	68	137	97
Omagh (Edenfel)	8.30	9.78	18.08	75	118	94

RAINFALL OF MARCH, 1909.



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0 10 20 30 40 50 60 70 80 90 100
SCALE OF ENGLISH MILES

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average in Ireland, the north-west and north-east of England, and the east, north and west of Scotland. At two stations in Ireland the fall for the six months comes out as a little above the average, but the surrounding stations do not indicate that this held good over any considerable area. The greater part of England and Wales had less than 75 per cent. of the average rainfall, but only one out of the 53 stations considered had less than 63 per cent. The accompanying table shows the rainfall for each of the three months and for the six months of the winter half year expressed as percentage of the average for the stations usually published in our monthly tables. Generalizing these returns we get the following result.

*General Rainfall for Winter Six Months, October, 1908—March, 1909
expressed as percentage of the average.*

	England & Wales.	Scotland.	Ireland.	BRITISH ISLES
Oct.—Dec., 1908.....	61	71	81	68
Jan.—Mar., 1909	88	99	94	92
Oct., 1908—Mar., 1909 ...	72	82	86	78

The extreme of dryness is, as usual, less marked in Ireland than in Great Britain, and for that country and for Scotland the shortage of rain, although distinct, is not serious. For England and Wales, however, a deficiency of more than one quarter of the normal rainfall of the half year must be viewed with some anxiety. The dry autumn of 1908 may indeed, if followed by no counterbalancing severity of weather in summer, be expected to produce an exceptionally heavy wheat harvest in 1909; but the general dryness of the whole winter half year cannot fail to cause anxiety as to the yield of wells and the replenishment of reservoirs. While it has been shown that some wells are not dependent on the winter rain, but respond to showers at all seasons, in most instances the summer rainfall fails to percolate through three feet of soil but is either evaporated or absorbed by vegetation before it reaches the subsoil. It would, therefore, be prudent for owners of wells and water authorities in the central parts of England, whose resources have not at all times an ample margin, to make preparations in time for the possibility of a deficient yield in the warm months.

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## THE WEATHER OF MARCH, 1909.

By FRED. J. BRODIE.

THE peculiarly inclement weather of last month may, as a matter of fact, be attributed to the extraordinary type of pressure distribution, which was the very reverse of what it should have been. In an average March the mean height of the barometer diminishes gradually from about 30·0 in. over France, and a trifle less in the south of England, to about 29·7 in. in an area lying between Iceland and Greenland. Last month the highest mean pressures were found in the Icelandic region, and the lowest over the south-western parts

of the United Kingdom. In the former region the barometer was about three-tenths of an inch too high, while in the south of England it was about four tenths too low, the mean pressure in London being the lowest observed in March as far back at least as the year 1871. With an anticyclonic system existing almost constantly in the neighbourhood of Iceland, and another extending very frequently over south-western Europe from the southern portions of the North Atlantic, the United Kingdom occupied an unenviable position in an intervening valley of low pressure, and became the breeding place for numerous barometrical depressions, each of which was accompanied by snow or by more or less copious falls of rain.

In the first week the entire country experienced frosts and snow-storms of mid-winter severity, the coldest weather occurring between the 3rd and 6th of the month, when the sheltered thermometer fell in nearly all districts below  $15^{\circ}$ . Over the inland parts of Great Britain readings below  $10^{\circ}$  were common, the thermometer sinking to  $5^{\circ}$  at Balmoral, to  $3^{\circ}$  at Swarraton (Hants), to  $1^{\circ}$  at West Linton, and to zero at Marlborough. In some places the indications of thermometers exposed on the ground were rendered unreliable owing to the fact that the instruments were covered with snow; but at Llangammarch Wells a reading of  $4^{\circ}$  below zero was reached, and at West Linton a reading of  $5^{\circ}$  below zero. Over the United Kingdom generally the frost in this opening week of March was the sharpest experienced since February, 1895, and in not a few places it was the sharpest ever recorded at so late a period in the season. After the 6th the month became a trifle less cold, but on the night either of the 10th or 11th another sharp frost was experienced over North Britain, the exposed thermometer falling in several places slightly below  $20^{\circ}$ .

After the middle of the month the wind, which had hitherto blown almost persistently from between north and east, shifted to the southward, and temperature rose decidedly, the mildest weather being experienced between the 19th and 21st, when the thermometer in many parts of England rose slightly above  $55^{\circ}$ . A sharp frost occurred, however, in some districts on the night of the 20th or 21st, the exposed thermometer at Buxton falling on the latter occasion to a minimum of  $20^{\circ}$ . The closing portion of the month was marked by great variations both in wind and weather. As a rule the temperature was slightly above the normal, but no readings as high as  $60^{\circ}$  were recorded until the 29th, when that value was reached and slightly exceeded in several isolated parts of England, the thermometer at Greenwich rising to  $62^{\circ}$ . On the night of the 26th a sharp frost occurred, the sheltered thermometer falling in many places to about  $25^{\circ}$ , while the instruments exposed on the grass sank below  $20^{\circ}$ , and at Llangammarch Wells to  $13^{\circ}$ .

Over the country generally the month was the coldest March experienced for many years past. In London and many other parts of eastern and central England the mean temperature was the lowest

recorded since 1892; at Aberdeen it was the lowest since 1888, and at Leith it was the lowest shown by the Meteorological Office record extending back to 1872. In the last-mentioned locality the thermometer last month did not once rise above  $49^{\circ}$ , the absolute maximum being at least  $5^{\circ}$  lower than in any March of the previous 37 years. In London (at the recording station in connection with the Meteorological Office) the thermometer rose  $10^{\circ}$  higher than in the Edinburgh neighbourhood. The absolute maximum of  $59^{\circ}$  was, as a matter of fact, a trifle higher than that of a twelvemonth ago, but with that exception it was the lowest recorded in March since 1901.

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### ROYAL METEOROLOGICAL SOCIETY.

THE March meeting of this Society is always the "popular" night of the session, and Wednesday evening, March 17th, was no exception to the rule. The meeting was held at the Institution of Civil Engineers, and there was a large gathering of the Fellows and their friends to hear Dr. Vaughan Cornish deliver an interesting lecture on "Wind-waves in Water, Sand and Snow." Mr. H. Mellish, President, occupied the chair.

Dealing first with waves of the sea, Dr. Cornish described the gradual evolution of large sea waves during the passage of a cyclone or other depression across the Atlantic. The great sea-waves are produced at that portion of the cyclone where the direction of the wind coincides with the direction of advance of the depression. Along this line of advance the waves in their gravitational progress are accompanied by a strong wind blowing across their ridges as long as the atmospheric depression maintains itself. Thus the waves are developed until they attain a considerable steepness. The average height attained by these waves in feet is about half the velocity of the wind in miles per hour. Thus a wind of 52 miles per hour gives waves of an average height of about 26 feet, although individuals will then attain a height of 40 feet. The speed and, therefore, length of the steep waves probably depends upon the rate of advance of the atmospheric depression as well as upon the velocity of the wind; because of all the sets of waves running the growth of that particular set is fostered the length, and consequently the speed, of which is such that its gravitational progress is at the same rate as the advance of the atmospheric depression. In the circumpolar Southern Ocean the height of North Atlantic waves is somewhat exceeded, but the outstanding feature of the waves of high southern latitudes is their greater length from crest to crest. South of the Cape of Good Hope and of Cape Horn there is neither windward nor leeward shore, and the prevailing wind in all longitudes is westerly. Thus, wherever a westerly wind springs up it finds a long westerly swell, the effect of a previous wind, still running, and the principal effect of the newly-born wind is to increase the steepness of the long swell already running, so as to form majestic storm-waves, which sometimes attain

a length of 1200 feet from crest to crest. The longest swells due to wind are almost invisible during storms, for they are masked by the shorter and steeper waves. They emerge into view, however, after or beyond the storm, and Dr. Cornish has found their speed to be approximately equal to that of the wind by which they are created, sometimes attaining even in the North Atlantic a velocity of more than sixty miles per hour.

The action of the wind to drift dry sand in a procession of regular waves was studied by the lecturer in the Egyptian deserts. As the sand-waves are unable to travel by gravitation, as do the waves of the sea, their movements are entirely directed and controlled by the wind, and when comparatively small they are therefore simpler and more regular in form and movement than ocean waves. When they grow to great size as in the desert sand-dunes, which attain a height of several hundred feet, the forms become more complicated owing to the partial consolidation of the lower layers of sand by pressure.

Mackerel-sky (a rippled form of cloud) is produced by the formation of an undulating surface where a lighter layer of air flows over a heavier one. The positive and negative of a rippled-cloud photograph were shown, and it was explained that the negative, showing the pattern not of the clouds themselves but of the unclouded sky between, was the true aerial "ripplemark," corresponding to sand-waves.

For the purpose of studying snow-waves, the lecturer traversed Canada twice during winter, and found the phenomenon best developed on the prairies near Winnipeg, when the temperature was below zero (Fahrenheit) and the snow had quite lost the adhesive character which it retains in less cold weather. Freshly-fallen dry snow is drifted by wind in a procession of regular waves similar to desert sand-waves, but less than half as steep, the wave-length being fifty times as great as the height. The flatness of the wind-formed snow-waves affords an indication of the great distance to which hills give effective shelter from wind, and helps to explain the climatic advantages of certain localities. The forms of snow-drifts produced in the neighbourhood of obstructions were also studied by the lecturer. Multitudinous shapes are assumed while the eddy-space formed by the obstacle is being filled up with snow, but when sufficient snow has fallen and been drifted in, so that the space is filled, the vertical section of the drift is fish-shaped, with a blunt head and tapering tail, which is the form of least eddy-making resistance.

The lecture was illustrated by numerous photographs taken by Dr. Cornish in his travels.

Prof. Cleveland Abbe (U.S. Weather Bureau, Washington), Dr. J. R. Sutton (Kimberley, Cape Colony), and M. Léon Teisserenc de Bort (Paris) were elected Honorary Members; and Mr. W. H. Brown, Col. C. R. Barn, Mr. J. E. Burnett, Mr. E. Gurney, Capt. S. A. Pidgeon, Capt. M. S. H. Smith, Mr. E. K. Toogood, F.L.S., Capt. T. Trotter, Dr. R. H. Wilshaw and Mr. H. E. Wood, were elected Fellows of the Society.

## SCOTTISH METEOROLOGICAL SOCIETY.

AN evening meeting of the Society was held (by permission of the University Court) in the University Engineering Class-Room, Edinburgh, on 18th March, Professor C. G. Knott, in the chair.

The chairman explained that whilst the meeting had been promoted for a discussion on "The Study of Weather Knowledge in Schools," there was no desire on the part of the Society to press for the recognition of meteorology as a regular subject in an already over-crowded curriculum.

Mr. T. S. Muir, of the Royal High School, Edinburgh, in opening the discussion, pointed out that man's place in nature was so bound up with climatic considerations that without a knowledge of meteorology geography could not be properly taught. Much could be done without an elaborate or expensive equipment. Considering the subject from the point of view of a teacher of geography, the course of study followed from the junior classes up to the highest was described in detail. He was convinced that the most logical method, and that most easily grasped, was to divide the world into climatic regions. At the High School practical observing work was done in the science department, and the senior pupils periodically discussed the Daily Weather Report.

Mr. H. J. Findlay, of George Watson's College, also showed a number of slides and explained that at his school they had a regulation Stevenson Screen and a full observing equipment. The boys took it in turns to observe, and the observations were systematically recorded and worked up.

Mr. G. G. Chisholm, Lecturer on Geography at Edinburgh University, strongly objected to the commonly used term "insular climate," since an island, *e.g.*, Long Island, might be characterised by a climate of great extremes.

The discussion was continued by Messrs. Cash and Fairgrieve (Edinburgh Academy), Cossar and Crockett (George Heriot's School), Miss Meiklejohn (George Watson's Ladies' College), Mr. J. B. Clark, Headmaster of George Heriot's School, and Mr. James Macdonald, Secretary of the Highland and Agricultural Society. There was considerable difference of opinion as to the powers of an average junior pupil to grasp the full meaning of the isobaric maps of the Daily Weather Report. It was, however, the experience of one teacher who had charge of a junior class, that boys of 13 and 14 took a great interest in the maps and were capable of thoroughly understanding them.

Miss Meiklejohn said that at George Watson's Ladies' College the senior pupils were accustomed to plot on blank maps the data from the first page of the Daily Weather Report, to develop the isobaric lines, and to frame forecasts which were subsequently compared with the official deliverances of the Meteorological Office.

Dr. Shaw, Director of the Meteorological Office, had sent for distribution a supply of the Daily Weather Report for the two preceding

days, and had suggested in a letter that the preparation of maps, such as those in the Monthly Weather Report from the data given in the reports was a useful exercise, and might be carried out for Canada, India, and probably in course of time for Australia. It would be a simple matter to organize a lending library for schools for various official publications.

A letter was read from the Rev. J. S. Begg, of West Linton. With the hearty approval of the School Board, he was in the habit of giving relays of children from the local school instruction in the use of the various instruments at his observing station.

Mr. A. Watt, Secretary, showed a large number of slides, most of them from original diagrams. He was of opinion that a boldly drawn "home-made" diagram was often more useful for purposes of demonstration than a highly finished professional production. Note-books were exhibited with specimens of work done in the various schools, and Professor Knott, in summing up, said that there was no doubt that a large amount of excellent work in meteorology was being done in the secondary schools of Edinburgh. He felt that the meeting had been of a most stimulating character.

### ESSAY PRIZE IN METEOROLOGY.

THE Scottish Meteorological Society offers, through its Council, a Prize of £20 for the best essay on a meteorological subject. As an indication of the kind of essay the Council are prepared to consider, the following subject may be mentioned :—

A discussion of the extent to which the heat set free when water vapour is converted into the liquid state influences the temperature of the atmosphere, with special reference to the climatology of different parts of Scotland.

The Council, however, wish it to be clearly understood that an essay on any other subject will be equally eligible.

The following are the conditions on which the prize is offered :—

1. The competition shall be open to regular matriculated students of the four Scottish Universities, including University College, Dundee, who have attended classes of Mathematics and Natural Philosophy, or to graduates of the Scottish Universities who at 1st January, 1910, shall be of not more than five years' standing.

2. The essays must be lodged with the Secretary to the Scottish Meteorological Society, 122, George Street, Edinburgh, on or before 31st March, 1910, with a statement of the Candidate's qualification to compete.

3. All essays must be legibly written, or typewritten, on one side of the paper only.

4. The Council of the Society shall appoint a referee or referees to report on the essays, and the decision of the Council as intimated by the Secretary shall be final.

5. The Council reserve the right to publish the successful essay in the Society's *Journal*. The other essays will be returned to the competitors.

## SNOWDONIA'S AUGUST FLOODS.

By J. R. GETHIN JONES.

REFERRING to Mr. Lockwood's interesting letter, *re* the above, in the January number, I beg to make a few remarks on the same rainfall mentioned by him, to show the influence of wind force, elevation and mountain condensation at the south-west and north-east end of the range, which are about 12 miles apart. The range runs from south-west to north-east. The particulars and records of Mr. Lockwood at the south-west, and my own at the north-east end, with the weather prevailing at the time, were as follows :—

| DATE.<br>1908.  | SOUTH-WEST END.                    |                                     | NORTH-EAST END.                   |                                     | Wind Conditions during<br>each Storm.    |
|-----------------|------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------|------------------------------------------|
|                 | Gwynant<br>Vale.<br>300 ft<br>o.d. | Llydaw<br>Lake.<br>1400 ft.<br>o.d. | Conway<br>Vale.<br>25 ft.<br>o.d. | Eigiau<br>Lake.<br>1200 ft.<br>o.d. |                                          |
| August 20 ..... | in<br>1·11                         | in.<br>1·33                         | in.<br>·95                        | in.<br>1·10                         | Wind force about 1,<br>Direction S.E.    |
| „ 26 .....      | 1·79                               | 3·16                                | ·91                               | 1·64                                | Wind force about 5,<br>Direction S.W.    |
| „ 31 .....      | 1·32                               | 2·53                                | 1·64                              | 2·23                                | Wind force 6, Direc-<br>tion S.W. & N.W. |
| Total .....     | 4·22                               | 7·02                                | 3·50                              | 4·97                                |                                          |

I find, from general observations, that when it rains without wind the amount is the same, practically, at any elevation and all parts of the range. but if the wind blows parallel with the range, from either end, the rainfall is much heavier at the first contact position and least at the forward. The additional quantity, due to elevation, will remain in the same general ratio at both ends, shewing that the chief factor to cause such difference in the rainfall is the wind force and its direction in relation to the range, thereby varying the condensation conditions.

The average rainfall at Gwynant Vale and Llydaw Lake is about 100 and 180 inches a year, and at Conway Vale and Eigiau Lake, 60 and 100 inches. During the rain storm of August 20th it will be seen that, with a slight wind, the percentage of difference due to elevation at both the south-west and north-east end of the range is the same, viz., 20%, and the quantity at the high and low level at each end—compared with the average—is practically the same.

The storm of August 26th, with a wind force of 5 blowing south-west and parallel to the range, shows the decreased precipitation towards the north-east end, the amount being in proportion to the average difference of the low and the high level at each end; the difference due to the elevation being also the same, viz., 90%.

During the storm of August 31st, with a high wind from south-west and then veering to north-west, the record in each case is what

one may expect, because the north-west wind would blow across the range and therefore produce an equal amount at each end ; hence the decreased difference from the average.

I believe the high proportion recorded at the north-east, low level, was on account of local special features, because at the time when the wind veered from south-west to north-west the wind changed suddenly during a very heavy rain and a whirlwind, both of sufficient strength to produce a cloud-burst, which fell on a steep slope and the side sheltered from the wind at the time. A cloud-burst is a very unusual occurrence so near the vale. The most notable feature about this burst was that it took place *exactly* at the change of the barometer and turn of the wind, and when the centre of the cyclone was nearest to North Wales.

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### Correspondence.

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

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#### A HIGH BAROMETER RAINSTORM.

THE recent rainstorm, which flooded Ireland on April 2nd and 3rd, is particularly noticeable because of the height of the barometer throughout the downpour. I will confine myself to the observations at my own station in the City of Dublin.

At 9 a.m. on Friday, April 2nd, the barometer stood at 30·392 inches. From that point it fell slowly to 30·118 inches by 4 p.m. on Saturday, the 3rd inst. Thence it rose equally slowly to 30·294 inches at 9 a.m. to-day (Monday, April 5th). On Friday the wind gradually freshened from S.E. and S.S.E. until it blew a fresh gale early on Saturday. In the afternoon of this latter day it moderated without veering beyond S. On Sunday it backed, and to-day it blows freshly from S.E. At 7 a.m. on Friday a sheet of cirrus and cirro-stratus cloud had already spread across the entire sky as seen from Dublin. Through this cloud-veil the sun was seen dimly at times ; but the veil was too dense to allow a halo to form in it, and early in the afternoon the sun was quite blotted out. At 4 p.m. rain began to fall, and it continued to do so, with a couple of hours intermission on Saturday afternoon, until 11 a.m. on Sunday, when it finally ceased. By 9 a.m. on Saturday 368 inch had fallen. In the subsequent 24 hours, 1·581 inches were measured. A further fall of 0·29 inch on Sunday forenoon brought the total precipitation up to 1·978 inches in a downpour which lasted for 37 hours.

Saturday's rainfall of more than one and a half inches in Dublin far exceeds the total fall in this city in either January (1·264 inches) or February (1·593 inch) of the present year. During the week ended Saturday, April 3rd, rain fell in Dublin on six days to the amount of nearly 2½ inches (2·720 inches), thus exceeding the total measurement for March, namely 2·693 inches.

The continuous and heavy rainfall in Ireland on April 2nd and 3rd apparently resulted from the chilling of a moist Atlantic air current by an in-draught of cold air from an anticyclonic system lying over Great Britain and the North Sea. This system developed with extreme rapidity in the wake of a cyclonic depression, which travelled swiftly across the British Isles eastwards on March 31st. It assumed the form of a ridge of high pressure (30·5 inches), which on Friday morning, April 2nd, stretched southwards from the Orkneys to the neighbourhood of Bristol. Within its confines sharp frost prevailed at a time when an Atlantic low pressure area had already arrived off the west coast of Ireland. The latter system failed to spread eastward—in fact, it ultimately passed out again over the Atlantic and disappeared.

So far as Dublin is concerned, the remarkable rainstorm of the opening days of April has more than made up the previously existing large deficit in the rainfall of 1909.

JOHN W. MOORE, M.A., M.D., D.Sc., F.R.Met.Soc.

*40, Fitzwilliam Square, W., Dublin, April 5th, 1909.*

### THE PROSPECT OF A SHORT WATER SUPPLY.

SPEAKING particularly of the Thames Valley, I am afraid we must look forward to a deficient water supply in the coming summer. I base my prediction on the measurements of a well in the Upper Greensand, of which I have a daily record for the last 40 years and more, in fact ever since it was sunk. My father, the Rev. J. C. Clutterbuck, of Long Wittenham, Berks, who was a great authority on water supply, always considered this well as a very good test as regards water supply. Now as to present conditions of the well, only on two occasions has the well been as low as it is now; first in the autumn of 1898, when it was quite dry, and was then cleaned out and deepened two and a half feet. On that occasion it began to rise about the end of the year, and by the end of January there was 18 feet of water in the well. The second occasion was in the spring of 1905. In that year the well never rose at all, as is usual, but kept falling slightly till the end of the year. 1905 was a year of very short water supply in the Thames Valley, and I predict the same shortness again this year. I have always noticed that it requires 10 inches of rain from the 1st October before the well begins to rise. It is well known, especially by those who keep a Dalton's Rain Gauge, that there is no percolation to the deeper springs from the 1st of April to the 1st of October, except under exceptional circumstances, such as occurred in June, 1903, or in April, 1908. In the six months, October-March inclusive, 1904-5, the rainfall was 9·24; in 1908-9 it was 9·13, almost similar conditions. Therefore we may expect the same deficiency this year as was experienced in 1905.

F. C. CLUTTERBUCK.

*Culham Vicarage, Abingdon.*

### COMPARISON OF SUNSHINE REGISTERED BY TWO SUNSHINE RECORDERS OF THE CAMPBELL-STOKES PATTERN.

THE great differences of sunshine registered at Westminster, Camden Square and Mill Hill during January are certainly caused by local influences, but may they not be exaggerated by instrumental errors? That two sunshine recorders of the Campbell-Stokes pattern, placed side by side, do not always give the same results, can be seen from the following example.

At the Central Physical Observatory of St. Petersburg the sunshine is registered regularly by a Campbell-Stokes sunshine recorder. In June, 1906, there was placed another tested sunshine recorder of the same pattern at the side of the first. These two sunshine recorders gave the following registrations :—

|               |       | I.— <i>Sunshine Recorder of</i> | II.— <i>Sunshine Recorder taken</i> |
|---------------|-------|---------------------------------|-------------------------------------|
|               |       | <i>the Observatory.</i>         | <i>for comparison.</i>              |
|               |       | hours.                          | hours.                              |
| 1906, June 13 | ..... | 8·9                             | 7·6                                 |
| „ „ 14        | ..... | 5·9                             | 5·3                                 |
| „ „ 15        | ..... | 10·9                            | 10·5                                |
| „ „ 16        | ..... | 11·2                            | 10·0                                |
| „ „ 17        | ..... | 13·8                            | 9·9                                 |
| „ „ 18        | ..... | 10·2                            | 9·8                                 |
| „ „ 19        | ..... | 12·1                            | 11·7                                |
| „ „ 21        | ..... | 14·2                            | 13·5                                |

These differences, which reached 3·9 hours on one day, certainly depend on the different qualities of the glass spheres used for the sunshine recorders.

P. WANNARY.

*St. Petersburg, March, 1909.*

[The question raised by this letter is of great interest, although we believe that the disparity of the records referred to in our article was entirely due to fog and smoke. We hope, however, to deal with the comparability of Campbell-Stokes records at an early date, and should be glad of the views of observers on the matter.—ED. S.M.M.]

### THE REMARKABLE METEOR OF [FEBRUARY 22nd.

A GREAT number of observations of this object were made, some of them by qualified persons, but the majority by casual spectators, and the discordances amongst them are difficult to harmonize. The meteor seems to have been rather higher in the air than the preliminary calculations indicated, the elevation based on later and more accurate data being 56 to 41 miles, while the radiant point was about 14° E.N.E. of  $\beta$  Leonis, or at  $190^{\circ} + 20^{\circ}$ — . The streak remained visible in a distinct form for fully two hours according to about a score of the observers, but several others watched its lingering relics for three hours after the meteor's flight at 7.30 p.m.

W. F. DENNING.

*Bristol, March 31st, 1909.*

## METEOROLOGICAL NEWS AND NOTES.

LIEUTENANT SHACKLETON'S ANTARCTIC EXPEDITION has proved the most successful in the history of South Polar exploration. The magnetic pole of the Earth was reached in  $72^{\circ} 25' S.$ ,  $154^{\circ} E.$ ; and the main expedition southward, under Lieut. Shackleton himself, attained the unprecedented latitude of  $88^{\circ} 23'$  in  $162^{\circ} E.$  This point is  $1^{\circ} 37'$ , or 97 nautical miles or 113 statute miles from the south pole, and is by far the nearest approach yet made to either extremity of the Earth's axis. The telegraphic reports do not enable us to say anything definite as to meteorological results, but we are confident that these will be of great value and interest.

A "WINTER SUNSHINE RACE" has been kept up in the columns of the *Daily Mirror* from October 1st to March 31st, the weekly duration of sunshine at 44 places in England and Wales being published in order of magnitude, and the total duration to date. The "contest" is so far satisfactory that it is confined to stations using the same type of sunshine recorder; but it is deprived of all scientific value by the measurement of the cards being made by 44 different individuals, for everyone who has attempted to measure a sunshine card on a day of fleeting clouds knows how much scope there is for individual variation. Apart from this, the idea of rivalry in the measurement of natural phenomena is to be deprecated, and some of the remarks reported regarding this "contest" in the records of Town or District Council meetings in local newspapers show a serious misapprehension of the principles according to which scientific instruments ought to be selected.

DEW-PONDS formed the subject of an interesting address by Mr. George Hubbard at the Royal Society of Arts on March 3rd, published in the *Journal* of the Society, Vol. 57, p. 331. We note, however, the usual failure to take account of the action of rain in filling dew-ponds, which we are convinced is the principal factor. On the summit of the South Downs the annual rainfall is from 35 to 40 inches; the annual evaporation is certainly not more than 20 inches, and so from rain alone a pond should accumulate a depth of from 15 to 20 inches in a year, supposing that the bottom is watertight.

THE NATIONAL PHYSICAL LABORATORY at Bushy House, Teddington, was open on March 19th for the inspection of an invited party of men of science and representatives of the press, when the various departments of the great institution which has grown up within the last few years were seen in working order. The Laboratory is concerned with the testing of instruments for every sort of physical measurement, apart from those concerned with meteorology, which are cared for in the separate building of Kew Observatory.

## RAINFALL TABLE FOR MARCH, 1909.

| STATION.                           | COUNTY.                      | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.    |              |
|------------------------------------|------------------------------|------------|----------------------|--------------------------------|--------------------------|--------------|
|                                    |                              |            |                      |                                | Aver.<br>1870-99.<br>in. | 1909.<br>in. |
| Camden Square.....                 | <i>London</i> .....          | 51 32      | 0 8                  | 111                            | 1'62                     | 2'84         |
| Tenterden.....                     | <i>Kent</i> .....            | 51 4       | *0 41                | 190                            | 1'89                     | 4'35         |
| West Dean.....                     | <i>Hampshire</i> .....       | 51 3       | 1 38                 | 137                            | 1'79                     | 3'98         |
| Hartley Wintney.....               | ".....                       | 51 18      | 0 53                 | 222                            | 1'77                     | 4'00         |
| Hitchin.....                       | <i>Hertfordshire</i> .....   | 51 57      | 0 17                 | 238                            | 1'53                     | 3'25         |
| Winslow (Addington).....           | <i>Buckinghamsh.</i> .....   | 51 58      | 0 53                 | 309                            | 1'62                     | 2'05         |
| Bury St. Edmunds (Westley).....    | <i>Suffolk</i> .....         | 52 15      | *0 40                | 226                            | 1'64                     | 2'57         |
| Brundall.....                      | <i>Norfolk</i> .....         | 52 37      | *1 26                | 66                             | 1'65                     | 2'65         |
| Winterbourne Steepleton.....       | <i>Dorset</i> .....          | 50 42      | 2 31                 | 316                            | 2'41                     | 5'60         |
| Torquay (Cary Green).....          | <i>Deron</i> .....           | 50 28      | 3 32                 | 12                             | 2'45                     | 5'53         |
| Polapit Tamar [Launceston].....    | ".....                       | 50 40      | 4 22                 | 315                            | 2'41                     | 5'18         |
| Bath.....                          | <i>Somerset</i> .....        | 51 23      | 2 21                 | 67                             | 1'94                     | 3'23         |
| Stroud (Upfield).....              | <i>Gloucestershire</i> ..... | 51 44      | 2 13                 | 226                            | 1'86                     | 3'65         |
| Church Stretton (Wolstaston).....  | <i>Shropshire</i> .....      | 52 35      | 2 48                 | 800                            | 2'01                     | 2'88         |
| Coventry (Kingswood).....          | <i>Warwickshire</i> .....    | 52 24      | 1 30                 | 340                            | 1'75                     | 3'14         |
| Boston.....                        | <i>Lincolnshire</i> .....    | 52 58      | 0 1                  | 25                             | 1'36                     | 3'19         |
| Worksop (Hodsock Priory).....      | <i>Nottinghamshire</i> ..... | 53 22      | 1 5                  | 56                             | 1'55                     | 3'23         |
| Derby (Midland Railway).....       | <i>Derbyshire</i> .....      | 52 55      | 1 28                 | 156                            | 1'49                     | 3'07         |
| Bolton (Queen's Park).....         | <i>Lancashire</i> .....      | 53 35      | 2 28                 | 390                            | 2'88                     | 3'60         |
| Wetherby (Ribston Hall).....       | <i>Yorkshire, W.E.</i> ..... | 53 59      | 1 24                 | 130                            | 1'85                     | 4'21         |
| Arncliffe Vicarage.....            | ".....                       | 54 8       | 2 6                  | 732                            | 5'03                     | 4'22         |
| Hull (Pearson Park).....           | <i>E.R.</i> .....            | 53 45      | 0 20                 | 6                              | 1'79                     | 3'58         |
| Newcastle (Town Moor).....         | <i>Northumberland</i> .....  | 54 59      | 1 38                 | 201                            | 2'10                     | 5'35         |
| Borrowdale (Seathwaite).....       | <i>Cumberland</i> .....      | 54 30      | 3 10                 | 423                            | 10'51                    | 9'08         |
| Cardiff (Ely).....                 | <i>Glamorgan</i> .....       | 51 29      | 3 13                 | 53                             | 2'79                     | 4'25         |
| Haverfordwest (High Street).....   | <i>Pembroke</i> .....        | 51 48      | 4 58                 | 95                             | 3'03                     | 6'28         |
| Aberystwyth (Gogerddan).....       | <i>Cardigan</i> .....        | 52 26      | 4 1                  | 83                             | 2'93                     | 3'23         |
| Llandudno.....                     | <i>Carnarvon</i> .....       | 53 20      | 3 50                 | 72                             | 1'97                     | 2'52         |
| Cargen [Dumtries].....             | <i>Kirkcudbright</i> .....   | 55 2       | 3 37                 | 80                             | 3'01                     | 5'59         |
| Hawick (Branxholm).....            | <i>Roxburgh</i> .....        | 55 24      | 2 51                 | 457                            | 2'55                     | 4'21         |
| Edinburgh (Royal Observy.).....    | <i>Midlothian</i> .....      | 55 55      | 3 11                 | 442                            | ...                      | 4'20         |
| Girvan (Pinnmore).....             | <i>Ayr</i> .....             | 55 10      | 4 49                 | 207                            | 3'47                     | 3'47         |
| Glasgow (Queen's Park).....        | <i>Renfrew</i> .....         | 55 53      | 4 18                 | 144                            | 2'33                     | 2'46         |
| Inveraray (Newtown).....           | <i>Argyll</i> .....          | 56 14      | 5 4                  | 17                             | 4'96                     | '93          |
| Mull (Quinish).....                | ".....                       | 56 36      | 6 13                 | 35                             | 4'23                     | 1'62         |
| Dundee (Eastern Necropolis).....   | <i>Forfar</i> .....          | 56 28      | 2 57                 | 199                            | 1'92                     | 3'25         |
| Braemar.....                       | <i>Aberdeen</i> .....        | 57 0       | 3 24                 | 1114                           | 2'42                     | 2'80         |
| Aberdeen (Cranford).....           | ".....                       | 57 8       | 2 7                  | 120                            | 2'43                     | 5'65         |
| Cawdor.....                        | <i>Nairn</i> .....           | 57 31      | 3 57                 | 250                            | 2'16                     | 2'96         |
| Fort Augustus (S. Benedict's)..... | <i>E. Inverness</i> .....    | 57 9       | 4 41                 | 68                             | 3'68                     | '77          |
| Loch Torridon (Bendamph).....      | <i>W. Ross</i> .....         | 57 32      | 5 32                 | 20                             | 6'38                     | 2'91         |
| Dunrobin Castle.....               | <i>Sutherland</i> .....      | 57 59      | 3 56                 | 14                             | 2'47                     | 3'11         |
| Castletown.....                    | <i>Caitness</i> .....        | 58 35      | 3 23                 | 100                            | ...                      | 1'69         |
| Killarney (District Asylum).....   | <i>Kerry</i> .....           | 52 4       | 9 31                 | 178                            | 4'03                     | 3'70         |
| Waterford (Brook Lodge).....       | <i>Waterford</i> .....       | 52 15      | 7 7                  | 104                            | 2'55                     | 4'01         |
| Broadford (Hurdlestown).....       | <i>Clare</i> .....           | 52 48      | 8 38                 | 167                            | 2'17                     | 2'90         |
| Abbey Leix (Blandsfort).....       | <i>Queen's County</i> .....  | 52 56      | 7 17                 | 532                            | 2'38                     | 2'72         |
| Dublin (Fitz William Square).....  | <i>Dublin</i> .....          | 53 21      | 6 14                 | 54                             | 1'85                     | 2'69         |
| Mullingar (Belvedere).....         | <i>Westmeath</i> .....       | 53 29      | 7 22                 | 367                            | 2'46                     | 2'59         |
| Ballinasloe.....                   | <i>Galway</i> .....          | 53 20      | 8 15                 | 160                            | 2'45                     | 2'63         |
| Crossmolina (Enniscoe).....        | <i>Mayo</i> .....            | 54 4       | 9 18                 | 74                             | 3'95                     | 3'82         |
| Collooney (Markree Obsy.).....     | <i>Sligo</i> .....           | 54 11      | 8 27                 | 127                            | 2'99                     | 2'63         |
| Seaforde.....                      | <i>Down</i> .....            | 54 19      | 5 50                 | 180                            | 2'56                     | 5'76         |
| Londonderry (Creggan Res.).....    | <i>Londonderry</i> .....     | 54 59      | 7 19                 | 320                            | 3'06                     | 3'95         |
| Omagh (Edenfel).....               | <i>Tyrone</i> .....          | 54 36      | 7 18                 | 280                            | 2'47                     | 4'11         |

## RAINFALL TABLE FOR MARCH, 1909—continued.

| RAINFALL OF MONTH (con.) |            |                   |       |             | RAINFALL FROM JAN. 1. |           |                      |            | Mean Annual 1870-1899. | STATION.            |
|--------------------------|------------|-------------------|-------|-------------|-----------------------|-----------|----------------------|------------|------------------------|---------------------|
| Diff. from Av. in.       | o/o of Av. | Max. in 24 hours. |       | No. of Days | Aver. 1870-99. in.    | 1909. in. | Diff. from Aver. in. | o/o of Av. |                        |                     |
|                          |            | in.               | Date. |             |                       |           |                      |            |                        |                     |
| +1.22                    | 175        | .39               | 6     | 25          | 5.13                  | 4.05      | -1.08                | 79         | 25.16                  | Camden Square       |
| +2.46                    | 230        | .83               | 3     | 25          | 6.10                  | 5.87      | -.23                 | 96         | 28.36                  | Tenterden           |
| +2.19                    | 222        | .95               | 7     | 18          | 6.74                  | 5.07      | -1.67                | 76         | 29.93                  | West Dean           |
| +2.23                    | 226        | 1.20              | 6     | 27          | 6.22                  | 5.34      | -.88                 | 86         | 27.10                  | Hartley Wintney     |
| +1.72                    | 213        | .85               | 6     | 25          | 4.88                  | 4.46      | -.42                 | 91         | 24.66                  | Hitchin             |
| + .43                    | 127        | .47               | 6     | 22          | 5.40                  | 3.40      | -2.00                | 63         | 26.75                  | Addington           |
| + .93                    | 157        | .53               | 6     | 19          | 4.89                  | 4.03      | -.86                 | 82         | 25.39                  | Westley             |
| +1.00                    | 161        | .47               | 6     | 19          | 4.81                  | 3.89      | -.92                 | 81         | 25.40                  | Brundall            |
| +3.19                    | 232        | 1.15              | 6     | 25          | 9.42                  | 7.67      | -1.75                | 81         | 39.00                  | Winterbourne Stpltn |
| +3.08                    | 226        | 1.51              | 8     | 24          | 8.51                  | 7.54      | -.97                 | 89         | 35.00                  | Torquay             |
| +2.77                    | 215        | .70               | 8     | 27          | 9.12                  | 8.81      | -.31                 | 97         | 38.85                  | Polapit Tamar       |
| +1.29                    | 167        | .91               | 6     | 19          | 6.58                  | 5.06      | -1.52                | 77         | 30.75                  | Bath                |
| +1.79                    | 196        | .82               | 6     | 26          | 6.45                  | 5.46      | -.99                 | 85         | 29.85                  | Stroud              |
| + .87                    | 143        | .46               | 24    | 20          | 7.09                  | 5.57      | -1.52                | 79         | 33.04                  | Wolstaston          |
| +1.39                    | 179        | 1.11              | 6     | 20          | 6.08                  | 4.99      | -1.09                | 82         | 29.21                  | Coventry            |
| +1.83                    | 235        | .90               | 6     | 24          | 4.50                  | 4.57      | + .07                | 102        | 23.30                  | Boston              |
| +1.68                    | 209        | 1.14              | 6     | 23          | 4.87                  | 4.90      | + .03                | 101        | 24.70                  | Hodsock Priory      |
| +1.58                    | 206        | .94               | 6     | 20          | 5.10                  | 5.00      | -.10                 | 98         | 26.18                  | Derby               |
| + .72                    | 125        | 1.29              | 24    | 21          | 8.93                  | 7.73      | -1.20                | 87         | 42.43                  | Bolton              |
| +2.36                    | 227        | 1.00              | 6     | 21          | 5.37                  | 5.66      | + .29                | 105        | 26.96                  | Ribston Hall        |
| - .81                    | 84         | 1.03              | 28    | 21          | 16.10                 | 13.94     | -2.16                | 87         | 60.96                  | Arnccliffe Vic.     |
| +1.79                    | 200        | 1.02              | 6     | 22          | 5.45                  | 5.28      | -.17                 | 97         | 27.02                  | Hull                |
| +3.25                    | 254        | 1.06              | 6     | 23          | 5.64                  | 8.00      | +2.36                | 142        | 27.99                  | Newcastle           |
| -1.43                    | 86         | 1.62              | 29    | 19          | 36.86                 | 31.16     | -5.70                | 85         | 132.68                 | Seathwaite          |
| +1.46                    | 152        | .93               | 24    | 24          | 9.77                  | 6.99      | -2.78                | 72         | 42.81                  | Cardiff             |
| +3.25                    | 207        | 1.06              | 5     | 27          | 11.86                 | 9.15      | -2.71                | 77         | 47.88                  | Haverfordwest       |
| + .30                    | 110        | .85               | 24    | 17          | 9.83                  | 7.09      | -2.74                | 72         | 45.41                  | Gogerddan           |
| + .55                    | 128        | .43               | 24    | 22          | 6.51                  | 5.76      | -.75                 | 88         | 30.98                  | Llandudno           |
| +2.58                    | 186        | .88               | 28    | 15          | 11.17                 | 13.32     | +2.15                | 119        | 43.43                  | Cargen              |
| +1.66                    | 165        | .90               | 23    | 21          | 8.36                  | 9.14      | + .78                | 109        | 34.80                  | Branxholm           |
| ...                      | ...        | 1.23              | 24    | 20          | ...                   | 8.04      | ...                  | ...        | ...                    | Edinburgh           |
| ..00                     | 100        | .80               | 25    | 19          | 12.39                 | 12.26     | -.13                 | 99         | 48.87                  | Girvan              |
| + .13                    | 106        | .60               | 24    | 15          | 8.11                  | 9.60      | +1.49                | 118        | 35.80                  | Glasgow             |
| -4.03                    | 19         | .19               | 18    | 12          | 16.49                 | 14.60     | -1.89                | 88         | 57.90                  | Inveraray           |
| -2.61                    | 38         | .48               | 19    | 15          | 14.58                 | 11.74     | -2.84                | 81         | 57.53                  | Quinich             |
| +1.33                    | 169        | 1.01              | 7     | 19          | 6.12                  | 5.54      | -.58                 | 91         | 28.95                  | Dundee              |
| + .38                    | 116        | ...               | ...   | ...         | 8.03                  | 6.63      | -1.40                | 82         | 36.07                  | Braemar             |
| +3.22                    | 232        | .85               | 30    | 29          | 7.18                  | 8.39      | +1.21                | 117        | 33.01                  | Aberdeen            |
| + .80                    | 137        | .51               | 29    | 15          | 6.16                  | 6.55      | + .39                | 106        | 29.37                  | Cawdor              |
| -2.91                    | 21         | .10               | 7     | 17          | 12.66                 | 8.79      | -3.87                | 69         | 43.71                  | Fort Augustus       |
| -3.47                    | 46         | 1.15              | 7     | 13          | 21.90                 | 21.27     | -.63                 | 97         | 86.50                  | Bendamph            |
| + .64                    | 126        | 1.20              | 7     | 16          | 7.48                  | 8.01      | + .53                | 107        | 31.60                  | Dunrobin Castle     |
| ...                      | ...        | .27               | 1     | 22          | ...                   | 7.04      | ...                  | ...        | ...                    | Castletown          |
| - .33                    | 92         | .65               | 17    | 26          | 16.04                 | 12.36     | -3.68                | 77         | 58.11                  | Killarney           |
| +1.46                    | 157        | .95               | 28    | 21          | 9.91                  | 6.79      | -3.12                | 68         | 39.30                  | Waterford           |
| + .73                    | 134        | .46               | 27    | 23          | 7.34                  | 7.84      | + .50                | 107        | 33.47                  | Hurdlestown         |
| + .34                    | 114        | .38               | 28    | 25          | 8.10                  | 6.20      | -1.90                | 77         | 35.19                  | Abbey Leix          |
| + .84                    | 145        | .44               | 28    | 19          | 5.99                  | 4.54      | -1.45                | 76         | 27.75                  | Dublin              |
| + .13                    | 105        | .52               | 27    | 15          | 8.03                  | 6.96      | -1.07                | 87         | 36.48                  | Mullingar.          |
| + .18                    | 107        | .43               | 27    | 21          | 8.42                  | 6.53      | -1.89                | 78         | 37.04                  | Ballinasloe         |
| - .13                    | 97         | .44               | 2     | 27          | 12.96                 | 12.11     | -.85                 | 93         | 50.50                  | Enniscoe            |
| - .36                    | 88         | .37               | 24    | 22          | 9.44                  | 9.77      | + .33                | 104        | 41.83                  | Markree Obsy.       |
| +3.20                    | 225        | .99               | 6     | 21          | 9.16                  | 9.57      | + .41                | 104        | 38.61                  | Seaforde            |
| + .89                    | 129        | .67               | 29    | 27          | 9.35                  | 12.79     | +3.44                | 137        | 41.20                  | Londonderry         |
| +1.64                    | 166        | .73               | 19    | 22          | 8.30                  | 9.78      | +1.48                | 118        | 37.85                  | Omagh               |

## SUPPLEMENTARY RAINFALL, MARCH, 1909.

| Div.  | STATION.                    | Rain<br>inches | Div.   | STATION.                     | Rain.<br>inches |
|-------|-----------------------------|----------------|--------|------------------------------|-----------------|
| II.   | Warlingham, Redvers Road    | 4.15           | XI.    | Rhayader, Tyrmynydd .....    | 4.74            |
| „     | Ramsgate .....              | 2.50           | „      | Lake Vyrnwy .....            | 4.81            |
| „     | Steyping .....              | 4.21           | „      | Llangyhanfal, Plâs Draw....  | 2.38            |
| „     | Hailsham .....              | 3.75           | „      | Llwdiarth Esgob.....         | 3.48            |
| „     | Totland Bay, Aston House.   | 3.72           | „      | Snowdon, Cwm Dyli .....      | 9.13            |
| „     | Stockbridge, Ashley .....   | 4.15           | „      | Lligwy .....                 | 2.83            |
| „     | Grayshott.....              | 5.11           | „      | Douglas, Woodville .....     | 4.10            |
| „     | Reading, Calcot Place.....  | 3.27           | XII.   | Stoneykirk, Ardwell House    | 3.57            |
| III.  | Harrow Weald, Hill House.   | 3.11           | „      | Dalry, The Old Garroch ...   | 5.11            |
| „     | Oxford, Magdalen College... | 2.27           | „      | Langholm, Drove Road.....    | 3.37            |
| „     | Pitsford, Sedgebrook .....  | 2.68           | „      | Moniaive, Maxwellton House   | 5.03            |
| „     | Huntingdon, Brampton.....   | 3.49           | XIII.  | N. Esk Reservoir [Penicuick] | 6.15            |
| „     | Woburn, Milton Bryant.....  | 3.09           | XIV.   | Maybole, Knockdon Farm..     | 2.80            |
| „     | Wisbech, Monica Road.....   | 4.06           | XV.    | Campbeltown, Witchburn...    | 3.33            |
| IV.   | Southend Water Works.....   | 2.34           | „      | Glenreadell Mains.....       | 2.86            |
| „     | Colchester, Lexden .....    | 2.45           | „      | Ballachulish House.....      | .72             |
| „     | Newport, The Vicarage.....  | 3.42           | „      | Islay, Eallabus .....        | 2.61            |
| „     | Rendlesham .....            | 2.51           | XVI.   | Dollar Academy .....         | 3.55            |
| „     | Swaffham .....              | 2.95           | „      | Loch Leven Sluice .....      | 2.93?           |
| „     | Blakeney .....              | 2.19           | „      | Balquhiddy, Stronvar .....   | 2.65            |
| V.    | Bishops Cannings .....      | 4.11           | „      | Perth, The Museum .....      | 3.87            |
| „     | Ashburton, Druid House ...  | 7.99           | „      | Coupar Angus .....           | 3.17            |
| „     | Honiton, Combe Raleigh ..   | 5.29           | „      | Blair Atholl.....            | 1.65            |
| „     | Okehampton, Oaklands.....   | 6.94           | „      | Montrose, Sunnyside Asylum   | 4.67            |
| „     | Hartland Abbey .....        | 3.38           | XVII.  | Alford, Lynturk Manse ...    | 8.14            |
| „     | Lynmouth, Rock House .....  | 4.09           | „      | Keith Station .....          | 4.18            |
| „     | Probus, Lamellyn .....      | 4.37           | XVIII. | N. Uist, Lochmaddy .....     | 1.87            |
| „     | North Cadbury Rectory ..    | 4.21           | „      | Alvey Manse .....            | 2.19            |
| VI.   | Clifton, Pembroke Road ...  | 3.59           | „      | Loch Ness, Drumadrochit.     | 2.07            |
| „     | Ross, The Graig .....       | 2.77           | „      | Glencarron Lodge .....       | 2.35            |
| „     | Shifnal, Hatton Grange..... | 2.35           | „      | Fearn, Lower Pitkerrie.....  | 1.44            |
| „     | Blockley, Upton Wold.....   | 4.04           | XIX.   | Invershin .....              | 1.09            |
| „     | Worcester, Boughton Park.   | 3.02           | „      | Altnaharra .....             | 2.10            |
| VII.  | Market Overton .....        | 4.08           | „      | Bettyhill .....              | 1.89            |
| „     | Market Rasen .....          | 3.18           | XX.    | Dunmanway, The Rectory..     | 4.92            |
| „     | Bawtry, Hesley Hall.....    | 2.78           | „      | Cork .....                   | 3.17            |
| „     | Buxton.....                 | 4.72           | „      | Mitchelstown Castle .....    | 3.28            |
| VIII. | Neston, Hinderton Lodge...  | 2.34           | „      | Darrynane Abbey .....        | 5.40            |
| „     | Southport, Hesketh Park...  | 2.85           | „      | Glenam [Clonmel] .....       | 3.49            |
| „     | Chatburn, Middlewood .....  | 2.79           | „      | Ballingarry, Gurteen .....   | 2.36            |
| „     | Cartmel, Flookburgh .....   | 3.75           | „      | Miltown Malbay.....          | 2.99            |
| IX.   | Langsett Moor, Up. Midhope  | 5.23           | XXI.   | Gorey, Courtown House ...    | 3.04            |
| „     | Scarborough, Scalby .....   | 6.66           | „      | Moynalty, Westland .....     | 3.52            |
| „     | Ingleby Greenhow .....      | 3.99           | „      | Athlone, Twyford .....       | 2.51            |
| „     | Mickleton.....              | 3.89           | XXII.  | Woodlawn .....               | 3.92            |
| X.    | Bardon Mill, Beltingham ... | 4.11           | „      | Westport, St. Helens .....   | 3.55            |
| „     | Ewesley, Font Reservoir ... | 3.94           | „      | Mohill .....                 | 3.03            |
| „     | Hderton, Lilburn Cottage... | 5.82           | XXIII. | Enniskillen, Portora .....   | 3.18            |
| „     | Keswick, The Bank .....     | 4.23           | „      | Dartrey [Cootehill].....     | 3.12            |
| XI.   | Llanfrechfa Grange.....     | 5.43           | „      | Warrenpoint, Manor House     | 3.23            |
| „     | Treherbert, Tyn-y-waun ...  | 7.96           | „      | Banbridge, Milltown .....    | 3.72            |
| „     | Carmarthen, The Friary..... | 4.67           | „      | Belfast, Springfield .....   | 4.21            |
| „     | Castle Malgwyn [Llechryd].  | 4.77           | „      | Bushmills, Dundarave .....   | 2.61            |
| „     | Plynlimon.....              | 5.50           | „      | Sion House .....             | 3.69            |
| „     | Crickhowell, Ffordlas.....  | 5.10           | „      | Killybegs .....              | 3.91            |
| „     | New Radnor, Ednol .....     | 3.80           | „      | Horn Head .....              | 3.89            |

## METEOROLOGICAL NOTES ON MARCH, 1909.

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 was dull and cheerless almost throughout, with much R and S. On the evening of 2nd and morning of 3rd S fell to a depth of 5 inches, and an additional 2½ inches fell during the afternoon and evening of 3rd. Bar always below 30 in., and average bar. the lowest for March in record of 51 years. Duration of sunshine, 59·7\* hours, and of R 94·0 hours. Mean temp. 39°·8, was 2°·3 below the average, or equal to the average for February. Shade max. 60°·5 on 29th; min. 18°·5 on 5th, and the lowest on record for March with the single exception of 15°·6 on 4th March, 1890. F 11, f 19.

TENTERDEN.—Duration of sunshine 79·5† hours. Mean temp. 38°·6. Shade max. 57°·5 on 29th; min. 9°·0 on 5th. F 12, f 17.

TOTLAND BAY.—Duration of sunshine 96·7\* hours, and the lowest amount ever recorded in March. Shade max. 53°·2 on 29th; min. 19°·6 on 3rd, which is the lowest March temp. for 23 years. F 9, f 17.

PITSFORD.—R 98 in. above the average. Mean temp. 38°·2. Shade max. 60°·4 on 29th; min. 17°·3 on 5th. F 18.

TORQUAY.—Duration of sunshine 106·7\* hours, or 36·6 hours below the average. Mean temp. 41°·6, or 2°·5 below the average. Shade max. 56°·0 on 23rd; min. 24°·9 on 5th. F 8, f 15.

NORTH CADBURY.—A cold, wet and stormy month. The R and the number of rain days were the greatest in 13 Marches. Shade max. 57°·0 on 29th; min. 14°·5 on 5th. F 10, f 24.

ROSS.—Shade max. 56°·6 on 30th; min. 7°·6 on 5th. F 15, f 20.

HODSOCK PRIORY.—The coldest March since 1892, and the wettest, except 1889, in 33 years. Mean pressure was the lowest in any month during 30 years. Shade max. 58°·0 on 29th; min. 21°·3 on 17th. F 17, f 23.

SOUTHPORT.—R 68 in. above the average of 35 years. Duration of sunshine 102·8\* hours, or 24·8 hours below the average. Duration of R 88·1 hours. Mean temp. 39°·1, or 2°·4 below the average. Shade max. 56°·7 on 22nd; min. 22°·2 on 4th. F 13, f 19.

HULL.—Shade max. 60°·0 on 29th; min. 22°·0 on 17th. F 15, f 22.

HAVERFORDWEST.—Duration of sunshine 93·8\* hours. Shade max. 52°·4; min. 23°·2. F 10, f 13.

LLANDUDNO.—Shade max. 53°·5 on 19th and 29th; min. 23°·7 on 4th. F 8.

DOUGLAS.—A most disagreeable month, with the wind always in a cold quarter, low temp., and excessive R, especially towards the end. The ground was too sodden and cold for seeding purposes, and there were no signs of any material change for the better.

CARGEN.—One of the most disagreeable months of March on record, with constant S storms, cold E. winds, and low temp. Farm work was at a standstill and vegetation very backward. Max. temp. 53°·0 on 22nd; min. 13°·0 on 5th. F 15.

EDINBURGH.—Shade max. 48°·6 on 22nd; min. 21°·8 on 6th. F 14, f 19.

DUNDEE.—Shade max. 48°·0 on 27th; min. 21°·6 on 4th. F 15.

FORT AUGUSTUS.—Shade max. 53°·1 on 22nd; min. 12°·9 on 5th. F 14.

WATERFORD.—Shade max. 56°·0 on 23rd; min. 18°·0 on 5th. F 14.

DUBLIN.—Severely cold at first; gloomy and wet towards the close. Mean temp. 40°·8. Shade max. 55°·3 on 24th; min. 25°·8 on 4th. F 10, f 14.

MARKREE.—The coldest month for many years. S and H, with some heavy frosts were recorded to 18th. Bright sunshine was much under the average. Shade max. 55°·8 on 23rd; min. 14°·0 on 6th. F 17, f 22.

WARRENPOINT.—Shade max. 58°·0 on 20th and 23rd; min. 24°·0 on 2nd and 4th. F 11, f 22.

\* Campbell-Stokes

† Jordan

## Climatological Table for the British Empire, October, 1908.

| STATIONS.<br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                |            |       |                 |
| London, Camden Square                                            | 79.0      | 2     | 32.9     | 25    | 62.4     | 47.3 | 51.1       | 93        | 110.2        | 27.4           | 1.95       | 10    | 8.5             |
| Malta ... ..                                                     | 79.3      | 28    | 62.0     | 21    | 74.8     | 65.4 | 60.4       | 72        | 143.0        | ...            | 1.38       | 11    | 4.6             |
| Lagos ... ..                                                     | 91.0      | 7     | 71.0     | 9     | 84.6     | 73.8 | 74.2       | 82        | 158.0        | 63.0           | 8.24       | 19    | 7.9             |
| <i>Cape Town</i> ... ..                                          | 82.6      | 13    | 46.5     | 15    | 69.0     | 53.2 | 51.0       | 70        | ...          | ...            | 2.03       | 9     | 4.7             |
| <i>Durban, Natal</i> ... ..                                      | 83.9      | 25    | 53.7     | 6     | 74.1     | 61.6 | ...        | ...       | 141.8        | ...            | 8.11       | 21    | 7.1             |
| <i>Johannesburg</i> ... ..                                       | 84.1      | 17    | 33.1     | 6     | 72.6     | 50.3 | 46.0       | 61        | 147.2        | 33.2           | 4.04       | 7     | 3.3             |
| <i>Mauritius</i> ... ..                                          | 82.9      | 15    | 57.6     | 19    | 80.8     | 65.2 | 62.0       | 70        | 154.4        | 48.4           | 1.04       | 15    | 5.4             |
| Calcutta... ..                                                   | 92.1      | 18    | 63.5     | 31    | 89.3     | 73.5 | 71.5       | 74        | 154.8        | 58.0           | 1.94       | 5     | 3.0             |
| Bombay... ..                                                     | 93.1      | 24    | 72.8     | 19    | 88.3     | 77.4 | 75.1       | 80        | 140.0        | 68.8           | .62        | 3     | 3.1             |
| Madras ... ..                                                    | 96.6      | 2     | 70.1     | 12    | 89.4     | 74.7 | 74.5       | 83        | 144.7        | 65.9           | 24.78      | 11    | 4.8             |
| Kodaikanal ... ..                                                | 64.6      | 2     | 50.0     | 21    | 60.8     | 51.6 | 54.1       | 89        | 130.6        | 37.2           | 16.42      | 25    | 7.6             |
| Colombo, Ceylon ... ..                                           | 89.2      | 14    | 71.2     | 22    | 85.9     | 75.1 | 73.8       | 81        | 157.8        | 71.0           | 13.27      | 23    | 7.0             |
| Hongkong ... ..                                                  | 86.5      | 5     | 67.0     | 31    | 80.8     | 73.4 | 69.5       | 78        | 136.9        | ...            | 5.44       | 16    | 6.9             |
| <i>Melbourne</i> ... ..                                          | 89.2      | 6     | 36.8     | 3     | 67.4     | 47.7 | 45.5       | 64        | 144.1        | 30.1           | 2.22       | 12    | 5.3             |
| <i>Adelaide</i> ... ..                                           | 99.1      | 29    | 39.9     | 10    | 72.9     | 50.7 | 47.8       | 60        | 158.5        | 32.1           | 3.59       | 10    | 4.7             |
| <i>Coolgardie</i> ... ..                                         | 95.6      | 26    | 40.2     | 7     | 77.0     | 49.0 | 42.1       | 47        | 155.4        | 37.2           | .44        | 4     | 2.8             |
| <i>Perth</i> ... ..                                              | 87.8      | 22    | 43.4     | 13    | 70.8     | 52.6 | 50.0       | 66        | 141.5        | 38.3           | 2.19       | 13    | 4.8             |
| <i>Sydney</i> ... ..                                             | 90.5      | 7     | 45.1     | 9     | 70.6     | 53.7 | 49.9       | 62        | 124.0        | 33.9           | 1.33       | 17    | 4.2             |
| <i>Wellington</i> ... ..                                         | 64.6      | 11    | 39.6     | 14    | 58.1     | 48.0 | 45.6       | 76        | 116.0        | 31.0           | 5.09       | 16    | 7.7             |
| <i>Auckland</i> ... ..                                           | 66.0      | 18,22 | 44.0     | 28    | 61.5     | 50.3 | 47.4       | 78        | 131.0        | 38.0           | 4.02       | 19    | 6.2             |
| Jamaica, Kingston ... ..                                         | 90.8      | 13    | 69.6     | 21    | 87.5     | 72.3 | 71.6       | 80        | ...          | ...            | 4.72       | 15    | ...             |
| Trinidad ... ..                                                  | 90.0      | 15*   | 68.0     | 29    | 86.9     | 72.8 | 73.4       | 85        | 165.0        | 60.0           | 5.45       | 20    | ...             |
| Grenada ... ..                                                   | 86.4      | 2     | 72.5     | 30    | 83.9     | 74.8 | 76.0       | 79        | 147.4        | ...            | 11.40      | 25    | 5.5             |
| Toronto ... ..                                                   | 76.9      | 18    | 28.2     | 12    | 59.3     | 41.5 | ...        | ...       | 99.2         | 24.8           | 1.01       | 7     | ...             |
| Fredericton ... ..                                               | 76.6      | 16    | 24.8     | 21    | 59.5     | 35.5 | ...        | 76        | ...          | ...            | 5.63       | 4     | 3.9             |
| St. John's, N.B. ... ..                                          | 68.2      | 17    | 30.0     | 31    | 57.1     | 43.0 | ...        | ...       | ...          | ...            | 3.60       | 10    | 4.6             |
| Victoria, B.C. ... ..                                            | 67.0      | 10    | 31.2     | 21    | 55.4     | 43.2 | ...        | 82        | ...          | ...            | 2.33       | 14    | 6.7             |
| Dawson ... ..                                                    | 52.0      | 2     | -22.5    | 23    | 24.3     | 9.3  | ...        | ...       | ...          | ...            | .69        | 7     | ...             |

\* and 19, 25. † and 17, 28.

MALTA.—Mean temp. of air 69° 9. Average bright sunshine 6.6 hours per day.

*Johannesburg*.—Bright sunshine 291 hours.*Mauritius*.—Mean temp. of air 0° 3 and dew point 0° 2, above, and R .59 in. below, averages. Mean hourly velocity of wind 9.9 miles, or 1.1 below average.

KODAIKANAL.—Bright sunshine 100 hours. Rain much above average.

COLOMBO.—Mean temp. of air 78° 9, or 1° 2 below, of dew point 0° 7 above, and R 1.40 in. below, averages. Mean hourly velocity of wind 5 miles. TSS on 2 days.

HONGKONG.—Mean temp. of air 76° 8. Bright sunshine 174.4 hours, or 28 hours below average. Mean hourly velocity of wind 17.2 miles, or 2.6 above average.

*Melbourne*.—Mean temp. of air 0° 1 above, and R .14 in. below, averages.*Adelaide*.—Mean temp. of air normal. R 1.84 in. above average.*Sydney*.—Mean temp. of air 1° 1 below, and R 1.53 in. below, averages.*Wellington*.—Mean temp. of air 1° 2 below, and R .86 in. above, averages. Bright sunshine 167.4 hours.

TRINIDAD.—R 1.20 in. below the 43 years' average.





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## THE ORGANIZATION OF AERONAUTICAL RESEARCH.

THERE is one valuable compensation for retarded development in the case of scientific organization ; it becomes possible when the subject is at last seriously undertaken to launch it carefully planned and completely equipped.

We have to announce two very important steps in the progress of aeronautical research in Great Britain, which we welcome as certain to lead to an advance in the study of meteorological conditions, with which the aeronautic art even more than navigation has vitally to do. The Government has decided that both the Navy and Army should be concerned in the designing and testing of air-ships and aeroplanes, and that ample provision should be made for the expense of the necessary experiments. Realizing that scientific principles and engineering skill must be brought to bear on the problems involved, the Government has decided to make use of the facilities afforded by the National Physical Laboratory at Teddington, where a special aeronautical department is to be organized. A permanent Treasury Committee is to superintend this department, and to be available for consultation by the Admiralty and War Office on the various problems that may arise. *The Times* states that of the Committee as nominated,

Lord Rayleigh is President, and Dr. R. T. Glazebrook, the director of the laboratory, Chairman. The other members are :—Major-General Sir Charles Hadden, representing the Army ; Captain R. H. S. Bacon, representing the Navy ; Sir Alfred Greenhill, F.R.S., a distinguished authority on hydrodynamics and formerly Professor of Mathematics in the Ordnance College, Woolwich ; Dr. W. N. Shaw, F.R.S., the Director of the Meteorological Office ; Mr. Horace Darwin, F.R.S., of the Cambridge Scientific Instrument Company ; Mr. H. R. A. Mallock, F.R.S., a consulting engineer and member of the Ordnance Committee ; Mr. J. E. Petavel, F.R.S., Professor of Engineering in the University of Manchester ; and Mr. F. W. Lanchester, an engineer who has given much attention to aeronautical matters and the author of a well-known text-book on the subject.

We miss the name of Mr. W. H. Dines, F.R.S., whose long experience in research on the upper air and remarkable inventive skill

should surely have led to his nomination as a member of such a Committee. Apart from this omission, the appointment of the Committee is a sign of enlightened action being taken in high quarters in connection with the striking developments now going on in aerial navigation, which concern the means of national defence as much as the advancement of science.

While a new body of an exceptionally representative character is being created to aid the Government in the perfection and application of new means of aerial defence, it is gratifying to find that the various private bodies, which have identified themselves with aeronautical matters, have come to a practical understanding to avoid needless rivalry, and to delimit the portions of the subject to which each is to direct attention. The Aeronautical Society of Great Britain has kept the spark of interest in the science of aeronautics alive through two generations of public apathy; and of its younger contemporaries, the Aero Club pursues aeronautics as a sport in the earnest English way, and the Aerial League was formed to keep before the public the necessity of being foremost in practical aeronautics as a means of national defence. These three bodies have formally pledged themselves to respect each other's provinces and to be mutually helpful. The scientific aspects of aerial navigation and the problem of flight will, as heretofore, be the special care of the Aeronautical Society, which will receive the support of the newer bodies, and be saved from the very real risk of being elbowed out by the stronger appeals of sport and patriotism.

The memorandum of agreement drawn up on May 3rd, 1909, provides as follows:—

With this object in view it is now proposed that the three bodies shall come to a definite written agreement to recognize the respective spheres of action of each separate body.

For the purposes of this agreement the Aeronautical Society shall be regarded as the paramount scientific authority on aeronautical matters, and shall be consulted on all questions dealing with the scientific side of the question.

The Aero Club shall be recognized as the paramount body in all matters of sport and the development of the art of aeronautics.

The Aerial League shall be recognized as the paramount body for patriotic movements and for education.

In order to assist the Parliamentary Committee which is in process of formation, each of these bodies will nominate three of its members to advise and assist when required.

The need for co-operation and definition of spheres of interest has long been felt amongst meteorologists, and we hope that so definite and practical a movement amongst other votaries of aerial science may help to overcome such difficulties as remain in the way of a complete federation of the meteorological activities of the country



## THE WEATHER OF APRIL, 1909.

By FRED. J. BRODIE.

At the commencement of April a large anticyclone extended over western Europe from the northward and produced a spell of remarkably fine weather, commencing on the 1st, and lasting over England until the 11th (Easter Day). In Ireland, Scotland and Wales the conditions between the 2nd and 4th were however affected more or less seriously by a cyclonic system whose borders spread in from the Atlantic, the rainfall in Ireland on the 2nd and 3rd being sufficiently heavy to occasion floods of considerable local severity. After the 4th the influence of the anticyclone became supreme, and for six or seven days brilliantly fine weather prevailed over the entire kingdom, the duration of sunshine being in some districts the highest ever observed in a calendar week since the general establishment of sunshine recorders in 1881. The generalised results for large districts given in the Weekly Weather Report show that in the week ending the 10th as much as 89 per cent of the possible amount of sunshine was registered in the east of England, and as much as 87 per cent. in the south-east. For individual stations the amount was even nearer the limit of possibility, the percentage in some parts of our eastern and southern counties varying between 92 and 94. With so clear a sky both in the daytime and at night, the amount of solar and terrestrial radiation was very large, the days being warm but the nights cold with occasional sharp frost in many districts. The highest shade temperatures were recorded very commonly on the 9th and 10th, when the thermometer rose to  $70^{\circ}$  and upwards in several parts of England and at some few places in the south of Ireland, to  $73^{\circ}$  at Hereford and to  $74^{\circ}$  at Cullompton. The lowest night readings occurred mostly between the 5th and 8th, when the thermometer in the screen fell to  $25^{\circ}$  or less in many inland parts of Great Britain, a reading as low as  $18^{\circ}$  being recorded at Balmoral, and a reading of  $22^{\circ}$  at Llangammarch Wells. On the grass the frost was naturally more severe, the exposed thermometer falling under  $20^{\circ}$  in many places (as far south even as Greenwich), and reaching a minimum of  $9^{\circ}$  at Llangammarch Wells.

After the 10th the anticyclone began to recede southwards, and for the remainder of the month the country was influenced by numerous areas of low barometrical pressure, which spread in from the Atlantic. Typical April weather now prevailed, frequent and in some cases heavy falls of rain being interspersed with substantial intervals of bright sunshine. With a current of air blowing usually from between south and west, the thermometer until very near the end of the month was above its average level. No great warmth was however experienced, the daily maxima being seldom as high as  $65^{\circ}$  even in the most highly favoured localities. The highest readings were observed on the 19th, when the thermometer in some parts of the London district (Greenwich and Tottenham) reached  $69^{\circ}$ . Night

frosts were reported at various times in inland parts of the country, but these were not sufficiently severe to occasion much injury to vegetation, scarcely any temperatures below  $20^{\circ}$  being registered even on the surface of the grass. Quite at the close of the month a cold wind from north to north-west sprang up in the rear of a cyclonic disturbance which moved rapidly eastwards across Ireland and England, and showers of hail, sleet or snow fell in nearly all parts of the kingdom. In spite of a large amount of bright sunshine the thermometer on the 30th scarcely rose above  $50^{\circ}$  in any part of England, while in the northern districts of Ireland and Scotland it did not reach  $45^{\circ}$ .

The mean temperature for the month was above the average over nearly the whole of the United Kingdom, but in the western and northern districts the excess was small, and in a few scattered places there was a trifling deficiency. The greatest excess, more than two and a half degrees, was reported in the east of England.

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### ROYAL METEOROLOGICAL SOCIETY.

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

Mr. Baldwin Latham, M. Inst. C.E., read a paper on "Percolation, Evaporation, and Condensation," in which he gave the results of the observations which he had carried out at Croydon on these subjects during the last 30 years. Two percolation gauges were used, both of which were exactly a superficial yard in area, and contained a cubic yard of natural soil, one of chalk and the other of gravel. The average annual amount of percolation through the chalk gauge was 10.84 in., and through the gravel gauge 10.34 in. The average annual rainfall was 25.45 in. It appears that the rate of percolation is governed by the rate of rainfall, for when once the gauges have become sensitive, by being thoroughly wetted, the rate at which rain percolates depends entirely on the quantity of rain immediately falling. The evaporator used for determining the evaporation was a floating copper vessel 1 foot in diameter supported by a life-buoy ring, connected by four arms with the evaporating vessel, the whole being floated in a tank 4 feet internal diameter containing about 3 feet depth of water. The average annual amount of evaporation by this gauge was 18.14 in., and the average annual amount of condensation was .36 in.

Mr. W. Marriott referred to the percolation observations which had been carried on at Nash Mills, Apsley Mills, Rothamsted, and Berkhamsted. At Apsley Mills, Sir John Evans had 3 gauges—one with chalk, one with sand, and one with natural soil. The percolation was greatest through the sand. Mr. Marriott also referred to the evaporation observations carried out at Camden Square by Dr. Mill.

and at Downholland, near Southport, by Mr. Baxendell. He considered that the chief factors influencing evaporation were the dryness of the air, the temperature of the water and the wind.

Mr. C. Salter said that during the last three years, Dr. Mill (who had asked him to express his regret at not being present) had been experimenting with the object of ascertaining the relation of evaporation measurements to other meteorological elements. The results seem to indicate that wind movement had but little effect upon the amount evaporated, except perhaps in winter, but a remarkable parallelism was shown between the curves, both of duration of sunshine and black bulb maxima and those of evaporation during the summer months. The evaporation was more closely related to shade temperature in winter.

Mr. W. H. Dines said that his father had made many observations on evaporation, and was of opinion that wind was important.

Mr. J. E. Clark, Mr. F. C. Bayard, Dr. W. N. Shaw, Mr. J. Hopkinson, and the President, also took part in the discussion, and Mr. Latham replied.

A paper on "The Meteorological Conditions in the Philippine Islands, 1908," by the Rev. José Algué, S.J., Director of the Philippine Weather Bureau, was read by the Secretary.

The year 1908 was one of extraordinary meteorological conditions. Heavy floods occurred, and frequent violent cyclonic storms passed over or affected the Archipelago. The author stated that out of fourteen typhoons of extraordinary intensity which have occurred during the past 29 years, 5 occurred in the year 1908, the most violent being those of September 23rd, October 13th, and December 5th. It seems that the part of the Archipelago that is visited the most frequently by these extraordinary typhoons is the northern part of Luzon, from parallel 15°30' to the Batanes Islands and from parallel 11° to 14° N.

The following gentlemen were elected Fellows of the Society:— Prof. H. T. Barnes, Dr. W. R. Blair, Prof. J. E. Church, Mr. H. B. Hersey, Capt. J. E. Leach, Mr. E. R. Miller, Mr. E. C. Shankland, and Capt. T. J. Uren.

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## SCOTTISH METEOROLOGICAL SOCIETY.

A MEETING of the Society was held in the Rooms of the Highland and Agricultural Society, Edinburgh, on 5th May, Sir Archibald Buchan-Hepburn, Bart., Vice-President, in the chair.

The Chairman explained that the meeting had a peculiar interest as the formation of the Society was the result of a meeting which was held in 1855 in the rooms of the Highland and Agricultural Society, composed of members of that Society interested in meteorology.

A discussion on the relation of Meteorology to Forestry was opened by Mr. A. W. Borthwick, D.Sc., who summarized the present state of our knowledge with regard to the influence of Forests on climate. Forest meteorology in this country is not so advanced as on the continent. In France, Germany and Sweden, and in America, Forest Meteorological Stations are abundant, and records of the greatest importance are kept. Within forests extremes of temperature are not so great and the average humidity of the air is increased. It is doubtful whether rainfall is actually increased, but the quantity and distribution of rain throughout the year is altered. With regard to the surrounding country, forests are of enormous importance in regulating the drainage and water supply, and in retarding and tempering the effect of violent, cold or dry winds.

Mr. R. Stewart Macdougall, D.Sc., discussed the importance of meteorological conditions from the point of view of plant life. Trees give off a large quantity of water by transpiration in the course of a year. In winter the temperature of the soil falls so much that inflow of water at the roots is made impossible. Provision is therefore made in various ways, *e.g.*—by the shedding of leaves to prevent evaporation and transpiration during winter. Just as with human beings, trees in an unhealthy or dying condition, frequently have a far higher temperature than a healthy tree. Late and early frosts, and, in general variable weather conditions are of great value because the death rate among insect pests is then very high.

Mr. Cadell, of Grange, suggested an enquiry into the effect of the needles of coniferous trees in collecting atmospheric electricity, and thought that this might have some influence on the growth of trees.

Mr. J. H. Milne Home drew attention to the fact, that in well wooded districts the ripening of grain crops is delayed on account of the decrease in warmth and sunshine, but thought that any loss to farmers on this account would be compensated for by the better growth of other crops in the rotation, and by the shelter afforded to stock.

Mr. E. M. Wedderburn suggested that in connection with the establishment of Demonstration Forests, or in the event of the afforestation of large areas by the State, Forest Meteorological Stations should be established, the records from which would be of great value.

Mr. A. Watt pointed out that the relation of meteorology to forestry was of especial interest in Scotland in view of the recommendations of the Royal Commission on Coast Erosion. He was of opinion that afforestation, even on a large scale would not materially alter the climate of Scotland.



## Correspondence.

To the Editor of Symons's Meteorological Magazine.

## ROYALTY AND RAIN.

IN *Notes and Queries*, first series, Volume V., pp. 242-3, is a copy of a letter (from Miscellaneous Collections by Dr. Richard Pococke, in British Museum, MS. Add., No. 15,801, folio 33) written by Philip Herbert, third Earl of Pembroke, to the Sheriff of Staffordshire in the time of Charles I., touching the belief that burning brought on rain by ascent of smoke.

“ Sr.—His Majesty taking notice of an opinion entertained in Staffordshire that the burning of ferne doth draw downe rain and being desirous that the country and himself may enjoy fair weather as long as he remains in those parts His Majesty hath commanded me to write unto you to cause all burning of ferne to bee forborne untill His Majesty bee passed the country. Wherein not doubting but that the consideration of their own interest as well as of His Ma<sup>ties</sup> will invite the country to a ready observance of this, His Ma<sup>ties</sup> command, I rest

“ Your very loving friend,

“ PEMBROKE AND MONTGOMERY.

“ Belvoir, 1st August, 1636.

“ To my very loving friend the High Sheriff of the County of Stafford.”

This extract is interesting at least, as carrying the royal interest in rainfall as far back as the time of Charles the First.

R. BENTLEY.

*Upton, Slough, Bucks.*

### THE EVAPORATING AND RECEIVING AREAS OF DEW-PONDS.

IN the remarks on dew-ponds in your Magazine for April (p. 57), rain is rightly stated to be the principal factor in filling them, and the *difference* between the rainfall and the evaporation—on the summit of the South Downs from 15 to 20 inches per annum—is given as the depth of accumulation of water from rain alone. This, however, leaves out of account the difference between the evaporating and the receiving area. Dew-ponds being made in the form of a shallow inverted cone, their gathering area is larger than the evaporating surface of the water, except when they are full. The consequence of this is, as I pointed out in a discussion on dew-ponds at a conference of delegates of Corresponding Societies of the British Association (*Rep. Brit. Assoc.*, for 1900, p. 584), that the depth of water accumulated is usually greater than the difference between the rainfall and the evaporation. With the one area double that of the other—about an average difference—every inch of rain would add two inches of

water to the pond. In wet weather there may be but little difference, but in a dry summer I have seen the water occupying about a tenth of the gathering area. Then rain would when commencing to fall add ten times its own depth to the depth of water in the pond, the excess in proportion gradually decreasing with continued rain. That the less water there is in a pond, the more effect has the rain in increasing its depth is the reason these ponds maintain a more equable level than do ponds with a flat bottom and steep sides, a fact which appears to have been hitherto overlooked.

JOHN HOPKINSON.

*Weetwood, Watford, 7th May, 1909.*

[Our note designedly stated the lowest possible value for rain replenishment on the assumption of a vertical-sided depression with a sharp rim. The points referred to above were fully appreciated in the discussion on Mr. Martin's paper, see p. 77.—ED., *S.M.M.*]

### ROTHESAY AND GREENWICH WEATHER.

SOME time ago I remarked on a relation between Rothesay summers and Greenwich winters as possibly helpful in forecasting. Further enquiry seems to indicate an interesting relation between the year's rainfall at Rothesay and the character of the Greenwich year following. In such studies the climates of those two places are, of course, taken as largely representative.

Consider what happens at Greenwich in the year after a very wet year at Rothesay. Last year at the latter was decidedly wet, with close on 56 in. (the average is 48·6 in.). Suppose we take all Rothesay years with more than 55 in. (in 1841-1907); and note in each case, for Greenwich (1) the number of frost days, (2) the number of days with 70° or more in the year following. We find this—

|     | Very wet Years,<br>Rothesay,<br>( > 55 in.). | Frost Days<br>Year follow-<br>ing (Green-<br>wich). | Relation<br>to<br>Average. |       | Days with 70°<br>or more in Year<br>following<br>(Greenwich). | Relation<br>to<br>Average. |
|-----|----------------------------------------------|-----------------------------------------------------|----------------------------|-------|---------------------------------------------------------------|----------------------------|
| 1.  | 1841..... 65·9                               | 51                                                  | — 3                        | ..... | 82                                                            | + 5                        |
| 2.  | 1861..... 56·3                               | 35                                                  | —19                        | ..... | 67                                                            | —10                        |
| 3.  | 1862..... 59·5                               | 34                                                  | —20                        | ..... | 66                                                            | —11                        |
| 4.  | 1866..... 58·7                               | 64                                                  | +10                        | ..... | 78                                                            | + 1                        |
| 5.  | 1868..... 57·2                               | 50                                                  | — 4                        | ..... | 76                                                            | — 1                        |
| 6.  | 1872..... 70·2                               | 52                                                  | — 2                        | ..... | 79                                                            | + 2                        |
| 7.  | 1877..... 68·6                               | 57                                                  | + 3                        | ..... | 76                                                            | — 1                        |
| 8.  | 1882..... 59·6                               | 44                                                  | —10                        | ..... | 73                                                            | — 4                        |
| 9.  | 1903..... 61·6                               | 56                                                  | + 2                        | ..... | 66                                                            | —11                        |
| 10. | 1906..... 56·3                               | 45                                                  | — 9                        | ..... | 60                                                            | —17                        |
| 11. | 1907..... 58·5                               | 49                                                  | — 5                        | ..... | 77                                                            | 0                          |
|     | Average .....                                | 48·8                                                | — 5·2                      | ..... | 72·7                                                          | — 4·3                      |

Here we have in both kinds of days a preponderance of minus values (8 and 7 out of 11); and where there is excess it is never great. (The annual frost days have ranged up to 95, and the warm

days up to 132.) The group here considered is not large, and the relation may perhaps be upset in time; but until that happens we might, it seems, be justified in expecting no great frost and no great warmth (in the above senses) in the Greenwich year following a very wet one at Rothesay.

Consider now the rainfall of summer at Greenwich in relation to a very wet preceding year at Rothesay. Taking the 20 wettest and the 20 driest years at Rothesay since 1841, I find this: after the former Greenwich had 16 dry summers, 4 wet; after the latter, 8 dry, 12 wet. This would point to a dry-summer as probable this year; but there are other lines of evidence which, I think, may make one doubtful. Last summer was one of the 4 "exceptions" to the "rule" (as we might perhaps put it), and conformity to the "exceptions" has to be reckoned with.

Once more, the Greenwich year after a very wet Rothesay year (in the sense of those 20 wettest) rarely has more than 6 months wet (only one case, 1867, which had 8). Such years with over 6 wet months seem to occur about 1 in 4 in the period 1815-1907.

I do not here enter into the theory of the above relations. In some cases a reason may, I think, be perceived; while others are more obscure. Some discussion of the facts might be acceptable.

ALEX. B. MACDOWALL.

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## THE GREAT SNOWSTORM OF APRIL 25th, 1908— A SUGGESTED EXPLANATION.\*

By CATHERINE O. STEVENS.

IN the case of this storm the track of precipitation of snow was restricted to a curiously limited area of Southern England, and the snowfall was actually most excessive along the coast-line of Dorset, Hampshire, and Sussex. Official Meteorological records for the inclusive dates, April 25th—26th, show that two cyclonic disturbances pursuing nearly parallel courses passed, during these three days, from west to east, the centre of one crossing the Midlands, and that of the other moving up the Channel. By means of a projected telescopic image of the sun evidence was secured at Oxford, at 3 p.m., on April 24th, of the fact that these two cyclones were, at this time, already actually overlapping one another. The drift of visible cloud was still from N.N.W., but the movements of distortion of the sun's telescopic image gave evidence of a lower stratum of movement from S.S.E. or S. Later in the day the south wind became more and more marked, and intensely cold; at 10.30 p.m. it was recorded that minute needles of ice were falling on a very light south wind, and

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\* Paper read to Section A of the British Association at Dublin, Sept., 1908.

when daylight returned the ground was already covered several inches deep in snow, with the wind now blowing strongly from south-south-east.

It is suggested that the moisture-laden air of the comparatively warm (water-borne) southern cyclone was impregnated with ice-crystals associated with the cold (land-borne) northern cyclone, and that, in consequence, what would otherwise have been precipitated as drops of rain became first converted into flakes of snow by the process of spontaneous crystallisation. It is desired to lay stress upon the fact that evidence of the relative positions of these two cyclones was obtained (by the employment of the telescopic method of scrutinizing the atmospheric distortions of the sun's limb) *hours* before other more tangible evidence was obtainable, of their coming into conflict with one another, making it appear that, by the employment of this means of research, granted the origin of that precipitation of snow has been rightly surmised, it would be within the reach of the meteorologist to forecast such blizzards with considerable certainty, and so avert, to some extent, the more disastrous of their results. This probability is strengthened by the fact that in every case yet examined into of sudden and phenomenal snowfall (such as that of December 24th and 25th, 1906, and January 18th, 1881), the same circumstances were attendant upon the same results—that is to say, there proves to have been the occurrence of a near approach together of two cyclones, the one from over the Atlantic, inevitably warm and vapour-laden, conflicting with the other of more northerly, or even of Arctic origin. But without the employment of the telescopic method, evidence of the preliminary overlapping of such systems is generally not obtainable, and is certainly not known to me to have been obtained, excepting only in the case of the recent storm that has been made the subject of this paper.

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### LOCAL AUTHORITIES AND METEOROLOGICAL INSTRUMENTS.

IN the opinion of many experienced engineers, as well as in that of most meteorologists, it is the duty of the State to encourage and even to subsidize scientific observations on the climate, and particularly the rainfall of the country which constitute at present natural resources of unknown value. We have been met in several recent efforts to induce local authorities to establish rain gauges or meteorological stations by the statement that the Local Government Board auditors will not allow any expenditure for such a purpose, and data of inestimable value are lost to the country, unless some public-spirited individual is found to provide the few shillings or pounds required at his own charges. We have no time to fight against stupidity in high quarters. Mr. Symons's long struggle with

an autocratic official of the Post Office shows how hopeless such a strife is; but we rejoice to cull the following from the *Sanitary Record* of April 15th:—

“The provision of meteorological instruments by District Councils for recording local rainfall, amount of sunshine, temperature, &c., is one which is almost a necessity in health resorts and residential towns now-a-days, for that town which can show the most hours of sunshine—and one or two of the south-coast towns, by the way, seem, judging from the “tall” records furnished to the daily papers, to get a special sun all to themselves—is deemed to beat all other competitors. The question has, however, arisen in a number of cases as to whether expenditure in the purchase of such instruments would be legal, and would be passed by the Auditors of the Local Government Board, for most towns which already possess such instruments have their own Auditors, and their expenditure is not supervised by the Local Government Board. It appears that the Board have given a decision in favour of the legality of such expenditure on an appeal against a surcharge made by one of their Auditors. ‘The Board do not consider,’ that communication runs, ‘that the Auditor’s decision in this case can be sustained. They are advised that instruments of this description are useful for the purpose of obtaining information as to influences likely to affect the public health, and they are consequently of opinion that the possession of these instruments enables the Medical Officer of Health to discharge with greater efficiency the duties pertaining to his office. This being so, the Board consider that it was competent to the District Council to provide the instruments for the use of the Medical Officer of Health at the cost of the funds under their control.’”

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### METEOROLOGICAL NEWS AND NOTES.

UNDER THE HEAD OF “ECCLESIASTICAL INTELLIGENCE,” *The Times* of April 29th says, but without italicizing the last sentence:—

“During a heavy thunderstorm which passed over South Lincolnshire yesterday, the ancient parish church of Walcot, near Billingham, was seriously damaged by lightning. The weather vane and about 8 feet of its beautiful crocketed spire were demolished. Masses of masonry fell through the roof of the church, and considerable damage was done to the belfry. It is feared that the steeple will have to be almost entirely rebuilt, as there is a bad crack extending towards the base. *The church was restored only a year ago, but owing to lack of funds a lightning conductor was not fixed.*”

METEOROLOGICAL HUMOUR has been frozen out of our pages for some months, but as a sign of returning spring we welcome “that blessed word” *until* in a letter written to a western paper by a resident of Torquay.

“Torquay has long suffered, and is still suffering, because of the lack of winter attractions, which a pavilion would supply. Until that comes we must continue to show up our climatic advantages.”

WEATHER LORE VERSES by a worried meteorologist have reached us bearing the well-known initials "R.T.O.," and our readers may like this :—

To sit down on the spur of the moment  
 Presages an early Spring,  
 And the summation of columns of figures  
 We expect the Summer\* to bring.



## REVIEWS.

*Pocket Book of Aeronautics* by HERMANN W. L. MOEDEBECK, in collaboration with O. CHANUTE and others. Authorised English edition translated by W. MANSERGH VARLEY, B.A., D.Sc., Ph.D., London, Whittaker & Co., 1907. Size  $6\frac{1}{2} \times 4\frac{1}{2}$ . Pp. xiv. + 496. Price 10s. 6d. net.

THE rapid progress of aeronautics makes it important for those who wish to follow new developments, to have a convenient work of reference such as that before us, in which the foundations and history of the subject are clearly set forth. The author, in his preface, acknowledges the co-operation of the well-known English authority, Mr. P. Y. Alexander. Professor Kremser, of Berlin, contributes a chapter on the Physics of the Atmosphere, and another on Meteorological Observations in Balloon Ascents and the Computation of Results. These are excellent summaries; but the methods of using self-recording instruments on kites and ballons-sondes are not described.

*Notes on Meteorology and Weather Forecasting for Junior Navigators.* By COMMANDER A. C. SCOTT, R.N. Portsmouth and London: J. Griffin & Co., 1909. Size 10 × 6. Pp. (8) + 40, 24 plates. Price 5s. net.

THE theoretical meteorologist often gets new light on his own science from the practical man whose concern is only in the application of meteorology to some special purpose. In the sailorly little treatise before us we see how a navigating officer on a modern man-of-war utilizes the means of forecasting the weather at his disposal, and the form which his experience suggests as the best for conveying the necessary information to young officers. The summary seems to us rather too terse to satisfy an enquiring mind, and it should, we think, be supplemented by some references to meteorological literature; but we have no doubt that Commander Scott knows exactly what he is about, and that his notes and diagrams will be very useful to his brother-officers. It is interesting to note his remark on the use of the barograph: "The instrument is not at present supplied

\* i.e., he who sums.

to ships for the use of the navigating officer, but nearly every ship has one either in the ward-room or in some officer's cabin." The men on the spot, in fact, have discovered, perhaps a generation before the officials ashore, that the barograph is far and away the most useful meteorological instrument for sea service.

The first four sentences of the Introduction on the utility of meteorology in modern navigation are so telling that we gladly quote them in full:—

The need for meteorological knowledge in these days of costly hulls, machinery and armaments, is all important.

In time of war, if the scene of operations were in the North Sea, Baltic, or anywhere in these latitudes, it might mean everything to the Commander-in-Chief of a fleet to be able to tell, say 24 hours in advance, what the weather is likely to be; not only for his battle fleet, but also as regards the movements of smaller craft, destroyers, and submarines.

With wireless telegraphy it is possible to obtain at any time from the Meteorological Office the positions of the existing areas of high and low pressure, and from this information the Commander-in-Chief can more or less forecast what winds and weather he will experience for the next 12 or 24 hours, and, perhaps, in some cases a longer period than that in advance.

Even without information from the Meteorological Office it is still possible for a solitary observer by carefully watching the barometer, the direction of the wind, and the general appearance of the weather, to foretell with a fair degree of accuracy, what the weather is going to do some hours ahead.

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*Brief List of Meteorological Text-Books and Reference Books.* A selection of works suitable for General, Scientific and University Libraries in the United States. Prepared under the direction of WILLIS L. MOORE, Chief U.S. Weather Bureau, by C. FITZHUGH TALMAN, Librarian. Washington, 1909. Size 9 × 6. Pp. 16.

THIS list is long and elaborately sub-divided. The works left unselected will no doubt stimulate British Meteorologists by showing the space their labours fill in the ampler horizons of the west. As Dr. H. N. Dickson's little volume on "Meteorology," which is to our mind by far the best introduction to the more detailed treatises on the science, Dr. Shaw's "Life History of Surface Air Currents," and all his other writings; Mr. W. F. Tyler's suggestive "Psycho-Physical Aspect of Climate"; the "Scottish Meteorological Journal," and the whole literature of Arctic and Antarctic Meteorology (including the records of the circum-polar observations of 1882) are excluded, we cannot feel that there is any special slur cast on this Magazine or on "British Rainfall" by their absence from what is in most respects an admirable list. Although works "addressed to the specialist" are not intended to be included, we note that Ferrel's "Popular Treatise on the Winds" finds a place, as well as Pernter's "Meteorologische Optik."

## THE ROYAL GEOGRAPHICAL SOCIETY.

At recent meetings of the Research Department of the Royal Geographical Society, several papers bearing on the ground common to Geography and Meteorology have been brought forward for discussion, and we now offer short summaries of three discussions which are, or will be, given fully in the *Geographical Journal*.

At the January meeting Mr. George Bransby Williams, C.E., discussed the geographical distribution of the mean annual rainfall of Wales and Monmouthshire, and presented a map which he had prepared.\* The map, of which the paper is a description, is compiled on the basis of a 35-years' average, the period being 1872—1906 in North Wales, and 1868—1902 in South Wales and Monmouthshire, the difference between the two periods being fixed by the author as only 0·15 per cent., a negligible quantity. Mr. Williams gives a table which we quote below showing the difference between the computed mean deduced by the usual method from a short record and the actual mean at the same stations, a number of long and apparently accurate records having been discussed in detail for this purpose. For our own part we doubt the admissibility of the fundamental assumption of accuracy in the records, and believe that the very large uncertainty of mean falls deduced from one or two years' observations is in part due to the existence of errors of observation which are neutralized in a longer period; though we fully recognize that the coincidence of several exceptionally wet days in a single year, due to local thunderstorms, must often make the computations very uncertain.

*Table showing Average Percentage of Error obtained in calculating Mean Annual Rainfall from Short Periods.*

| Length of Record. | Average Error. | PERCENTAGE OF RESULTS WITH ERROR OF |                      |                      |                     |                       |
|-------------------|----------------|-------------------------------------|----------------------|----------------------|---------------------|-----------------------|
|                   |                | more than 20 per cent.              | between 15 & 20 p.c. | between 10 & 15 p.c. | between 5 & 10 p.c. | less than 5 per cent. |
| years.            | per cent.      | per cent.                           | per cent.            | per cent.            | per cent.           | per cent.             |
| 1                 | 8·03           | 5·4                                 | 9·1                  | 11·4                 | 36·1                | 38·0                  |
| 2                 | 6·59           | 3·0                                 | 5·1                  | 13·1                 | 27·3                | 51·5                  |
| 3                 | 5·29           | nil                                 | 1·3                  | 11·7                 | 29·9                | 57·1                  |
| 4                 | 4·59           | nil                                 | 1·5                  | 10·1                 | 23·2                | 65·2                  |
| 5                 | 4·32           | nil                                 | nil                  | 7·9                  | 22·3                | 69·8                  |
| 10                | 2·96           | nil                                 | nil                  | nil                  | 18·0                | 82·0                  |

While we believe that the map as a whole is substantially correct, we do not agree with all the details, and, in particular, we feel that the area with rainfall above 100 inches in the Brecon Beacons is greatly exaggerated, while the rainfall on the Black Mountains on the borders of Brecon and Monmouthshire is under-estimated.

\* Published in the *Geographical Journal* for March, 1909.

Another rainfall paper was read at the meeting in February, when Mr. Alexander Knox discussed the rainfall data available for the construction of a rainfall map of the region between the Sahara and the Sudan in northern Africa. He recapitulated the scanty data, and put forward a map which differed somewhat in detail from the map published by Dr. Herbertson in his "Mean Rainfall of the Land," and also differed in detail from the map published by Dr. Fraunberger in *Petermanns Mitteilungen* for 1906. The data are so few however, and our knowledge of the method of observation so uncertain that it seems to us that either of the three maps might equally well be accepted as within the wide limits of error which must be allowed in balancing so many uncertainties.

The third paper to which we have to refer was a report at the April meeting on an investigation of dew-ponds by Mr. E. A. Martin, who has been undertaking investigations on the subject on the South Downs in Sussex. It may be well to remind our readers that the name dew-pond is applied to small ponds artificially formed on the summits of the flat chalk downs in the south of England, which have no apparent source of supply, but nevertheless contain water even in dry weather when ponds at a lower level fed by the drainage of considerable areas of land become dry. The popular notion is that these ponds collect dew in some manner in which other ponds at lower levels fail to act, and Mr. Martin has been endeavouring to ascertain what this action may be. He points out that the traditional dew-pond is made by digging a hollow, placing a quantity of straw in it, and then covering the straw by clay or chalk puddle worked so as to be watertight. Some experiments which he made seemed to suggest that the water surface condensed moisture from the air even when the lower layer of the atmosphere remained above the dew-point; but he fully allowed that the influence of rainfall must be considerable, and by measuring the nearly flat edges of several of the Sussex dew-ponds, he showed that they constituted a drainage area which in some instances increased the gathering ground to twice or even four times the water-surface. It seems to us that this fact solves the whole problem, for with a rainfall of 35 inches, which is about the average for the summit of the Sussex Downs as measured in a rain gauge, and an evaporation of even 20 inches, the depth of water in a pond which has once been filled should increase (if the area of the rim is equal to that of the water-surface) by 30 inches per annum, an ample reserve for occasional droughts and sufficient to supply the demand of many sheep. The reason why the ponds at low levels run dry is probably largely the fact that they have not been so carefully puddled and rendered watertight, and perhaps partly because the supply is drawn upon to a much greater extent for farmyard purposes. No doubt on the top of the Downs a considerable amount of condensation which escapes the rain gauge is drawn from drifting mists by even the low vegetation which the thin chalk soil around the margin bears.

## RAINFALL TABLE FOR APRIL, 1909.

| STATION.                           | COUNTY.              | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.    |              |
|------------------------------------|----------------------|------------|----------------------|--------------------------------|--------------------------|--------------|
|                                    |                      |            |                      |                                | Aver.<br>1870-99.<br>in. | 1909.<br>in. |
| Camden Square.....                 | London.....          | 51 32      | 0 8                  | 111                            | 1'69                     | 1'90         |
| Tenterden.....                     | Kent.....            | 51 4       | *0 41                | 190                            | 1'77                     | 1'67         |
| West Dean.....                     | Hampshire.....       | 51 3       | 1 38                 | 137                            | 1'99                     | 1'48         |
| Hartley Wintney.....               | ".....               | 51 18      | 0 53                 | 222                            | 1'69                     | 1'62         |
| Hitchin.....                       | Hertfordshire.....   | 51 57      | 0 17                 | 238                            | 1'62                     | 1'51         |
| Winslow (Addington).....           | Buckinghamsh. ....   | 51 58      | 0 53                 | 309                            | 1'83                     | 1'74         |
| Bury St. Edmunds (Westley).....    | Suffolk.....         | 52 15      | *0 40                | 226                            | 1'54                     | 1'46         |
| Brundall.....                      | Norfolk.....         | 52 37      | *1 26                | 66                             | 1'68                     | 1'42         |
| Winterbourne Steepleton.....       | Dorset.....          | 50 42      | 2 31                 | 316                            | 2'60                     | 1'96         |
| Torquay (Cary Green).....          | Devon.....           | 50 28      | 3 32                 | 12                             | 2'45                     | 1'87         |
| Polapit Tamar [Launceston].....    | ".....               | 50 40      | 4 22                 | 315                            | 2'23                     | 2'58         |
| Bath.....                          | Somerset.....        | 51 23      | 2 21                 | 67                             | 2'05                     | 2'13         |
| Stroud (Upfield).....              | Gloucestershire..... | 51 44      | 2 13                 | 226                            | 2'05                     | 2'12         |
| Church Stretton (Wolstaston).....  | Shropshire.....      | 52 35      | 2 48                 | 800                            | 2'14                     | 3'00         |
| Coventry (Kingswood).....          | Warwickshire.....    | 52 24      | 1 30                 | 340                            | 1'96                     | 1'60         |
| Boston.....                        | Lincolnshire.....    | 52 58      | 0 1                  | 25                             | 1'59                     | 1'51         |
| Worksop (Hodsock Priory).....      | Nottinghamshire..... | 53 22      | 1 5                  | 56                             | 1'69                     | 1'52         |
| Derby (Midland Railway).....       | Derbyshire.....      | 52 55      | 1 28                 | 156                            | 1'72                     | 1'48         |
| Bolton (Queen's Park).....         | Lancashire.....      | 53 35      | 2 28                 | 390                            | 2'15                     | 4'11         |
| Wetherby (Ribston Hall).....       | Yorkshire, W.R.....  | 53 59      | 1 24                 | 130                            | 1'98                     | 2'81         |
| Arncliffe Vicarage.....            | ".....               | 54 8       | 2 6                  | 732                            | 3'32                     | 5'51         |
| Hull (Pearson Park).....           | "..... E.R.....      | 53 45      | 0 20                 | 6                              | 1'72                     | 1'75         |
| Newcastle (Town Moor).....         | Northumberland.....  | 54 59      | 1 38                 | 201                            | 1'79                     | 2'68         |
| Borrowdale (Seathwaite).....       | Cumberland.....      | 54 30      | 3 10                 | 423                            | 6'27                     | 7'54         |
| Cardiff (Ely).....                 | Glamorgan.....       | 51 29      | 3 13                 | 53                             | 2'34                     | 2'66         |
| Haverfordwest (High Street).....   | Pembroke.....        | 51 48      | 4 58                 | 95                             | 2'67                     | 3'60         |
| Aberystwyth (Gogerddan).....       | Cardigan.....        | 52 26      | 4 1                  | 83                             | 2'39                     | 3'71         |
| Llandudno.....                     | Carnarvon.....       | 53 20      | 3 50                 | 72                             | 1'82                     | 2'58         |
| Cargen [Dumtries].....             | Kirkcudbright.....   | 55 2       | 3 37                 | 80                             | 2'30                     | 4'15         |
| Hawick (Braxholm).....             | Roxburgh.....        | 55 24      | 2 51                 | 457                            | 1'92                     | 3'35         |
| Edinburgh (Royal Observatory)..... | Midlothian.....      | 55 55      | 3 11                 | 442                            | ...                      | 2'14         |
| Girvan (Pinmore).....              | Ayr.....             | 55 10      | 4 49                 | 207                            | 2'45                     | 3'12         |
| Glasgow (Queen's Park).....        | Renfrew.....         | 55 53      | 4 18                 | 144                            | 1'77                     | 3'33         |
| Inveraray (Newtown).....           | Argyll.....          | 56 14      | 5 4                  | 17                             | 3'40                     | 5'23         |
| Mull (Quinish).....                | ".....               | 56 36      | 6 13                 | 35                             | 2'80                     | 4'03         |
| Dundee (Eastern Necropolis).....   | Forfar.....          | 56 28      | 2 57                 | 199                            | 1'94                     | 3'46         |
| Braemar.....                       | Aberdeen.....        | 57 0       | 3 24                 | 1114                           | 2'18                     | 3'14         |
| Aberdeen (Cranford).....           | ".....               | 57 8       | 2 7                  | 120                            | 2'22                     | 3'29         |
| Cauldor.....                       | Nairn.....           | 57 31      | 3 57                 | 250                            | 1'49                     | 2'21         |
| Fort Augustus (S. Benedict's)..... | E. Inverness.....    | 57 9       | 4 41                 | 68                             | 2'04                     | 1'90         |
| Loch Torridon (Bendamph).....      | W. Ross.....         | 57 32      | 5 32                 | 20                             | 4'31                     | 4'48         |
| Dunrobin Castle.....               | Sutherland.....      | 57 59      | 3 56                 | 14                             | 1'81                     | 3'58         |
| Castletown.....                    | Caithness.....       | 58 35      | 3 23                 | 100                            | ...                      | 2'78         |
| Killarney (District Asylum).....   | Kerry.....           | 52 4       | 9 31                 | 178                            | 3'71                     | 4'86         |
| Waterford (Brook Lodge).....       | Waterford.....       | 52 15      | 7 7                  | 104                            | 2'56                     | 5'36         |
| Broadford (Hurdlestown).....       | Clare.....           | 52 48      | 8 38                 | 167                            | 2'17                     | 5'66         |
| Abbey Leix (Blandsfort).....       | Queen's County.....  | 52 56      | 7 17                 | 532                            | 2'40                     | 5'40         |
| Dublin (Fitz William Square).....  | Dublin.....          | 53 21      | 6 14                 | 54                             | 2'00                     | 4'08         |
| Mullingar (Belvedere).....         | Westmeath.....       | 53 29      | 7 22                 | 367                            | 2'34                     | 5'68         |
| Ballinasloe.....                   | Galway.....          | 53 20      | 8 15                 | 160                            | 2'32                     | 5'08         |
| Crossmolina (Ennisco).....         | Mayo.....            | 54 4       | 9 18                 | 74                             | 2'90                     | 4'95         |
| Collooney (Markree Obsy.).....     | Sligo.....           | 54 11      | 8 27                 | 127                            | 2'30                     | 3'70         |
| Seaforde.....                      | Down.....            | 54 19      | 5 50                 | 180                            | 2'59                     | 4'99         |
| Londonderry (Creggan Res.).....    | Londonderry.....     | 54 59      | 7 19                 | 320                            | 2'32                     | 2'77         |
| Omagh (Edenfel).....               | Tyrone.....          | 54 36      | 7 18                 | 280                            | 2'25                     | 4'12         |

RAINFALL TABLE FOR APRIL, 1909—continued.

| RAINFALL OF MONTH (con.) |          |                   |       |             | RAINFALL FROM JAN. 1. |           |                      |          | Mean Annual 1870-1899. | STATION.            |
|--------------------------|----------|-------------------|-------|-------------|-----------------------|-----------|----------------------|----------|------------------------|---------------------|
| Diff. from Av. in.       | % of Av. | Max. in 24 hours. |       | No. of Days | Aver. 1870-99. in.    | 1909. in. | Diff. from Aver. in. | % of Av. |                        |                     |
|                          |          | in.               | Date. |             |                       |           |                      |          |                        |                     |
| + .21                    | 112      | .53               | 19    | 12          | 6.82                  | 5.95      | — .87                | 87       | 25.16                  | Camden Square       |
| — .10                    | 94       | .63               | 19    | 10          | 7.87                  | 7.54      | — .33                | 96       | 28.36                  | Tenterden           |
| — .51                    | 74       | .29               | 22    | 13          | 8.73                  | 6.55      | —2.18                | 75       | 29.93                  | West Dean           |
| — .07                    | 96       | .40               | 19    | 12          | 7.91                  | 6.96      | — .95                | 88       | 27.10                  | Hartley Wintney     |
| — .11                    | 93       | .50               | 29    | 11          | 6.50                  | 5.97      | — .53                | 92       | 24.66                  | Hitchin             |
| — .09                    | 95       | .57               | 29    | 12          | 7.23                  | 5.14      | —2.09                | 71       | 26.75                  | Addington           |
| — .08                    | 95       | .53               | 19    | 11          | 6.43                  | 5.49      | — .94                | 85       | 25.39                  | Westley             |
| — .26                    | 85       | .40               | 30    | 11          | 6.49                  | 5.31      | —1.18                | 82       | 25.40                  | Brundall            |
| — .64                    | 75       | .59               | 19    | 16          | 12.02                 | 9.63      | —2.39                | 80       | 39.00                  | Winterbourne Stpltn |
| — .58                    | 76       | .69               | 22    | 11          | 10.96                 | 9.41      | —1.55                | 86       | 35.00                  | Torquay             |
| + .35                    | 116      | .85               | 22    | 18          | 11.35                 | 11.39     | + .04                | 100      | 38.85                  | Polapit Tamar       |
| + .08                    | 104      | .41               | 19    | 15          | 8.63                  | 7.19      | —1.44                | 83       | 30.75                  | Bath                |
| + .07                    | 103      | .50               | 29    | 12          | 8.50                  | 7.58      | — .92                | 89       | 29.85                  | Stroud              |
| + .86                    | 140      | .45               | 19    | 15          | 9.23                  | 8.57      | — .66                | 93       | 33.04                  | Wolstaston          |
| — .36                    | 82       | .29               | 23    | 13          | 8.04                  | 6.59      | —1.45                | 82       | 29.21                  | Coventry            |
| — .08                    | 95       | .74               | 19    | 12          | 6.09                  | 6.08      | — .01                | 100      | 23.30                  | Boston              |
| — .17                    | 90       | .44               | 19    | 11          | 6.56                  | 6.42      | — .14                | 98       | 24.70                  | Hodsock Priory      |
| — .24                    | 86       | .36               | 19    | 14          | 6.82                  | 6.48      | — .34                | 95       | 26.18                  | Derby               |
| +1.96                    | 191      | .55               | 19    | 17          | 11.08                 | 11.84     | + .76                | 107      | 42.43                  | Bolton              |
| + .83                    | 142      | .53               | 19    | 14          | 7.35                  | 8.47      | +1.12                | 115      | 26.96                  | Ribston Hall        |
| +2.19                    | 166      | .75               | 21    | 18          | 19.42                 | 19.45     | + .03                | 100      | 60.96                  | Arnelife Vic.       |
| + .03                    | 102      | .59               | 19    | 15          | 7.17                  | 7.03      | — .14                | 98       | 27.02                  | Hull                |
| + .89                    | 150      | .61               | 24    | 15          | 7.43                  | 10.68     | +3.25                | 144      | 27.99                  | Newcastle           |
| +1.27                    | 120      | 1.34              | 24    | 17          | 43.13                 | 38.70     | —4.43                | 90       | 132.68                 | Seathwaite          |
| + .32                    | 114      | .54               | 23    | 13          | 12.11                 | 9.65      | —2.46                | 80       | 42.81                  | Cardiff             |
| + .93                    | 135      | .48               | 3     | 18          | 14.53                 | 12.75     | —1.78                | 88       | 47.88                  | Haverfordwest       |
| +1.32                    | 155      | .72               | 23    | 19          | 12.22                 | 10.80     | —1.42                | 88       | 45.41                  | Gogerddan           |
| + .76                    | 142      | .40               | 13    | 18          | 8.33                  | 8.34      | + .01                | 100      | 30.98                  | Llandudno           |
| +1.85                    | 180      | .86               | 24    | 13          | 13.47                 | 17.47     | +4.00                | 130      | 43.43                  | Cargen              |
| +1.43                    | 174      | .66               | 24    | 16          | 10.28                 | 12.49     | +2.21                | 122      | 34.80                  | Branxholm           |
| ...                      | ...      | .62               | 27    | 17          | ...                   | 10.18     | ...                  | ...      | ...                    | Edinburgh           |
| + .67                    | 127      | .36               | 16    | 20          | 14.84                 | 15.38     | + .54                | 104      | 48.87                  | Girvan              |
| +1.56                    | 188      | .61               | 26    | 16          | 9.88                  | 12.93     | +3.05                | 131      | 35.80                  | Glasgow             |
| +1.83                    | 154      | .82               | 3     | 21          | 19.89                 | 19.83     | — .06                | 100      | 57.90                  | Inveraray           |
| +1.23                    | 144      | 1.17              | 3     | 22          | 17.38                 | 15.77     | —1.61                | 91       | 57.53                  | Quinish             |
| +1.52                    | 178      | .52               | 19    | 18          | 8.06                  | 9.00      | + .94                | 112      | 28.95                  | Dundee              |
| + .96                    | 144      | ...               | ...   | ...         | 10.21                 | 9.77      | — .44                | 96       | 36.07                  | Braemar             |
| +1.07                    | 148      | .72               | 13    | 17          | 9.40                  | 11.68     | +2.28                | 124      | 33.01                  | Aberdeen            |
| + .72                    | 148      | .50               | 3     | 11          | 7.65                  | 8.76      | +1.11                | 115      | 29.37                  | Cawdor              |
| — .14                    | 93       | .48               | 12    | 17          | 14.70                 | 10.69     | —4.01                | 73       | 43.71                  | Fort Augustus       |
| + .17                    | 104      | .88               | 12    | 18          | 26.21                 | 25.75     | — .46                | 98       | 86.50                  | Bendauph            |
| +1.77                    | 198      | 1.00              | 3     | 12          | 9.29                  | 11.59     | +2.30                | 125      | 31.60                  | Dunrobin Castle     |
| ...                      | ...      | 1.33              | 3     | 19          | ...                   | 9.82      | ...                  | ...      | ...                    | Castletown          |
| +1.15                    | 131      | .51               | 22    | 23          | 19.75                 | 17.22     | —2.53                | 87       | 58.11                  | Killarney           |
| +2.80                    | 209      | 1.38              | 2     | 18          | 12.47                 | 12.15     | — .32                | 97       | 39.30                  | Waterford           |
| +3.49                    | 261      | 1.63              | 2     | 22          | 9.51                  | 13.50     | +3.99                | 142      | 33.47                  | Hurdlestown         |
| +3.00                    | 225      | .90               | 3     | 22          | 10.50                 | 11.60     | +1.10                | 110      | 35.19                  | Abbey Leix          |
| +2.08                    | 204      | 1.58              | 3     | 22          | 7.99                  | 8.62      | + .63                | 108      | 27.75                  | Dublin              |
| +3.34                    | 242      | 1.20              | 3     | 18          | 10.37                 | 12.64     | +2.27                | 122      | 36.48                  | Mullingar.          |
| +2.76                    | 219      | .96               | 2     | 23          | 10.74                 | 11.61     | + .87                | 108      | 37.04                  | Ballinasloe         |
| +2.05                    | 171      | .74               | 2     | 24          | 15.86                 | 17.06     | +1.20                | 108      | 50.50                  | Enniscoe            |
| +1.40                    | 161      | .48               | 2     | 23          | 11.74                 | 13.47     | +1.73                | 115      | 41.83                  | Markree Obsy.       |
| +2.40                    | 193      | 1.99              | 3     | 18          | 11.75                 | 14.56     | +2.81                | 124      | 38.61                  | Seaforde            |
| + .45                    | 119      | .60               | 26    | 24          | 11.67                 | 15.56     | +3.89                | 133      | 41.20                  | Londonderry         |
| +1.87                    | 183      | .65               | 3     | 21          | 10.55                 | 13.90     | +3.35                | 132      | 37.85                  | Omagh               |

## SUPPLEMENTARY RAINFALL, APRIL, 1909.

| Div.  | STATION.                     | Rain<br>inches | Div.   | STATION.                    | Rain.<br>inches |
|-------|------------------------------|----------------|--------|-----------------------------|-----------------|
| II.   | Warlingham, Redvers Road     | 2·08           | XI.    | Rhayader, Tyrmynydd .....   | 5·42            |
| „     | Ramsgate .....               | 1·26           | „      | Lake Vyrnwy .....           | 4·67            |
| „     | Steyning .....               | 1·61           | „      | Llangyhanfal, Plás Draw.... | 2·79            |
| „     | Hailsham .....               | 2·13           | „      | Llwdiarth Esgob.....        | 3·13            |
| „     | Totland Bay, Aston House.    | 1·36           | „      | Snowdon, Cwm Dyli .....     | 7·51            |
| „     | Stockbridge, Ashley .....    | 1·68           | „      | Lligwy .....                | ...             |
| „     | Grayshott.....               | 1·92           | „      | Douglas, Woodville .....    | 3·35            |
| „     | Reading, Calcot Place.....   | 2·27           | XII.   | Stoneykirk, Ardwell House   | 2·64            |
| III.  | Harrow Weald, Hill House.    | 1·67           | „      | Dalry, The Old Garroch ...  | 4·34            |
| „     | Oxford, Magdalen College..   | 1·55           | „      | Langholm, Drove Road.....   | ...             |
| „     | Pitsford, Sedgebrook .....   | 1·55           | „      | Moniaive, Maxwellton House  | 3·95            |
| „     | Huntingdon, Brampton.....    | 1·52           | XIII.  | N. Esk Reservoir [Penicuik] | 2·00            |
| „     | Woburn, Milton Bryant.....   | 1·40           | XIV.   | Maybole, Knockdon Farm..    | 2·80            |
| „     | Wisbech, Monica Road.....    | 1·49           | XV.    | Campbeltown, Witchburn...   | 3·50            |
| IV.   | Southend Water Works.....    | 1·49           | „      | Glenreasdell Mains.....     | 3·67            |
| „     | Colchester, Lexden.....      | 1·56           | „      | Balachulish House.....      | 6·52            |
| „     | Newport, The Vicarage.....   | 1·79           | „      | Islay, Eallabus .....       | 3·69            |
| „     | Rendlesham .....             | 1·63           | XVI.   | Dollar Academy .....        | 3·69            |
| „     | Swoffham .....               | 1·20           | „      | Loch Leven Sluice .....     | 3·78            |
| „     | Blakeney .....               | 1·75           | „      | Balquhider, Stronvar .....  | 7·24            |
| V.    | Bishops Cannings .....       | 1·59           | „      | Perth, The Museum .....     | 3·16            |
| „     | Ashburton, Druid House ...   | 3·39           | „      | Coupar Angus .....          | 3·26            |
| „     | Honiton, Combe Raleigh ...   | 3·40           | „      | Blair Atholl .....          | 3·69            |
| „     | Okehampton, Oaklands.....    | 3·50           | „      | Montrose, Sunnyside Asylum  | 3·43            |
| „     | Hartland Abbey .....         | 2·18           | XVII.  | Alford, Lynturk Manse ...   | 3·30            |
| „     | Lynmouth, Rock House ...     | 3·76           | „      | Keith Station .....         | 4·08            |
| „     | Probus, Lamellyn .....       | 2·12           | XVIII. | N. Uist, Lochmaddy .....    | 3·89            |
| „     | North Cadbury Rectory ..     | 2·01           | „      | Alvey Manse .....           | 1·95            |
| VI.   | Clifton, Pembroke Road ...   | 3·37           | „      | Loch Ness, Drumnadrochit.   | 1·97            |
| „     | Ross, The Graig .....        | 2·02           | „      | Glencarron Lodge .....      | 4·84            |
| „     | Shifnal, Hatton Grange.....  | 2·22           | „      | Fearn, Lower Pitkerrie..... | 1·64            |
| „     | Blockley, Upton Wold .....   | 2·58           | XIX.   | Invershin .....             | 2·84            |
| „     | Worcester, Boughton Park.    | 2·10           | „      | Altnaharra .....            | 2·72            |
| VII.  | Market Overton .....         | 1·25           | „      | Bettyhill .....             | 2·28            |
| „     | Market Rasen .....           | 1·78           | XX.    | Dunmanway, The Rectory..    | 8·06            |
| „     | Bawtry, Hesley Hall.....     | 1·33           | „      | Cork .....                  | 5·67            |
| „     | Buxton.....                  | 3·01           | „      | Mitchelstown Castle .....   | 6·90            |
| VIII. | Neston, Hinderton Lodge...   | 2·21           | „      | Darrynane Abbey .....       | 6·44            |
| „     | Southport, Hesketh Park...   | 2·98           | „      | Glenam [Clonmel] .....      | 4·94            |
| „     | Chatburn, Middlewood .....   | 4·25           | „      | Ballingarry, Gurteen .....  | 4·29            |
| „     | Cartmel, Flookburgh .....    | 3·87           | „      | Miltown Malbay.....         | 4·35            |
| IX.   | Langsett Moor, Up. Midhope   | 2·56           | XXI.   | Gorey, Courtown House ...   | 4·14            |
| „     | Scarborough, Scalby .....    | 2·99           | „      | Moynalty, Westland .....    | 4·98            |
| „     | Ingleby Greenhow .....       | 3·03           | „      | Athlone, Twyford .....      | 4·94            |
| „     | Mickleton.....               | 2·13           | XXII.  | Woodlawn .....              | 5·25            |
| X.    | Bardon Mill, Beltingham ...  | ...            | „      | Westport, St. Helens .....  | 4·45            |
| „     | Ewesley, Font Reservoir ...  | 3·87           | „      | Mohill .....                | 4·53            |
| „     | Ilderton, Lilburn Cottage... | 3·52           | XXIII. | Enniskillen, Portora .....  | 4·27            |
| „     | Gaswick, The Bank .....      | 3·34           | „      | Dartrey [Cootehill].....    | 4·85            |
| „     | Llanfrecfa Grange.....       | 3·06           | „      | Warrenpoint, Manor House    | 4·37            |
| „     | Treherbert, Tyn-y-waun ...   | 6·71           | „      | Banbridge, Milltown .....   | 2·78            |
| „     | Carmarthen, The Friary.....  | 3·74           | „      | Belfast, Springfield .....  | 4·49            |
| „     | Castle Malgwyn [Llechryd].   | 4·21           | „      | Bushmills, Dundarave .....  | 2·91            |
| „     | Plynlimon.....               | 7·20           | „      | Sion House .....            | 3·37            |
| „     | Crickhowell, Ffordlas.....   | 3·80           | „      | Killybegs .....             | 5·96            |
| „     | New Radnor, Ednol .....      | 3·61           | „      | Horn Head .....             | 2·85            |

## METEOROLOGICAL NOTES ON APRIL, 1909.

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.—April showers were less frequent than usual there being no R until the 12th, and half the subsequent total falling in less than nine hours, on two days. The duration of sunshine, 218·5\* hours, was unusually great and there was only one sunless day. Records of 10 hours or more occurred in 7 days, and on 25th the duration was 11·8 hours. Duration of R 32·7 hours. Mean temp. 49°·8, or 1°·7 above the average. Shade max. 70°·6 on 11th; min. 28°·5 on 2nd. F 2, f 12.

TENTERDEN.—Duration of sunshine 238·0† hours. Shade max. 69°·6 on 11th; min. 30°·0 on 2nd and 4th. F 4, f 13.

TOTLAND BAY.—Duration of sunshine 227·3\* hours, or 57·5 hours above the average. Shade max. 68°·3 on 10th; min. 30°·7 on 2nd. F 1, f 11.

MILL HILL.—Bright sunshine 233·5\* hours. Shade max. 70°·0 on 9th; min. 28°·2 on 2nd. F 1, f 19.

PITSFORD.—E 29 in. below the average. Mean temp. 48°·3. Shade max. 71°·0 on 10th; min. 27°·0 on 2nd and 8th. F 10.

TORQUAY.—Duration of sunshine 194·3\* hours, or 14·2 hours above the average. Mean temp. 50°·1, or 1°·9 above the average. Shade max. 67°·9 on 9th; min. 35°·0 on 5th. F 0, f 2.

NORTH CADBURY.—Dry and sunny to 11th with light winds from between N. and S.E. The remainder of the month was showery, cool, and very boisterous. Shade max. 74°·4 on 9th; min. 29°·5 on 2nd. F 1, f 12.

ROSS.—Shade max. 73°·0 on 10th; min. 25°·6 on 2nd. F 6, f 9.

HODSOCK PRIORY.—Duration of sunshine, 208·0\* hours, and the greatest amount since 1893. Shade max. 71°·0 on 10th; min. 23°·4 on 5th. F 9, f 19.

SOUTHPORT.—E 1·26 in. above the average of 35 years. Duration of sunshine 221·4\* hours, or 44·3 hours above the average. Duration of R 54·5 hours. Mean temp. 47°·5, or 1°·6 above the average. Shade max. 62°·6 on 10th; min. 28°·8 on 2nd. F 2, f 10.

HULL.—Shade max. 68°·0 on 8th, 10th, and 11th; min. 28°·0 on 8th. F 5, f 19. Duration of sunshine 138\* hours. TS on 27th.

HAVERFORDWEST.—Duration of sunshine 182·5\* hours. Shade max. 69°·4 on 9th; min. 32°·1 on 8th. F 0, f 7.

LLANDUDNO.—Shade max. 65°·5 on 10th; min. 32°·4 on 2nd. F 0.

DOUGLAS.—Fine and springlike from 5th to 10th but otherwise the month was generally wet with strong cold winds. The last three days were a veritable return of winter and H fell daily. Vegetation seemed almost unprecedentedly backward.

CARGEN.—A fairly good seed time during the first half was succeeded by cold, wet weather, during which vegetation was at a complete standstill. Trees and hedgerows showed little signs of spring. Shade max. 67°·0 on 9th; min. 27°·0 on 2nd; F 9.

EDINBURGH.—Shade max. 64°·6 on 10th; min. 29°·6 on 6th. F 2, f 12.

DUNDEE.—Shade max. 65°·0 on 8th; min. 26°·0 on 2nd. F 3.

FORT AUGUSTUS.—Shade max. 63°·2 on 9th; min. 20°·0 on 2nd. F 9.

WATERFORD.—Shade max. 64°·0 on 9th and 10th; min. 30°·0 on 9th. F 4.

DUBLIN.—Mild, and characteristically showery with a marked preponderance of S winds until the last four days when a cold N. current prevailed with H showers. On 2nd and 3rd 1·98 in. of R fell in 37 hours. Mean temp. 48°·6, or 1°·0 above the average. Shade max. 68°·0 on 10th; min. 34°·4 on 8th. F 0, f 2.

MARKREE.—Shade max. 67°·0 on 9th; min. 28°·5 on 7th. F 8, f 15.

WARRENPOINT.—Shade max. 70°·0 on 10th; min. 31°·0 on 7th. F 2, f 8.

\* Campbell-Stokes.

† Jordan.

## Climatological Table for the British Empire, November, 1908.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain |       | Aver.  |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|------------|-------|--------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. | Cloud. |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |            |       |        |
| London, Camden Square                                            | 58°5      | 12    | 23°1     | 10    | 52°6     | 41°1 | 43°8          | 0-100     | 86°0            | 19°3              | inches     | 10    | 7·7    |
| Malta ... ..                                                     | 77°0      | 5     | 51°0     | 23    | 67°9     | 57°6 | 54°1          | 74        | 138°9           | ...               | 1·33       | 12    | 6·1    |
| Lagos ... ..                                                     | 89°0      | 11*   | 71°0     | 5     | 86°4     | 74°5 | 74°4          | 78        | 155°0           | 60°0              | 2·07       | 11    | 7·6    |
| Cape Town ... ..                                                 | 90°3      | 18    | 42°7     | 5     | 70°8     | 55°5 | 52°6          | 67        | ...             | ...               | 1·04       | 11    | 3·9    |
| Durban, Natal ... ..                                             | 86°4      | 25    | 57°8     | 1,7,8 | 78°5     | 64°6 | ...           | ...       | 144°8           | ...               | 4·24       | 22    | 6·6    |
| Johannesburg ... ..                                              | 76°9      | 12†   | 44°6     | 1     | 72°6     | 53°8 | 52°7          | 73        | 155°1           | 42°5              | 3·45       | 14    | 5·1    |
| Mauritius ... ..                                                 | 87°5      | 30    | 63°4     | 3     | 82°6     | 68°8 | 65°5          | 72        | 166°2           | 55°1              | 2·08       | 16    | 5·7    |
| Calcutta... ..                                                   | 86°8      | 1     | 57°7     | 25    | 83°4     | 61°9 | 59°2          | 65        | 144°1           | 51°5              | ·04        | 0     | 2·2    |
| Bombay... ..                                                     | 89°2      | 5     | 68°3     | 21    | 86°1     | 72°3 | 67°6          | 70        | 132°5           | 57°9              | ·00        | 0     | 0·6    |
| Madras ... ..                                                    | 87°4      | 10    | 65°0     | 10    | 83°9     | 69°0 | 67°9          | 79        | 137°2           | 60°1              | 12·01      | 8     | 4·0    |
| Kodaikanal ... ..                                                | 64°7      | 23    | 40°6     | 15    | 59°3     | 46°6 | 46°8          | 82        | 122°6           | 32°6              | 1·73       | 5     | 4·8    |
| Colombo, Ceylon ... ..                                           | 90°0      | 17    | 68°4     | 13    | 87°3     | 72°7 | 71°2          | 76        | 158°6           | 61°0              | 3·53       | 9     | 4·9    |
| Hongkong ... ..                                                  | 84°1      | 6     | 53°0     | 28    | 75°8     | 65°6 | 57°9          | 63        | 136°3           | ...               | ·15        | 5     | 6·0    |
| Melbourne ... ..                                                 | 95°0      | 15    | 43°1     | 9     | 75°5     | 53°6 | 49°6          | 56        | 149°1           | 35°9              | ·93        | 9     | 4·4    |
| Adelaide ... ..                                                  | 102°8     | 25    | 45°0     | 17    | 82°4     | 56°3 | 50°6          | 52        | 164°4           | 39°0              | ·35        | 6     | 3·5    |
| Coolgardie ... ..                                                | 99°2      | 13    | 43°0     | 7     | 85°5     | 56°5 | 45°9          | 40        | 166°0           | 41°0              | ·39        | 4     | 2·1    |
| Perth ... ..                                                     | 94°7      | 20    | 47°5     | 25    | 76°1     | 56°2 | 54°2          | 65        | 160°5           | 39°1              | 1·07       | 11    | 4·0    |
| Sydney ... ..                                                    | 101°9     | 7     | 52°9     | 10    | 75°7     | 60°4 | 56°5          | 66        | 139°1           | 44°0              | ·81        | 18    | 6·3    |
| Wellington ... ..                                                | 70°0      | 28    | 43°2     | 7     | 61°8     | 50°2 | 47°8          | 74        | 124°0           | 36°0              | 1·67       | 6     | 5·8    |
| Auckland ... ..                                                  | 73°0      | 30    | 51°0     | 10    | 65°2     | 54°5 | 50°2          | 70        | 142°0           | 44°0              | 1·95       | 6     | 5·4    |
| Jamaica, Kingston ... ..                                         | 91°7      | 27    | 66°7     | 30    | 88°4     | 71°0 | 68°4          | 77        | ...             | ...               | 1·54       | 9     | 4·6    |
| Trinidad ... ..                                                  | 91°0      | 14    | 66°0     | 21    | 86°8     | 70°4 | 66°9          | 70        | 160°0           | 56°0              | 2·65       | 13    | ...    |
| Grenada ... ..                                                   | 87°4      | 27    | 71°0     | 8     | 84°4     | 74°4 | 70°7          | 74        | 145°0           | ...               | 4·59       | 17    | 3·2    |
| Toronto ... ..                                                   | 62°7      | 26    | 23°0     | 17    | 46°2     | 33°0 | ...           | ...       | 73°2            | 20°6              | 1·61       | 11    | ...    |
| Fredericton ... ..                                               | 55°0      | 27    | 13°0     | 19    | 39°5     | 26°3 | ...           | 82        | ...             | ...               | 2·20       | 7     | 5·7    |
| St. John's, N.B. ... ..                                          | 54°5      | 4     | 21°5     | 18    | 42°9     | 32°9 | ...           | ...       | ...             | ...               | 1·84       | 13    | 6·6    |
| Victoria, B.C. ... ..                                            | 62°9      | 3     | 31°9     | 26    | 51°3     | 42°8 | ...           | 88        | ...             | ...               | 4·02       | 16    | 7·5    |
| Dawson ... ..                                                    | 28°0      | 17    | -25°0    | 7     | 6°5      | -5°7 | ...           | ...       | ...             | ...               | 1·48       | 11    | ...    |

\* 27 and 29. † and 22.

MALTA.—Mean temp. of air 62°·6. Average sunshine 5·9 hours per day. Mean hourly velocity of wind 8·6 miles.

Johannesburg.—Bright sunshine 261·3 hours.

Mauritius.—Mean temp. of air 0°·1 below, dew point 1°·2, and R ·20 in., above, averages. Mean hourly velocity of wind 10·6 miles, or 0·1 below average.

KODAIKANAL.—Bright sunshine 194 hours.

COLOMBO.—Mean temp. of air 79°·0, or 0°·8 below, of dew point 1°·1 below, and R 8·42 in. below, averages. Mean hourly velocity of wind 6·6 miles. TS on 26th.

HONGKONG.—Mean temp. of air 70°·2. R 1·30 in. below average. Bright sunshine 189·8 hours. Mean hourly velocity of wind 11·7 miles.

Melbourne.—Mean temp. of air 3°·5 above, and R 1·33 in. below, averages.

Adelaide.—Mean temp. of air 2°·3 above, and R ·68 in. below, averages.

Sydney.—Mean temp. of air 1°·2 above, and R 2·19 in. below, averages.

Wellington.—Mean temp. of air 1°·0 below, and R 1·94 in. below, averages. Bright sunshine 229·4 hours.

TRINIDAD.—R 4·33 in. below the 43 years' average.

# Symons's Meteorological Magazine.

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## Georg von Neumayer.

1826—1909.

THE characteristic and beautiful portrait in the frontispiece was to have appeared in this number of the Magazine, in illustration of the article by Mr. Harries, describing a recent visit to Dr. von Neumayer, and it is with the deepest regret that we have to preface that article with this notice. The personality of Dr. Neumayer was exceptionally attractive, his courtesy belonged to the stately manners of a past generation, and lent to the generous kindness of his disposition a gracious dignity which won the hearts of all who met him. It was our good fortune to have known him well, and to have been associated with him in the work of international congresses and scientific meetings in England and in Germany, especially in the furtherance of Antarctic exploration, a subject which engaged him for nearly fifty years, and always lay very near his heart. His efforts in this direction were set out in detail in a volume, "Auf zum Südpol," which is almost an autobiography. We have summarised the narrative in "The Siege of the South Pole," pp. 339-342.

Dr. von Neumayer was a disciple of Maury, and the glamour of the sea was always strong upon him, and has been transmitted to the oceanographers who were in their turn his disciples, foremost amongst them Professor Otto Krümmel, of Kiel, and Professor Gerhard Schott, of Hamburg. Dr. Neumayer paid a special visit to London in 1898, in order to take part in a great meeting at the Royal Society to advocate the resumption of Antarctic exploration, and on many other occasions he visited this country in connection with his magnetic researches and his meteorological work.

When Mr. Harries sent us his article about six months ago, we submitted a proof to Dr. von Neumayer, and his long silence suggested that his wonderfully maintained health had begun to give way; but he wrote returning it after revision on April 14th, though saying it was hardly to his taste to see himself praised and appreciated so highly in his lifetime. He explained the long delay in these words:—

"The article reached me, unfortunately, at a time when I was suffering from a severe attack of a bronchial nature, which shortly afterwards was followed by the illness of my sister, with whom I have

been living next door for many years. At the commencement of the year my dear sister died, and left me quite isolated and depressed. Again, my former illness set in, and even at the present moment I am far from being well." He died on May 24th universally mourned.

Dr. von Neumayer was unmarried, and devoted himself to his scientific work and to unobtrusive charity. At the time of the last severe outbreak of cholera in Hamburg he returned there from a holiday, in order by his presence to give confidence to the employes at the observatory, and to assist in commending sanitary precautions amongst the poor. He told us how in one street, in the poorer quarter of the city, through which he had to pass daily, he induced the people to fit wire screens to their windows and doors to exclude flies, which he regarded as the chief carriers of infection, and not a single case of cholera occurred in the houses so protected.

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### A VISIT TO DR. VON NEUMAYER.

By HENRY HARRIES.

DURING the Jubilee Meeting of the German Meteorological Society, at Hamburg, last October, one revered name was on every lip—the Wirkliche Geheimer Rat Excellenz Professor Dr. von Neumayer, or in the English equivalent, His Excellency the Right Honourable George Balthasar von Neumayer. Not only had he for many years been the successful Director of the Deutsche Seewarte, but he had been instrumental in organising the Society itself, having been elected its first President in November, 1883. To the great regret of everybody, however, he was not present in person at the special celebration of the twenty-fifth anniversary of the Society in the city of its birth, but his spirit exercised a magic influence on the assembly. It was obvious from the repeated references to him in various speeches by his successor at the Seewarte, Admiral Herz, by the President of the Society, by the Burgomaster of Hamburg, and others, that Dr. von Neumayer was a Grand Old Man of the Fatherland, honoured by the Emperor, idolised by meteorologists, and held in the highest esteem by the Senate and the citizens of Hamburg, where he laboured so long to render meteorology of real practical utility to navigators.

For more than a score of years I have been familiar with this great personality. When, therefore, the meeting of the Society came to a close, and the train bore me southward on a long journey to the Taunus and the Rheingau, I regarded it as a pleasurable duty to devote a day to travel still further south, into the heart of the Bavarian Palatinate, to pay my respects to Dr. von Neumayer in his retirement, at Neustadt in the Haardt. The partiality which his Excellency shows for this neighbourhood is easily explained. Not far from Neustadt, at Kirchheimbolanden, Georg Balthasar Neumayer first saw the light on June 21st, 1826, and during his

long career he has often visited, and has sometimes resided for years, amongst the scenes of his childhood's days. Now he has returned there to enjoy the calm restful evening of life. "Time's rude hand," has dealt very gently with him. Notwithstanding his fourscore and three years, he is still hale and hearty. The leonine, Beethoven-like features, and the flowing locks of days long, long ago, have not departed,—they are still there, adding, if it were possible, increased dignity to the noble aspect of the venerable figure. All of us who have known him personally will appreciate the opinion of him in the early years of his career, expressed by one of the Royal Society's cloak-room attendants. Throughout his life his one weakness has been his throat, so that, summer and winter, he wears a "muffler" out of doors. On one of his visits to London he attended a *Conversazione* of the Royal Society. On arrival at the Society's rooms he divested himself of all the usual encumbrances, excepting the muffler, which he forgot to remove, and strode majestically into the reception room. While in the act of being presented to the President, he was greeted by Dr. Sharpey with—"I must do a kind service to you; you have still your yellow wrap round your throat!" After the meeting was over he asked the attendant why he had not taken off the wrap with the other things. "Well, sir," replied the man, "I did not like to say anything, I thought you were some great foreign prince!" That was the Neumayer of a former generation—it is also the Neumayer of to-day.

Still vivacious and of vigorous intellect he plied me with questions on all topics of interest—the Hamburg meeting, the welfare of numbers of English men of science known to him either personally or by repute, the future of meteorology in view of wireless telegraphy and the study of the upper regions of the atmosphere, and other matters. Then followed an inspection of the treasures of the establishment. First was a large portfolio containing series of sketches depicting scenes or incidents in his long life, presented to him on his seventieth birthday. A sketch of Kirchheimbolanden, his birth-place, and of the house there, in which he was born, naturally came first. After his student days at Munich, he was desirous of gaining a practical acquaintance with maritime observations and nautical astronomy, and he therefore undertook a voyage to South America when he was twenty-four years old. Then he went to Trieste to enter the Imperial Navy as practical navigator and hydrographer, but left there for Hamburg, in 1851. He had, however, developed a love for the sea, and in the following year he sailed for the Southern ocean again, returning in 1854. Two years later he could not resist the call of Australia, and in 1857 he succeeded in organising at Melbourne, the Flagstaff Observatory for the study of magnetical and meteorological problems. Here he worked hard, and to this day he prides himself, and justly so, on his magnetic survey of Victoria. Laden with information he, in 1864, boarded the famous Aberdeen clipper "Garrawald" and sailed for England, where the nature of his

work brought him into contact with Sir Edward Sabine and other distinguished men of science. Returning to his native Palatinate, he spent about five years working up the Melbourne records, and the authorities at Berlin recognising the value of his researches promoted him to the post of Hydrographer to the Navy, in 1872; and he became Director of the Seewarte at Hamburg in 1876. On attaining the age of three score years and ten he desired to be relieved of his duties, but the Imperial authorities would not hear of his retirement until 1903, when he was nearing the close of his 77th year. It was from this long and varied record that Dr. von Neumayer's friends at Hamburg selected scenes for illustration, life at home, at sea, in Australia, at College, at work, and in authority—an interesting series indicating the immense changes that have taken place in the world within the span of a single life.

But these are not the only reminders of the past by which he lays great store. The residence is decorated with numerous other pictures and works of art of interest to men of science. A few only need be mentioned to afford a general idea of the whole. There is an oil painting of Sir William Herschell, a life-size photograph of Buys Ballot (head and shoulders), medallions of Dove (by Blaeser) and Donders, a bronze statue of Gauss (a reduced copy of the great monument by Schaper at Brunswick), and scenes in Victoria, one of the Mount Kosciusko region, with the Neumayer magnetic survey party in the foreground.

When the inspection of these and other treasures was over, my host was ready to take me for a walk to see the neighbourhood—"up the hill at the back of the town, so as to have the best view." It was a beautifully fine day, with the sun shining bright and warm from a cloudless sky, so that we proceeded at a very leisurely pace. My host was in excellent spirits, and soon showed that age has in no way affected his memory, for he not only spoke about many English and other scientific worthies whom he has known, but he also discussed the writings of modern workers, for he keeps himself in touch with the progress of the science of to-day by studying the latest publications.

The recital of anecdotes of personal experiences in Australia and elsewhere carried us away, so that we were oblivious of the passage of time. The day had waned, the sun had set, and it became necessary for me to part from my genial and delightful friend to catch the last train going northward, his last words being, "Greetings to all my friends and acquaintances in England."



## ROYAL METEOROLOGICAL SOCIETY.

THE first of the afternoon meetings of this Society for the present session, was held in the Society's Rooms, 70, Victoria Street, Westminster, on Wednesday, May 19th, Mr. H. Mellish, President, in the chair.

Colonel H. E. Rawson, C.B., read a paper on "The Anticyclonic Belt of the northern hemisphere." In a previous communication the author brought forward some facts regarding the anticyclonic belt of the southern hemisphere, derived from an examination of the South African records from the year 1841 to 1906. He found that the indications of a cyclical oscillation of the belt to and from the equator over South Africa were strong enough to encourage the belief that an analysis of Australian records on the one side, and of Argentine records on the other, would prove that all the action centres of the atmosphere were moving together over this wide area, and that a similar oscillation existed in the northern hemisphere. Colonel Rawson subsequently found that investigations of Mr. H. C. Russell and Dr. W. J. S. Lockyer supported his conclusion that there is a period of about 9.5 years between the greatest north and greatest south position of the anticyclonic belt in the southern hemisphere, the double oscillation thus taking 19 years. He has since extended the enquiry into the movements of the action centres in the northern hemisphere, with a view to ascertaining whether they show any similar oscillation to and from the equator, which is not to be explained by seasonal changes of position. Dealing with the Nile floods, he draws the inference that the high-pressure systems which affect North-east Africa, are farther north when the floods are in excess, and nearer to Egypt when they are deficient. He has also made an analysis of the tracks of the hurricanes which passed north and south of Manila Observatory, and found that these throw an interesting light upon the oscillations of the action-centres of the atmosphere.

Captain M. W. C. Hepworth said that the positions north and south of the anticyclones of the great oceans had doubtless a great effect in determining the paths of depressions, travelling eastward across the adjacent land areas, which were responsible for a good deal of the weather experienced there. He thought however that the oscillations east and west would have as great, and perhaps a greater, effect on the conditions in those areas than the oscillations north and south.

Dr. W. J. S. Lockyer said that at the Solar Physics Observatory they had discovered a short period pressure variation of about 4 years, India representing one type, and Cordoba the reverse type; they called it a short period barometric see-saw. Australia and India went together, and were opposed to Cordoba. When all the short period changes were eliminated, they obtained longer variations. He had expected to find the long period variations for India and Australia alike, but such was not the case, Australia showed a 19 years' variation, South America indicated also a 19 year change inverse in

form to the Australian one, but the epochs of maxima and minima did not coincide.

Dr. W. N. Shaw, Capt. D. Wilson-Barker, and the President, also took part in the discussion.

Colonel Rawson, in reply, said that if they examined charts of the ocean currents of the southern hemisphere they would find that winds were blowing for such length of time over a distinct area, that the normal ocean currents were modified and in some cases reversed. He was of opinion that the permanent systems squeezed out from themselves the travelling anticyclones, which went on to feed the adjoining system. Latitude must not be neglected when looking for evidences of the 19 year cycle.

A paper by Mr. A. Walter, of the Royal Alfred Observatory, Mauritius, on "Errors of Estimation in Thermometric Observations," was read by the Secretary. In examining the returns from a newly inaugurated series of second-order meteorological stations in Mauritius, it was noticed that a large percentage of the thermometer readings were in whole or half degrees. This led the author to analyse the returns, and he gave in the paper the frequency curves of the various tenths recorded by observers, showing how certain fractions in subdividing a degree on the thermometer scale came more often than others, though, in fact, the mercury must in a long series of observations have stood an equal number of times at each tenth.

Mr. W. W. Bryant, Mr. W. Marriott, Mr. R. G. K. Lempfert and Mr. R. Inwards took part in the discussion.

The following gentlemen were elected Fellows of the Society:—  
Mr. J. C. Carson, Capt. R. P. Craven, Lieut. E. J. Headlam, F.R.G.S.,  
and Mr. A. O. Lees.

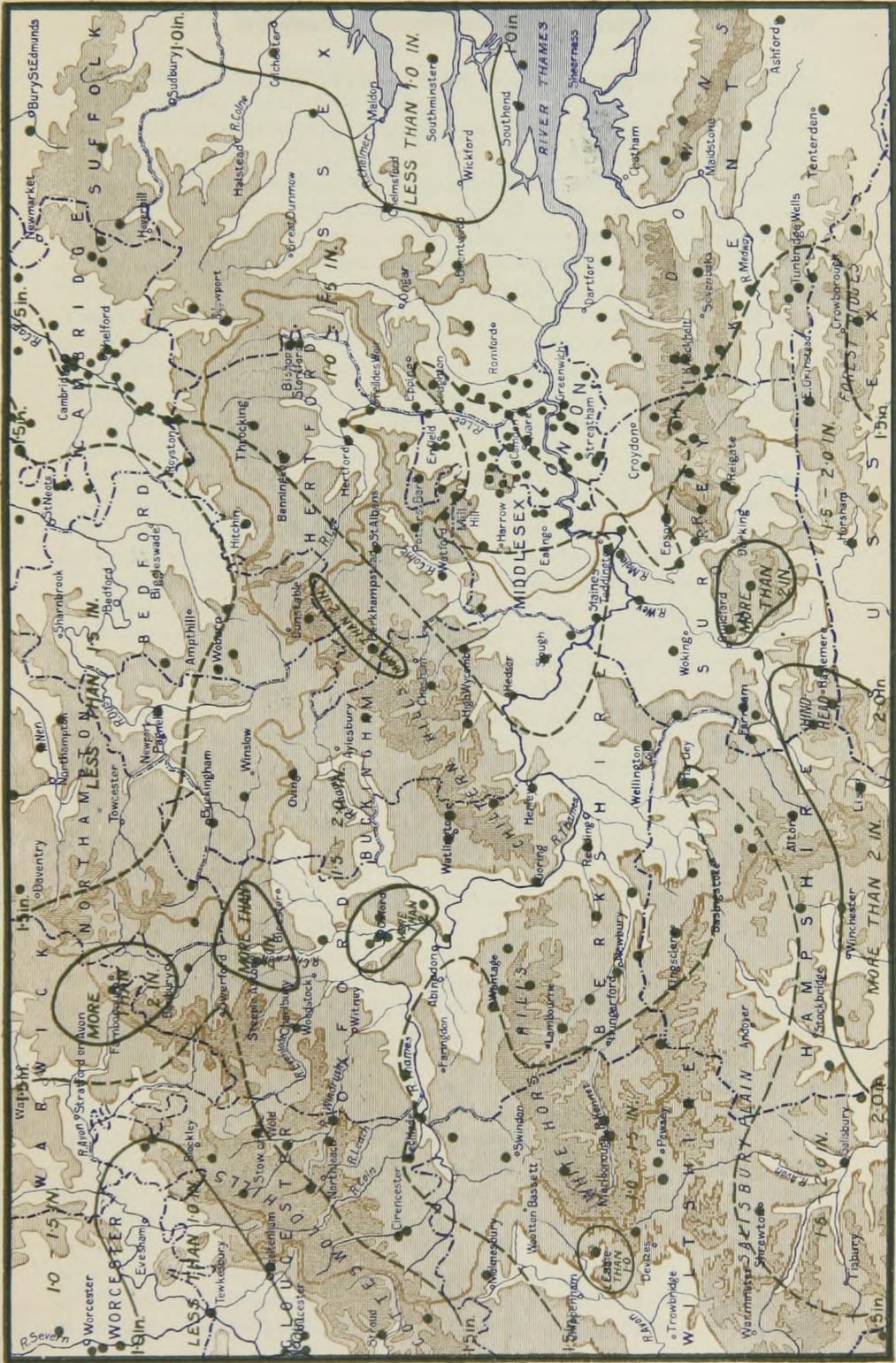
## THE WEATHER OF MAY, 1909.

By FRED. J. BRODIE.

LAST month opened with as cheerless a specimen of a May Day as could well be imagined. With a current of air pouring down in an unbroken stream from the Arctic Sea, the thermometer over a large portion of the United Kingdom failed to rise within  $10^{\circ}$  of its normal level, the wintry temperature being accompanied in many places by showers of hail, sleet or snow. During the ensuing night (that of the 1st—2nd) a sharp frost occurred in west, northern and central districts, the thermometer in the screen falling to between  $5^{\circ}$  and  $8^{\circ}$  below the freezing point. On the surface of the grass as many as  $12^{\circ}$  of frost were registered in several localities, and as far south even as Greenwich. At Burnley the exposed thermometer sank to a minimum of  $19^{\circ}$ , and at West Linton to  $18^{\circ}$ , while at Llangammarch Wells it went as low as  $14^{\circ}$ .

After this inauspicious start an anticyclone spread in from the Atlantic, and from the 2nd to about the 10th a spell of exceptionally

RAINFALL OF THAMES VALLEY. MAY, 1909.



ALTITUDE SCALE

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

SCALE OF MILES





fine weather was experienced. Over the country as a whole the amount of bright sunshine registered during the week ending the 8th was as large as in any calendar week since the general establishment of recording instruments in 1881, and at most places in the south and east of England it was quite the largest. Owing, however, to the prevalence of winds from some easterly quarter, the shade temperatures registered about this time were not particularly high, few places reporting maxima appreciably above  $70^{\circ}$ . Along our east coasts, where the air flowed in from the cold surface waters of the North Sea, the thermometer, in fact, seldom reached  $60^{\circ}$ , and was often not much above  $55^{\circ}$ . In all districts the clearness of the atmosphere was favourable for the progress of brisk nocturnal radiation, and, although no very sharp frosts were recorded, the minimum readings were generally low, and the daily range of temperature consequently large.

One of the most constant phenomena in our very variable climate is the appearance of a spell of cold weather about the second week in May. The month under review acted in this respect quite in accordance with precedent, and after about the 11th a harsh wind from the northward set in, the polar current being accompanied in all districts by much cloud, and on the 13th and 14th by showers of sleet and snow, which found their way, in the form of a few fleeting flakes, as far south as Rothamsted and London. Between the 13th and 16th the thermometer in many parts of the Kingdom failed to reach  $50^{\circ}$ , the night temperatures being in several places well below the freezing point. In the screen, readings as low as  $22^{\circ}$  were recorded at West Linton, and  $24^{\circ}$  at Balmoral, Paltalloch and Cally (Kirkcudbright); while on the surface of the ground the thermometer fell to  $20^{\circ}$  or less in many northern and central parts of Great Britain, to  $17^{\circ}$  at West Linton and Birmingham (Edgbaston), and to  $13^{\circ}$  at Llangammarch Wells.

After the middle of the month the wind, which became for a time rather variable, ultimately got round to south, and with the reappearance of almost continuous sunshine the thermometer rose briskly, the highest temperatures of the month occurring very generally on the 21st and 22nd. In Ireland and Scotland the shade maxima were very little above  $70^{\circ}$ , but in many parts of England the thermometer rose to  $80^{\circ}$  or more, a reading of  $84^{\circ}$  being registered at Greenwich on the 22nd. In the closing week the extension of cyclonic systems from the Atlantic resulted in winds mainly from between west and south, and in somewhat broken weather, considerable falls of rain being experienced in many districts on the 25th. In the south and east of England, however, the showers were interspersed with long intervals of bright sunshine, and over the country generally the thermometer remained at a fairly high level, the shade maxima of the 31st being above  $70^{\circ}$  in many parts of England and as high as  $76^{\circ}$  at Greenwich.

The mean temperature of the month differed but little from the average, a slight defect being reported in Scotland, and an equally

small excess in most parts of England and Ireland. The leading feature in the weather was, without doubt, the extraordinary prevalence of bright sunshine over England, and especially over the southern and eastern counties. In the latter districts the total number of hours was by far the largest ever observed in May, and in very many places, including London, it was by far the largest observed in any month of the year back to 1881. At some stations in the Isle of Wight and on the coasts of Hampshire and Sussex slightly over 350 hours were registered, giving a mean for the whole month of rather over 11·14 hours per day. In the early part of June the sunshine recorder, after this very remarkable display of energy decided upon enjoying a brief period of repose, and for five days, beginning with the 2nd, the instrument at Westminster failed to register a single gleam.

### RAINFALL AND THE DESIGN OF SEWERS.

A VALUABLE paper bearing on the influence of rainfall on the design of sewers was read before the Society of Engineers at the Royal United Service Institution, on May 3rd, by Mr. C. A. Battiscombe. The author laid special stress upon the capacity of sewerage systems required to adequately cope with storm-waters, and pointed out that, owing to the necessity of allowing for a maximum flow following exceptionally heavy rainfall, no inference could safely be drawn from the average annual precipitation of the locality in question, or upon the average rate of fall per hour, could that be ascertained. Experiments had been carried out with the object of ascertaining the amount of water which might be expected to escape the sewers either by being re-evaporated or by percolation through the soil. The former was considered to be an almost negligible quantity between the commencement of a storm and the dispersal of the water deposited; the absorption requires to be calculated by reference to the proportional areas of permeable and impermeable surface in the area to be drained. The opinion was expressed that the maximum fall of rain which should be considered need not exceed 3·00 in. per hour for a period of twenty minutes, and that, after making due allowance for absorption, sewers need in no case be constructed of dimensions capable of discharging more than that amount of water. Exceptions would have to be made in the case of extreme gradients owing to the increased rate of flow-off under such conditions.

A vigorous discussion followed, in the course of which the author's estimate of the required capacity of drains was challenged as unnecessarily high. It was also urged that any generalization as to the relation of flow to rainfall was exceedingly dangerous owing to the great diversity of conditions presented by different localities. With regard to the heaviest rainfall which might be considered possible in such a short period as an hour, a large number of authenticated instances of rainfalls far in excess of the suggested maximum were

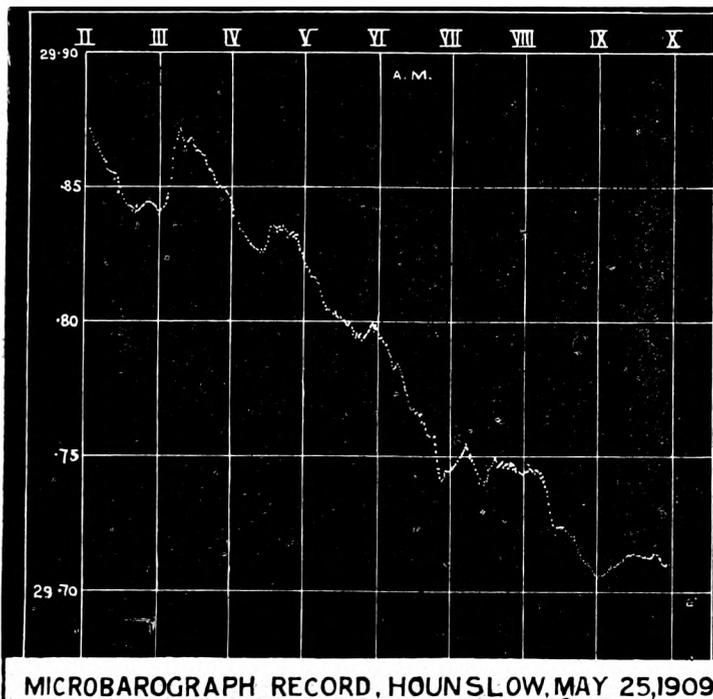
quoted, and it was suggested that much light might be thrown upon the meteorological aspect of this somewhat difficult problem by the detailed study of the accumulated data published each year in *British Rainfall*. Maps of the geographical distribution of thunderstorm rains also have an important bearing on the subject. It was suggested that owing to the small area usually affected by the most intense rainfall in thunderstorms, the size of the drainage area might well be taken into consideration in deciding upon the required capacity, and that this might possibly be safely reduced in the case of very large systems. Emphasis was laid by several speakers upon the extreme desirability of the more extended use of self-recording rain gauges by engineers concerned with the planning of sewerage systems.

### Correspondence.

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

#### RAPID BAROMETRIC FLUCTUATIONS.

THE accompanying Micro-barograph tracing shows the rapid fluctuations of atmospheric pressure during the heavy rainstorm of Tuesday morning, May 25th. The rapid rise shortly after three o'clock was



coincident with the commencement of the heavy downpour. The trace was obtained from a "Thread-recording" aneroid movement, marking once per minute.

T. J. MURDAY.

*Hounslow, May 25th, 1909.*

### ODOUR FROM THE RAINBOW.

MORE than half a century ago a singular controversy took place in the press regarding the existence of this supposed emanation.

Its occurrence was affirmed on the authority of many writers of the past, *e.g.*, Pliny (Lib. XII., c. 24), Aristotle (Prob. Quest. XII), a Greek writer referred to by Coleridge (in his "Table Talk"), Georgius de Rhodes (in his "Peripatetic Philosophy"), Bacon (in his "Sylva"), Browne (in "Britannia's Pastorals"), and more lately by Robert Snow (in one of his "Poems"); thus showing a belief held in different countries, over many centuries.

Everyone is familiar at a certain season of the year with the increase of scent given by plants and shrubs on a warm evening after the air has been newly washed by rain, and this would *coincide* often with the appearance of a rainbow; but the suggestion of the above authors is that the perfume is actually produced by the rainbow itself. Are any other instances of this belief on record?

*Upton, Slough, 18th May, 1909.*

RICHARD BENTLEY.

### REMARKABLE RECORD OF BRIGHT SUNSHINE.

THE number of hours of bright sunshine registered at the Falmouth Observatory, by the Campbell-Stokes' Bright Sunshine Recorder belonging to the Meteorological Office, during the 22 consecutive days from the 30th April to the 21st May, inclusive, was 262·1, representing a daily average of 11·9 hours. The total is 66 hours in excess of the sunshine of last month—which was itself unusually sunny. The longest duration was 14·4 hours on the 19th, the least 8·5 on the 6th and 15th; only three days had less than 10 hours' sunshine, and 13 more than 12 hours.

*Falmouth, 24th May, 1909.*

WILSON LLOYD FOX.

[The sunshine of the neighbourhood of London has suffered some neglect on account of the fact that quotations are usually made from some point within the daily influence of smoke. The record kept at Mill Hill, 6 miles north of Camden Square, for the 22 days in question, showed a total of 227·5 hours, an average of 10·3 per day, the longest duration was 13·4 hours on the 19th, the least 3·1 hours on the 17th; 10 days had less than 10 hours sunshine, and 8 more than 12 hours; but trees cut off the sunshine from the recorder at 6.15 p.m., and, but for this, 8 hours more would probably have been recorded in the 22 days.—ED., *S.M.M.*]

### HOT WIND AT LYNMOUTH.

I do not know whether it is anything unusual, but on May 20th we had a very strong *hot* wind here from the south-south-east; so strong that I was told that people could hardly stand at Lynton. The

barometer was falling very slightly, being 30·19 in. at 9 a.m., and 30·06 in. at the same hour on the 21st. I did not hear of any thunderstorms locally afterwards.

Personally I have never felt such a hot wind before.

T. H. MEAD-BRIGGS.

Rock House, Lynmouth, 1st June, 1909.

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## METEOROLOGICAL NEWS AND NOTES.

MR. E. H. SHACKLETON, who arrived in London on June 14th from his great expedition towards the South Pole, has promised a communication on the meteorological results of his expedition for an early number of this Magazine.

THE ROYAL METEOROLOGICAL SOCIETY is arranging at the forthcoming Show of the Royal Agricultural Society, to be held at Gloucester from June 22nd to 26th, a Meteorological Section in connection with the Agricultural Education Exhibition. Mr. W. Marriott will give an address on "The method of taking Weather Observations," each day, and this will be followed by the ascent of pilot balloons for obtaining records in the upper air. We hope that all rainfall observers and others interested in meteorology who may visit the Show, will make a point of inspecting the Meteorological Section, and of making themselves known to Mr. Marriott or his assistants, who will be happy to explain in detail any matters of special interest.

PROFESSOR FILIP AKERBLOM has been appointed to the vacant directorship of the Meteorological Observatory of Upsala, Sweden.

SNOW ON APRIL<sup>7</sup> 31ST was reported from stations in all parts of Great Britain and in the north-east of Ireland. At Lynturk in Aberdeenshire the depth was given at three-quarters of an inch.

SPELLING REFORM IN THE UNITED STATES introduces some quaint words, even in the *Monthly Weather Review*, and we need not feel surprised in finding that dissenting meteorological bodies adopt a characteristic orthography. One of these sends us a postcard from Kansas City, which shows its contempt for the Capital by calling itself the "international weather bureau," and amongst other interesting matter assures us "the planet, jupiter, repelling the earth nearer the sun until may 12th will be the warm tendency in spring-time to prevent injury to fruit in general. june will average cool for june weather." But alas there is room for lurking doubt for "except when counter-acted by positions of unknown planets, the above forecasts (based upon grover's new principles, heat, or repulsion, the force of gravitation) will be found to be practically correct."

## ON M. ANGOT'S STUDIES ON THE TEMPERATURE OF FRANCE.\*

By L. C. W. BONACINA.

THE study made by M. Angot upon the mean temperature of the air in France may be considered analogous to the work accomplished by Dr. Buchan upon the mean temperature of the British Islands. For the production of isothermal maps showing the mean temperature for each of the twelve months of the year, for the whole year, and the range of mean temperature between the hottest and coldest months over the area of France, he has utilized observations made at 148 stations, out of which 58 are in France, 40 in the southern half of Britain, and the remainder in Holland, Belgium, Western Germany and Austria, Switzerland, Northern Italy and Northern Spain. The period covered by the observations is the 50 years 1851-1900; and although comparatively few of the stations have furnished homogeneous observations for the whole period, those with fragmentary records have been reduced to the fifty years by a method involving comparison with the nearest stations possessing complete observations. The rough daily means† of temperature for the building up of monthly and annual means, have been reduced to the true mean of the twenty-four hours by applying a correction depending upon what combination of hours was used at the several stations in making the daily observations. At most of the stations care has been exercised in obtaining a suitable site for installing the thermometers, which are sheltered by a Stevenson screen, or one answering its purpose; but at the stations in the north of Italy the observations were made with thermometers placed outside windows, in the midst of towns, and consequently the readings from that region are for a double reason too high. All the readings for the production of the isothermal maps have been reduced to the level of the sea, and this was also, I believe, the procedure adopted by Dr. Buchan in the case of the British Islands. It is known as the result of diverse observations made in many parts of Europe that the average rate of decrease of temperature with the elevation of the land is, roughly, 0°·55 C. per 100 metres, or 1° F. per 300 feet. The rate varies according to the time of year, 0°·55 C. per 100 metres representing the mean decrease for the whole year, with a range from 0°·37 C. in December, to 0°·70 C. in April and May. This law which holds good up to a height of about 500 metres, but becomes uncertain above it, is represented by the expression:—

$$Dt = 0^{\circ}\cdot55 + \cdot15 \sin (m. + 300^{\circ}) + \cdot05 \sin (2m. + 260^{\circ}).$$

\* Annales du Bureau Central Météorologique de France; Mémoires, 1903; "Études sur le Climat de la France; Température Moyenne;" par A. Angot.

† Annales du Bureau Central Météorologique de France; Mémoires, 1902; "Variation Diurne de la Température," par A. Angot.

where  $m$ . represents time expressed in angles onwards from the 1st of January, the period of variation, namely the year, being denoted by  $360^\circ$ , and the periods January, January-February, January-February-March, &c., by corresponding angles. On the strength of this law, therefore, corrections of monthly mean temperatures for altitude can be made; and it is not a little remarkable that a relation so precise should be found to exist when one remembers that the temperature gradient varies greatly in individual cases, sometimes becoming inverted and depending not only upon meteorological conditions but also upon the general relief of the land, and the *manner* in which it rises from one contour line to another. The propriety of reducing temperature observations to sea-level is a matter open to much discussion, and is a philosophical question to which it behoves meteorologists to give further consideration. In the first place, the case of temperature is not analogous to that of pressure. The object with which we take daily barometer readings, namely, to understand the distribution of atmospheric pressure with accompanying weather systems, and to deduce forecasts therefrom, necessitates the reduction of the readings to a common level—for convenience, that of the sea. But we study the temperature of the air for climatological purposes; and since altitude as a climatic factor and temperature modifier ranks second in importance only to latitude, it is not surely permissible to correct the recorded temperature of a locality for its altitude. If we make this correction we are really defeating our object, which is to ascertain the actual temperature of the air from *all* causes, not so local in their action as to be devoid of geographical signification. Apparently both Dr. Buchan in Britain, and M. Angot in France, were compelled to reduce temperature readings to sea-level in preparing their isothermal maps, on account of the impossibility of obtaining concurrent isothermal lines on a map, especially in the case of highly mountainous regions, without making this correction, unless there is a far greater number of observing stations than is usually available.

It is clear that to draw isothermal lines corrected for altitude across mountainous tracts like Wales, the Scottish Highlands, or Switzerland, is quite devoid of signification—countries where even the lowest ground is usually far above sea-level. In the case, however, of a comparatively level country like France, with which M. Angot's work is primarily concerned—where there are numerous local inequalities of surface in broad plains, not forming any pronounced system of relief—there is more to be said for the practice of reducing temperature readings to sea-level. Bearing in mind, therefore, that M. Angot's isothermal lines of France and neighbouring countries are to some extent artificial, although probably maintaining the trend and shape of the *natural* isothermal lines, some of the main facts of the distribution of mean temperature in France and neighbouring countries may be here stated. The coldest month of the year is January over all parts of the area considered

except the relatively warm western coasts of France and Britain, where it is February. This indicates that while the lowest mean temperature of the air lags nearly a month behind the winter solstice over the land, it lags nearly two months behind the lowest sun over the sea. In January the mean temperature ranges from about 45° F. on the Riviera, the north-west coast of France and south-west coast of Britain, to about 34° F. over eastern France, 32° F. over western Germany, and 31° F. over parts of the Po valley in northern Italy. In February the area of greatest cold has been transferred from northern Italy northwards to western Germany and eastern France, and the cold in north Italy is very much less severe than in January, showing that while more southern countries often experience severe cold in the *depth* of winter, they are the first to feel the influence of the returning sun in spring. By March the coldest area has shifted to Holland, Belgium and England, the southern half of the latter country forming the northern boundary of the region under discussion. March is the equinoctial month, and the isothermal lines which in January and February ran across France from N.W. to S.E., now run nearly E. and W., indicating that in this month the land becomes as hot as the sea—in other words, that in March the transition from a winter to a summer distribution of temperature takes place. In the northern latitude of Britain, however, the land is still colder than the neighbouring sea. April is the first month with a distinct summer distribution of temperature, the lines across France now running from S.W. to N.E. in the direction of the great land area to the east and north-east of France. England and northern Holland are very conspicuously the coldest region in April. The months of May and June show a steady intensification of the heat of summer, and a more and more marked summer distribution with respect to land and sea. In July—the hottest month of the year—the mean temperature increases rapidly eastward, south-eastward and southward from a little below 60° F. on the south-west coasts of Britain and a little above 60° F. on the north-west coast of France to a maximum of over 75° F. in the plain of northern Italy—the very region which was so cold in January. In August a decided leakage of heat is apparent over the land, but the cool western seaboard stations which were colder in February than in January are a little warmer in August than in July. The retardation of the highest mean air temperature behind the highest sun in June is therefore two months over the sea, but only one month over the land. The equinoctial month of September points to the transition from a summer to a winter distribution of temperature in the middle latitude of France; but in the northern region of England—the first to get cold in autumn and the last to get warm in spring—the land is already distinctly colder than the sea. In October the temperature distribution is quite that of winter, and in November and December a rapid strengthening of the cold of winter takes place.

The fall of temperature between September and October is greater

than the rise between March and April, and represents a greater change than occurs between any other two consecutive months. It may, perhaps, be possible to explain on physical principles why the Earth should lose heat in autumn more rapidly than it gains it in spring, but the causes cannot be discussed in this paper. The map showing the mean annual temperature brings out very clearly the influence of latitude, and the lines run approximately due E. and W. One important and interesting feature is that the trend of the isothermal lines distinctly shows on the balance of the year the land to be hotter than the sea south of the 45th parallel, which passes through northern Italy and the southern half of France, but the sea hotter than the land north of 45° N. This affords evidence in support of belief founded on theory that the 45th parallel of north latitude, forming the middle of the temperate zone and coinciding approximately with the mean annual isotherm of 55° F.,\* may be regarded as separating what one may describe as the warm temperate countries of Europe from the cold temperate countries. The map of the amplitude of the annual variation of mean temperature shows that the range of air temperature between January and July is from about 15° F. on the coasts of Ireland, Cornwall and Brittany, to about 30° F. in eastern France and western Germany, and to over 40° F. in the plain of northern Italy. The boundaries of the area in question as given in the first part of this article must, of course, be borne in mind in studying these comparisons. If the area extended just a little further eastward into Germany and Austria, the coldest region in January would doubtless be no longer in northern Italy. Finally, the mean annual temperature of the whole of France, as determined by the measurement of areas bounded by the different isothermal lines with the planimeter, is given by M. Angot as 53° F. (reduced to sea-level). France is thus considerably warmer than Britain—the mean temperature of England and Ireland may be put at 49° F., and of Scotland at 47° F. The existence of mountain and hill ranges and elevated land in general causes the mean temperatures to be, of course, higher in reality than these figures indicate. M. Angot's maps unfortunately do not show us the modification imposed upon the mean temperature of France by such great mountain systems as the Alps, the Vosges, the Cevennes, the Auvergne and the Pyrenees, except in so far as these systems must necessarily exert an influence upon the temperature conditions prevailing at lower-lying observing stations in their neighbourhood—an influence which the reduction of figures to sea-level cannot eliminate.

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\* A mean annual temperature of 55° F. is usually regarded as more temperate than any other.



## RAINFALL TABLE FOR MAY, 1909.

| STATION.                       | COUNTY.            | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.    |              |
|--------------------------------|--------------------|------------|----------------------|--------------------------------|--------------------------|--------------|
|                                |                    |            |                      |                                | Aver.<br>1870-99.<br>in. | 1909.<br>in. |
| Camden Square.....             | London.....        | 51 32      | 0 8                  | 111                            | 1'72                     | 1'80         |
| Tenterden.....                 | Kent.....          | 51 4       | *0 41                | 190                            | 1'72                     | 1'16         |
| West Dean.....                 | Hampshire.....     | 51 3       | 1 38                 | 137                            | 1'86                     | 1'98         |
| Hartley Wintney.....           | ".....             | 51 18      | 0 53                 | 222                            | 1'79                     | 1'40         |
| Hitchin.....                   | Hertfordshire..... | 51 57      | 0 17                 | 238                            | 1'87                     | 1'82         |
| Winslow (Addington).....       | Buckinghamsh..     | 51 58      | 0 53                 | 309                            | 2'06                     | 1'92         |
| Bury St. Edmunds(Westley)      | Suffolk.....       | 52 15      | *0 40                | 226                            | 1'85                     | 1'21         |
| Brundall.....                  | Norfolk.....       | 52 37      | *1 26                | 66                             | 1'74                     | 1'30         |
| Winterbourne Steepleton...     | Dorset.....        | 50 42      | 2 31                 | 316                            | 2'02                     | 1'20         |
| Torquay (Cary Green).....      | Devon.....         | 50 28      | 3 32                 | 12                             | 1'96                     | '90          |
| Polapit Tamar [Launceston]     | ".....             | 50 40      | 4 22                 | 315                            | 1'98                     | 1'50         |
| Bath.....                      | Somerset.....      | 51 23      | 2 21                 | 67                             | 2'09                     | 1'56         |
| Stroud (Upfield).....          | Gloucestershire..  | 51 44      | 2 13                 | 226                            | 2'10                     | 1'22         |
| Church Stretton (Wolstaston).. | Shropshire.....    | 52 35      | 2 48                 | 800                            | 2'62                     | '88          |
| Coventry (Kingswood).....      | Warwickshire.....  | 52 24      | 1 30                 | 340                            | 2'11                     | 1'54         |
| Boston.....                    | Lincolnshire.....  | 52 58      | 0 1                  | 25                             | 1'73                     | '90          |
| Worksop (Hodsock Priory)..     | Nottinghamshire    | 53 22      | 1 5                  | 56                             | 2'01                     | 1'40         |
| Derby (Midland Railway).....   | Derbyshire.....    | 52 55      | 1 28                 | 156                            | 1'96                     | 1'84         |
| Bolton (Queen's Park).....     | Lancashire.....    | 53 35      | 2 28                 | 390                            | 2'46                     | 3'44         |
| Wetherby (Ribston Hall)...     | Yorkshire, W. R.   | 53 59      | 1 24                 | 130                            | 1'90                     | 1'66         |
| Arncliffe Vicarage.....        | ".....             | 54 8       | 2 6                  | 732                            | 3'36                     | 3'53         |
| Hull (Pearson Park).....       | E. R.....          | 53 45      | 0 20                 | 6                              | 1'95                     | 1'33         |
| Newcastle (Town Moor)...       | Northumberland     | 54 59      | 1 38                 | 201                            | 1'89                     | 1'79         |
| Borrowdale (Seathwaite)...     | Cumberland.....    | 54 30      | 3 10                 | 423                            | 7'26                     | 5'73         |
| Cardiff (Ely).....             | Glamorgan.....     | 51 29      | 3 13                 | 53                             | 2'55                     | 1'88         |
| Haverford west(High Street)    | Pembroke.....      | 51 48      | 4 58                 | 95                             | 2'53                     | 1'46         |
| Aberystwyth (Gogerddan)..      | Cardigan.....      | 52 26      | 4 1                  | 83                             | 2'44                     | 1'79         |
| Llandudno.....                 | Carnarvon.....     | 53 20      | 3 50                 | 72                             | 1'85                     | '94          |
| Cargen [Dumries].....          | Kirkcudbright...   | 55 2       | 3 37                 | 80                             | 2'60                     | 2'18         |
| Hawick (Branxholm).....        | Roxburgh.....      | 55 24      | 2 51                 | 457                            | 2'17                     | 1'80         |
| Edinburgh (Royal Observy.)     | Midlothian.....    | 55 55      | 3 11                 | 442                            | ...                      | 1'59         |
| Girvan (Pinmore).....          | Ayr.....           | 55 10      | 4 49                 | 207                            | 2'73                     | 1'55         |
| Glasgow (Queen's Park)...      | Renfrew.....       | 55 53      | 4 18                 | 144                            | 2'36                     | 2'15         |
| Inveraray (Newtown).....       | Argyll.....        | 56 14      | 5 4                  | 17                             | 3'04                     | 5'20         |
| Mull (Quinish).....            | ".....             | 56 36      | 6 13                 | 35                             | 2'91                     | 3'62         |
| Dundee (Eastern Necropolis)    | Forfar.....        | 56 28      | 2 57                 | 199                            | 1'88                     | 3'86         |
| Braemar.....                   | Aberdeen.....      | 57 0       | 3 24                 | 1114                           | 2'29                     | 3'15         |
| Aberdeen (Cranford).....       | ".....             | 57 8       | 2 7                  | 120                            | 2'20                     | 2'23         |
| Cawdor.....                    | Nairn.....         | 57 31      | 3 57                 | 250                            | 2'03                     | 2'59         |
| Fort Augustus(S. Benedict's)   | E. Inverness.....  | 57 9       | 4 41                 | 68                             | 2'32                     | 3'15         |
| Loch Torridon (Bendanph)       | W. Ross.....       | 57 32      | 5 32                 | 20                             | 5'05                     | 5'29         |
| Dunrobin Castle.....           | Sutherland.....    | 57 59      | 3 56                 | 14                             | 2'02                     | 2'20         |
| Castletown.....                | Caitness.....      | 58 35      | 3 23                 | 100                            | ...                      | 1'95         |
| Killarney (District Asylum)    | Kerry.....         | 52 4       | 9 31                 | 178                            | 2'95                     | 2'45         |
| Waterford (Brook Lodge)...     | Waterford.....     | 52 15      | 7 7                  | 104                            | 2'11                     | 2'10         |
| Broadford (Hurdlestown)...     | Clare.....         | 52 48      | 8 38                 | 167                            | 2'09                     | 1'92         |
| Abbey Leix (Blandsfort)....    | Queen's County..   | 52 56      | 7 17                 | 532                            | 2'27                     | 2'00         |
| Dublin(Fitz William Square)    | Dublin.....        | 53 21      | 6 14                 | 54                             | 1'94                     | 1'47         |
| Mullingar (Belvedere).....     | Westmeath.....     | 53 29      | 7 22                 | 367                            | 2'40                     | 2'23         |
| Ballinasloe.....               | Galway.....        | 53 20      | 8 15                 | 160                            | 2'49                     | 1'84         |
| Crossmolina (Enniscoe).....    | Mayo.....          | 54 4       | 9 18                 | 74                             | 2'93                     | 2'21         |
| Collooney (Markree Obsy.)..    | Sligo.....         | 54 11      | 8 27                 | 127                            | 2'61                     | 2'08         |
| Seaforde.....                  | Down.....          | 54 19      | 5 50                 | 180                            | 2'45                     | 2'01         |
| Londonderry (Creggan Res.)     | Londonderry.....   | 54 59      | 7 19                 | 320                            | 2'48                     | 3'07         |
| Omagh (Edenfel).....           | Tyrone.....        | 54 36      | 7 18                 | 280                            | 2'43                     | 2'57         |

RAINFALL TABLE FOR MAY, 1909—continued.

| RAINFALL OF MONTH (con.) |          |                   |       |             | RAINFALL FROM JAN. 1. |           |                      |          | Mean Annual 1870-1899. | STATION.            |
|--------------------------|----------|-------------------|-------|-------------|-----------------------|-----------|----------------------|----------|------------------------|---------------------|
| Diff. from Av. in.       | % of Av. | Max. in 24 hours. |       | No. of Days | Aver. 1870-99. in.    | 1909. in. | Diff. from Aver. in. | % of Av. |                        |                     |
|                          |          | in.               | Date. |             |                       |           |                      |          |                        |                     |
| + .08                    | 105      | .57               | 24    | 9           | 8.54                  | 7.75      | — .79                | 91       | 25.16                  | Camden Square       |
| — .56                    | 67       | .28               | 16†   | 7           | 9.59                  | 8.70      | — .89                | 91       | 28.36                  | Tenterden           |
| + .12                    | 106      | .81               | 31    | 9           | 10.59                 | 8.53      | —2.06                | 81       | 29.93                  | West Dean           |
| — .39                    | 78       | .78               | 24    | 9           | 9.70                  | 8.36      | —1.34                | 86       | 27.10                  | Hartley Wintney     |
| — .05                    | 97       | .54               | 24    | 9           | 8.37                  | 7.79      | — .58                | 93       | 24.66                  | Hitchin             |
| — .14                    | 93       | .65               | 27    | 12          | 9.29                  | 7.06      | —2.23                | 76       | 26.75                  | Addington           |
| — .64                    | 65       | .55               | 25    | 9           | 8.28                  | 6.70      | —1.58                | 81       | 25.39                  | Westley             |
| — .44                    | 75       | .80               | 25    | 10          | 8.23                  | 6.61      | —1.62                | 80       | 25.40                  | Brundall            |
| — .82                    | 59       | .50               | 24    | 6           | 14.04                 | 10.83     | —3.21                | 77       | 39.00                  | Winterbourne Stpltn |
| —1.06                    | 46       | .42               | 24    | 7           | 12.92                 | 10.31     | —2.61                | 80       | 35.00                  | Torquay             |
| — .48                    | 76       | .93               | 26    | 10          | 13.33                 | 12.89     | — .44                | 97       | 38.85                  | Polapit Tamar       |
| — .53                    | 75       | .69               | 26    | 6           | 10.72                 | 8.75      | —1.97                | 82       | 30.75                  | Bath                |
| — .88                    | 58       | .44               | 26    | 9           | 10.60                 | 8.80      | —1.80                | 83       | 29.85                  | Stroud              |
| —1.74                    | 34       | .33               | 24    | 8           | 11.85                 | 9.45      | —2.40                | 80       | 33.04                  | Wolstaston          |
| — .57                    | 73       | .66               | 24    | 12          | 10.15                 | 8.13      | —2.02                | 80       | 29.21                  | Coventry            |
| — .83                    | 52       | .45               | 25    | 8           | 7.82                  | 6.98      | — .84                | 89       | 23.30                  | Boston              |
| — .61                    | 70       | .36               | 25    | 11          | 8.57                  | 7.82      | — .75                | 91       | 24.70                  | Hodsock Priory      |
| — .12                    | 94       | .57               | 24    | 12          | 8.78                  | 8.32      | — .46                | 95       | 26.18                  | Derby               |
| + .98                    | 140      | .65               | 24    | 13          | 13.54                 | 15.28     | +1.74                | 113      | 42.43                  | Bolton              |
| — .24                    | 87       | .50               | 25    | 13          | 9.25                  | 10.13     | + .88                | 110      | 26.96                  | Ribston Hall        |
| + .17                    | 105      | 1.00              | 25    | 12          | 22.78                 | 22.98     | + .20                | 101      | 60.96                  | Arneliffe Vic.      |
| — .62                    | 68       | .57               | 25    | 12          | 9.12                  | 8.36      | — .76                | 92       | 27.02                  | Hull                |
| — .10                    | 95       | 1.03              | 25    | 11          | 9.32                  | 12.47     | +3.15                | 134      | 27.99                  | Newcastle           |
| —1.53                    | 79       | 1.17              | 30    | 15          | 50.39                 | 44.43     | —5.96                | 88       | 132.68                 | Seathwaite          |
| — .67                    | 74       | .89               | 26    | 7           | 14.66                 | 11.53     | —3.13                | 79       | 42.81                  | Cardiff             |
| —1.07                    | 58       | .51               | 24    | 8           | 17.06                 | 14.21     | —2.85                | 83       | 47.88                  | Haverfordwest       |
| — .65                    | 73       | .56               | 24    | 9           | 14.66                 | 12.59     | —2.07                | 86       | 45.41                  | Gogerddan           |
| — .91                    | 51       | .47               | 24    | 10          | 10.18                 | 9.28      | — .90                | 91       | 30.98                  | Llandudno           |
| — .42                    | 84       | .98               | 25    | 7           | 16.07                 | 19.65     | +3.58                | 122      | 43.43                  | Cargen              |
| — .37                    | 83       | .89               | 25    | 13          | 12.45                 | 14.29     | +1.84                | 115      | 34.80                  | Branxholm           |
| ...                      | ...      | .67               | 25    | 13          | ...                   | 11.77     | ...                  | ...      | ...                    | Edinburgh           |
| —1.18                    | 57       | .39               | 25    | 15          | 17.57                 | 16.93     | — .64                | 96       | 48.87                  | Girvan              |
| — .21                    | 91       | .47               | 25    | 13          | 12.24                 | 15.08     | +2.84                | 123      | 35.80                  | Glasgow             |
| +2.16                    | 171      | .80               | 30    | 19          | 22.93                 | 25.03     | +2.10                | 109      | 57.90                  | Inveraray           |
| + .71                    | 124      | .53               | 28    | 18          | 20.29                 | 19.39     | — .90                | 96       | 57.53                  | Quinish             |
| +1.98                    | 205      | 1.63              | 25    | 14          | 9.94                  | 12.86     | +2.92                | 129      | 28.95                  | Dundee              |
| + .86                    | 138      | ...               | ...   | ...         | 12.50                 | 12.92     | + .42                | 103      | 36.07                  | Braemar             |
| + .03                    | 101      | .65               | 25    | 16          | 11.60                 | 13.91     | +2.31                | 120      | 33.01                  | Aberdeen            |
| + .56                    | 128      | .49               | 11    | 15          | 9.68                  | 11.35     | +1.67                | 117      | 29.37                  | Cawdor              |
| + .83                    | 136      | .63               | 25    | 18          | 17.02                 | 13.84     | —3.18                | 81       | 43.71                  | Fort Augustus       |
| + .24                    | 105      | .67               | 28    | 24          | 31.26                 | 31.04     | — .22                | 99       | 86.50                  | Bendamp             |
| + .18                    | 109      | .38               | 11    | 17          | 11.31                 | 13.79     | +2.48                | 122      | 31.60                  | Dunrobin Castle     |
| ...                      | ...      | .31               | 18    | 19          | ...                   | 11.77     | ...                  | ...      | ...                    | Castletown          |
| — .50                    | 83       | .63               | 25    | 16          | 22.70                 | 19.67     | —3.03                | 87       | 58.11                  | Killarney           |
| — .01                    | 100      | .81               | 24    | 9           | 14.58                 | 14.25     | — .35                | 98       | 39.30                  | Waterford           |
| — .17                    | 92       | .52               | 24    | 10          | 11.60                 | 15.42     | +3.82                | 133      | 33.47                  | Hurdlestown         |
| — .27                    | 88       | .62               | 31    | 10          | 12.77                 | 13.60     | + .83                | 107      | 35.19                  | Abbeyleix           |
| — .47                    | 76       | .38               | 17    | 12          | 9.93                  | 10.09     | + .16                | 102      | 27.75                  | Dublin              |
| — .17                    | 93       | .65               | 24    | 9           | 12.77                 | 14.87     | +2.10                | 117      | 36.48                  | Mullingar.          |
| — .65                    | 74       | .55               | 24    | 11          | 13.23                 | 13.45     | + .22                | 102      | 37.04                  | Ballinasloe         |
| — .72                    | 75       | .47               | 30    | 18          | 18.79                 | 19.27     | + .48                | 103      | 50.50                  | Enniscoe            |
| — .53                    | 80       | .45               | 24    | 17          | 14.35                 | 15.55     | +1.20                | 108      | 41.83                  | Markree Obsy.       |
| — .44                    | 82       | .56               | 24    | 13          | 14.20                 | 16.57     | +2.37                | 117      | 38.61                  | Seaforde            |
| + .59                    | 124      | .68               | 16    | 17          | 14.15                 | 18.63     | +4.48                | 132      | 41.20                  | Londonderry         |
| + .14                    | 106      | .38               | 17    | 18          | 12.98                 | 16.47     | +3.49                | 127      | 37.85                  | Omagh               |

† and 24. 95

## SUPPLEMENTARY RAINFALL, MAY, 1909.

| Div.  | STATION.                     | Rain<br>inches | Div.   | STATION.                     | Rain.<br>inches |
|-------|------------------------------|----------------|--------|------------------------------|-----------------|
| II.   | Warlingham, Redvers Road     | 1.47           | XI.    | Rhayader, Tyrmynydd .....    | 2.66            |
| „     | Ramsgate .....               | 1.08           | „      | Lake Vyrnwy .....            | 1.78            |
| „     | Steyning.....                | 1.74           | „      | Llangyhanfal, Plás Draw....  | .55             |
| „     | Hailsham .....               | 1.27           | „      | Llwydiarth Esgob .....       | 1.71            |
| „     | Totland Bay, Aston House.    | 1.38           | „      | Snowdon, Cwm Dyli .....      | 3.45            |
| „     | Stockbridge, Ashley .....    | 2.07           | „      | Lligwy .....                 | .94             |
| „     | Grayshott .....              | 2.50           | „      | Douglas, Woodville .....     | 1.45            |
| „     | Reading, Calcot Place.....   | 1.87           | XII.   | Stoneykirk, Ardwell House    | 1.07            |
| III.  | Harrow Weald, Hill House.    | 1.47           | „      | Dalry, The Old Garroch ...   | 2.82            |
| „     | Oxford, Magdalen College..   | 2.22           | „      | Langholm, Grove Road.....    | 2.69            |
| „     | Pitsford, Sedgebrook.....    | 1.31           | „      | Moniaive, Maxwellton House   | 2.54            |
| „     | Huntingdon, Brampton.....    | 1.03           | XIII.  | N. Esk Reservoir [Penicuick] | 2.50            |
| „     | Woburn, Milton Bryant.....   | 1.65           | XIV.   | Maybole, Knockdon Farm..     | 1.75            |
| „     | Wisbech, Monica Road.....    | 1.15           | XV.    | Campbeltown, Witchburn...    | 2.65            |
| IV.   | Southend Water Works.....    | 1.10           | „      | Glencreadell Mains.....      | 2.43            |
| „     | Colchester, Lexden.....      | .66            | „      | Ballachulish House.....      | 6.17            |
| „     | Newport, The Vicarage.....   | 1.22           | „      | Islay, Fallabus .....        | 3.01            |
| „     | Rendlesham .....             | 1.19           | XVI.   | Dollar Academy .....         | 3.67            |
| „     | Swaffham .....               | 1.22           | „      | Loch Leven Sluice .....      | 2.35            |
| „     | Blakeney .....               | .52            | „      | Balquhiddy, Stronvar .....   | 5.29            |
| V.    | Bishops Cannings .....       | 1.11           | „      | Perth, The Museum .....      | 3.10            |
| „     | Ashburton, Druid House ...   | 1.43           | „      | Coupar Angus .....           | 3.07            |
| „     | Honiton, Combe Raleigh ..    | 1.64           | „      | Blair Atholl.....            | 2.65            |
| „     | Okehampton, Oaklands.....    | 1.99           | „      | Montrose, Sunnyside Asylum   | 2.47            |
| „     | Hartland Abbey .....         | 1.33           | XVII.  | Alford, Lynturk Manse ...    | 3.46            |
| „     | Lynmouth, Rock House ...     | 1.56           | „      | Keith Station .....          | 2.86            |
| „     | Probus, Lamellyn .....       | .89            | XVIII. | N. Uist, Lochmaddy .....     | 3.30            |
| „     | North Cadbury Rectory ..     | .90            | „      | Alvey Manse .....            | 2.54            |
| VI.   | Clifton, Pembroke Road ...   | 1.77           | „      | Loch Ness, Drumnadrochit.    | 2.74            |
| „     | Ross, The Graig .....        | .97            | „      | Glencarron Lodge .....       | 4.77            |
| „     | Shifnal, Hatton Grange ..    | 1.05           | „      | Fearn, Lower Pitkerrie.....  | 1.83            |
| „     | Blockley, Upton Wold .....   | 1.06           | XIX.   | Invershin .....              | 2.23            |
| „     | Worcester, Boughton Park.    | 1.12           | „      | Altnaharra .....             | 1.85            |
| VII.  | Market Overton .....         | 2.06           | „      | Bettyhill .....              | 1.49            |
| „     | Market Rasen .....           | .85            | XX.    | Dunmanway, The Rectory..     | 2.96            |
| „     | Bawtry, Hesley Hall.....     | 1.36           | „      | Cork .....                   | 1.80            |
| „     | Buxton.....                  | 2.64           | „      | Mitchelstown Castle .....    | 2.66            |
| VIII. | Neston, Hinderton Lodge...   | 1.10           | „      | Darrynane Abbey .....        | 3.41            |
| „     | Southport, Hesketh Park...   | 1.40           | „      | Glenam [Clonmel] .....       | 3.06            |
| „     | Chatburn, Middlewood .....   | 1.93           | „      | Ballingarry, Gurteen .....   | 2.91            |
| „     | Cartmel, Flookburgh .....    | 2.30           | „      | Miltown Malbay.....          | 1.85            |
| IX.   | Langsett Moor, Up. Midhope   | 2.04           | XXI.   | Gorey, Courtown House ...    | 1.56            |
| „     | Scarborough, Scalby .....    | 1.90           | „      | Moynalty, Westland .....     | 1.94            |
| „     | Ingleby Greenhow .....       | 1.47           | „      | Athlone, Twyford .....       | 1.77            |
| „     | Mickleton.....               | 1.07           | XXII.  | Woodlawn .....               | 1.44            |
| X.    | Bardou Mill, Beltingham ...  | 1.06           | „      | Westport, St. Helens .....   | 1.92            |
| „     | Ewesley, Font Reservoir ...  | 1.75           | „      | Mohill .....                 | 2.42            |
| „     | Ilderton, Lilburn Cottage... | 1.55           | XXIII. | Enniskillen, Portora .....   | 3.03            |
| „     | Keswick, The Bank .....      | 1.88           | „      | Dartrey [Cootehill].....     | 1.93            |
| XI.   | Llanfrechfa Grange.....      | 1.79           | „      | Warrenpoint, Manor House     | 2.23            |
| „     | Treherbert, Tyn-y-waun ..    | 2.85           | „      | Banbridge, Milltown .....    | 1.24            |
| „     | Carmarthen, The Friary....   | 1.85           | „      | Belfast, Springfield .....   | 1.51            |
| „     | Castle Malgwyn [Llechryd].   | 1.53           | „      | Bushmills, Dundarave .....   | 2.14            |
| „     | Plynlimon.....               | 4.20           | „      | Sion House .....             | 2.19            |
| „     | Crickhowell, Ffordlas.....   | 1.50           | „      | Killybegs .....              | 3.45            |
| „     | New Radnor, Ednol .....      | 1.62           | „      | Horn Head ... ..             | 1.91            |

## METEOROLOGICAL NOTES ON MAY, 1909.

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.—Fine, dry and sunny generally, there being but little R until 24th, but on this and the three succeeding days 1.53 in., or 85 per cent. of the total for the month, fell. The duration of sunshine, 276.1\* hours, was the greatest for any month since the record began, and there were no sunless days. Duration of R, 28.3 hours. Mean temp. 54.5 or 0.5 above the average. Shade max. 83.7 on 22nd; min. 33.5 on 16th. F 0, f 8.

TENTERDEN.—Duration of sunshine 317.0† hours, was remarkable. Shade max. 80.5 on 22nd; min. 33.0 on 16th. F 0, f 7.

TOTLAND BAY.—The sunniest month on record; duration of sunshine 350.7\* hours, or 147.2 hours above the average. Shade max. 71.2 on 21st; min. 36.6 on 3rd. F 0, f 6.

PITSFORD.—R .74 in. below the average. Mean temp. 47.1. Shade max. 83.5 on 23rd; min. 30.2 on 3rd and 13th. F 10.

TORQUAY.—Duration of sunshine, 315.1\* hours, or 90.7 hours above the average. Mean temp. 53.0. Shade max. 73.2 on 12th; min. 36.0 on 3rd. F 0, f 2.

NORTH CADBURY.—The least cloudy month in 13 years with an absolute drought from 1st to 17th. Shade max. 83.0 on 21st, and the highest recorded in May in 13 years; min. 33.0 on 2nd and 15th. F 0, f 10.

ROSS.—Shade max. 82.0 on 24th; min. 31.5 on 2nd and 15th. F 2, f 6.

HODSOCK PRIORY.—Shade max. 78.3 on 21st; min. 29.1 on 13th. F 6, f 17.

SOUTHPORT.—R .70 in. below the average of 35 years. Duration of sunshine 284.8\* hours, or 75.1 hours above the average. Duration of R 27.8 hours. Mean temp. 50.8, or 0.3 above the average. Shade max. 78.4 on 21st; min. 31.2 on 16th. F 1, f 14.

HULL.—Duration of sunshine 163.4\* hours. S early on 15th. Shade max. 79.0 on 22nd; min. 31.0 on 1st. F 1, f 16.

HAVERFORDWEST.—Duration of sunshine 295.2\* hours. Shade max. 72.3 on 20th; min. 32.1 on 16th. F 0, f 4.

LLANDUDNO.—Duration of sunshine, 282.9\* hours, was much above the average. Shade max. 74.2 on 20th; min. 32.4 on 16th. F 0.

DOUGLAS.—Brilliantly fine days with cold N.E. winds and dry, frosty nights until 20th. Warmer thereafter with welcome R to which vegetation responded. A trying time to farm and garden and more R urgently needed.

CARGEN.—Shade max. 72.0 on 20th; min. 27.0 on 16th; F 4.

EDINBURGH.—Shade max. 70.4 on 22nd; min. 29.3 on 15th. F 2, f 7.

DUNDEE.—Shade max. 72.8 on 22nd; min. 30.0 on 15th. F 3.

FORT AUGUSTUS.—Shade max. 70.0 on 22nd; min. 27.0 on 15th and 16th. F 4.

WATERFORD.—The first 16 days were rainless but there were late frosts which "burnt" potatoes etc. Shade max. 73.5 on 11th; min. 30.0 on 2nd and 17th. F 3.

DUBLIN.—Dry until 21st after which R fell frequently, though not heavily. The fall on 17th, .38 in., was the product of a local downpour of cold R, H and ice fragments. Mean temp. 52.6, or 0.4 above the average. Shade max. 72.7 on 21st; min. 33.1 on 2nd. F 0, f 3.

MARKREE.—Shade max. 71.0 on 9th; min. 26.6 on 2nd. F 4, f 11.

WARRENPOINT.—Shade max. 69.0 on 11th and 13th; min. 27.0 on 1st. F 5, f 7.

\* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, December, 1908.

| STATIONS.<br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |       |            |           | Absolute.    |                | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|-------|------------|-----------|--------------|----------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min.  | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |       |            |           |              |                |            |       |                 |
| London, Camden Square                                            | 52·9      | 13    | 11·4     | 30    | 44·2     | 36·4  | 38·2       | 91        | 60·0         | ...            | 1·89       | 16    | 8·9             |
| Malta ... ..                                                     | 66·0      | 2     | 46·8     | 30    | 60·0     | 52·1  | 47·5       | 76        | 135·2        | ...            | 7·34       | 20    | 5·1             |
| Lagos ... ..                                                     | 90·0      | sev.  | 71·0     | 12    | 88·3     | 74·1  | 74·1       | 75        | 150·0        | 60·0           | ·33        | 1     | 7·5             |
| Cape Town ... ..                                                 | 95·6      | 19    | 47·8     | 3     | 78·6     | 58·7  | 56·9       | 67        | ...          | ...            | ·43        | 4     | 3·2             |
| Durban, Natal ... ..                                             | 88·7      | 8     | 61·6     | 19    | 81·9     | 67·2  | ...        | ...       | 150·6        | ...            | 3·45       | 19    | 5·6             |
| Johannesburg ... ..                                              | 84·2      | 26    | 48·8     | 19    | 76·0     | 55·7  | 57·0       | 76        | 157·0        | 46·9           | 2·06       | 13    | 4·8             |
| Mauritius ... ..                                                 | 89·1      | 3     | 68·1     | 16    | 86·6     | 71·3  | 69·5       | 76        | 162·0        | 59·0           | 5·91       | 17    | 6·8             |
| Calcutta ... ..                                                  | 83·2      | 26    | 49·5     | 20    | 78·3     | 53·3  | 51·4       | 63        | 135·8        | 42·0           | ·00        | 0     | 1·4             |
| Bombay ... ..                                                    | 87·1      | 27    | 64·3     | 25    | 83·8     | 68·1  | 62·2       | 65        | 133·0        | 57·4           | ·00        | 0     | 0·4             |
| Madras ... ..                                                    | 85·4      | 25    | 62·4     | 8     | 82·4     | 68·4  | 65·7       | 75        | 137·1        | 58·7           | 2·28       | 4     | 4·4             |
| Kodaikanal ... ..                                                | 70·5      | 20    | 38·0     | 10    | 63·3     | 46·5  | 42·4       | 66        | 120·3        | 20·5           | 1·77       | 4     | 4·9             |
| Colombo, Ceylon ... ..                                           | 90·0      | 12*   | 70·2     | 9     | 86·3     | 72·7  | 70·8       | 77        | 151·2        | 65·2           | 1·09       | 11    | 5·3             |
| Hongkong ... ..                                                  | 79·8      | 6     | 51·6     | 9     | 67·9     | 59·5  | 55·8       | 76        | 131·9        | ...            | 4·29       | 9     | 7·5             |
| Melbourne ... ..                                                 | 95·4      | 1     | 45·9     | 20    | 79·6     | 56·9  | 48·4       | 49        | 158·6        | 40·2           | ·63        | 6     | 5·1             |
| Adelaide ... ..                                                  | 107·8     | 7     | 49·1     | 26    | 86·6     | 60·3  | 51·5       | 46        | 164·0        | 41·0           | ·72        | 3     | 3·3             |
| Coolgardie ... ..                                                | 111·0     | 29    | 50·4     | 21    | 95·6     | 62·8  | 49·7       | 36        | 172·0        | 48·9           | ·27        | 2     | 2·0             |
| Perth ... ..                                                     | 104·7     | 27    | 49·8     | 16    | 83·5     | 60·3  | 56·3       | 58        | 161·0        | 40·9           | ·11        | 2     | 3·5             |
| Sydney ... ..                                                    | 96·1      | 30    | 57·4     | 9     | 80·3     | 63·9  | 58·6       | 60        | 137·0        | 47·1           | 1·58       | 16    | 4·9             |
| Wellington ... ..                                                | 71·0      | 12†   | 46·4     | 12    | 63·9     | 52·7  | 49·4       | 72        | 125·0        | 37·0           | 2·87       | 11    | 6·9             |
| Auckland ... ..                                                  | 74·0      | 25    | 50·0     | 9     | 68·0     | 56·0  | 52·7       | 72        | 137·0        | 46·0           | 4·49       | 14    | 4·9             |
| Jamaica, Kingston ... ..                                         | 91·4      | 1     | 64·7     | 10    | 87·6     | 68·6  | 65·4       | 73        | ...          | ...            | 4·83       | 6     | 2·8             |
| Trinidad ... ..                                                  | 90·0      | 19†   | 67·0     | 24    | 86·1     | 69·5  | 71·1       | 86        | 158·0        | 58·0           | 8·68       | 23    | ...             |
| Grenada ... ..                                                   | 85·2      | 4     | 70·0     | 23    | 82·4     | 73·5  | 71·3       | 81        | 140·6        | ...            | 13·17      | 27    | 5·5             |
| Toronto ... ..                                                   | 49·3      | 1     | 6·0      | 10    | 35·2     | 23·0  | ...        | ...       | 60·5         | 3·0            | 2·06       | 19    | ...             |
| Fredericton ... ..                                               | 48·0      | 1,7,8 | -20·0    | 23    | 26·0     | 6·5   | ...        | 83        | ...          | ...            | 3·56       | 14    | 4·8             |
| St. John's, N.B. ... ..                                          | 50·2      | 7, 8  | -4·3     | 23    | 32·9     | 15·5  | ...        | ...       | ...          | ...            | 4·44       | 17    | 5·5             |
| Victoria, B.C. ... ..                                            | 52·0      | 25    | 28·3     | 4     | 43·3     | 36·3  | ...        | 86        | ...          | ...            | 4·88       | 15    | 6·9             |
| Dawson ... ..                                                    | 25·0      | 10    | -49·0    | 29    | -1·5     | -14·6 | ...        | ...       | ...          | ...            | 1·96       | 13    | ...             |

\* and 13. † and 16. ‡ and 20.

MALTA.—Mean temp. of air 55°·3. Average bright sunshine 4·8 hours per day.

Johannesburg.—Bright sunshine 245 hours.

Mauritius.—Mean temp. of air 0°·1 below, dew point 1°·9, and R ·96 in., above, averages. Mean hourly velocity of wind 7·5 miles, or 3·3 below average.

KODAIKANAL.—Bright sunshine 235 hours. Hoar frost on 12 days.

COLOMBO.—Mean temp. of air 77°·7, or 1°·4 below, of dew point equal to, and R 4·29 in. below, average. Mean hourly velocity of wind 11·0 miles.

HONGKONG.—Mean temp. of air 63°·3. Bright sunshine 101·7 hours, or 77 hours below average. Mean hourly velocity of wind 10·5 miles.

Melbourne.—Mean temp. of air 3°·8 above, and R 1·64 in. below, averages.

Sydney.—Mean temp. of air 2°·1 above, and R ·88 in. below, averages.

Wellington.—Bright sunshine 237 hours. R ·53 in. below the average.

TRINIDAD.—R 3·95 in. above the 43 years' average.



RAINFALL OF THAMES VALLEY. - JUNE, 1909.



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.

Map published of River Thames above Teddington, and River Lee above Felstead Weir.

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# Symons's Meteorological Magazine.

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## INTERNATIONAL METEOROLOGICAL MEETING IN LONDON.

By R. G. K. LEMPERT, M.A.

THE last two weeks of June witnessed the assembly in London of a number of distinguished foreign meteorologists. We all agree that progress in meteorology depends to a great extent on co-operation, but the machinery for securing co-operation on the international scale is familiar to few of us. It may, therefore, not be out of place to describe briefly the organization which has grown up in the course of time for dealing with such matters. The body from which all authority derives is known as a "Conference of Directors." All heads of meteorological offices or of independent official observatories are entitled to receive invitations to these conferences. Three meetings on these lines have been held hitherto—at Munich in 1891, at Paris in 1896, and at Innsbruck in 1905.

The conferences appoint a Committee, consisting at the present time of not more than seventeen members, which holds office until the next conference. One of the duties entrusted to the Committee appointed at Innsbruck was that of crystallizing the various precedents set at previous meetings into a comprehensive scheme for regulating international meteorological business, and accordingly, at the meeting held in Paris in 1907, a "règlement" was discussed and approved. This provides that the Committee shall meet, as a rule, once in three years. Each member must belong to a separate country, and must be the Director of an independent meteorological establishment. The functions of the Committee are defined as follows:—"The Committee shall superintend the carrying out of the resolutions adopted at the conferences. It shall make it its business to propose measures likely to prove helpful to the development of science, to bring about uniformity or to foster the maintenance of good relations between the services of different countries, and shall prepare for discussion questions to be submitted to the conferences. Whenever necessary it shall appoint Commissions, whose duty it will be to advance the study of special questions."

These Commissions by affording opportunity for discussion of details across the table, have done much to promote progress. The

meetings which have just been held among us were of this nature. The Commissions which assembled numbered three. (1) The Commission on Weather Telegraphy, consisting of Dr. W. N. Shaw, President; Professor A. Angot, the Head of the French Meteorological Service; Rear-Admiral Herz, Director of the Deutsche Seewarte; Professor Willis L. Moore, Chief of the United States Weather Bureau, and Lieutenant-General Rykatcheff, the Director of the Russian Service. MM. Herz and Rykatcheff were unable to attend; Admiral Herz was represented by Professor Grossmann, of the Deutsche Seewarte. Prof. Moore was accompanied by Mr. C. F. Talman, the Librarian of the Weather Bureau, as Secretary. Dr. P. Polis, the Director of the Meteorological Observatory at Aachen, took part in some of the meetings of the Commission. (2) The Commission on Storm Signals, consisting of the gentlemen named above and the Rev. L. Froc, S.J., Director of the Zi-ka-wei Observatory, Shanghai, which issues storm-warnings for the coasts of China; Professor H. Mohn, Director of the Norwegian Service, and Mr. K. Nakamura, Director of the Central Observatory at Tokio, who was unable to be present. (3) The Solar Commission, which met under the presidency of Sir Norman Lockyer.

The Commission on Weather Telegraphy had on its programme, in the first instance, the question of wireless messages from the Atlantic Ocean as a means of extending to the westward the area mapped in our Daily Weather Reports. Other questions were concerned with the details of the code used in the European system for transmitting the daily messages. One of the most important changes suggested was that of introducing into the messages the barometric "tendency," *i.e.*, the variation of the barometer as shown on a barograph during the three hours preceding the hour of observation.

The second Commission was appointed to discuss the possibility of introducing an international system of storm warning signals. At present each country has its own system, and a signal which means one thing when displayed on one side of the Channel may mean something quite different on the opposite side. Our ocean liners are largely independent of wind, but even in these days of steam there are many small craft, sailing into foreign waters, to which warning of approaching gales is of great importance. The advantage of uniformity in such matters is obvious. The Commission favoured the general adoption of a system in which the different arrangements of two cones are used to indicate the probability of gales from each of the four directions, N.E., S.E., S.W., N.W., and of a hurricane from any quarter.

This Commission also had on its programme the consideration of a proposal made by Father Froc for extending a system now in use on the coast of China for signalling, by semaphore, to the captains of passing vessels the positions and intensities of atmospheric disturbances. A third question submitted was that of the most suitable scale and projection for marine meteorological charts.

The Solar Commission was appointed at the meeting of the International Committee at Southport in 1903, at the suggestion of Sir Norman Lockyer and Dr. Shaw, to further the study of the connection between Meteorology and Solar Physics. The Commission has held two previous meetings, at Cambridge in 1904 and Innsbruck in 1905. It consists of many members but on this occasion only a few were able to attend. They were Sir Norman Lockyer, President, M.M. Angot, Mohn and Shaw, Professor van Everdingen, Director of the Meteorological Service of the Netherlands, Captain Lyons, late Director of the Survey Department of Egypt, and Captain Americo Silvano, until recently the head of the Brazilian Service. The meetings were held in the rooms of the Royal Society.

The subject entrusted to the Commission is a most fascinating one and its successful prosecution promises great rewards. The apparent connection between sunspot frequency and weather, though highly suggestive, cannot be looked upon as definitely established. The problem before us is a vastly complex one and success is likely to crown our efforts in proportion as we learn to regard our globe as one indivisible whole. World Meteorology must be our aim. Progress in the direction of securing data from distant regions is slow, but the last few years have seen a great advance in this direction, due partly to the efforts of the Commission. But what of the discussion of the results? He who has access to a large meteorological library will find much information but he will also find that his data are scattered through many hundreds of volumes and the labour of abstracting them is vast. Moreover many results are unpublished and thus the individual worker finds his efforts to deal with world meteorology hampered at every turn, even though he be fortunate in having access to a library. But where the individual fails, co-operative effort may succeed, and the question to be discussed by the Commission was that of making arrangements for the collection and publication, in convenient form, of the meteorological results, and of the corresponding solar data.

The lighter side of international intercourse was not absent. On Tuesday evening, June 22nd, Dr. Shaw entertained the foreign visitors at dinner in the Hotel Windsor, and invited a number of English men of science to meet them. The gathering at the hotel was preceded by an inspection of the evening work of the Meteorological Office. On Wednesday some of the members visited Cambridge to accept an invitation from the Master and Fellows of Christ's College to a garden party, given in connection with the celebration of the centenary of the birth of Darwin. Later they dined with the Master and Fellows of Emmanuel College. On Saturday the Commission was invited by the Director of the National Physical Laboratory to inspect the laboratory, and also the Kew Observatory. The proceedings terminated with a reception by Sir Norman Lockyer on the evening of Tuesday, June 29th, when Dr. W. J. S. Lockyer showed a fine collection of cloud photographs.

## THE WEATHER OF JUNE, 1909.

By FRED. J. BRODIE.

THE miserably inclement weather of June was due, principally, to a material change in the position of the Atlantic anticyclone, which at this season of the year usually lies well south of the 50th parallel. Last month the borders of the system extended beyond our own western shores, and not infrequently as far north as Iceland; and as the barometer was at the same time low over the Continent, the atmospherical conditions were favourable for the flow of a stream of cold air from the neighbourhood of the Arctic Sea. The only material interruption occurred in the fourth week, when the high pressure system was temporarily broken into by a complex barometrical disturbance, which advanced very slowly across the United Kingdom from the westward, and produced a cyclonic circulation of wind, and extremely unsettled rainy weather in all districts.

In the middle of the month there were three distinct periods of fairly warm weather, but in none of them did the thermometer rise appreciably beyond its normal summer level. The first spell occurred between the 7th and 10th, when shade maxima exceeding  $65^{\circ}$  were registered in many parts of Great Britain, no station recording, however, a reading as high as  $70^{\circ}$ . The second period occurred between the 14th and 16th in Ireland, but a day or two later in England and Scotland. At some time between the 14th and 19th the thermometer rose above  $70^{\circ}$  in nearly all parts of the United Kingdom; a reading of  $75^{\circ}$  being recorded on the 17th at Camden Square, and a reading of  $74^{\circ}$  on the 19th at Greenwich. In the third period, occurring between the 19th and 21st, no station in Ireland or Scotland experienced a shade temperature much above  $65^{\circ}$ , but many places in England went slightly above  $70^{\circ}$ , and Greenwich touched  $73^{\circ}$ . A June in which the thermometer fails to exceed  $75^{\circ}$  in any part of the United Kingdom may certainly be regarded as a most exceptional month. At Westminster, the highest reading ( $71^{\circ}$  on the 17th) was lower than in any other June since 1879, when the absolute maximum temperature was the same as this year.

The deficiency of warmth last month was most marked in the daytime, but the nights were sometimes also very cool. Between the 3rd and 7th, the screened thermometer fell slightly below the freezing point in many western and northern districts; while instruments exposed on the grass sank to  $21^{\circ}$  at Llangammarch Wells, to  $26^{\circ}$  or  $27^{\circ}$  in the north of England, and to  $29^{\circ}$  as far south as London. Over the northern half of the kingdom, another ground frost occurred between the 10th and 12th, when the exposed thermometer fell to  $23^{\circ}$  at Crathes and Llangammarch Wells, and to  $25^{\circ}$  at Birmingham (Edgbaston). In the latter part of the month the sky was too cloudy to permit of much terrestrial radiation, so that while the night temperatures were often low, nothing more than a suspicion of frost was reported in any district.

Owing more to the absence of summer warmth than to the prevalence of great cold, the mean temperature of the month was below the average over the whole kingdom. In this respect, however, and also as regards sunshine and rainfall, the weather in Ireland and Scotland was less unfavourable than in England; the general conditions showing a complete reversal of those which obtained in the preceding month. In May, the duration of bright sunshine over the south of England was, it will be remembered, the highest on record for the month, and in some localities, including London, it was the highest on record for any time in the year. Last month the duration in the same district was the smallest on record for June, and in some places it was the smallest on record for any summer month. In an average June, the mean daily duration of bright sunshine at Westminster amounts to rather more than  $5\frac{1}{2}$  hours; last month it was only a trifle over 3 hours, and was considerably less than one-third of the daily allowance in May. In the western and northern parts of the United Kingdom the sunshine record for last month was not much below the average, and at some places in the South of Ireland and in South Wales it was slightly in excess of the normal.

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### THE RAINFALL OF JUNE, 1909.

OUR Tables of rainfall this month show that June proved exceptionally dry in Scotland and Ireland, especially on the west coast, in striking contrast to the extreme, though by no means unprecedented, wetness of the south of England. There was no part of Ireland with so much as four inches of rain, and only a small part of the south of Scotland had as much. The north of England also had a comparatively slight excess where there was an excess at all, but the whole of England south-east of a line joining the Bristol Channel and the Wash had a large excess of rainfall. On the map for the month more than four inches are seen to have fallen in most parts of the country between Hampshire on the south and Warwickshire and Cambridgeshire on the north, and between Cornwall on the west and Suffolk on the east. The greater part of Hampshire received more than five inches, and patches of an equally heavy fall occurred in Oxfordshire, Buckinghamshire, Cambridgeshire and Suffolk, while at two points the total June fall reached or surpassed six inches. The general distribution recalled that of the very severe June of 1903; but that was due to eight very wet days; this to a wet and cloudy month.

The districts in which the rainfall was greatest appear on our monthly map of the Thames Valley and surrounding country, the greater part of which received more than four inches of rain, and several patches of considerable size had more than five inches; the largest of these extended from Winchester to Basingstoke, and others were near Aldermaston in Berkshire, round Chesham, near Woodstock and Burford, north-east of Cambridge, and in the extreme north-east of the map where more than six inches fell at Cockfield.

The rainfall of England and Wales was, as a whole, 141 per cent. of the average; that of Scotland on the other hand was only 69 per cent. of the average, the month having been a dry one, and the rainfall of Ireland came out as 83 per cent. of the average, while the British Isles as a whole had 110 per cent., the actual volume of rain which fell on our Islands being very little above the average.

At Camden Square the rainfall was 3·79 in., but here June has been wetter on eight occasions, the fall for the month having been as much as 6·43 in. in 1903 and 6·71 in. in 1878. Taking into account temperature as well as rainfall the only June, since the record began in 1858, which can compete in unseasonable dreariness with that of 1909 was that of 1860, which though not quite so cold abounded more in rain.



### THE TEMPERATURE OF LONDON IN JUNE, 1909.

THE long record of rainfall and temperature in Camden Square was commenced by the late Mr. Symons in 1858, and during the half century which has since elapsed every variety of weather has been recorded in almost every degree so that it is rare, and yearly becoming rarer, to find a day, a month or a year more extreme in any particular than some one which has gone before. We therefore consider it worth while to put on record the fact that June, 1909, was in some respects the coldest June of the period over which our observations extend. (We beg any journalists who may do us the honour of quoting this statement to quote also the limitation that we speak of London only, and not of the whole country. It is most probable that this petition will be disregarded; our experience is full of instances of the detestation of the paragraphist for saving clauses. The latest was so much in point that we enlarge our parenthesis to include it. We were quoted as having said that June was a wet month with a large number of rain days, and on this text a journalist made the gloss that it was poor comfort indeed for the unfortunate people who had chosen June as the month for their holiday. As a matter of fact the contrary was the case. Outside London there were wide stretches of country where the sun shone and showers were few, and from a properly chosen holiday haunt the number of wet days in London could only appear as an added charm.)

Temperature may be compared in various ways of which we will refer to three:—(1) the maximum temperature in the shade, (2) the minimum temperature in the shade, and (3) the mean temperature.

In June, 1909, at Camden Square the mean of all the daily maximum temperatures was 63°·9, or 7°·4 less than the average for 40 years, which is 71°·3. This was the lowest in the record, showing a great want of afternoon warmth; the lowest previously recorded was 64°·7 in June, 1860. The highest temperature reached by the air at any time in June, 1909, was 75·1 on the 17th; but on three occasions, denoted in heavy type in the table, there had been Junes which failed to show so much, the worst being June, 1860, with 71°·9. The lowest maximum temperature for the month was 55°·1; but

there were nine earlier occasions when one afternoon failed to surpass that figure. It must be remembered that a single high or low temperature has only a small effect in altering the average of the thirty which go to the month; but a low mean can only result from a preponderance of low values.

The mean minimum temperature in the shade for June, 1909, was  $48^{\circ}5$ , and it was lower on only two occasions, in 1871 by one fifth of a degree, and in 1869 by  $1^{\circ}6$ . The highest shade minimum for the month was  $57^{\circ}4$ ; but in ten earlier years the highest had not gone above this, and the lowest shade minimum in the month was  $39^{\circ}0$ , lower values having been recorded on six occasions. The coldness of the month was thus due rather to cool days than to cold nights, and taking account of all conditions of temperature—highest, lowest, 9 a.m. and 9 p.m.—the mean temperature of June, 1909, comes out at  $55^{\circ}6$ , an unprecedentedly low figure,  $4^{\circ}8$  below the average mean temperature of the month, which is  $60^{\circ}4$ , and nearly a degree lower than that of the coldest previous June; 1860, when it was  $56^{\circ}4$ .

The Table prepared to accompany this article gives the data for every year in which any one of the temperature conditions was as low as in 1909, or lower. The coldness of June was no doubt due to the small amount of sunshine. We have not a sufficiently long sunshine record to afford a good comparison though other London records show that it was the least sunny June since they were established.

*Temperature Records at Camden Square in the Month of June.*

| Year. | SHADE MAX. TEMP. |                  |         |         | SHADE MIN. TEMP. |                  |         |         | MEAN TEMP. |                  | Year. |
|-------|------------------|------------------|---------|---------|------------------|------------------|---------|---------|------------|------------------|-------|
|       | Mean.            | Diff. from Aver. | Highest | Lowest. | Mean.            | Diff. from Aver. | Highest | Lowest. | Mean.      | Diff. from Aver. |       |
| 1860  | 64.7             | -6.6             | 71.9    | 55.3    | 49.6             | -1.3             | 57.9    | 43.4    | 56.4       | -4.0             | 1860  |
| 1861  | 71.2             | -0.1             | 83.6    | 58.0    | 50.9             | 0.0              | 56.4    | 42.0    | 60.6       | +0.2             | 1861  |
| 1864  | 70.5             | -0.8             | 78.2    | 56.3    | 50.2             | -0.7             | 57.4    | 42.7    | 59.4       | -1.0             | 1864  |
| 1869  | 68.6             | -2.7             | 89.3    | 54.9    | 46.9             | -4.0             | 56.2    | 35.6    | 57.4       | -3.0             | 1869  |
| 1871  | 66.8             | -4.5             | 76.0    | 57.2    | 48.3             | -2.6             | 57.4    | 39.0    | 56.5       | -3.9             | 1871  |
| 1875  | 72.3             | +1.0             | 85.1    | 62.1    | 50.9             | 0.0              | 56.5    | 43.3    | 60.7       | +0.3             | 1875  |
| 1879  | 67.1             | -4.2             | 74.0    | 57.0    | 50.6             | -0.3             | 57.3    | 40.6    | 58.1       | -2.3             | 1879  |
| 1880  | 69.1             | -2.2             | 79.8    | 59.6    | 50.1             | -0.8             | 57.0    | 38.3    | 58.6       | -1.8             | 1880  |
| 1881  | 70.6             | -0.7             | 82.7    | 55.6    | 50.4             | -0.5             | 58.2    | 37.4    | 60.1       | -0.3             | 1881  |
| 1882  | 66.8             | -4.5             | 74.3    | 58.6    | 49.4             | -1.5             | 56.6    | 41.5    | 57.8       | -2.6             | 1882  |
| 1886  | 69.6             | -1.7             | 80.2    | 54.7    | 49.2             | -1.7             | 55.0    | 40.2    | 58.5       | -1.9             | 1886  |
| 1888  | 68.1             | -3.2             | 84.7    | 54.7    | 50.8             | -0.1             | 61.3    | 43.9    | 58.6       | -1.8             | 1888  |
| 1889  | 72.7             | +1.4             | 84.5    | 53.5    | 53.4             | +2.5             | 61.6    | 46.9    | 62.1       | +1.7             | 1889  |
| 1892  | 69.6             | -1.7             | 82.7    | 54.3    | 49.6             | -1.3             | 59.3    | 38.6    | 58.9       | -1.5             | 1892  |
| 1893  | 74.9             | +3.6             | 90.4    | 64.8    | 51.4             | +0.5             | 59.2    | 38.3    | 62.2       | +1.8             | 1893  |
| 1897  | 71.7             | +0.4             | 87.8    | 55.1    | 53.0             | +2.1             | 62.3    | 43.3    | 61.9       | +1.5             | 1897  |
| 1900  | 72.2             | +0.9             | 90.1    | 54.4    | 52.3             | +1.4             | 60.3    | 45.8    | 61.4       | +1.0             | 1900  |
| 1903  | 67.5             | -3.8             | 85.9    | 50.8    | 48.6             | -2.3             | 61.3    | 39.7    | 57.6       | -2.8             | 1903  |
| 1904  | 70.1             | -1.2             | 76.7    | 61.1    | 49.4             | -1.5             | 54.4    | 43.1    | 59.2       | -1.2             | 1904  |
| 1905  | 71.3             | 0.0              | 81.9    | 52.5    | 53.0             | +2.1             | 59.7    | 46.2    | 61.4       | +1.0             | 1905  |
| 1907  | 67.0             | -4.3             | 78.0    | 58.0    | 50.4             | -0.5             | 56.1    | 43.9    | 58.0       | -2.4             | 1907  |
| 1909  | 63.9             | -7.4             | 75.1    | 55.1    | 48.5             | -2.4             | 57.4    | 39.0    | 55.6       | -4.8             | 1909  |

## Correspondence.

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

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**JUNE, 1909.**

THIS must have been one of the coldest Junes on record. I have registered as follows:—

| Maximum. | Minimum. | Mean. | Grass. |
|----------|----------|-------|--------|
| 59°·2    | 44°·9    | 52°·1 | 40°·5  |

The next lowest in 30 years are:—

| Maximum.     | Minimum.     | Mean.        | Grass.       |
|--------------|--------------|--------------|--------------|
| 59°·7 (1907) | 45°·0 (1903) | 53°·2 (1907) | 41°·2 (1903) |

The mean temperature is thus 1°·1 below any other June since and including 1879.

CHARLES LEWIS BROOK.

*Harewood Lodge, Meltham, July 7th, 1909.*

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**CLOUD OBSERVATIONS, JUNE, 1909.**

THE presence of mammato-cumulus cloud being of infrequent occurrence, it is, perhaps, somewhat remarkable to have to chronicle its appearance upon three days during the month of June, the 1st, 13th, and 26th. The formation on the 13th was of such an unstable and fleeting character that it must be dismissed without further remark. On the 1st, the weather becoming showery towards 4 p.m., cumulo-nimbus spread over from S.W. (the surface wind being N.), and at 4.30 p.m. at the zenith, a well-developed form of mammato-cumulus cloud was apparent; the cloud moved from a S.W. point, and was visible nearly ten minutes, when a very rapid coalescence of the balls of cloud took place. A thunderstorm and heavy rain followed five hours afterwards. On the 26th, towards 3.30 p.m., cumulo-nimbus (thunder clouds) gathered in N.W. and W., and moved slowly across the sky from N.W. (the surface wind being S.W.). At 4 p.m. mammato-cumulus again formed, near the zenith, the well-developed shape of the cloud balls closely approximating to figure 26 of the "International Cloud Atlas." The cloud moved very sluggishly from N.W., and remained visible nearly 20 minutes. A rainfall of seventeen hours duration followed. The formation of this cloud appears to be an indication of very disturbed conditions, and a precursor of heavy rain.

On June 27th an observation was obtained of the apparent absorption of cirro-cumulus by cumulus. Massive cumulus formed about half-an-hour after sunset; at the time there were small drifts of cirro-cumulus over the sky. The passage of the cumulus across the cirro-cumulus was followed by a complete disappearance of the latter cloud.

SPENCER C. RUSSELL.

*Epsom, July 3rd, 1909.*

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### SOME RELATIONS OF JUNE.

It is useful, I think, to compare the rainfall of June (at Greenwich) with the character of the summer season as a whole.

If June has more than 3 inches, it seems rare for the days with 80° or more, or with 70° or more, to be in excess. Such Junes occurred in 1848, 1852, 1860, 1863, 1866, 1878, 1879, 1888, 1902, 1903, 1905 (eleven cases). Only in 1852 had the season an excess of days with 80° or more (21 = + 6; and only in 1848 an excess of days with 70° or more (79 = + 2).

Similarly, with such Junes, the rainfall of summer as a whole (3 months) is usually over average (6·75 in.) In one case only, 1863, was it under (slightly, 6·61 in.) On the other hand, when June has less than 1·50 in. the summer rainfall is pretty sure to be under average (21 cases to 3).

“A wet June makes a dry September.” In a little book on “Observing and Forecasting the Weather,” I find Mr. Horner refers to this saying as “almost invariably true.” I don't think, however, it holds for Greenwich. Thus, in the 68 years, 1841–1908, there were 30 Junes wet (rainfall over average); September was wet in 14 cases, dry in 16—too small a difference. Curiously, however, on further analysis the “saw” would appear to be justified by the experience since 1883, for 12 wet Junes (since then) have been followed by a dry September, and only one by a wet. But from 1841 to 1883 it is distinctly the other way, only 4 wet Junes followed by a dry September, 13 by a wet. Thus the “saw” does not seem to help us much, unless a relation which has prevailed for the last 26 years is likely to continue. As for dry Junes, these were followed about twice as often by a dry September as by a wet (26 to 12).

ALEX. B. MACDOWALL.

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### MAY SUNSHINE RECORDS.

I HAVE been informed that in *Symons's Meteorological Magazine* for this month there is a paragraph about the remarkable record of bright sunshine at Falmouth during the 22 days, April 30th to May 21st, both inclusive, the number of hours being 262·1.

Upon looking up the record taken by one of Messrs. Negretti and Zambra's Campbell-Stokes' sunshine recorders belonging to this Council, I find that the total recorded is 286·6 hours, and enclose you a copy of the daily record herewith, thinking that you may be interested therein :—

|                 |           |                |           |
|-----------------|-----------|----------------|-----------|
| 30th April..... | 12·6 hrs. | 12th May ..... | 13·0 hrs. |
| 1st May.....    | 12·8 „    | 13th „ .....   | 13·2 „    |
| 2nd „ .....     | 14·0 „    | 14th „ .....   | 10·0 „    |
| 3rd „ .....     | 13·2 „    | 15th „ .....   | 14·0 „    |
| 4th „ .. .....  | 13·6 „    | 16th „ .....   | 6·8 „     |
| 5th „ .....     | 14·2 „    | 17th „ .....   | 13·2 „    |
| 6th „ .....     | 14·0 „    | 18th „ .....   | 14·0 „    |
| 7th „ .....     | 13·6 „    | 19th „ .....   | 14·8 „    |
| 8th „ .....     | 14·0 „    | 20th „ .....   | 14·6 „    |
| 9th „ .....     | 14·2 „    | 21st „ .....   | 11·6 „    |
| 10th „ .....    | 11·2 „    |                |           |
| 11th „ .....    | 14·0 „    | Total ...      | 286·6 „   |

*Urban District Council, Town Hall,  
Ilfracombe, 26th June, 1909.*

OSWALD M. PROUSE.

NORTH DEVON was favoured with brilliant weather during the twenty-two days, April 30th to May 21st, as the following records show :—

Ilfracombe, 286·6 hours, daily average 13 hours ; on 16 days the duration was over 13 hours, the longest being 14·8 on the 19th.

Woolacombe, 270·5 hours, daily average 12·2 hours ; on 10 days the average was 13 hours or over, the longest duration 14·5 on the 19th.

THOS. WAINWRIGHT.

*Barnstaple, 26th June, 1909.*

[No records of *June* sunshine have been sent in to us from watering places or health resorts ; the contrast with May could not fail to be extremely interesting.—Ed., *S.M.M.*]

### JUNE FROST.

ONE degree of frost was registered here during early a.m. of 8th inst. ; the following being readings of Kew verified thermometers :—

Screen min., 38°·7                      Grass min., 31°·0.

This is the first June frost experienced at this station since observations commenced—six years ago.

W. J. CARTER.

*Montem Road, New Malden, June 9th, 1909.*

## A SHELTERED RAIN GAUGE

FEARING that a yew hedge to the west of my rain gauge, though at a greater distance than its height, might prevent some rain falling into the gauge, I placed on the 1st January a new gauge at a distance of 108 feet in a south-easterly direction on a lawn in a perfectly open position. I have continued to take readings from the old gauge, and am interested to find that every month the partially screened gauge has given a larger total than the new gauge on the open ground, the difference for the six months being half an inch. The figures are :—

|                | New Gauge. |       | Old Gauge. |
|----------------|------------|-------|------------|
| January.....   | 2·00 in.   | ..... | 2·13 in.   |
| February ..... | 2·20 „     | ..... | 2·23 „     |
| March.....     | 2·67 „     | ..... | 2·79 „     |
| April .....    | 3·49 „     | ..... | 3·61 „     |
| May.....       | 1·98 „     | ..... | 2·01 „     |
| June .....     | 2·27 „     | ..... | 2·33 „     |
| Total .....    | 14·61 „    | ..... | 15·10 „    |

*Hampson-in-Ellel, Lancaster.*

W. G. WELCH.

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**DINNER OF THE ROYAL METEOROLOGICAL SOCIETY.**

THE Third Annual Dinner of the Royal Meteorological Society was held at the Trocadero Restaurant, Piccadilly Circus, on Tuesday evening, June 15th, the attendance of Fellows being supplemented by guests invited by the President and the Council. The seating of the company in small groups at separate tables gave a pleasing effect and also tended to promote conversation. The speakers were at a long table, so as to be seen and heard easily by all the others in the room.

The President, Mr. H. Mellish, occupied the chair, and the company included the following (the names of the guests being printed in small capitals :—Mr. F. Campbell Bayard, Mr. R. Bentley, Mr. F. J. Brodie, Capt. F. G. P. Butler, Capt. W. F. Caborne, C.B., Mr. C. J. P. Cave, SIR WILLIAM CHURCH, Bart., President of the Royal Society of Medicine, Mr. J. E. Clark, Capt. M. H. Clarke, Mr. R. Cooke, Mr. R. Cross, Major H. A. Cummins, MR. T. S. DYMOND, Mr. F. B. Edmonds, Mr. H. N. Farrington, Mr. L. R. W. Forrest, SIR DAVID GILL, K.C.B., F.R.S., Mr. E. Gold, Dr. Gordon, REV. DR. J. Gow, Headmaster of Westminster School, Mr. W. Vaux Graham, Mr. N. Holden, Mr. R. Inwards, Mr. A. P. Jenkin, Mr. B. Lailey, Mr. Baldwin Latham, Mr. G. B. Latham, Mr. R. G. K. Lempfert, Capt. W. G. Lingham, Dr. W. J. S. Lockyer, MR. A. MALLOCK, F.R.S., Mr. S. S. Markham, Mr. W. E. Markham, Mr. W. Marriott, Mr. W. J. Marriott, Dr. H. R. Mill,

Mr. H. W. Monckton, Mr. R. Mond, Mr. P. P. Pennant, Col. H. E. Rawson, C.B., Mr. C. Salter, Dr. R. H. Scott, F.R.S., Mr. W. Sedgwick, Dr. W. N. Shaw, F.R.S., Mr. C. H. Thompson, Dr. J. H. T. TUDSBERY, Mr. S. G. Warner and Dr. C. Theodore Williams.

The musical arrangements were under the direction of Mr. H. Schartau.

After the usual loyal toasts had been proposed by the President, Dr. H. R. Mill proposed "Kindred Institutions" and associated with it the names of Sir David Gill, President of the Royal Astronomical Society, and Sir William Church, President of the Royal Society of Medicine.

Sir David Gill, referring to his stay at the Cape Observatory, said that in the Colonies it seems to be thought by the public that the duties of an astronomer are to make meteorological predictions. He, however, used to explain that his kingdom began at the moon and extended outwards; or else, that he never prophesied unless he knew, and he did not know. He also stated that in meteorology there is the peculiarity that while meteorological observations are of themselves perhaps in their simpler forms the easiest to make, we have yet to find the meteorological Newton able to cope with the highest flights of meteorology; and when found he would have to tackle a problem so enormously complicated that the work of Newton and Adams would be child's play compared with it.

Sir William Church, in acknowledging the toast, said that meteorology necessarily is of interest to most of those who practice medicine as climate plays its part in the treatment of disease.

The Rev. Dr. J. Gow, Headmaster of Westminster School, proposed the toast of "The Royal Meteorological Society."

The President in responding expressed regret at the absence of Professor Willis Moore whose ship was delayed on the Atlantic, and of several others who had hoped to be present, and then referred to some branches of the work which the Society is carrying on, especially with regard to education and research.

Mr. Richard Bentley proposed the toast of "The Visitors," to which Dr. J. H. T. Tudsbery, Secretary of the Institution of Civil Engineers, responded.

Dr. W. N. Shaw then proposed the toast of "The Chairman," and the President briefly replied.

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## ROYAL METEOROLOGICAL SOCIETY.

THE last meeting for the present session was held in the Society's rooms, 70, Victoria Street, Westminster, on Wednesday afternoon, June 16th, Mr. H. Mellish, President, in the chair.

A paper by Mr. R. C. Mossman on the "Interdiurnal Variability

of Temperature in Antarctic and sub-Antarctic regions," was read by the Secretary. The author discussed the day to day difference in the mean temperature of successive days at a few places in the Antarctic regions, for which the necessary detailed daily observations are available. The greatest mean annual temperature variability, viz.  $5^{\circ}9$ , was recorded during the drift of the *Belgica* in the ice pack, this high value being closely followed by a mean of  $5^{\circ}3$  at the South Orkneys. In the Victoria Land region, Ross Island and Cape Adare have a somewhat lower temperature variability of  $4^{\circ}5$ , the values of the southern station being higher in summer and autumn, and lower in winter and spring than at the northern station. South Georgia occupies an intermediate position between a continental and an oceanic climate in its curve of variability, the mean monthly values varying according to the proximity of the pack ice. At this station the seasonal values show a small variation, and this is also the case at Ushuaia in Tierra del Fuego. The variability at the Falkland Islands and New Year's Island is very small, pointing to the conserving influence exerted by the insular conditions which prevail at these places. The maximum variability occurs in winter, and the minimum in summer, at the three Antarctic stations as well as at South Georgia and the South Orkneys. The smallest variability at any season for any station occurs at the South Orkneys in summer, being only  $1^{\circ}4$ . It is at this season that cloud amount and fog frequency are at a maximum, while at the same time rapidly moving cyclonic disturbances are of infrequent occurrence.

Mr. W. W. Bryant, Colonel H. E. Rawson, Dr. W. N. Shaw, Mr. W. B. Tripp, Mr. W. Marriott, and the President took part in the discussion.

Mr. Ernest Gold described some experiments which he and Dr. W. Schmidt, of Vienna, had made with a view of ascertaining if appreciable errors could enter into the temperatures recorded in balloon ascents, owing to errors in the alcohol-carbonic acid method of testing the apparatus.

Mr. F. Campbell Bayard, Mr. W. W. Bryant, Mr. C. J. P. Cave, Dr. W. N. Shaw, and the President took part in the discussion, and Mr. Gold replied.

A paper by Mr. L. C. W. Bonacina, advocating the use of freely exposed thermometers in addition to sheltered ones, was read by the Secretary. Mr. W. D. Horner, Mr. F. J. Brodie, Dr. H. R. Mill, Mr. C. J. P. Cave, Mr. W. Marriott, Mr. W. W. Bryant, Mr. R. Inwards, and the President took part in the discussion.

The following gentlemen were elected Fellows of the Society:—  
Mr. Edward C. Burton, Mr. Cecil Broadbent, and Mr. Bankim C. Sen.

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## REVIEWS.

*The Force of the Wind*, by HERBERT CHATLEY, B.Sc. Illustrated. London, Charles Griffin & Co., Ltd., 1909. Size  $7\frac{1}{2} \times 5$ . Pp. viii + 84. Price 3s. net.

THE author classifies the practical problems in which wind-force plays a part into (1) Wind Load on structures, (2) Resistance to Moving Bodies, (3) Power Production; the second including problems of resistance to trains and flying machines. The theory of stream lines is introduced to explain the action of wind on obstacles, and a series of interesting diagrams is given showing the action of wind in producing eddies on coming in contact with an obstruction. This is the part of the subject which is of interest in the disturbance of rainfall measurements by high wind. The treatment of wind-force could not well be more terse or pointed than the author has succeeded in making it.

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*Chambers's Wonder Books. The Atmosphere.* By EDWIN J. HOUSTON, Ph.D. New York, Frederick A. Stokes Company. London and Edinburgh, W. & R. Chambers, Ltd. 1908. Size  $7\frac{1}{2} \times 5\frac{1}{2}$ . Pp. [viii.] + 326.

A POPULAR book touching lightly on many interesting phenomena of the atmosphere, but apparently written at different times. The references to weather and weather predictions apply mainly to the United States. It would be a good exercise for a student to determine the dates of the various chapters by considering the internal evidence. As an introduction to the study of the air the book should be useful, as the style is likely to attract readers, and the subject matter to interest them.

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*Observing and Forecasting the Weather. Meteorology without Instruments.* By D. W. HORNER, F.R.Met.Soc. Second edition. London, Witherby & Co. Price 6d. net. Size  $7\frac{1}{2} \times 5$ . Pp. 48. Plates.

THIS pamphlet has been revised and enlarged, and in its new form with illustrations is much improved. The statement on p. 11 that when stratus cloud is *high* it produces intense gloom seems to us erroneous, though it is true that, as stated, when in contact with the ground it forms fog. Extensive low stratus within a very small distance of the ground is, no doubt, meant as the cloud which produces intense gloom.

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## METEOROLOGICAL NEWS AND NOTES.

BRITISH RAINFALL 1908, is now in an advanced stage of preparation, and several sheets have already been printed off. It is still possible, however, to find room in the General Table for late returns if they are sent in within a week of the publication of this number. Any reader who knows of rainfall records which have not yet appeared in *British Rainfall* would help in making the new volume more complete by writing on the subject to the Editor, at 62, Camden Square, London, N.W.

WIRELESS WEATHER MESSAGES are now being received daily at the Meteorological Office, giving the height of the barometer as observed on Atlantic steamers, and although the hour of the observations varies, and the time of arrival does not always enable the figures to be utilized, there have been occasions recently in which the drawing of the isobars over the Atlantic on the charts in the *Daily Weather Report* has been facilitated by figures received in time.

THE DREARY JUNE and its continuation through the early part of July will lead many readers to sympathize with the member of the Athenæum Club, who sends to *The Times* of July 12th, as an apt quotation, the dismal lines of Tennyson—

“ Midnight—and joyless June gone by,  
And from the deluged park  
The cuckoo of a worse July  
Is calling through the dark.”

PRAYERS FOR RAIN AND FINE WEATHER form the subject of a letter in a country newspaper of July 9th, 1909, which we quote below.

Sir,—Some time since a letter appeared in your columns from the Bishop requesting the clergy to intercede for rain, and (if in direct answer or not, I know not) we seem to be getting a little. In view of the present great necessity for reverse conditions, would it not be well if we prayed for fair weather?

Perhaps a request from our worthy Bishop would lead to such petitions on the coming Sunday?—Yours truly,  
H. D. R.

ERRATUM.—To explain a joke is a dreary business, and to have to explain that a statement was not a joke but a blunder is not much more agreeable. On p. 93 of our last issue “Snow on April 31st” was reported and escaped the eyes of the Editor and Printer, and of all their assistants, until a correspondent wrote for enlightenment, “as it was beyond his brain-power to see the joke.” For 31st read 30th.

## RAINFALL TABLE FOR JUNE, 1909.

| STATION.                           | COUNTY.              | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.    |              |
|------------------------------------|----------------------|------------|----------------------|--------------------------------|--------------------------|--------------|
|                                    |                      |            |                      |                                | Aver.<br>1870-99.<br>in. | 1909.<br>in. |
| Camden Square.....                 | London.....          | 51 32      | 0 8                  | 111                            | 2'09                     | 3'79         |
| Tenterden.....                     | Kent.....            | 51 4       | *0 41                | 190                            | 1'96                     | 2'68         |
| West Dean.....                     | Hampshire.....       | 51 3       | 1 38                 | 137                            | 2'02                     | 3'30         |
| Hartley Wintney.....               | ".....               | 51 18      | 0 53                 | 222                            | 1'89                     | 4'58         |
| Hitchin.....                       | Hertfordshire.....   | 51 57      | 0 17                 | 238                            | 1'89                     | 4'95         |
| Winslow (Addington).....           | Buckinghamshr.....   | 51 58      | 0 53                 | 309                            | 1'99                     | 3'68         |
| Bury St. Edmunds (Westley).....    | Suffolk.....         | 52 15      | *0 40                | 226                            | 2'04                     | 3'50         |
| Brundall.....                      | Norfolk.....         | 52 37      | *1 26                | 66                             | 1'89                     | 2'75         |
| Winterbourne Steepleton.....       | Dorset.....          | 50 42      | 2 31                 | 316                            | 2'32                     | 3'82         |
| Torquay (Cary Green).....          | Devon.....           | 50 28      | 3 32                 | 12                             | 2'13                     | 4'34         |
| Polapit Tamar [Launceston].....    | ".....               | 50 40      | 4 22                 | 315                            | 2'12                     | 2'65         |
| Bath.....                          | Somerset.....        | 51 23      | 2 21                 | 67                             | 2'31                     | 2'68         |
| Stroud (Upfield).....              | Gloucestershire..... | 51 44      | 2 13                 | 226                            | 2'23                     | 2'97         |
| Church Stretton (Wolstaston).....  | Shropshire.....      | 52 35      | 2 48                 | 800                            | 2'46                     | 4'18         |
| Coventry (Kingswood).....          | Warwickshire.....    | 52 24      | 1 30                 | 340                            | 2'41                     | 3'17         |
| Boston.....                        | Lincolnshire.....    | 52 58      | 0 1                  | 25                             | 1'94                     | 3'38         |
| Worksop (Hodsock Priory).....      | Nottinghamshire..... | 53 22      | 1 5                  | 56                             | 2'24                     | 3'08         |
| Derby (Midland Railway).....       | Derbyshire.....      | 52 55      | 1 28                 | 156                            | 2'70                     | 2'26         |
| Bolton (Queen's Park).....         | Lancashire.....      | 53 35      | 2 28                 | 390                            | 3'21                     | 2'96         |
| Wetherby (Ribston Hall).....       | Yorkshire, W. R..... | 53 59      | 1 24                 | 130                            | 2'38                     | 3'36         |
| Arnccliffe Vicarage.....           | ".....               | 54 8       | 2 6                  | 732                            | 3'69                     | 3'95         |
| Hull (Pearson Park).....           | "..... E. R.....     | 53 45      | 0 20                 | 6                              | 2'12                     | 3'16         |
| Newcastle (Town Moor).....         | Northumberland.....  | 54 59      | 1 38                 | 201                            | 2'03                     | 2'18         |
| Borrowdale (Seathwaite).....       | Cumberland.....      | 54 30      | 3 10                 | 423                            | 6'97                     | 4'74         |
| Cardiff (Ely).....                 | Glamorgan.....       | 51 29      | 3 13                 | 53                             | 2'53                     | 2'18         |
| Haverfordwest (High Street).....   | Pembroke.....        | 51 48      | 4 58                 | 95                             | 2'61                     | 1'93         |
| Aberystwyth (Gogerddan).....       | Cardigan.....        | 52 26      | 4 1                  | 83                             | 2'93                     | 2'94         |
| Llandudno.....                     | Carnarvon.....       | 53 20      | 3 50                 | 72                             | 2'00                     | 1'95         |
| Cargen [Dumtries].....             | Kirkcudbright.....   | 55 2       | 3 37                 | 80                             | 2'68                     | 3'04         |
| Hawick (Branxholm).....            | Roxburgh.....        | 55 24      | 2 51                 | 457                            | 2'21                     | 2'00         |
| Edinburgh (Royal Observatory)..... | Midlothian.....      | 55 55      | 3 11                 | 442                            | ...                      | 1'91         |
| Girvan (Pinmore).....              | Ayr.....             | 55 10      | 4 49                 | 207                            | 2'95                     | 3'30         |
| Glasgow (Queen's Park).....        | Renfrew.....         | 55 53      | 4 18                 | 144                            | 2'70                     | 2'98         |
| Inveraray (Newtown).....           | Argyll.....          | 56 14      | 5 4                  | 17                             | 3'64                     | 2'06         |
| Mull (Quinish).....                | ".....               | 56 36      | 6 13                 | 35                             | 3'55                     | 1'19         |
| Dundee (Eastern Necropolis).....   | Forfar.....          | 56 28      | 2 57                 | 199                            | 2'15                     | '83          |
| Braemar.....                       | Aberdeen.....        | 57 0       | 3 24                 | 1114                           | 2'44                     | 1'38         |
| Aberdeen (Cranford).....           | ".....               | 57 8       | 2 7                  | 120                            | 2'09                     | 1'39         |
| Cawdor.....                        | Nairn.....           | 57 31      | 3 57                 | 250                            | 2'24                     | 1'49         |
| Fort Augustus (S. Benedict's)..... | E. Inverness.....    | 57 9       | 4 41                 | 68                             | 2'28                     | '75          |
| Loch Torridon (Bendamp).....       | W. Ross.....         | 57 32      | 5 32                 | 20                             | 4'78                     | 1'45         |
| Dunrobin Castle.....               | Sutherland.....      | 57 59      | 3 56                 | 14                             | 2'14                     | 1'93         |
| Castletown.....                    | Caithness.....       | 58 35      | 3 23                 | 100                            | ...                      | 1'94         |
| Killarney (District Asylum).....   | Kerry.....           | 52 4       | 9 31                 | 178                            | 3'29                     | 1'79         |
| Waterford (Brook Lodge).....       | Waterford.....       | 52 15      | 7 7                  | 104                            | 2'61                     | 2'30         |
| Broadford (Hurdlestown).....       | Clare.....           | 52 48      | 8 38                 | 167                            | 2'52                     | 3'22         |
| Abbey Leix (Blandsfort).....       | Queen's County.....  | 52 56      | 7 17                 | 532                            | 2'43                     | 3'51         |
| Dublin (Fitz William Square).....  | Dublin.....          | 53 21      | 6 14                 | 54                             | 1'95                     | 1'96         |
| Mullingar (Belvedere).....         | Westmeath.....       | 53 29      | 7 22                 | 367                            | 2'73                     | 2'37         |
| Ballinasloe.....                   | Galway.....          | 53 20      | 8 15                 | 160                            | 2'69                     | 1'94         |
| Crossmolina (Ennisco).....         | Mayo.....            | 54 4       | 9 18                 | 74                             | 2'95                     | 1'94         |
| Collooney (Markree Obsy.).....     | Sligo.....           | 54 11      | 8 27                 | 127                            | 3'16                     | 1'85         |
| Seaford.....                       | Down.....            | 54 19      | 5 50                 | 180                            | 2'72                     | 2'76         |
| Londonderry (Creggan Res.).....    | Londonderry.....     | 54 59      | 7 19                 | 320                            | 2'92                     | 1'49         |
| Omagh (Edenfel).....               | Tyrone.....          | 54 36      | 7 18                 | 280                            | 2'88                     | 1'21         |

RAINFALL TABLE FOR JUNE, 1909—*continued.*

| RAINFALL OF MONTH (con.) |            |                   |       |             | RAINFALL FROM JAN. 1. |       |                      |            | Mean Annual 1870-1899. | STATION.            |
|--------------------------|------------|-------------------|-------|-------------|-----------------------|-------|----------------------|------------|------------------------|---------------------|
| Diff. from Av. in.       | o/o of Av. | Max. in 24 hours. |       | No. of Days | Aver. 1870-99.        | 1909. | Diff. from Aver. in. | o/o of Av. |                        |                     |
|                          |            | in.               | Date. |             |                       |       |                      |            | in.                    | in.                 |
| +1.70                    | 181        | .53               | 26    | 17          | 10.63                 | 11.54 | + .91                | 109        | 25.16                  | Camden Square       |
| + .72                    | 137        | .85               | 3     | 16          | 11.55                 | 11.38 | - .17                | 99         | 28.36                  | Tenterden           |
| +1.28                    | 163        | .74               | 1     | 21          | 12.61                 | 11.83 | - .78                | 94         | 29.93                  | West Dean           |
| +2.69                    | 242        | 1.33              | 1     | 18          | 11.59                 | 12.94 | +1.35                | 112        | 27.10                  | Hartley Wintney     |
| +3.06                    | 262        | 1.38              | 1     | 16          | 10.26                 | 12.74 | +2.48                | 124        | 24.66                  | Hitchin             |
| +1.69                    | 185        | .73               | 23    | 18          | 11.28                 | 10.74 | - .54                | 95         | 26.75                  | Addington           |
| +1.46                    | 172        | .73               | 26    | 15          | 10.32                 | 10.20 | - .12                | 99         | 25.39                  | Westley             |
| + .86                    | 145        | .60               | 1     | 17          | 10.12                 | 9.36  | - .76                | 92         | 25.40                  | Brundall            |
| +1.50                    | 165        | .63               | 6     | 21          | 16.36                 | 14.65 | -1.71                | 90         | 39.00                  | Winterbourne Stpltn |
| +2.21                    | 204        | 1.22              | 3     | 15          | 15.05                 | 14.65 | - .40                | 97         | 35.00                  | Torquay             |
| + .53                    | 125        | 1.08              | 3     | 14          | 15.45                 | 15.54 | + .09                | 101        | 38.85                  | Polapit Tamar       |
| + .37                    | 116        | .44               | 22    | 16          | 13.03                 | 11.43 | -1.60                | 88         | 30.75                  | Bath                |
| + .74                    | 133        | .40               | 21    | 17          | 12.83                 | 11.77 | -1.06                | 92         | 29.85                  | Stroud              |
| +1.72                    | 170        | .81               | 5     | 16          | 14.31                 | 13.63 | - .68                | 95         | 33.04                  | Wolstaston          |
| + .76                    | 131        | .60               | 1     | 14          | 12.56                 | 11.30 | -1.26                | 90         | 29.21                  | Coventry            |
| +1.44                    | 174        | 1.20              | 24    | 16          | 9.76                  | 10.36 | + .60                | 106        | 23.30                  | Boston              |
| + .84                    | 137        | .69               | 25    | 17          | 10.81                 | 10.90 | + .09                | 101        | 24.70                  | Hodsock Priory      |
| - .44                    | 84         | .70               | 24    | 14          | 11.48                 | 10.58 | - .90                | 92         | 26.18                  | Derby               |
| - .25                    | 92         | .46               | 23    | 16          | 16.75                 | 18.24 | +1.49                | 109        | 42.43                  | Bolton              |
| + .98                    | 141        | 1.32              | 24    | 14          | 11.63                 | 13.49 | +1.86                | 116        | 26.96                  | Ribston Hall        |
| + .26                    | 107        | 1.06              | 23    | 14          | 26.47                 | 26.93 | + .46                | 102        | 60.96                  | Arneliffe Vic.      |
| +1.04                    | 149        | .85               | 24    | 16          | 11.24                 | 11.52 | + .28                | 102        | 27.02                  | Hull                |
| + .15                    | 107        | .62               | 26    | 14          | 11.35                 | 14.65 | +3.30                | 129        | 27.99                  | Newcastle           |
| -2.23                    | 68         | .95               | 22    | 14          | 57.36                 | 49.17 | -8.19                | 86         | 132.68                 | Seathwaite          |
| - .35                    | 86         | .55               | 21    | 18          | 17.19                 | 13.71 | -3.48                | 80         | 42.81                  | Cardiff             |
| - .68                    | 74         | .57               | 21    | 8           | 19.67                 | 16.14 | -3.53                | 82         | 47.88                  | Haverfordwest       |
| + .01                    | 100        | .70               | 23    | 12          | 17.59                 | 15.53 | -2.06                | 88         | 45.41                  | Gogerddan           |
| - .05                    | 98         | .40               | 4     | 16          | 12.18                 | 11.23 | - .95                | 92         | 30.98                  | Llandudno           |
| + .36                    | 113        | 1.70              | 22    | 8           | 18.75                 | 22.69 | +3.94                | 121        | 43.43                  | Cargen              |
| - .21                    | 91         | .81               | 22    | 14          | 14.66                 | 16.29 | +1.63                | 111        | 34.80                  | Branxholm           |
| ...                      | ...        | .53               | 22    | 14          | ...                   | 13.68 | ...                  | ...        | ...                    | Edinburgh           |
| + .35                    | 112        | 1.30              | 23    | 14          | 20.52                 | 20.23 | - .29                | 99         | 48.87                  | Girvan              |
| + .28                    | 110        | 1.15              | 22    | 13          | 14.94                 | 18.06 | +3.12                | 121        | 35.80                  | Glasgow             |
| -1.58                    | 57         | .91               | 21    | 12          | 26.57                 | 27.09 | + .52                | 102        | 57.90                  | Inveraray           |
| -2.36                    | 34         | .44               | 21    | 11          | 23.84                 | 20.58 | -3.26                | 86         | 57.53                  | Quinish             |
| -1.32                    | 39         | .32               | 21    | 9           | 12.09                 | 13.69 | +1.60                | 113        | 28.95                  | Dundee              |
| -1.06                    | 57         | ...               | ...   | ...         | 14.94                 | 14.30 | - .64                | 96         | 36.07                  | Braemar             |
| - .70                    | 66         | .62               | 21    | 14          | 13.69                 | 15.30 | +1.61                | 112        | 33.01                  | Aberdeen            |
| - .75                    | 66         | .42               | 22    | 11          | 11.92                 | 12.84 | + .92                | 108        | 29.37                  | Cawdor              |
| -1.53                    | 33         | .17               | 27    | 8           | 19.30                 | 14.59 | -4.71                | 76         | 43.71                  | Fort Augustus       |
| -3.33                    | 30         | .49               | 17    | 9           | 36.04                 | 32.49 | -3.55                | 90         | 86.50                  | Bendamp             |
| - .21                    | 90         | .78               | 21    | 10          | 13.45                 | 15.72 | +2.27                | 117        | 31.60                  | Dunrobin Castle     |
| ...                      | ...        | .83               | 22    | 18          | ...                   | 13.71 | ...                  | ...        | ...                    | Castletown          |
| -1.50                    | 54         | .60               | 22    | 14          | 25.99                 | 21.46 | -4.53                | 83         | 58.11                  | Killarney           |
| - .31                    | 88         | .59               | 5     | 11          | 17.19                 | 16.55 | - .64                | 96         | 39.30                  | Waterford           |
| + .70                    | 128        | 1.38              | 24    | 13          | 14.12                 | 18.64 | +4.52                | 132        | 33.47                  | Hurdlestown         |
| +1.08                    | 144        | 1.14              | 23    | 13          | 15.20                 | 17.11 | +1.91                | 113        | 35.19                  | Abbey Leix          |
| + .01                    | 101        | .60               | 23    | 9           | 11.88                 | 12.05 | + .17                | 101        | 27.75                  | Dublin              |
| - .36                    | 87         | 1.10              | 23    | 12          | 15.50                 | 17.24 | +1.74                | 111        | 36.48                  | Mullingar.          |
| - .75                    | 72         | .55               | 21    | 16          | 15.92                 | 15.39 | - .53                | 97         | 37.04                  | Ballinasloe         |
| -1.01                    | 66         | .94               | 21    | 15          | 21.74                 | 21.21 | - .53                | 98         | 50.50                  | Ennisceoe           |
| -1.31                    | 59         | .90               | 21    | 13          | 17.51                 | 17.40 | - .11                | 99         | 41.83                  | Markree Obsy.       |
| + .04                    | 101        | .90               | 23    | 8           | 16.92                 | 19.33 | +2.41                | 114        | 38.61                  | Seaford             |
| -1.43                    | 51         | .45               | 22    | 16          | 17.07                 | 20.12 | +3.05                | 118        | 41.20                  | Londonderry         |
| -1.67                    | 42         | .30               | 23    | 11          | 15.86                 | 17.68 | +1.82                | 111        | 37.85                  | Omagh               |

## SUPPLEMENTARY RAINFALL, JUNE, 1909.

| Div.  | STATION.                          | Rain inches | Div.   | STATION.                     | Rain inches |
|-------|-----------------------------------|-------------|--------|------------------------------|-------------|
| II.   | Warlingham, Redvers Road          | 3.46        | XI.    | Rhayader, Tyrmynydd .....    | 2.88        |
| "     | Ramsgate .....                    | 2.18        | "      | Lake Vyrnwy .....            | 3.83        |
| "     | Steyning .....                    | 3.33        | "      | Llangyhanfal, Plás Draw....  | 3.68        |
| "     | Hailsham .....                    | 1.86        | "      | Llwydiarth Esgob .....       | 1.86        |
| "     | Totland Bay, Aston House.         | 3.62        | "      | Snowdon, Cwm Dyli .....      | 3.09        |
| "     | Stockbridge, Ashley .....         | 4.53        | "      | Lligwy .....                 | 1.52        |
| "     | Grayshott .....                   | 3.28        | "      | Douglas, Woodville .....     | 1.76        |
| "     | Reading, Calcot Place.....        | 4.60        | XII.   | Stoneykirk, Ardwell House    | 4.15        |
| III.  | Harrow Weald, Hill House.         | 3.63        | "      | Dalry, The Old Garroch ...   | 4.92        |
| "     | Oxford, Magdalen College..        | 3.56        | "      | Langholm, Drove Road.....    | 2.46        |
| "     | Pitsford, Sedgebrook .....        | 2.87        | "      | Moniaive, Maxwellton House   | 3.65        |
| "     | Huntingdon, Brampton.....         | 4.26        | XIII.  | N. Esk Reservoir [Penicuik]  | 2.50        |
| "     | Woburn, Milton Bryant....         | 3.93        | XIV.   | Maybole, Knockdon Farm..     | 2.63        |
| "     | Wisbech, Monica Road.....         | 3.80        | XV.    | Campbeltown, Witchburn...    | 2.72        |
| IV.   | Southend Water Works....          | 3.36        | "      | Glenreadell Mains.....       | 2.76        |
| "     | Colchester, Lexden.....           | 4.30        | "      | Ballachulish House.....      | ...         |
| "     | Newport, The Vicarage.....        | 4.29        | "      | Islay, Eallabus .....        | 1.45        |
| "     | Rendlesham .....                  | 3.23        | XVI.   | Dollar Academy .....         | 1.51        |
| "     | Swaffham .....                    | 3.56        | "      | Loch Leven Sluice .....      | 2.03        |
| "     | Blakeney .....                    | 2.42        | "      | Balquhiddier, Stronvar ..... | 2.45        |
| V.    | Bishops Cannings .....            | 3.35        | "      | Perth, The Museum .....      | 1.22        |
| "     | Ashburton, Druid House ...        | 3.85        | "      | Coupar Angus .....           | .83         |
| "     | Honiton, Combe Raleigh ..         | 3.68        | "      | Blair Atholl.....            | 1.21        |
| "     | Okelhampton, Oaklands.....        | 2.81        | "      | Montrose, Sunnyside Asylum   | 1.13        |
| "     | Hartland Abbey .....              | 1.45        | XVII.  | Alford, Lynturk Manse ...    | 1.49        |
| "     | Lynmouth, Rock House ...          | 1.53        | "      | Keith Station .....          | 2.47        |
| "     | Probus, Lamellyn .....            | 2.34        | XVIII. | N. Uist, Lochmaddy .....     | 1.35        |
| "     | North Cadbury Rectory ..          | 3.39        | "      | Alvey Manse .....            | 1.07        |
| VI.   | Clifton, Pembroke Road ...        | 4.07        | "      | Loch Ness, Drumnadrochit.    | 1.13        |
| "     | Ross, The Graig .....             | 2.11        | "      | Glencarron Lodge .....       | 1.46        |
| "     | Shifnal, Hatton Grange .....      | 3.10        | "      | Fearn, Lower Pitkerrie.....  | 1.93        |
| "     | Blockley, Upton Wold .....        | 5.28        | XIX.   | Invershin .....              | 1.70        |
| "     | Worcester, Boughton Park.         | 3.88        | "      | Altnaharra .....             | 1.52        |
| VII.  | Market Overton .....              | 1.90        | "      | Bettyhill .....              | 2.12        |
| "     | Market Rasen .....                | 2.30        | XX.    | Dunmanway, The Rectory..     | 1.18        |
| "     | Bawtry, Hesley Hall.....          | 2.22        | "      | Cork .....                   | 2.27        |
| "     | Buxton.....                       | 2.64        | "      | Mitchelstown Castle .....    | 1.45        |
| VIII. | Neston, Hinderton Lodge... 2.90   | 2.90        | "      | Darrynane Abbey .....        | 1.54        |
| "     | Southport, Hesketh Park... 2.68   | 2.68        | "      | Glenam [Clonmel] .....       | 2.02        |
| "     | Chatburn, Middlewood .....        | 2.41        | "      | Ballingarry, Gurteen .....   | 1.92        |
| "     | Cartmel, Flookburgh .....         | 2.47        | "      | Miltown Malbay.....          | 2.65        |
| IX.   | Langsett Moor, Up. Midhope 4.72   | 4.72        | XXI.   | Gorey, Courtown House ...    | 2.70        |
| "     | Scarborough, Scalby .....         | 3.17        | "      | Moynalty, Westland .....     | 2.00        |
| "     | Ingleby Greenhow .....            | 4.35        | "      | Athlone, Twyford .....       | 1.41        |
| "     | Mickleton .....                   | 2.74        | XXII.  | Woodlawn .....               | 1.90        |
| X.    | Bardon Mill, Beltingham ... 3.02  | 3.02        | "      | Westport, St. Helens .....   | 1.20        |
| "     | Ewesley, Font Reservoir ... 2.79  | 2.79        | "      | Mohill .....                 | 1.88        |
| "     | Ilderton, Lilburn Cottage... 2.22 | 2.22        | XIII.  | Enniskillen, Portora .....   | 1.48        |
| "     | Keswick, The Bank .....           | 3.18        | "      | Dartrey [Cootehill].....     | 1.75        |
| XI.   | Llanfrecfa Grange.....            | 3.14        | "      | Warrenpoint, Manor House     | 2.20        |
| "     | Treherbert, Tyn-y-waun ... 5.27   | 5.27        | "      | Banbridge, Milltown .....    | 2.03        |
| "     | Carmarthen, The Friary.... 1.75   | 1.75        | "      | Belfast, Springfield .....   | 2.36        |
| "     | Castle Malgwynu [Lechryd]. 1.91   | 1.91        | "      | Bushmills, Dundarave .....   | 1.75        |
| "     | Plynlimon .....                   | 4.80        | "      | Sion House .....             | 1.27        |
| "     | Crickhowell, Ffordlas..... 3.70   | 3.70        | "      | Killybegs .....              | 1.31        |
| "     | New Radnor, Ednol .....           | 2.86        | "      | Horn Head .....              | 2.05        |

## METEOROLOGICAL NOTES ON JUNE, 1909.

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.—With the exception of the third week which was fine and sunny, the weather throughout was of a cheerless nature. Cloudy skies and frequent R were associated with some remarkably low temp. records (see p. 108). Duration of sunshine, 91·9\* hours, and of R, 56·1 hours. Mean temp. 55°·6, or 4°·8 below the average and the lowest in the 52 years record. Shade max. 75°·1 on 17th; min. 39°·0 on 11th. F 0, f 0.

TENTERDEN.—Duration of sunshine 136·0† hours, or much less than half that in May. Shade max. 74°·5 on 1st; min. 36°·0 on 11th. F 0, f 0.

TOTLAND BAY.—Duration of sunshine, 153·3\* hours, was the least amount and the R the greatest amount ever recorded in June. Shade max. 67°·2 on 18th; min. 42°·1 on 8th. F 0, f 0.

PITSFORD.—R ·92 in. above the average. Mean temp. 53°·7. Shade max. 70°·4 on 20th; min. 39°·0 on 13th and 15th. F 0.

TORQUAY.—Duration of sunshine, 162·4\* hours, or 66·3 hours below the average. Mean temp. 56°·0, or 2°·6 below the average. Shade max. 71°·3 on 30th; min. 44°·2 on 28th. F 0, f 0.

NORTH CADBURY.—The coldest June in 13 years with many hours of R but no great amount. Dangerous TS on 29th, from 3 to 4 p.m., when a farmhouse was damaged by L. Shade max. 74°·5 on 15th, min. 41°·0 on 8th. F 0, f 0.

ROSS.—Shade max. 71°·8 on 14th; min. 38°·6 on 6th. F 0, f 0.

HODSOCK PRIORY.—The wettest June since 1896 and the coldest since the record commenced in 1876. Shade max. 70°·6 on 17th; min. 32°·8 on 7th. F 0, f 5.

BOLTON.—Mean temp. 51°·4, or 3°·9 below the average. Shade max. 66°·5 on 14th; min. 38°·2 on 7th. F 0, f 1.

SOUTHPORT.—R ·52 in. above the average of 35 years. Duration of sunshine 180·7\* hours, or 35·1 hours below the average. Duration of R 57·4 hours. Mean temp. 53°·2, or 3°·7 below the average, and the lowest in 38 years' record. Shade max. 67°·8 on 15th; min. 37°·2 on 7th. F 0, f 3.

HULL.—Shade max. 68°·0 on 18th; min. 38°·0 on 7th. F 0, f 1.

CARMARTHEN.—Cold, dull, and dry. Hay and corn crops growing but little; crops generally light.

HAVERFORDWEST.—Duration of sunshine 228·3\* hours; no sunless days.

LLANDUDNO.—Shade max. 67°·0 on 18th; min. 42°·0 on 7th. F 0, f 0.

DOUGLAS.—Fine to 15th with much bright sunshine and strong polar winds. Generally wet and gloomy from 17th to 26th. Cold throughout, temp. being persistently below normal.

CARGEN.—Shade max. 71°·0 on 14th; min. 35°·0 on 6th.

EDINBURGH.—Shade max. 65°·8 on 17th; min. 38°·9 on 6th. F 0, f 1.

DUNDEE.—Shade max. 71°·2 on 19th; min. 38°·7 on 7th. F 0.

FORT AUGUSTUS.—Shade max. 66°·3 on 16th; min. 35°·0 on 6th. F 0.

WATERFORD.—Shade max. 72°·0 on 19th; min. 40°·0 on 22nd. F 0.

DUBLIN.—A cool month. Dry till 18th, after which a sunny spell lasted to 28th. Constant polar winds. Mean temp. 55°·2. Shade max. 67°·1 on 14th; min. 39°·0 on 7th. F 0, f 0.

MARKREE.—Shade max. 67°·0 on 29th; min. 33°·4 on 7th. F 0, f 5.

WARRENPOINT.—Shade max. 70°·0 on 14th, 18th, and 21st; min. 40°·0 on 1st and 2nd. F 0, f 0.

\* Campbell-Stokes.

† Jordan.

## Climatological Table for the British Empire, January, 1909.

| STATIONS.<br><br>(Those in <i>italics</i> are<br>South of the Equator.) | Absolute. |       |          |       | Average. |       |               |           | Absolute.       |                   | Total Rain    |       | Aver.<br>Cloud. |
|-------------------------------------------------------------------------|-----------|-------|----------|-------|----------|-------|---------------|-----------|-----------------|-------------------|---------------|-------|-----------------|
|                                                                         | Maximum.  |       | Minimum. |       | Max.     | Min.  | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.        | Days. |                 |
|                                                                         | Temp.     | Date. | Temp.    | Date. |          |       |               |           |                 |                   |               |       |                 |
| London, Camden Square                                                   | 51°0      | 14    | 24°6     | 25    | 42°6     | 34°0  | 35°8          | 90        | 73°2            | 19°7              | inches<br>·71 | 13    | 7·1             |
| Malta ... ..                                                            | 62·1      | 7     | 42·0     | 21    | 56·4     | 43·6  | 45·8          | 79        | 131·6           | ...               | 4·34          | 22    | 5·5             |
| Lagos ... ..                                                            | 91·0      | 9     | 68·0     | 7, 8  | 86·8     | 73·8  | 72·8          | 75        | 148·0           | 65·0              | 4·75          | 5     | 8·0             |
| <i>Cape Town</i> ... ..                                                 | 90·7      | 1     | 53·5     | 8     | 78·8     | 61·6  | 59·0          | 68        | ...             | ...               | ·58           | 4     | 2·5             |
| <i>Durban, Natal</i> ... ..                                             | 90·3      | 10    | 63·6     | 19    | 82·9     | 68·9  | ...           | ...       | 148·3           | ...               | 4·61          | 23    | 7·2             |
| <i>Johannesburg</i> ... ..                                              | 82·9      | 4     | 47·9     | 19    | 71·5     | 56·5  | 57·5          | 87        | 155·8           | 46·5              | 18·42         | 23    | 7·8             |
| <i>Mauritius</i> ... ..                                                 | 87·1      | 8     | 65·3     | 7     | 84·7     | 71·8  | 69·6          | 77        | 163·4           | 60·5              | 5·00          | 22    | 6·2             |
| Calcutta... ..                                                          | 87·1      | 25    | 51·0     | 30    | 81·7     | 58·5  | 55·5          | 62        | 138·1           | 44·0              | ·00           | 0     | 1·8             |
| Bombay... ..                                                            | 83·3      | 2     | 61·3     | 12    | 80·2     | 66·5  | 62·9          | 71        | 127·4           | 54·4              | ·00           | 0     | 0·6             |
| Madras ... ..                                                           | 87·3      | 29    | 64·5     | 25    | 83·9     | 68·1  | 67·9          | 81        | 138·8           | 60·7              | 4·30          | 5     | 3·5             |
| Kodaikanal ... ..                                                       | 68·8      | 25    | 44·6     | 30    | 63·1     | 48·7  | 37·6          | 51        | 122·2           | 28·2              | 9·87          | 7     | 3·4             |
| Colombo, Ceylon ... ..                                                  | 89·4      | 14*   | 68·0     | 13    | 87·2     | 71·9  | 70·2          | 75        | 154·8           | 63·0              | 1·66          | 9     | 4·2             |
| Hongkong ... ..                                                         | 73·4      | 19    | 50·8     | 15    | 61·1     | 57·6  | 54·8          | 80        | 121·2           | ...               | 1·46          | 6     | 8·3             |
| <i>Melbourne</i> ... ..                                                 | 98·9      | 28    | 46·5     | 23    | 74·8     | 57·1  | 51·9          | 60        | 167·5           | 42·5              | 3·24          | 11    | 5·6             |
| <i>Adelaide</i> ... ..                                                  | 112·1     | 2     | 49·8     | 24    | 85·8     | 60·2  | 51·9          | 49        | 170·5           | 44·1              | ·74           | 6     | 4·0             |
| <i>Coolgardie</i> ... ..                                                | ...       | ...   | ...      | ...   | ...      | ...   | ...           | ...       | ...             | ...               | ...           | ...   | ...             |
| <i>Perth</i> ... ..                                                     | ...       | ...   | ...      | ...   | ...      | ...   | ...           | ...       | ...             | ...               | ...           | ...   | ...             |
| <i>Sydney</i> ... ..                                                    | 104·0     | 3     | 55·0     | 24    | 79·6     | 64·3  | 57·6          | 60        | 136·0           | 45·9              | 1·41          | 1     | 5·6             |
| <i>Wellington</i> ... ..                                                | 74·0      | 29    | 44·0     | 1     | 65·5     | 53·8  | 51·1          | 74        | 125·0           | 35·0              | 3·06          | 13    | 8·0             |
| <i>Auckland</i> ... ..                                                  | 77·0      | 7, 24 | 50·0     | 16    | 70·1     | 58·2  | 53·8          | 42        | 142·0           | 44·0              | 1·88          | 13    | 5·2             |
| Jamaica, Kingston ... ..                                                | 88·1      | 13    | 62·7     | 11    | 84·5     | 66·2  | 65·0          | 77        | ...             | ...               | 1·24          | 11    | 4·3             |
| Trinidad ... ..                                                         | 89·0      | 16    | 65·0     | 4, 18 | 85·7     | 67·6  | 71·5          | 86        | 158·0           | 55·0              | 5·69          | 17    | ...             |
| Grenada ... ..                                                          | 96·0      | 11    | 70·0     | 16    | 82·6     | 72·7  | 69·2          | 76        | 144·2           | ...               | 4·61          | 26    | 5·0             |
| Toronto ... ..                                                          | 57·0      | 24    | -2·6     | 18    | 33·6     | 19·1  | ...           | ...       | 56·0            | -13·0             | 2·66          | 18    | 7·0             |
| Fredericton ... ..                                                      | 52·8      | 6     | -27·0    | 2     | 24·2     | 2·3   | ...           | 84        | ...             | ...               | 5·75          | 11    | 5·8             |
| St. John's, N.B. ... ..                                                 | 53·3      | 6     | -9·6     | 17    | 30·8     | 12·2  | ...           | ...       | ...             | ...               | 2·80          | 16    | 5·5             |
| Victoria, B.C. ... ..                                                   | 50·8      | 19    | 7·4      | 7     | 36·5     | 28·5  | ...           | 85        | ...             | ...               | 3·25          | 19    | 8·0             |
| Dawson ... ..                                                           | -12·0     | 1     | -65·0    | 24    | -37·7    | -48·7 | ...           | ...       | ...             | ...               | ·30           | 7     | 7·2             |

\* and 27.

MALTA.—Mean temp. of air 51°·9. Average sunshine 5·5 hours per day.

*Johannesburg*.—R twice that of any previous month since 1888, when observations commenced. Bright sunshine 147·4 hours.*Mauritius*.—Mean temp. of air 1°·3, of dew point 0°·6, and R 2·95 in., below averages. Mean hourly velocity of wind 9·7 miles, or 1·4 below average.

KODAIKANAL.—Bright sunshine 251 hours. Hoar frost on 7 days.

COLOMBO.—Mean temp. of air 78°·4, or 0°·7 below, of dew point 0°·1 above, and R 1·82 in. below, average. Mean hourly velocity of wind 6·7 miles. TS on 19th.

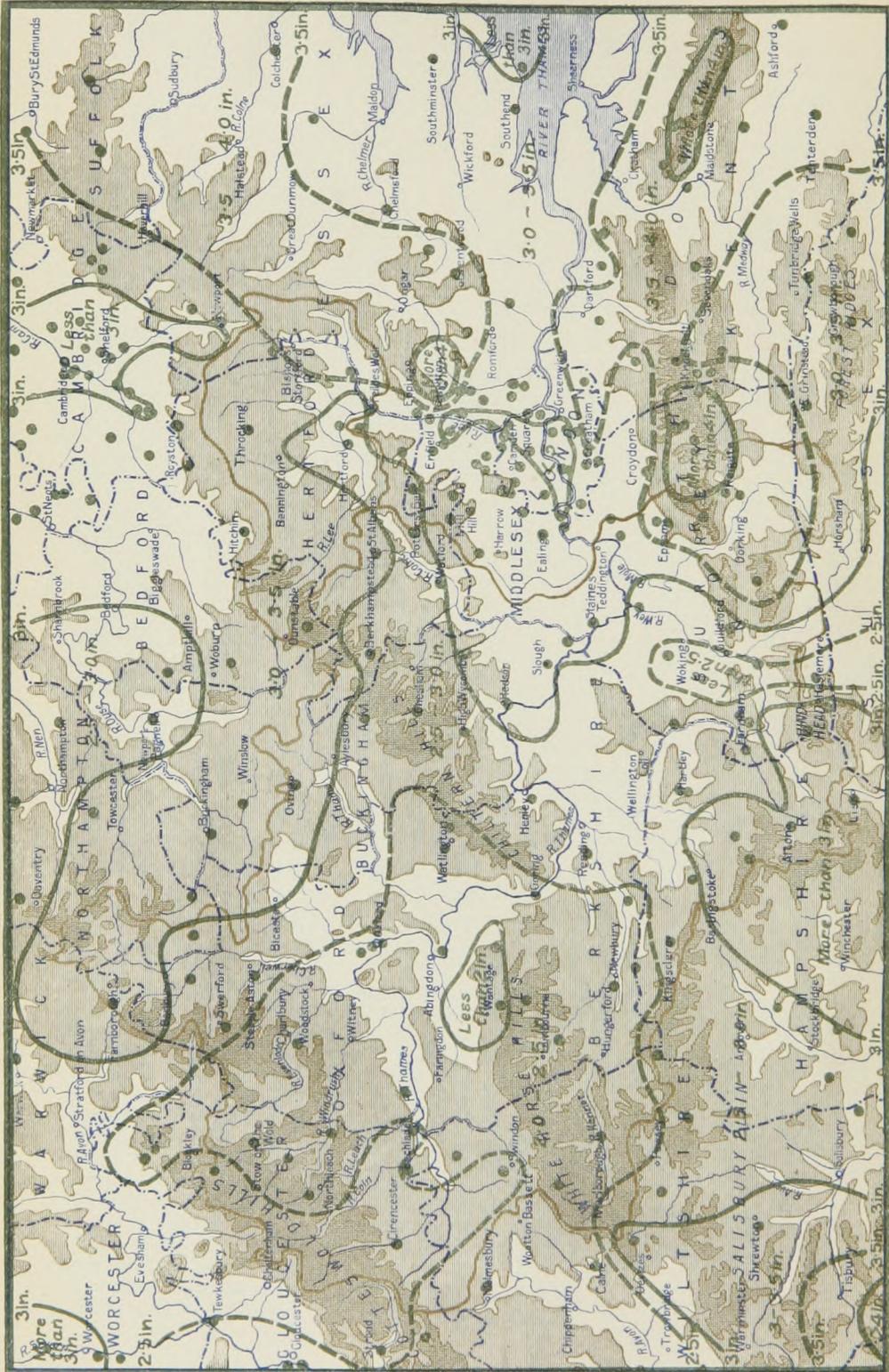
HONGKONG.—Mean temp. of air 60°·6. Bright sunshine 85 hours, or 57 below average. Mean hourly velocity of wind 14·1 miles.

*Melbourne*.—Mean temp. of air 1°·6 below, and R 1·36 in. above, averages.*Sydney*.—Mean temp. of air 0°·4 above, and R 2·00 in. below, averages.*Wellington*.—Mean temp. of air 3°·2 below, and R ·37 in. below averages. Bright sunshine 235·9 hours.*Auckland*.—Mean temp. of air 3°·0 below, and R ·75 in. below, averages.

TRINIDAD.—R 2·84 in. above the 45 years' average.



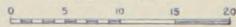
RAINFALL OF THAMES VALLEY — JULY, 1909.



ALTITUDE SCALE

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

SCALE OF MILES



# Symons's Meteorological Magazine.

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## THE MASTERY OF THE AIR.

No one who saw ten years ago the prophetic engraving which we reproduced as the frontispiece of our last volume would have hesitated to express the opinion that the Channel tunnel there delineated would be a highway of traffic long before the various aerial vessels also represented would carry a man across. Balloons, of course, have crossed the Channel many times, though at the mercy of the winds. Kites which rise against the wind were the only aeroplanes foreseen in 1804, and an aeroplane is merely a kite with an engine to drive it, instead of a string to call forth by its resistance the lifting power of moving air on an inclined plane. It has been pointed out—alas for verifying one's references in an age of morning and evening papers, each quoting the ideas of the other—that the pneumatic tyre which was invented to help the bicycle made possible the high speed motor car, and the internal combustion engines developed in lightness and strength by the motor car, made possible the mechanically driven aeroplane. An aeroplane engine not only propels the vehicle but by its unceasing motion it makes the road that carries it, and when the engine stops the road gives way and the winged chariot falls. But for an incident which would have meant only a few minutes roadside halt in a motor car, M. Hubert Latham would have flown across the channel on July 19th; as it was he alighted like a sea bird seven miles from land, and floated safely until he was picked up. To him belongs the honour of the pioneer, and if owing to a hitch with his engine he failed to fly as far over the sea as he had often flown over the land, he proved that a forced descent into the water did not mean certain death, and so he helped to smooth the way.

On July 25th M. Louis Blériot, in another type of aeroplane, flew easily from Calais to Dover, following a curved course of 30 miles, for a fog obscured the land, and he only required 37 minutes for the journey. The significance of the achievement is enormous, for it marks the emergence of a new era, an era in which it becomes possible to travel indifferently over land or sea, and in every student

of the ways of the air such a feat must arouse enthusiastic admiration. There are some things that make the doer of them a cause of pride to his countrymen and a source of chagrin to the people of other countries who cannot match the feat. But just as there are times when a great deed for the empire finds the public indifferent whether the hero hails from Lancashire or Yorkshire, so there are some achievements in the history of human progress so momentous that mankind rightly constituted is indifferent whether it has been honoured by a Frenchman, or a German, or an Englishman. We do not say this from any wish to detract from the glory of France in the conquest of the air; the idea is second-hand, for it occurred to us first, with a sense of the amazing parochialism of outlook with which an eminent writer viewed the deeds of E. H. Shackleton and his comrades in their attainment of an unprecedentedly high latitude amongst unheard of difficulties, when he hailed them as a triumph for the British flag. It was perfectly true; true also it was a triumph for Dulwich College: but we were glowing with the thought of the triumph of humanity, the new proof of the undying progressive power of mankind as the monarchs of the world.

To the meteorologist the coming of aerial navigation, still more of aviation, throws into relief certain special problems. These relate mainly to wind and the vertical components of aerial movements. The question of gusts is all important for the stability of so delicately poised a machine as an aeroplane; and questions of torrential showers, hailstorms, and above all, thunderstorms, are likely to become prominent too. The interest in weather forecasts will be enhanced, and an army of intelligent critics is in the making who will want to "know the reason why" when a forecaster fails.

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### BRITISH RAINFALL, 1908.

BEFORE another number of this Magazine is in the hands of our readers, the forty-eighth volume of *British Rainfall* will have been published; it is completed so far as proofs can tell as we write, and only the printer and bookbinder will feel the further stress of producing it. Of the eleven survivors whose records appeared in *British Rainfall*, 1861, no less than seven appear as Observers in 1908. The whole number of records dealt with now exceeds 4,500; the increase over last year amounts to 193 records, the largest accession in any year except 1903, when it was the same, and it is very satisfactory to know that many of the new returns, especially those from Scotland and Ireland, are in places concerning which no information was available before.

There is an important new departure in the treatment of Monthly Rainfall, the introduction of which is made the occasion of a historical retrospect, tracing the gradual development of the detailed

study of the months. Two maps of monthly rainfall are given side by side; one showing the actual amount of the fall in inches, the isohyetal lines being reduced from a large scale map on which are plotted the returns from about 2,000 stations; the other, based on a much smaller number of points, shows the variation from the average of the month, indicating by shading the various degrees of wetness and dryness, as judged by the standard of the normal for the month in question.

The Rainfall Organization does a national work, and is recognized in many ways as of public utility; but it has no financial support save the subscriptions of a limited number of the Observers and the personal credit of the Director, who bears the whole responsibility of keeping the system going from year to year. He feels the importance and the impending necessity of some more stable guarantee of permanence, and seizes the opportunity of a generous gift from an Observer to make of it the basis of an Endowment Fund which may, some time in the future, supply an income which will materially augment the subscriptions, and enable the data which come in to be more thoroughly and more quickly discussed.

With regard to the character of the year 1908, it is seen to have been on the whole moderately dry, but the coloured frontispiece shows that the average was exceeded in some parts of the country though not reached over a larger area. April and September were the months of largest rainfall in general, June and October those of the smallest; indeed it is pointed out that the area with a rainfall exceeding 4 inches was never nearly so small in any previous October.

The question of duration of rainfall is dealt with on the basis of a very small number of gauges, the records sent in for discussion bearing no reasonable proportion to the large number of recording gauges in use. This is probably due in some degree to the liability of many forms of recording gauge to go out of order unless tended with a solicitude for which few Observers have time. Some increase appears in the number of records of percolation and evaporation, and the detailed comparison of the evaporation and other elements of climate at Camden Square seems to suggest the possibility of arriving at the amount of loss from an exposed water surface by observations of sunshine and temperature.

The special articles in the volume include the description of a new self-recording rain gauge, the Hyetograph, which has been designed to combine simplicity and accuracy. Simplicity is secured by dispensing with an automatic emptying arrangement and making the receiver large enough to contain the greatest rainfall likely to occur in one day. Other special articles deal with the rainfall records on Snowdon, giving a map of the position of the gauges, and with a remarkable seasonal relationship pointed out by Mr. Gardhouse Charlton between the rainfall of Seathwaite and that of a station 38 miles to the east.

The volume is the largest yet issued, extending to 404 pp.

## THE WEATHER OF JULY, 1909.

By FRED. J. BRODIE.

THE best, and at the same time perhaps the worst, that can be said about the month of July is that over the United Kingdom generally it was a trifle better than in June. The comparison appears to have been most favourable in the south of England, where the sun, after a few weeks of partial retirement, shewed signs of something like activity, and in some places shone with a persistence not far removed from the normal. With winds blowing mainly from the westward and coming, in fact, straight from the cool surface waters of the Atlantic, the thermometer was as a rule well below its average summer level especially in the daytime; no station from which reports were received at the Meteorological Office experiencing a shade temperature as high as  $80^{\circ}$ . In many places the thermometer in fact never rose to  $70^{\circ}$ , and at Douglas (Isle of Man) there were as many as 13 days on which it failed to reach  $60^{\circ}$ .

A brief anticyclonic spell at the commencement of the month was marked by a wide range of temperature, the nights being very cool, but the days fairly warm. Early on the 1st a ground frost was experienced in many parts of the country, and as far south even as Kew, the lowest grass temperature reported being one of  $25^{\circ}$  at Llangammarch Wells. On the 2nd and 3rd, however, the thermometer in a number of places rose to between  $70^{\circ}$  and  $75^{\circ}$ , and at Greenwich and Killarney it touched  $76^{\circ}$ . The anticyclone afterwards receded to the southward, and between the 3rd and 5th a cool westerly type of weather prevailed. The wind afterwards veered to north-west or north, and from the 6th to the 11th the conditions were as a rule exceedingly inclement, the thermometer at many English stations failing on the last day of the period to reach a maximum of  $55^{\circ}$ . A brief interruption to this unseasonable spell occurred, however, on the 8th and 9th when readings above  $70^{\circ}$  were recorded somewhat commonly in England, and locally in Scotland and the south of Ireland. From the 12th to about the 16th a cool, showery, westerly type was again experienced, but after this the conditions improved, and for some four, five, or even more days an absence of rain was reported over all the more southern parts of the country, while temperature again rose a little above its normal height. Between the 17th and 19th maximum readings, ranging between  $70^{\circ}$  and  $75^{\circ}$ , were experienced in many places, the thermometer touching  $77^{\circ}$  at Cambridge and Raunds on the 17th, and  $78^{\circ}$  at Greenwich on the 18th. After about the 20th the weather became extremely unsettled and in the fourth week it was also very wet, the heaviest falls of rain being experienced respectively in Scotland, Wales, and some parts of Ireland, on the 25th, and over England generally on the 27th. Temperature was low for the time of year until quite the close of the month, when it again rose within a measurable distance of the

normal. On the 30th and 31st shade maxima of  $70^{\circ}$  and upwards were registered in many parts of the country, and on the latter day the thermometer at Greenwich touched  $76^{\circ}$ .

With such a conspicuous rarity of summer heat it is not surprising to find that the mean temperature of the month was everywhere below the average, the deficiency of warmth being, however, much greater in the daytime than at night. The total duration of bright sunshine was somewhat low, but in the south of England it was much larger than in June, the amounts at Westminster for the two months being respectively 166 hours and 91 hours. Considering the generally unsettled character of the weather the prevalence of thunderstorms was small, and those actually experienced were, with a few local exceptions, of no great severity.

## THE RAIN GAUGE IN AN ELEMENTARY SCHOOL.

By H. W. WALBANK.

*Usworth Central Council School, Co. Durham.*

As a means of introducing practical arithmetic into the ordinary school curriculum, we have adopted the rain gauge, and keep daily, monthly, and yearly records of the rainfall: these records, being in *hundredths* of an inch, certainly tend to make the pupils more disposed to use decimals (instead of vulgar fractions) in both thinking and working. Rules of arithmetic may be constantly applied—especially in the monthly and yearly records—and methods are kept in mind by constant use.

Accuracy being an essential point, we are most careful in obtaining the daily reading; just before 9 o'clock every morning two children are selected (volunteers are quite numerous) to take the measuring glass out to the rain gauge, and obtain the record for the day. In order to impress the children with the absolute need for accuracy, the teacher checks the report of the boys, by examining the measuring glass with the water in it, and it is very rarely that he finds an error in the reading. All the children of the First Class enter this record, while school registers are being marked, in their books, each being provided with a book for the purpose. We allow an extra fifteen minutes at the end of the month for making out *monthly records*.

The monthly returns we require consist of:—(a) Total rainfall. (b) Average rainfall per day. (c) Number of rain days. (d) Percentage of rain days.

It may be mentioned that a "rain day" is a day on which at least  $\cdot 01$  of an inch of rain is recorded; a faint mark on the measure shows half of  $\cdot 01$ , and if the reading is nearer  $\cdot 01$  than nothing, the record is inserted as  $\cdot 01$ , and the day is a rain day. The record is always the *nearest figure*.

A diagrammatic representation of the month's rainfall is also made. An ordinary scale drawing book is used—one page is blank for the figured table, and the next is ruled out in small squares; two squares along the length of the book are taken for each day of the month, while each square in the width of the page represents  $\cdot 02$  of an inch of rain. The total rainfall for the month is shown again at the end of the month. This is quite as valuable for educative purposes as the figured record. Yearly tables may also be prepared following very much the same lines as the monthly tables.

On commencing the use of a rain gauge, and occasionally afterwards, we thought it well to show the ratio of the area of the receiver to that of the measuring glass (diameter  $^2 \times \cdot 7854$  of each). Thus by a simple practical application of a somewhat abstruse rule, we are able to demonstrate the connection between the gauge and the measure, and show the truth of the markings on the latter. It interests the children to study how the evaporation of water is checked by the form and material of the gauge, and the best time for collection. We also teach them to sketch the instrument as a model, and in section.

The reading of the measure is so simple as to need no comment. Attention should be drawn, however, to the *two* apparent levels of the water, and in explaining this we have another valuable illustration of a natural law.

Problems for the mental and written arithmetic of the class are suggested by the use of the rain gauge, and will be the more practical as bearing on the records. It is well to know that for all practical purposes an inch of rain is equivalent to 100 tons of water per acre.

Our rain gauge is firmly fixed, one foot above ground, in the master's garden, so that it cannot be tampered with, and in order that he may take the records on Saturdays, Sundays, and holidays; but it is easily accessible from the school. It is clear of trees or buildings so as to give the true rainfall of the district.

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### Correspondence.

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

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### PHOTOGRAPHY AND METEOROLOGY.

WHEN was photography first applied to meteorological instruments? Apparently as far back as 1838; a time when the art was, one may say, in its birth, when Daguerre and Fox-Talbot were making their important discoveries.

In the early part of that year, Mr. Thos. B. Jordan, philosophical instrument maker, of Falmouth, and father of Mr. James B. Jordan, a name well known in instrumental meteorology, read a paper on the

subject to the Royal Cornwall Polytechnic Society, of which he was secretary. The plan was to furnish each instrument with a cylinder covered with Talbot's photographic paper, and revolved by clockwork behind the index of the instrument. In the barometer, *e.g.*, the paper was affected by the shadow of the varying mercury column (see the sixth Annual Report of the Society, p. 184). Mr. Jordan also described what he called a "heliograph" for registering the intensity of solar light; an inner fixed cylinder covered with sensitised paper, chloride of silver being the agent, and an outer one rotated by clockwork, and having a hole kept always opposite the sun's place. The outer cylinder was on a screwed axis, so as to give a spiral record of several days. A very similar arrangement by M. Eiffel was lately described in the *Bulletin* of the French Astronomical Society. A modification introduced later (7th Report, 1839, p. 115) consisted of a triangular opening cut the whole length of the outer cylinder, with graduated scale of metal foil admitting the light through cross slits. This instrument was placed in Kew Observatory.

A "magnetometer" was also described, registering photographically the diurnal variations of the needle.

At a meeting of the French Academy in June, 1840, M. Hubert brought forward a proposal very similar to Mr. Jordan's (see *Comptes Rendus*, 1840, Vol. 10, p. 876); and in October of that year Mr. Talbot called attention in the Academy to what Mr. Jordan had already done in that way, and gave an extract from the paper of 1838 above referred to (*Comptes Rendus*, 1840, Vol. 11, p. 574).

Some details of those early researches will be found in Prof. Hunt's work on Photography, in the "Encyclopædia Metropolitana," 1853, p. 153.

This bit of history, perhaps not widely known, was to me at least both interesting and surprising. How many of your readers, I wonder, if asked the question with which I began, would have given a date seventy years back for the development in question?

A.B.M.

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### JULY WEATHER.

THE *Standard* has recently quoted you as saying "We always expect heavy rain about July 25th: about an inch and a half as a rule."

In view of this statement I have analysed my record, 1897-1909, with the following result. The entire rainfall for the 13 Julys was 22·53 inches, of this total—

|                            |                            |
|----------------------------|----------------------------|
| July 22nd had 2·48 inches. | July 27th had 1·74 inches. |
| July 25th ,, 3·15 ,,       | July 28th ,, 1·61 ,,       |
| July 26th ,, 1·88 ,,       | July 29th ,, 1·56 ,,       |

so that 55 per cent. of the total fell on those 6 days, and 44 per cent. on the 5 days, July 25th-29th.

Taking the 11 years, 1897-1907, I find that—

|                                                                       |
|-----------------------------------------------------------------------|
| The first 24 days produced only 8·80 in. and the last 7 days 9·19 in. |
| ,, 21 ,, ,, 5·47 ,, ,, 10 ,, 12·52 ,,                                 |

Taking the 13 years, 1897-1909, and thus including 1908, in which year no rain fell after July 17th, I still find that—

The first 24 days produced 11·86 in. and the last 7 had 10·67 in.

„ 21 „ 8·33 „ „ 10 „ 14·20 „

The last 10 days of July exceeded the first 21 in 10 years out of 13.

„ 7 „ „ „ 24 „ 7 „ „

The large amounts credited to the last decade, or last week of July, would seem to be something more than fortuitous.

July, 1909, is the only July in the 13 years which has *not* had at least one clear week of bright hot weather. It is the only July which has not had a maximum of 80°, and which *has* had a maximum below 60°, viz., on 27th, when rain fell continuously for 18 hours from 6 a.m.—1·07 in. in all.

H. A. BOYS, F.R.Met.Soc.

*North Cadbury Rectory, August 2nd, 1909.*

[No doubt there is great probability of a severe thunderstorm occurring in the south of England in the last week of July, and near London it has often come on the 25th; but we would caution our readers against undertaking any laborious researches on the strength of a casual reference in the press. We are sometimes called up on the telephone on a Sunday afternoon, far from our records, by an enterprising journalist, who, perhaps, omits to mention the conditions of the interview, and, perhaps, fails to hear saving clauses.

—ED., *S.M.M.*]

## SUMMER SUNSHINE.

AN editorial wish, expressed in the last number of the Magazine, induces me to send in from Jersey, as a health resort, the following records of bright sunshine of May and June. At St. Louis' Observatory the observations are taken with the photographic Jordan's recorder, and they are *completed* by personal observation for the earlier and later hours of sunshine. As many days of June were here absolutely fine from the sunrise to the sunset, it will not be amazing that the total amount of bright sunshine exceed even that of Ilfracombe, recorded as 286·6 hours during the period of April 30th to May 21st.

### SUNSHINE AT JERSEY.

|                                |            |     |                |
|--------------------------------|------------|-----|----------------|
| From April 30th to May 21st... | 294·7 hrs. |     |                |
| Record of April .....          | 259·0 „    | ... | 63·3 per cent. |
| „ May .....                    | 382·2 „    | ... | 80·9 „         |
| „ June .....                   | 259·2 „    | ... | 53·7 „         |

MARC DECHEVRENS, S.J.

*Observatoire St. Louis, Jersey, July 18th, 1909.*

## SUMMER FROSTS.

I NOTICE that at New Malden (the district where the summer hours of my boyhood were spent) the first June frost in 6 years has been recorded. Here on the Birmingham Plateau, June frosts are of frequent occurrence, and in the present summer we have experienced frost in June, July and August. Below are the dates on which frost has been registered by the exposed thermometer in the Birmingham district:—

|                  | Min. on Grass<br>at Sparkhill. |       | Min. on Grass<br>at Edgbaston. |
|------------------|--------------------------------|-------|--------------------------------|
| June 8th .....   | 30°                            | ..... | 33°·6                          |
| „ 13th .....     | 28°                            | ..... | 24°·8                          |
| „ 15th .....     | 32°                            | ..... | 32°·4                          |
| July 2nd .....   | 31°                            | ..... | 29°·5                          |
| August 3rd ..... | 33°                            | ..... | 30°·8                          |

*Sparkhill, August 4th, 1909.*

DAVID HILL OWEN.

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THE AGRICULTURAL EDUCATION AND NATURE STUDY EXHIBITION AT GLOUCESTER.

FOR some years past the Journal and Education Committee of the Royal Agricultural Society have organized an Educational Exhibition in connection with the Annual show of the Society. Such exhibitions enable the general public who attend the Shows, to see the latest scientific methods of dealing with the agricultural problems, and also the steps that are being taken in the elementary schools to impart knowledge on these questions, through the Nature Study course. Meteorology is fully recognized in these exhibitions, and for the past three years the Royal Meteorological Society has co-operated by organizing a special exhibit.

The Education Exhibition at the Show, held at Gloucester in June, was the best of the series, and it afforded grounds for believing that some educational authorities are at last waking up to the fact that Meteorology has some claims to be placed in the school curriculum. The Royal Meteorological Society had a large exhibit presenting a great deal of useful information in a popular form. There were diagrams relating to temperature, rainfall, wind, sunshine, the influence of weather on crops, and on health, and a large collection of photographs and lantern slides of Meteorological phenomena. Various patterns of self-recording and other meteorological instruments were shown, among which, were two new self recording rain gauges, made public for the first time, viz:—Messrs. Casella & Co's tipping bucket pattern, recording to ·005 in., and Messrs. Negretti and Zambra's Hyetograph.

In the grounds adjoining the Exhibition Shed, a Climatological Station was arranged, and Mr. Marriott gave daily demonstrations on

the method of taking weather observations. Advantage was taken to familiarize the public with the latest phase of meteorological work—the Investigation of the Upper Atmosphere, Mr. Marriott's addresses on the first three days of the Show being followed by the ascent of a ballon-sonde carrying a meteorograph, and on the closing days by the ascent of pilot balloons. We understand that two of the meteorographs sent up, were recovered with good records before July 10th.

Among the exhibits from the Agricultural Colleges, was one from the Harper-Adams' College showing the results of experiments that are being made, including the amount of Nitrogen as ammonia and nitrates brought down by Rain. The Wye Agricultural College showed some illustrations of the experiments being carried out for the protection of fruit trees from spring frosts.

The Nature Study exhibit of the County Councils Associations from the schools in the Counties of Gloucester, Hereford, Monmouth, Oxford, Somerset, Warwick, Wilts, and Worcester contained many specimens of meteorological work. Some of the note books contained a very full and detailed daily account of the weather phenomena observed, from which many official observers might with advantage take a lesson. There were several examples of home-made instruments, some of which were very ingenious, whilst others would come under the category of "curiosities." One of the exhibits was labelled "Simple Rain-gauge," specification; pickle-bottle, funnel, and measuring-glass: cost—funnel 2d., measuring-glass 2½d., total cost 4½d. The teacher in this case gets his boys to measure the rain in cubic centimetres and then convert the amount measured into inches, thus taking advantage to instruct his boys in English and metric measures as well as rainfall observing. It is not suggested that this instrument would receive the approval of the Editor, or that clumsy and complicated home-made makeshifts should take the place of simple and accurate standard patterns; but the spirit which expounds the principles of apparatus, is worthy of all encouragement.

On Friday, June 25th, a conference of teachers and others interested in Nature Study was held. Prof. Ainsworth Davis, Principal of the Cirencester Agricultural College, delivered an address on Nature Study, and he mentioned Meteorology amongst the subjects which he urged should be included in a Nature Study course. Mr. Marriott also spoke on the desirability of teachers imparting some knowledge of Meteorology to their scholars.

There is certainly a desire on the part of many teachers to take up the subject, but they want just such a lead in the right direction as is being supplied by the Royal Meteorological Society.

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This map shows the group of Counties in each of the twenty-three divisions used in the Supplementary Rainfall Tables and in *British Rainfall*.

## RAINFALL TABLE FOR JULY, 1909.

| STATION.                           | COUNTY.            | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.    |              |
|------------------------------------|--------------------|------------|----------------------|--------------------------------|--------------------------|--------------|
|                                    |                    |            |                      |                                | Aver.<br>1870-99.<br>in. | 1909.<br>in. |
| Camden Square.....                 | London.....        | 51 32      | 0 8                  | 111                            | 2'49                     | 3'49         |
| Tenterden.....                     | Kent.....          | 51 4       | *0 41                | 190                            | 2'26                     | 3'92         |
| West Dean.....                     | Hampshire.....     | 51 3       | 1 38                 | 137                            | 2'62                     | 2'69         |
| Hartley Wintney.....               | ".....             | 51 18      | 0 53                 | 222                            | 2'38                     | 2'77         |
| Hitchin.....                       | Hertfordshire..... | 51 57      | 0 17                 | 238                            | 2'55                     | 3'25         |
| Winslow (Addington).....           | Buckinghamsh..     | 51 58      | 0 53                 | 309                            | 2'77                     | 3'48         |
| Bury St. Edmunds (Westley).....    | Suffolk.....       | 52 15      | *0 40                | 226                            | 2'91                     | 3'46         |
| Brundall.....                      | Norfolk.....       | 52 37      | *1 26                | 66                             | 2'70                     | 2'85         |
| Winterbourne Steepleton.....       | Dorset.....        | 50 42      | 2 31                 | 316                            | 2'78                     | 4'14         |
| Torquay (Cary Green).....          | Devon.....         | 50 28      | 3 32                 | 12                             | 2'73                     | 2'19         |
| Polapit Tamar [Launceston].....    | ".....             | 50 40      | 4 22                 | 315                            | 2'93                     | 2'22         |
| Bath.....                          | Somerset.....      | 51 23      | 2 21                 | 67                             | 2'83                     | 1'95         |
| Stroud (Upfield).....              | Gloucestershire..  | 51 44      | 2 13                 | 226                            | 2'90                     | 2'56         |
| Church Stretton (Wolstaston).....  | Shropshire.....    | 52 35      | 2 48                 | 800                            | 2'66                     | 2'95         |
| Coventry (Kingswood).....          | Warwickshire.....  | 52 24      | 1 30                 | 340                            | 2'75                     | 3'87         |
| Boston.....                        | Lincolnshire.....  | 52 58      | 0 1                  | 25                             | 2'44                     | 4'20         |
| Worksop (Hodsock Priory).....      | Nottinghamshire    | 53 22      | 1 5                  | 56                             | 2'51                     | 3'57         |
| Derby (Midland Railway).....       | Derbyshire.....    | 52 55      | 1 28                 | 156                            | 2'63                     | 3'01         |
| Bolton (Queen's Park).....         | Lancashire.....    | 53 35      | 2 28                 | 390                            | 4'12                     | 7'08         |
| Wetherby (Ribston Hall).....       | Yorkshire, W. R.   | 53 59      | 1 24                 | 130                            | 2'61                     | 3'46         |
| Arncliffe Vicarage.....            | ".....             | 54 8       | 2 6                  | 732                            | 4'97                     | 9'01         |
| Hull (Pearson Park).....           | " E. R.            | 53 45      | 0 20                 | 6                              | 2'50                     | 4'11         |
| Newcastle (Town Moor).....         | Northumberland     | 54 59      | 1 38                 | 201                            | 2'91                     | 2'78         |
| Borrowdale (Seathwaite).....       | Cumberland.....    | 54 30      | 3 10                 | 423                            | 9'37                     | 16'75        |
| Cardiff (Ely).....                 | Glamorgan.....     | 51 29      | 3 13                 | 53                             | 3'52                     | 3'06         |
| Haverfordwest (High Street).....   | Pembroke.....      | 51 48      | 4 58                 | 95                             | 3'70                     | 4'16         |
| Aberystwyth (Gogerddan).....       | Cardigan.....      | 52 26      | 4 1                  | 83                             | 4'27                     | 5'02         |
| Llandudno.....                     | Carnarvon.....     | 53 20      | 3 50                 | 72                             | 2'61                     | 3'89         |
| Cargen [Dumtries].....             | Kirkcudbright..... | 55 2       | 3 37                 | 80                             | 3'30                     | ...          |
| Hawick (Braxholm).....             | Roxburgh.....      | 55 24      | 2 51                 | 457                            | 3'34                     | 2'59         |
| Edinburgh (Royal Observatory)..... | Midlothian.....    | 55 55      | 3 11                 | 442                            | ...                      | 3'32         |
| Girvan (Pinmore).....              | Ayr.....           | 55 10      | 4 49                 | 207                            | 3'60                     | 7'70         |
| Glasgow (Queen's Park).....        | Renfrew.....       | 55 53      | 4 18                 | 144                            | 3'36                     | 3'58         |
| Inveraray (Newtown).....           | Argyll.....        | 56 14      | 5 4                  | 17                             | 4'43                     | 5'91         |
| Mull (Quinish).....                | ".....             | 56 36      | 6 13                 | 35                             | 4'38                     | 4'73         |
| Dundee (Eastern Necropolis).....   | Forfar.....        | 56 28      | 2 57                 | 199                            | 3'03                     | 2'71         |
| Braemar.....                       | Aberdeen.....      | 57 0       | 3 24                 | 1114                           | 2'89                     | 3'20         |
| Aberdeen (Cranford).....           | ".....             | 57 8       | 2 7                  | 120                            | 3'02                     | 5'00         |
| Cawdor.....                        | Nairn.....         | 57 31      | 3 57                 | 250                            | 3'34                     | 4'44         |
| Fort Augustus (S. Benedict's)..... | E. Inverness.....  | 57 9       | 4 41                 | 68                             | 3'10                     | 3'91         |
| Loch Torridon (Bendamph).....      | W. Ross.....       | 57 32      | 5 32                 | 20                             | 6'46                     | 5'70         |
| Dunrobin Castle.....               | Sutherland.....    | 57 59      | 3 56                 | 14                             | 2'82                     | 1'90         |
| Castletown.....                    | Caitness.....      | 58 35      | 3 23                 | 100                            | ...                      | 2'33         |
| Killarney (District Asylum).....   | Kerry.....         | 52 4       | 9 31                 | 178                            | 3'99                     | 3'39         |
| Waterford (Brook Lodge).....       | Waterford.....     | 52 15      | 7 7                  | 104                            | 3'10                     | 3'08         |
| Broadford (Hurdlestown).....       | Clare.....         | 52 48      | 8 38                 | 167                            | 2'94                     | 3'50         |
| Abbey Leix (Blandsfort).....       | Queen's County..   | 52 56      | 7 17                 | 532                            | 3'05                     | 2'97         |
| Dublin (Fitz William Square).....  | Dublin.....        | 53 21      | 6 14                 | 54                             | 2'63                     | 3'32         |
| Mullingar (Belvedere).....         | Westmeath.....     | 53 29      | 7 22                 | 367                            | 3'47                     | 2'99         |
| Ballinasloe.....                   | Galway.....        | 53 20      | 8 15                 | 160                            | 3'31                     | 2'31         |
| Crossmolina (Ennisceoe).....       | Mayo.....          | 54 4       | 9 18                 | 74                             | 3'59                     | 3'78         |
| Collooney (Markree Obsy.).....     | Sligo.....         | 54 11      | 8 27                 | 127                            | 3'65                     | 3'13         |
| Seaforde.....                      | Down.....          | 54 19      | 5 50                 | 180                            | 3'40                     | 3'70         |
| Londonderry (Creggan Res.).....    | Londonderry.....   | 54 59      | 7 19                 | 320                            | 3'47                     | 4'81         |
| Omagh (Edenfel).....               | Tyrrone.....       | 54 36      | 7 18                 | 280                            | 3'39                     | 3'48         |

RAINFALL TABLE FOR JULY, 1909—continued.

| RAINFALL OF MONTH (con.) |          |                   |       |             | RAINFALL FROM JAN. 1. |           |                      |          | Mean Annual 1870-1899. | STATION.           |
|--------------------------|----------|-------------------|-------|-------------|-----------------------|-----------|----------------------|----------|------------------------|--------------------|
| Diff. from Av. in.       | % of Av. | Max. in 24 hours. |       | No. of Days | Aver. 1870-99. in.    | 1909. in. | Diff. from Aver. in. | % of Av. |                        |                    |
|                          |          | in.               | Date. |             |                       |           |                      |          |                        |                    |
| +1.00                    | 140      | 1.14              | 27    | 18          | 13.12                 | 15.03     | +1.91                | 115      | 25.16                  | Camden Square      |
| +1.66                    | 173      | 1.36              | 4     | 19          | 13.81                 | 15.30     | +1.49                | 111      | 28.36                  | Tenterden          |
| + .07                    | 103      | 1.25              | 27    | 17          | 15.23                 | 14.52     | - .71                | 95       | 29.93                  | West Dean          |
| + .39                    | 116      | .88               | 27    | 18          | 13.97                 | 15.71     | +1.74                | 113      | 27.10                  | Hartley Wintney    |
| + .70                    | 127      | .59               | 27    | 19          | 12.81                 | 15.99     | +3.18                | 125      | 24.66                  | Hitchin            |
| + .71                    | 126      | .69               | 27    | 19          | 14.05                 | 14.22     | + .17                | 101      | 26.75                  | Addington          |
| + .55                    | 119      | .60               | 27    | 16          | 13.23                 | 13.66     | + .43                | 103      | 25.39                  | Westley            |
| + .15                    | 106      | .69               | 27    | 20          | 12.82                 | 12.21     | - .61                | 95       | 25.40                  | Brundall           |
| +1.36                    | 149      | 2.85              | 27    | 14          | 19.14                 | 18.79     | - .35                | 98       | 39.00                  | Winterbourne Stptn |
| - .54                    | 80       | 1.11              | 27    | 12          | 17.78                 | 16.84     | - .94                | 95       | 35.00                  | Torquay            |
| - .71                    | 76       | .60               | 9     | 19          | 18.38                 | 17.76     | - .62                | 97       | 38.85                  | Polapit Tamar      |
| - .88                    | 69       | .50               | 27    | 19          | 15.86                 | 13.38     | -2.48                | 84       | 30.75                  | Bath               |
| - .34                    | 88       | .70               | 9     | 18          | 15.73                 | 14.33     | -1.40                | 91       | 29.85                  | Stroud             |
| + .29                    | 111      | 1.50              | 27    | 17          | 16.97                 | 16.58     | - .39                | 98       | 33.04                  | Wolstaston         |
| +1.12                    | 141      | 1.34              | 27    | 16          | 15.31                 | 15.17     | - .14                | 99       | 29.21                  | Coventry           |
| +1.76                    | 172      | 1.02              | 27    | 19          | 12.20                 | 14.56     | +2.36                | 119      | 23.30                  | Boston             |
| +1.06                    | 142      | .88               | 27    | 17          | 13.32                 | 14.47     | +1.15                | 109      | 24.70                  | Hodsock Priory     |
| + .38                    | 114      | 1.11              | 27    | 19          | 14.11                 | 13.59     | - .52                | 96       | 26.18                  | Derby              |
| +2.96                    | 172      | 1.20              | 30    | 24          | 20.87                 | 25.32     | +4.45                | 121      | 42.43                  | Bolton             |
| + .85                    | 133      | .66               | 15    | 21          | 14.24                 | 16.95     | +2.71                | 119      | 26.96                  | Ribston Hall       |
| +4.04                    | 181      | 1.25              | 20    | 22          | 31.44                 | 35.94     | +4.50                | 114      | 60.96                  | Arncliffe Vic.     |
| +1.61                    | 164      | .58               | 30    | 18          | 13.74                 | 15.63     | +1.89                | 114      | 27.02                  | Hull               |
| - .13                    | 96       | .63               | 30    | 20          | 14.26                 | 17.43     | +3.17                | 122      | 27.99                  | Newcastle          |
| +7.38                    | 179      | 2.48              | 20    | 25          | 66.73                 | 65.92     | - .81                | 99       | 132.68                 | Seathwaite         |
| - .46                    | 87       | .75               | 27    | 19          | 20.71                 | 16.77     | -3.94                | 81       | 42.81                  | Cardiff            |
| + .46                    | 112      | .91               | 27    | 18          | 23.37                 | 20.30     | -3.07                | 87       | 47.88                  | Haverfordwest      |
| + .75                    | 118      | 1.30              | 9     | 25          | 21.86                 | 20.55     | -1.31                | 94       | 45.41                  | Gogerddan          |
| +1.28                    | 149      | .73               | 16    | 21          | 14.79                 | 15.12     | + .33                | 102      | 30.98                  | Llandudno          |
| ...                      | ...      | ...               | ...   | ...         | 22.05                 | ...       | ...                  | ...      | 43.43                  | Cargen             |
| - .75                    | 78       | 1.13              | 25    | 18          | 18.00                 | 18.88     | + .88                | 105      | 34.80                  | Branxholm          |
| ...                      | ...      | 1.34              | 25    | 17          | ...                   | 17.00     | ...                  | ...      | ...                    | Edinburgh          |
| +4.10                    | 214      | 1.76              | 26    | 24          | 24.12                 | 27.93     | +3.81                | 116      | 48.87                  | Girvan             |
| + .22                    | 107      | 1.10              | 25    | 17          | 18.30                 | 21.64     | +3.34                | 118      | 35.80                  | Glasgow            |
| +1.48                    | 134      | 1.08              | 23    | 26          | 31.00                 | 33.00     | +2.00                | 106      | 57.90                  | Inveraray          |
| + .35                    | 108      | 1.02              | 15    | 22          | 28.22                 | 25.31     | -2.91                | 90       | 57.53                  | Quinish            |
| - .32                    | 89       | .98               | 25    | 16          | 15.12                 | 16.40     | +1.28                | 108      | 28.95                  | Dundee             |
| + .31                    | 111      | ...               | ...   | ...         | 17.83                 | 17.50     | - .33                | 98       | 36.07                  | Braemar            |
| +1.98                    | 166      | 2.00              | 25    | 19          | 16.71                 | 20.30     | +3.59                | 121      | 33.01                  | Aberdeen           |
| +1.10                    | 133      | 1.49              | 29    | 13          | 15.26                 | 17.28     | +2.02                | 113      | 29.37                  | Cawdor             |
| + .81                    | 126      | .69               | 30    | 20          | 22.40                 | 18.50     | -3.90                | 83       | 43.71                  | Fort Augustus      |
| - .76                    | 88       | .67               | 22    | 26          | 42.50                 | 38.19     | -4.31                | 90       | 86.50                  | Bendamph           |
| - .92                    | 67       | .29               | 15    | 15          | 16.27                 | 17.62     | +1.35                | 108      | 31.60                  | Dunrobin Castle    |
| ...                      | ...      | .40               | 6,20  | 21          | ...                   | 16.04     | ...                  | ...      | ...                    | Castletown         |
| - .60                    | 85       | .98               | 24    | 18          | 29.98                 | 24.85     | -5.13                | 83       | 58.11                  | Killarney          |
| - .02                    | 99       | .98               | 24    | 15          | 20.29                 | 19.63     | - .66                | 97       | 39.30                  | Waterford          |
| + .56                    | 119      | .76               | 9     | 25          | 17.06                 | 22.14     | +5.08                | 130      | 33.47                  | Hurdlestown        |
| - .08                    | 97       | .54               | 24    | 21          | 18.25                 | 20.08     | +1.83                | 110      | 35.19                  | Abbey Leix         |
| + .69                    | 126      | .53               | 24    | 22          | 14.51                 | 15.37     | + .86                | 106      | 27.75                  | Dublin             |
| - .48                    | 86       | .89               | 30    | 15          | 18.97                 | 20.23     | +1.26                | 107      | 36.48                  | Mullingar.         |
| -1.00                    | 70       | .51               | 30    | 25          | 19.23                 | 17.70     | -1.53                | 92       | 37.04                  | Ballinasloe        |
| + .19                    | 105      | .96               | 30    | 26          | 25.33                 | 24.99     | - .34                | 99       | 50.50                  | Enniscoie          |
| - .52                    | 86       | .64               | 30    | 25          | 21.16                 | 20.53     | - .63                | 97       | 41.83                  | Markree Obsy.      |
| + .30                    | 109      | .60               | 30    | 21          | 20.32                 | 23.03     | +2.71                | 113      | 38.61                  | Seaford            |
| +1.34                    | 139      | .57               | 23    | 25          | 20.54                 | 24.93     | +4.39                | 121      | 41.20                  | Londonderry        |
| + .09                    | 103      | .38               | 3     | 24          | 19.25                 | 21.16     | +1.91                | 110      | 37.85                  | Omagh              |

## SUPPLEMENTARY RAINFALL, JULY, 1909.

| Div.  | STATION.                     | Rain inches | Div.   | STATION.                    | Rain inches |
|-------|------------------------------|-------------|--------|-----------------------------|-------------|
| II.   | Warlingham, Redvers Road     | 3·98        | XI.    | Rhayader, Tyrmynydd .....   | 5·08        |
| „     | Ramsgate .....               | 2·88        | „      | Lake Vyrnwy .....           | 4·21        |
| „     | Steyning.....                | 2·99        | „      | Llangyhanfal, Plâs Draw.... | 2·36        |
| „     | Hailsham .....               | 2·61        | „      | Llwydiarth Esgob .....      | 5·69        |
| „     | Totland Bay, Aston House.    | 2·34        | „      | Snowdon, Cwm Dyli .....     | 9·69        |
| „     | Stockbridge, Ashley .....    | 2·96        | „      | Lligwy .....                | 4·37        |
| „     | Grayshott.....               | 3·03        | „      | Douglas, Woodville .....    | 4·88        |
| „     | Reading, Calcot Place.....   | 2·64        | XII.   | Stoneykirk, Ardwell House   | 4·74        |
| III.  | Harrow Weald, Hill House.    | 3·44        | „      | Dalry, The Old Garroch ...  | 6·32        |
| „     | Oxford, Magdalen College..   | 2·19        | „      | Langholm, Drove Road.....   | 4·51        |
| „     | Pitsford, Sedgebrook .....   | 2·57        | „      | Moniaive, Maxwellton House  | 4·79        |
| „     | Huntingdon, Brampton.....    | 3·40        | XIII.  | N. Esk Reservoir[Penicuick] | 4·70        |
| „     | Woburn, Milton Bryant.....   | 3·25        | XIV.   | Maybole, Knockdon Farm..    | 6·30        |
| „     | Wisbech, Monica Road.....    | 3·18        | XV.    | Campbeltown, Witchburn...   | 4·46        |
| IV.   | Southend Water Works.....    | 3·27        | „      | Glenreasdell Mains.....     | 5·60        |
| „     | Colchester, Lexden .....     | 3·66        | „      | Ballachulish House.....     | ...         |
| „     | Newport, The Vicarage.....   | 2·86        | „      | Islay, Fallabus .....       | 6·02        |
| „     | Rendlesham .....             | 2·60        | XVI.   | Dollar Academy .....        | 3·69        |
| „     | Swaffham .....               | 3·47        | „      | Loch Leven Sluice .....     | 4·26        |
| „     | Blakeney .....               | 3·69        | „      | Balquhidder, Stronvar ..... | 3·28        |
| V.    | Bishops Cannings .....       | 3·02        | „      | Perth, The Museum .....     | 3·38        |
| „     | Ashburton, Druid House ...   | 2·83        | „      | Coupar Angus .....          | 2·74        |
| „     | Honiton, Combe Raleigh ...   | 3·48        | „      | Blair Atholl .....          | 2·91        |
| „     | Okehampton, Oaklands.....    | 2·65        | „      | Montrose,SunnysideAsylum    | 4·25        |
| „     | Hartland Abbey .....         | 2·34        | XVII.  | Alford, Lynturk Manse ...   | 4·15        |
| „     | Lynmouth, Rock House ...     | 2·02        | „      | Keith Station .....         | 2·90        |
| „     | Probus, Lamellyn .....       | 2·48        | XVIII. | N. Uist, Lochmaddy .....    | 3·51        |
| „     | North Cadbury Rectory .....  | 2·90        | „      | Alvey Manse .....           | 3·90        |
| VI.   | Clifton, Pembroke Road ...   | 3·30        | „      | Loch Ness, Drumnadrochit.   | 3·65        |
| „     | Ross, The Graig .....        | 1·61        | „      | Glencarron Lodge .....      | 6·21        |
| „     | Shifnal, Hatton Grange.....  | 3·40        | „      | Fearn, Lower Pitkerrie..... | 1·64        |
| „     | Blockley, Upton Wold .....   | 2·88        | XIX.   | Invershin .....             | 2·61        |
| „     | Worcester, Boughton Park.    | 3·19        | „      | Altnaharra .....            | 2·98        |
| VII.  | Market Overton .....         | 3·64        | „      | Bettyhill .....             | 2·13        |
| „     | Market Rasen .....           | 4·44        | XX.    | Dunmanway, The Rectory..    | 1·61        |
| „     | Bawtry, Hesley Hall.....     | 3·54        | „      | Cork .....                  | ·97         |
| „     | Buxton.....                  | 5·12        | „      | Mitchelstown Castle .....   | 3·03        |
| VIII. | Neston, Hinderton Lodge...   | 3·04        | „      | Darrynane Abbey .....       | 3·86        |
| „     | Southport, Hesketh Park...   | 4·99        | „      | Glenam [Clonmel] .....      | 1·98        |
| „     | Chatburn, Middlewood .....   | 6·19        | „      | Nenagh Traverstown .....    | 2·78        |
| „     | Cartmel, Flookburgh .....    | 6·52        | „      | Miltown Malbay.....         | 3·32        |
| IX.   | Langsett Moor, Up. Midhope   | 4·70        | XXI.   | Gorey, Courtown House ...   | 4·07        |
| „     | Scarborough, Scalby .....    | 3·03        | „      | Moynalty, Westland .....    | 3·56        |
| „     | Ingleby Greenhow .....       | 2·82        | „      | Athlone, Twyford .....      | 2·41        |
| „     | Mickleton.....               | 2·27        | XXII.  | Woodlawn .....              | 3·33        |
| X.    | Bardon Mill, Beltingham ...  | 3·53        | „      | Westport, St. Helens .....  | 3·69        |
| „     | Ewesley, Font Reservoir ...  | 2·85        | „      | Mohill .....                | 3·05        |
| „     | Ilderton, Lilburn Cottage... | 1·77        | XXIII. | Enniskillen, Portora .....  | 3·28        |
| „     | Keswick, The Bank .....      | 6·22        | „      | Dartrey [Cootehill].....    | 3·99        |
| XI.   | Llanfrechfa Grange.....      | 2·57        | „      | Warrenpoint, Manor House    | 3·17        |
| „     | Treherbert, Tyn-y-waun ...   | 6·33        | „      | Banbridge, Milltown .....   | 3·03        |
| „     | Carmarthen, The Friary.....  | 3·47        | „      | Belfast, Springfield .....  | 4·37        |
| „     | Castle Malgwyn [Llechryd].   | 2·95        | „      | Bushmills, Dundarave .....  | 4·68        |
| „     | Plynlimon.....               | 12·20       | „      | Ston House .....            | 3·70        |
| „     | Crickhowell, Ffordlas.....   | 3·70        | „      | Killybegs .....             | 8·52        |
| „     | New Radnor, Ednol .....      | 3·95        | „      | Horn Head ... ..            | 5·74        |

## METEOROLOGICAL NOTES ON JULY, 1909.

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.—Changeable weather prevailed throughout, fine, bright days alternating with cloud and R. A sharp TS occurred at 3.45 p.m. on 13th, when .27 in. of R fell in 4 minutes, and on 27th R fell for 14.0 hours. Duration of sunshine, 163.0\* hours, and of R 53.3 hours. Mean temp. 61.4, or 1.9 below the average. Shade max. 77.6 on 18th; min. 44.1 on 1st. F 0, f 0.

TENTERDEN.—Cold and wet month, bad for haymaking and fruit. Severe TS on 4th, when 1.36 in. of R fell. Duration of sunshine 182.8† hours. Shade max. 74.0 on 18th; min. 43.0 on 1st. F 0, f 0.

TOTLAND BAY.—Duration of sunshine, 181.8\* hours, and the least recorded in July. Shade max. 70.0 on 19th; min. 38.1 on 2nd. F 0, f 0.

PITSFORD.—R 1.04 in. below the average. Mean temp. 59.5. Shade max. 74.6 on 17th; min. 41.3 on 1st. F 0.

TORQUAY.—Duration of sunshine, 233.4\* hours, or 7.2 hours above the average. Mean temp. 61.1, or 0.6 below the average. Shade max. 73.9 on 20th; min. 50.2 on 11th. F 0, f 0.

NORTH CADBURY.—The cloudiest, by far the windiest, and by day the coldest July in 13 years. Only once was there as much as three days together of decent haymaking weather. Shade max. 79.0 on 2nd; min. 46.0 on 1st and 24th. F 0, f 0.

ROSS.—Shade max. 73.8 on 3rd; min. 44.4 on 2nd. F 0, f 0.

BOLTON.—Duration of sunshine, 154.3\* hours, or 6.9 hours above the average. Mean temp. 55.3, or 2.1 below the average. Shade max. 70.9 on 2nd; min. 42.2 on 1st. F 0, f 0.

SOUTHPORT.—R 2.00 in. above the average and the heaviest for 20 years. Duration of sunshine 167.7\* hours, or 43.7 below the average. Duration of R 70.4 hours. Mean temp. 58.0, or 1.7 below the average. Windiest July in 40 years. Shade max. 70.9 on 2nd; min. 42.6 on 1st. F 0, f 0.

HULL.—Notable for the meagre amount of sunshine and heavy R. Shade max. 73.0 on 15th; min. 46.0 on 2nd. F 0, f 0.

CARMARTHEN.—Dull, cloudy and misty, with cold nights. R below the average and water supplies very low. Bad hay harvest due to the unsettled weather and T showers.

HAVERFORDWEST.—Duration of sunshine 185.4\* hours. Shade max. 70.9 on 1st; min. 44.2 on 9th. F 0, f 0.

LLANDUDNO.—Duration of sunshine 164.4\* hours. Shade max. 71.2 on 2nd and 3rd; min. 48.0 on 1st. F 0, f 0.

MAXWELTON HOUSE.—Cold and stormy with little sunshine. Severe TS and flood on 25th, when 1.96 in. of R fell. Shade max. 74.0 on 31st; min. 33.0 on 1st. F 0.

EDINBURGH.—Shade max. 69.5 on 8th; min. 42.3 on 1st. F 0, f 0.

DUNDEE.—Shade max. 73.2 on 16th; min. 39.4 on 1st. F 0.

FORT AUGUSTUS.—Shade max. 68.3 on 8th; min. 39.0 on 12th. F 0.

WATERFORD.—Shade max. 71.5 on 13th; min. 45.0 on 12th and 27th.

DUBLIN.—Mean temp. 59.2. Shade max. 73.2 on 3rd; min. 45.1 on 28th. F 0, f 0.

MARKREE.—Showery, with low temp. and N. and N.W. winds most of the month. Gales and slight H on a few occasions. Shade max. 71.0 on 1st; min. 36.8 on 28th. F 0, f 1.

WARRENPOINT.—Shade max. 69.0 on 1st, 17th, and 22nd; min. 44.0 on 27th. F 0, f 0.

\* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, February, 1909.

| STATIONS.<br><br>(Those in italics are South of the Equator.) | Absolute. |       |          |       | Average. |       |            |           | Absolute.    |                | Total Rain |       | Aver.<br>Cloud. |
|---------------------------------------------------------------|-----------|-------|----------|-------|----------|-------|------------|-----------|--------------|----------------|------------|-------|-----------------|
|                                                               | Maximum.  |       | Minimum. |       | Max.     | Min.  | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.     | Days. |                 |
|                                                               | Temp.     | Date. | Temp.    | Date. |          |       |            |           |              |                |            |       |                 |
| London, Camden Square                                         | 55°9      | 4     | 20°6     | 23    | 43°6     | 30°3  | 34°3       | 86        | 77·8         | 13°6           | ·50        | 8     | 7·5             |
| Malta ... ..                                                  | 60·4      | 28    | 43·1     | 19    | 55·7     | 48·2  | 42·3       | 77        | 127·6        | ...            | 2·24       | 18    | 6·9             |
| Lagos ... ..                                                  | 91·0      | 11*   | 71·0     | 25    | 87·4     | 75·7  | 74·8       | 78        | 153·0        | 68·0           | 5·27       | 5     | 8·6             |
| Cape Town ... ..                                              | 90·0      | 17    | 54·3     | 12    | 81·0     | 62·3  | 57·3       | 64        | ...          | ...            | ·06        | 3     | 2·6             |
| Durban, Natal                                                 | 87·1      | 2, 3  | 61·8     | 18    | 81·4     | 67·5  | ...        | ...       | 149·6        | ...            | 4·27       | 18    | 6·1             |
| Johannesburg ... ..                                           | 75·1      | 16    | 49·0     | 21    | 69·7     | 55·4  | 57·1       | 90        | 150·7        | 49·1           | 6·57       | 18    | 7·8             |
| Mauritius ... ..                                              | 88·5      | 4     | 69·6     | 19    | 86·1     | 73·4  | 73·0       | 82        | 160·8        | 64·2           | 7·60       | 22    | 7·              |
| Calcutta... ..                                                | 93·2      | 24    | 52·3     | 9     | 85·3     | 60·2  | 57·0       | 60        | 148·2        | 46·0           | ·10        | 0     | 2·3             |
| Bombay... ..                                                  | 86·2      | 28    | 65·1     | 1     | 82·7     | 68·2  | 65·3       | 73        | 130·2        | 56·9           | ·00        | 0     | 0·7             |
| Madras ... ..                                                 | 89·4      | 16    | 66·2     | 27    | 86·6     | 69·5  | 69·1       | 77        | 138·2        | 62·1           | ·05        | 1     | 3·0             |
| Kodaikanal ... ..                                             | 68·3      | 22    | 43·3     | 6     | 65·5     | 47·1  | 40·7       | 58        | 129·5        | 26·2           | ·08        | 1     | 3·1             |
| Colombo, Ceylon                                               | 92·8      | 11    | 69·0     | 2     | 88·6     | 72·7  | 70·8       | 74        | 162·2        | 63·1           | 1·02       | 4     | 4·3             |
| Hongkong ... ..                                               | 73·4      | 3     | 48·7     | 8     | 64·3     | 57·0  | 54·8       | 81        | 126·9        | ...            | 1·66       | 9     | 8·0             |
| Melbourne ... ..                                              | 101·5     | 23    | 48·0     | 5     | 77·3     | 56·5  | 50·9       | 56        | 154·3        | 41·0           | 1·47       | 5     | 4·0             |
| Adelaide ... ..                                               | 102·0     | 9     | 47·7     | 4     | 83·7     | 57·8  | 50·0       | 48        | 162·0        | 41·4           | ·22        | 3     | 3·4             |
| Coolgardie ... ..                                             | ...       | ...   | ...      | ...   | ...      | ...   | ...        | ...       | ...          | ...            | ...        | ...   | ...             |
| Perth ... ..                                                  | ...       | ...   | ...      | ...   | ...      | ...   | ...        | ...       | ...          | ...            | ...        | ...   | ...             |
| Sydney ... ..                                                 | 83·5      | 15    | 55·8     | 8     | 74·9     | 62·3  | 58·9       | 73        | 126·1        | 48·5           | 7·32       | 26    | 6·3             |
| Wellington ... ..                                             | 74·8      | 4, 5  | 47·2     | 25    | 67·0     | 55·3  | 53·0       | 75        | 124·0        | 40·0           | 2·99       | 6     | 6·0             |
| Auckland ... ..                                               | 81·0      | 15    | 56·0     | 13‡   | 74·0     | 60·7  | 58·1       | 73        | 141·0        | 52·0           | ·00        | 0     | ...             |
| Jamaica, Kingston                                             | 89·5      | 21    | 64·2     | 8     | 86·5     | 67·1  | 63·8       | 69        | ...          | ...            | ·03        | 1     | 3·7             |
| Trinidad ... ..                                               | 88·0      | 4†    | 65·0     | 16\|\| | 85·1     | 68·1  | 71·4       | 83        | 155·0        | 52·0           | 2·43       | 12    | ...             |
| Grenada ... ..                                                | 83·4      | 21    | 70·0     | 23    | 81·2     | 71·9  | 62·1       | 71        | 144·0        | ...            | 5·15       | 22    | 4·5             |
| Toronto ... ..                                                | 45·6      | 6     | -8·7     | 1     | 33·7     | 19·7  | ...        | ...       | 58·8         | -10·6          | 3·18       | 14    | 7·1             |
| Fredericton ... ..                                            | 46·0      | 6     | -23·0    | 2     | 26·5     | 3·6   | ...        | 80        | ...          | ...            | 2·37       | 5     | 5·8             |
| St. John's, N.B.                                              | 46·0      | 11    | -7·3     | 2     | 30·9     | 12·8  | ...        | ...       | ...          | ...            | 5·05       | 11    | 5·9             |
| Victoria, B.C. ... ..                                         | 53·5      | 16    | 28·2     | 11    | 45·9     | 36·8  | ...        | 84        | ...          | ...            | 2·20       | 19    | 8·0             |
| Dawson ... ..                                                 | 13·2      | 27    | -53·0    | 14    | -17·3    | -32·1 | ...        | ...       | ...          | ...            | ·48        | 5     | 5·6             |

\* and 16. † and 6, 26. ‡ and 19. || and 26.

MALTA.—Mean temp. of air 49°·8. Average sunshine 4·8 hours per day.

Johannesburg.—Bright sunshine 144·6 hours.

Mauritius.—Mean temp. of air 0°·6, of dew point 2°·1, and R ·25 in., above averages. Mean hourly velocity of wind 7·3 miles, or 3·7 below average.

KODAIKANAL.—Bright sunshine 252 hours. Hoar frost on 5 days.

COLOMBO.—Mean temp. of air 79°·8, or 0°·4 below, of dew point 0°·3 above, and R 1·01 in. below averages. Mean hourly velocity of wind 4·7 miles. TS on 10th and 21st.

HONGKONG.—Mean temp. of air 60°·4, or 2°·4 above average. Bright sunshine 85·6 hours. Mean hourly velocity of wind 14·2 miles.

Melbourne.—Mean temp. of air 0°·3 below, and R ·25 in. below, averages.

Adelaide.—Mean temp. of air 3°·3 below, and R ·37 in. below averages.

Sydney.—Mean temp. of air 2°·4 below, and R 2·55 in. above, averages.

Wellington.—Mean temp. of air 1°·1 below, and R ·23 in. below, averages. Bright sunshine 251·1 hours.

Auckland.—An absolutely rainless month and the only one recorded in Auckland.

TRINIDAD.—R ·88 in. above 46 years' average.



RAINFALL OF THAMES VALLEY — AUGUST, 1909.



ALTITUDE SCALE

|                |                 |                  |                 |
|----------------|-----------------|------------------|-----------------|
| Below 250 feet | 250 to 500 feet | 500 to 1000 feet | Above 1000 feet |
|----------------|-----------------|------------------|-----------------|

SCALE OF MILES

0 5 10 15 20

Synon's Meteorological Magazine. Viewed of River Thames above Taddington, and River Lee above Felde Weir

# Symons's Meteorological Magazine.

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No. 524.            SEPTEMBER, 1909.    VOL. XLIV.

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## THE LOWEST TEMPERATURE ON THE EARTH'S SURFACE.

THE good news that Commander Robert E. Peary, U.S.N., reached the North Pole on April 6th, 1909, comes to us just as we are leaving on a short holiday. Mr. Peary has striven for this goal for many years, and has won his way to the highest regard of the geographers of the world by his courage, resourcefulness and perseverance. The accuracy of his observations in the past, and the high character which has led him never to minimize failure or exaggerate success, makes his announcement sure of instant credence; but he has earned this credit by twenty-three years of unceasing effort in one direction, and by never making any claim on public faith unbacked by the clearest proofs.

The news came as we were correcting the proof of the following article, which we leave unchanged, the three days of continuous interviewing that Dr. Cook has undergone since it was written having revealed nothing to alter our opinions. He states, however, that the temperatures were Fahrenheit, not Centigrade; and that a glass artificial horizon was used in determining his latitude.

Owing to circumstances connected with the holiday season this number of the Magazine has to go to press at an earlier date than usual, and, when it comes to be read, the references in the newspapers which suggest this article may possibly have been corrected or amplified. The statement is made on the strength of a telegram from Lerwick, by Dr. F. A. Cook, that in the course of a journey to the North Pole he experienced a temperature of  $-83^{\circ}$  C. Dr. Cook is represented as stating that he reached the North Pole on April 21st, 1908, and from the particulars he gives of the route by which he travelled, we see no reason to doubt the accomplishment of the feat; but he states other things which appear to us a great deal more remarkable than reaching the pole, which, after all, only meant going 114 geographical miles farther than Commander Peary did in 1906. We cannot understand how he was able to determine local noon at the North Pole, on April 21st. So far as we understand it is either always local noon at the pole, if noon is taken at the southing of the

sun, or else local noon only occurs once a year, at the moment when the sun stands at its maximum altitude at the summer solstice ; and to determine the precise instant when that occurs on June 22nd, must be an operation of great delicacy. The telegram, which we quote from *The Times*, says "On April 21st the corrected altitude of the sun gave 89 deg. 59 min. 46 sec. The Pole therefore was in sight. We advanced the 14 sec., made supplementary observations, and prepared to stop long enough to permit a double round of observations. The sun indicated local noon, but time was a negative problem, for here all meridians meet." We cannot imagine how time could ever be a negative problem. Dr. Cook will no doubt explain in due time how the position was determined. It will suffice to exhibit the instrument he employed to obtain the altitudes, and prove that he is able to distinguish so small a difference as 14 seconds of arc. This will be necessary before what would otherwise have been a fairly clear and straightforward narrative can be credited and his claim to have reached the North Pole accepted. Most polar explorers consider themselves extremely fortunate if they secure observations to fix their position to within a few minutes of latitude ; and we had no idea that so close an approximation in determining latitude as 14 seconds was possible with any portable instrument.

We have, perhaps, travelled outside our province in this Magazine in referring to this question of latitude, but a precisely similar difficulty attaches to the temperature of  $-83^{\circ}$  C., stated by Dr. Cook to have been measured, presumably in February 1908, "when crossing the heights bordering Ellesmere Sound," presumably in latitude  $74^{\circ}$  N. This temperature corresponds to  $-117^{\circ}$  F., and if authentic, marks the greatest degree of cold ever recorded on the Earth's surface. Temperatures down to  $-120^{\circ}$  F. have been recorded in the ascents of free balloons at altitudes exceeding 30,000 feet ; but so far as we are aware the lowest temperature ever previously recorded on the Earth's surface was  $-90^{\circ}$  F. at Verkhoiansk in eastern Siberia just within the Arctic circle on January 15th, 1885. No temperatures approaching this in severity have previously been encountered on polar expeditions. The lowest at the winter quarters of the *Alert* in  $82^{\circ} 27'$  N., in March 1876, was  $-73^{\circ} 8$  F., and the lowest which occurred during the drift of the *Fram* on Dr. Nansen's expedition of 1893-96, was  $-63^{\circ}$  F., and the vessel passed one winter north of  $85^{\circ}$  N.\*

The difficulty of managing spirit thermometers is familiar to everyone who conducts the humdrum observations in the moderate warmths and coolnesses of the British climate ; and we are assured

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\* Dr. Cook explains that the word "centigrade" was inserted in his telegram by error instead of "Fahrenheit," but we are not informed how so serious and unusual an error came to be made. He adds that temperatures of  $-83^{\circ}$  F. are common in the Arctic regions, and this we have difficulty in accepting, as  $-73^{\circ} 8$  F. is the lowest authentic temperature reported by any polar explorer to whose records we are able to refer.

by polar travellers that the troubles are not less but infinitely greater in conditions of extreme cold, and especially when travelling. Unless specially constructed no thermometer could be found to read to one hundred degrees below zero Fahrenheit, and if the degree marks are open enough for easy reading the length of the instrument would be apt to make its transport exceedingly inconvenient. We sincerely trust that Dr. Cook will take an early opportunity of describing his instruments and the methods of using them, and so place in the hands of men of science some data by which they can judge of the limits within which they may be relied upon.

We do not in any way wish to detract from Dr. Cook's remarkable journey, or to throw doubt on anything he has said; but the somewhat hysterical style of the telegrams which have as yet appeared makes it difficult to judge how far the positions and temperatures are to be taken in a scientific sense. We trust that polar exploration will not be neglected even if the stimulus of being first to reach the Pole is withdrawn; and we anticipate a magnificent harvest of meteorological and oceanographical data from the voyage now being arranged for by Captain Roald Amundsen in Dr. Nansen's old ship the *Fram*. Captain Amundsen proposes to enter the Arctic regions by Bering Strait, to allow the *Fram* to become frozen into the sea ice, and leave her to drift across the polar area, while scientific observations are being carried on continuously on the air above, and the water below. He hopes to start in 1910, and intends to take with him provisions for seven years.

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## MEDIAEVAL METEOROLOGY.

By CARLE SALTER.

METEOROLOGY, dignified by the title of a science, may be said to be almost without a history in the ordinary acceptance of the term, but speculations as to the behaviour of the elements figure among the most ancient traditions, and took their place naturally in the writings of mediæval philosophers side by side with alchemy and astrology, from which, indeed, it is sometimes not easy to separate them. Unhampered by the formidable array of observed and verified facts which confronts the theorist of to-day, the savant of the middle ages was wont to allow his imagination, and with it his pen, to run riot in the realms of conjecture, and to take wild plunges into the unplumbed depths of the ocean of unexplained natural phenomena.

Some idea of the vague conceptions which held place in the esteem of our forefathers as the high-water mark of learning, may be gleaned from the following extracts. They are culled from Trevisa's translation of *De Proprietatibus Rerum* of Bartholomew Anglicus, the first Latin version of which famous work was given to the world about the middle of the thirteenth century, and which was for

hundreds of years a standard work of reference all over the then civilized world.

Concerning rain, we read :—

“Fumositities that are drawn out of the waters and off the earth by strength of heat of heaven are drawn to the nethermost part of the middle space of the air, and there by coldness of the place they are made thick, and then by heat dissolving and departing the moisture thereof and not wasting all, these fumositities are resolved and fall and turn into rain and showers.”

Making allowance for a characteristic and inevitable want of precision, this appears to be moderately sound meteorology. We have heard far worse at the present day. The extract continues :—

“If rain be temperate in quality and quantity, and agreeable to the time, it is profitable to infinite things. For rain maketh the land to bear fruit, and joineth it together, if there be many chines therein, and assaugeth and tempereth strength of heat, and cleareth the air, and ceaseth and stinteth winds, and fatteth fish, and helpeth and comforteth dry complexion. And if rain be evil and distemperate in its qualities, and discording to place and time, it is greivous and noyful to many things. For it maketh deepness and uncleanness and slipperiness in ways and in paths, and bringeth forth much unprofitable herbs and grass, and corrupteth and destroyeth fruit and seeds, and quenclheth in seeds the natural heat, and maketh darkness and thickness in the air, and taketh from us the sun beams, and gathereth mist and clouds, and letteth the work of labouring men, and tarrieth and letteth ripening of corn and of fruits, and exciteth rheum and running flux, and increaseth and strengtheneth all moist ills, and is cause of hunger and of famine, and of corruption and murrain of beasts and sheep ; for corrupt showers do corrupt the grass and herbs of pasture, whereof cometh needful corruption of beasts.”

The writer was obviously perfectly at home among the easily observed facts of everyday weather down below, but it is when among the clouds that he becomes more fantastic :—

“Of impressions that are gendered in the air of double vapour, the first is thunder, the which impression is gendered in watery substance of a cloud. For moving and shaking hither and thither of hot vapour and dry, that fleeth its contrary, is beset and constrained in every side, and smit into itself, and is thereby set on fire and on flame, and quenclheth itself at last in the cloud, as Aristotle saith. When a storm of full strong winds cometh in to the clouds, and the whirling wind and the storm increaseth, and seeketh out passage : it cleaveth and breaketh the cloud, and falleth out with a great rese and strong, and all to breaketh the parts of the cloud, and so it cometh to the ears of men and of beasts with horrible and dreadful breaking and noise. And that is no wonder : for though a bladder be light, yet it maketh great noise and sound, if it be strongly blown, and afterward violently broken. And with the thunder cometh lightning, but lightning is sooner seen, for it is clear and bright ; and thunder cometh later to our ears, for the wit of sight is more subtle than the wit of hearing. As a man

seeth sooner the stroke of a man that heweth a tree, than he heareth the noise of the stroke.

“The lightning which is called Clarum is of a wonderful kind, for it catcheth and draweth up wine out the tuns, and toucheth not the vessel, and melteth gold and silver in purses, and melteth not the purse.”

The properties of dew would seem to have been to a certain extent curtailed in these days ; unless, indeed, we moderns fail to recognize its beneficent qualities so fully as did the men of former times. It is difficult to understand how dew could have come to be supposed to be concerned in the formation of the pearl.

“And though dew be a manner of airy substance, and most subtle outward, natheless in a wonder manner it is strong in working and virtue. For it besprinkleth the earth, and maketh it plenteous, and maketh flour, pith, and marrow increase in corn and grains : and fatteth and bringeth forth broad oysters and other shell fish in the sea, and namely dew of spring time. For by night in spring time oysters open themselves against dew, and receive dew that cometh in between the two shells, and hold and keep it ; and that dew so holden and kept feedeth the flesh, and maketh it fat ; and by its incorporation with the inner parts of the fish breedeth a full precious gem, a stone that is called Margarita. Also the birds of ravens, while they are whitish in feathers, ere they are black, dew feedeth and sustaineth them, as Gregory saith.’

The last quotation, which as a matter of fact precedes the above in the order of the original, is a little more difficult to follow ; but it will be recognized by those familiar with the mediæval methods of reasoning, as containing some good examples of over-strained analogy leading to confusion. We are inclined to think that the idea in the writer's mind was of a symbolic representation of the four elements, but his somewhat ingenuous, although none the less picturesque, explanation, tends to obscure rather than emphasize the fact. We cannot help suspecting, however, that the introduction of a little mystery may have merely served as a convenient cloak for the author's want of a more convincing theory. There would seem to be some mistake about the arrangement of the colour bands, a point in which the most elementary of observers would hardly be expected to err.

The mention of Beda's prophesy of the ultimate drying up of the earth, brings forcibly to mind the gloomy prognostications of a more modern school of seers.

“The Rainbow is impression gendered in an hollow cloud and dewy, disposed to rain in endless many gutters, as it were shining in a mirror, and is shapen as a bow, and sheweth divers colours, and is gendered by the beams of the sun or of the moon. And is but seldom gendered by beams of the moon, no more but twice in fifty years, as Aristotle saith. In the rainbow by cause of its clearness be seen divers forms, kinds, and shapes that be contrary. Therefore the bow seemeth coloured, for, as Bede saith, it taketh colour of the four elements. For therein, as it were in any mirror, shineth figures and shapes and kinds of elements. For of fire he taketh red

colour in the overmost part, and of earth green in the nethermost, and of the air a manner of brown colour, and of water somedeal blue in the middle. And first is red colour, that cometh out of a light beam, that touches the outer part of the roundness of the cloud : then is a middle colour somedeal blue, as the quality asketh, that hath mastery in the vapour, that is in the middle of the cloud. Then the nethermost seemeth a green colour in the nether part of a cloud ; there the vapour is more earthly. And these colours are more principal than others.

“ As Beda saith, and the master of stories, forty years tofore the doom, the rainbow shall not be seen, and that shall be token of drying, and of default of elements.”

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### REVIEWS.

*The Observer's Handbook.* Approved for the Use of Meteorological Observers by the Meteorological Office, the Royal Meteorological Society, the Scottish Meteorological Society, the British Rainfall Organization. Annual Edition 1909. Published by the authority of the Meteorological Committee. London : for H.M. Stationery Office, 1909. Size  $9\frac{1}{2} \times 6$ . Pp. 154. Price 3s.

DR. SHAW says in the preface : “ Since Meteorological Science is entirely of a co-operative character, and observations are only useful in so far as they are comparable with those made in other places or at other times, it is clear that instructions in the use of instruments are only satisfactory in so far as they represent the general consensus of opinion as distinguished from the opinion of a single institution or individual. It is, therefore, an essential condition of progress that the arrangements for making and recording observations should be the subject of common agreement between the institutions responsible for the control of the various parts of the network of stations in this country.” Hence the important system of co-operation announced in the title page.

While most of the letterpress is of an eminently practical nature, exactly suited for the use of Observers, some of the particulars with regard to the adjustment of instruments appeal to a much smaller circle. An elaborate discussion of the units theoretically best for meteorological work seems only likely to puzzle and discourage Observers whose difficulties are of a much more elementary character, though it may be useful as a logical basis for the ultimate unification of measures throughout the world.

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*Fourth Annual Report of the Meteorological Committee to the Lords Commissioners of His Majesty's Treasury for the Year ended 31st March, 1909.* London : printed for H.M. Stationery Office. [Cd. 4813.] Size  $9\frac{1}{2} \times 6$ . Pp. 140. Price 1s. 5d.

THIS Report, as usual, contains much material bearing on the progress which is being made in the work of the Meteorological Office. The

frontispiece is a singularly interesting proof of the value of wireless telegraphy in meteorology, for it shows a weather chart extended over the whole of the western Atlantic by ships' observations, received, unfortunately, too late to be of service in the daily reports. An interesting account is given of the organization of the Wireless weather service in the Atlantic; and, as students of the Daily Weather Report know, from time to time a report is received in time to help the daily chart and strengthen the probability of the forecasts. An important criticism is given of the success of the weather forecasts and storm-warnings of the year. The usual statements regarding administration and publications will be read with interest. The most important fact is the completion of the first volume of the British Meteorological Year-book, issued in monthly parts, strictly up to date, and including the Observations at Second Order Stations, the Hourly Readings at the four observatories and the Monthly Weather Review.

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*Some Facts about the Weather.* By W. MARRIOTT, F.R.Met.Soc.  
Second and Revised Edition. London: E. Stanford, 1909. Size  
 $8\frac{1}{2} \times 5\frac{1}{2}$ . Pp. 38. Price 6d.

THIS useful popular pamphlet has been enlarged and considerably improved. It should be read by everyone interested in the study of the weather.

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### METEOROLOGICAL NEWS AND NOTES.

THE DAYLIGHT SAVING BILL has been reported upon adversely by a Parliamentary Committee after a prolonged and careful hearing of all the arguments for and against the proposal to change the hands of the clock twice a year, so as to compel earlier rising in summer. Not a word was said against the wisdom of the purpose which the Bill was intended to serve, and it may be hoped that by calling attention prominently to the waste of daylight the agitation will lead to a general improvement in the early rising habits of the community, while preserving the fundamental principles of the measurement of time.

THE BRITISH ASSOCIATION met this year in Winnipeg, this being the third occasion on which the meeting has been held in Canada, and the fourth outside the British Isles. The reports of the meeting which have been published have not referred to any papers of meteorological interest, but we are awaiting a special report.

MR. SHACKLETON'S ANTARCTIC EXPEDITION, the finances of which were based on the personal guarantee of himself and his friends, has been made the object of a Government grant of £20,000, which was offered by the Prime Minister as a recognition of the valuable scientific results obtained by the expedition and the small expense at which they had been secured.

## THE WEATHER OF AUGUST, 1909.

By FRED. J. BRODIE.

AUGUST opened with a continuation of the cool unsettled weather which had prevailed so extensively in the earlier part of the summer ; and on the 1st, when a shallow barometrical depression passed slowly eastwards across the country, an extremely heavy fall of rain occurred over our northern and eastern counties. Next day a large anticyclone began to spread in from the Atlantic, and although the weather in Ireland and Scotland was less settled than in England, the conditions over the United Kingdom generally during the ensuing fortnight were more seasonable than at any other time in the past inclement summer. With the northerly wind blowing round the edge of the advancing anticyclone the air was at first very cool for the time of year, and on the nights of the 1st and 2nd a slight ground frost was experienced in many parts of the western, northern and central districts, the exposed thermometer falling to  $28^{\circ}$  at Balmoral,  $30^{\circ}$  at West Linton, and  $31^{\circ}$  at Llangammarch Wells. The further extension of the Atlantic high pressure system was followed, however, by a change of wind, and with the bright sunny weather which now set in, the thermometer rose slowly but steadily to a high summer level.

In Ireland and Scotland the highest temperatures were recorded at various times between the 6th and the 11th ; few places experienced a shade reading as high as  $80^{\circ}$ , but Crieff reported a maximum of  $80^{\circ}$  on the 10th, Killarney and Kilkenny a similar value on the 8th and 11th, the reading at Killarney having been preceded by one of  $81^{\circ}$  on the 6th. In most English districts the thermometer rose to  $80^{\circ}$  and upwards on several occasions, the greatest heat occurring on the 12th, when a reading as high as  $85^{\circ}$  was recorded in many parts of the country ; at Greenwich, Shoeburyness, Raunds and Hereford, the maximum on this day was as high as  $86^{\circ}$ , while at Cullompton the thermometer touched  $89^{\circ}$ .

After the middle of the month the weather broke up completely, and for the remainder of the time the day temperatures were almost always below the average ; the nights being, however, as a rule, fairly mild for the season. Heavy falls of rain occurred over practically the whole of England on the 17th, and on the south-east coasts both on the 20th and 24th ; the only material break in the spell of cool, unsettled weather occurring about the close of the fourth week, when the brief visit of an anticyclone resulted in a fair amount of bright sunshine, with a shade temperature rising on the 28th and 29th to  $70^{\circ}$ , or a little above it in several parts of England. At the close of the month a bitterly cold wind swept down from the northward and north-westward, and on the 31st the thermometer over by far the greater portion of the United Kingdom failed to reach  $60^{\circ}$ , many places in the north recording a maximum as low as  $55^{\circ}$ .

The mean temperature for the month was in most places in fair agreement with the normal, but over the greater part of England the summer warmth of the first fortnight resulted in a slight excess. In the neighbourhood of London (the remark fails to apply to the south-east of England as a whole) the meteorological conditions during the three summer months showed a steady improvement, August being finer, drier and warmer than July, and July far sunnier and warmer than June. At Westminster, the mean maximum temperatures for the three months were respectively  $61^{\circ}\cdot5$ ,  $68^{\circ}\cdot2$  and  $71^{\circ}\cdot5$ ; the total sunshine values, 91 hours, 166 hours and 216 hours; and the total rainfall, 4.02 in., 2.95 in. and 1.43 in.

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### Correspondence.

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

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#### AUGUST METEORS.

A SUCCESSION of very clear nights between August 3rd and 14th enabled these objects to be well seen this year. The display was remarkable for the brilliancy of the individual meteors, rather than for any great abundance. A splendid Perseid fireball appeared on August 12th, 9.42 p.m., and was observed at Greenwich, Bristol, Hayling Island, Aberdare, and other places. Its height was from 87 to 53 miles, luminous course 68 miles long and velocity 35 miles per sec. Its flight was above places 10 miles W. of Ipswich and 15 miles E. of Croydon. A number of other large meteors, equal in brightness to Venus, Jupiter and Mars, were seen at various places. At Bristol, the hourly number of meteors was about 30 on August 11th, between 9 and 12 p.m. (one observer). On the following night the number had declined to 20 per hour, but the objects were of unusual lustre, and their long streaks formed a characteristic feature. The display seems to have been more generally and successfully observed than in any previous year, a fact partly due to the ideal summer weather which prevailed. Shade temperature rose to above  $80^{\circ}$  at Bristol, on nearly every day from August 5th to 14th; and there were pretty dense fogs on the mornings of August 12th and 15th, imparting an autumnal touch to the face of nature.

W. F. DENNING.

*44, Egerton Road, Bristol, August 25th, 1909.*

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#### LIGHTNING STORM OF AUGUST 8th, 1909.

AFTER a fine and hot day, with a shade maximum of  $78^{\circ}$ , sheet lightning was first seen in S. at 9.30 p.m. The night was fine and starlight, the only cloud being an irregular layer of stratus to S. and S.E., visible only when lit up by the flashes. The radiant point of the flashes, starting at S., worked slowly round to S.E. The more brilliant of the flashes shot up beyond the zenith from the horizon.

Table showing Number of Flashes of Sheet Lightning, at intervals of five minutes, from 10 p.m. to 12 p.m.

| 10 to 11 p.m.            |          |             | 11 to 12 p.m.           |          |             |
|--------------------------|----------|-------------|-------------------------|----------|-------------|
| 10 to 10.5               | .....    | 16 flashes. | 11 to 11.5              | .....    | 14 flashes. |
| 10.5                     | ,, 10.10 | 14 ,,       | 11.5                    | ,, 11.10 | 12 ,,       |
| 10.10                    | ,, 10.15 | 20 ,,       | 11.10                   | ,, 11.15 | 10 ,,       |
| 10.15                    | ,, 10.20 | 31 ,,       | 11.15                   | ,, 11.20 | 21 ,,       |
| 10.20                    | ,, 10.25 | 15 ,,       | 11.20                   | ,, 11.25 | 8 ,,        |
| 10.25                    | ,, 10.30 | 26 ,,       | 11.25                   | ,, 11.30 | 5 ,,        |
| 10.30                    | ,, 10.35 | 12 ,,       | 11.30                   | ,, 11.35 | 3 ,,        |
| 10.35                    | ,, 10.40 | 20 ,,       | 11.35                   | ,, 11.40 | 1 ,,        |
| 10.40                    | ,, 10.45 | 30 ,,       | 11.40                   | ,, 11.45 | 0 ,,        |
| 10.45                    | ,, 10.50 | 18 ,,       | 11.45                   | ,, 11.50 | 1 ,,        |
| 10.50                    | ,, 10.55 | 27 ,,       | 11.50                   | ,, 11.55 | 0 ,,        |
| 10.55                    | ,, 11    | 22 ,,       | 11.55                   | ,, 12    | 0 ,,        |
| 1 hour..... 251 flashes. |          |             | 1 hour..... 75 flashes. |          |             |

Table showing Colour of Flashes of Sheet Lightning, at intervals of fifteen minutes, from 10 p.m. to 12 p.m.

| 10 to 11 p.m.  | White. | Yellow. | Red. | 11 to 12 p.m.  | White. | Yellow. | Red. |
|----------------|--------|---------|------|----------------|--------|---------|------|
| 10 to 10.15    | 25     | 10      | 0    | 11 to 11.15    | 17     | 11      | 3    |
| 10.15 ,, 10.30 | 40     | 11      | 2    | 11.15 ,, 11.30 | 4      | 28      | 2    |
| 10.30 ,, 10.45 | 37     | 14      | 3    | 11.30 ,, 11.45 | 0      | 0       | 4    |
| 10.45 ,, 11    | 48     | 10      | 0    | 11.45 ,, 12    | 0      | 0       | 1    |
| 1 hour.....    | 150    | 45      | 5    | 1 hour.....    | 21     | 39      | 10   |

Summary.

Total number of flashes in 2 hours (10 p.m. to 12 p.m.) ..... 326  
 Total number of colour of flashes in 2 hours (10 p.m. to 12 p.m.)... 270

Distribution of Colours (10 to 12 p.m.)

White.                      Yellow.                      Red.  
 171                              84                              15

SPENCER C. RUSSELL.

Epsom, Surrey, August 10th, 1909.

THUNDERSTORMS OF AUGUST 17th—18th.

PERHAPS you would care to hear that between 7 and 9 a.m. on August 18th there was a thunder and lightning storm, with heavy rain, which at 9 a.m. this morning measured in the Snowdon gauge 2.69 inches. There was some rain after, but now, at 2 p.m., it is bright, sunny and warm again.

JAS. W. DUNCAN.

The Firs, Castle Hill, Maidenhead, 18th August, 1909.

A LITTLE rain fell here in the late afternoon of August 17th, I should think about  $\cdot 16$  in. ; then followed a clear starlight night. At about 6.30 a.m. on 18th it grew very dark, and then a great peal of thunder came from the north-east, but close overhead. Then rain, at times mixed with hail, began to fall, and torrential rain continued till about 8.15 a.m., when it ceased for a space. At 9 a.m.  $2\cdot 66$  in. was found in the rain gauge, which, allowing  $\cdot 16$  in. for the previous day, makes  $2\cdot 50$  in., in at the most 1 hour 45 minutes, and probably in an hour and a half. After 9 a.m.,  $\cdot 31$  in fell, and at 11 a.m. it completely ceased. This makes  $2\cdot 97$  in. altogether, or  $2\ 81$  in. after 6.30 a.m.

R. W. ROGERS.

*The Vicarage, Cookham, Berks, August 19th, 1909.*

### WEATHER REPORTS BY A FRUIT TREE.

BY P. P. PENNANT.

THERE will be found below weather reports of the summer months for over a quarter of a century, as recorded by a peach tree (River's early). The date given is that on which, each year, the first ripe peach was picked from this particular tree. The tree speaks not merely as to temperature like a thermometer, not merely as to rain or moisture, nor as to the amount of sunshine or light, during the previous months, but as to all three combined.

It will be observed that the fruit ripened latest in 1888, and earliest in 1893 and 1896. A reference to *British Rainfall* for these years shews the description of June and July in the first year to have been extremely dull and very wet, and in the latter to have been very hot and very bright.

This year, on July 31st, the fruit on the tree looked as though it might rival in lateness the crop of 1888, but the very brilliant weather of the first half of August altered all this most quickly.

Sometimes we have for a period bright mornings and dull evenings as a rule, or sometimes the exact opposite. I have observed how quickly fruit on a S.E. or S.W. wall responds to this. A few years ago I had two (Royal George) peach trees of the same age, one on a S.E. wall and the other on a S.W. wall. The gathering of the fruit from these two trees spoke clearly as to the brightness or the dulness of the mornings or the evenings respectively during the previous months.

|       |       |      |     |      |       |      |     |      |       |      |     |
|-------|-------|------|-----|------|-------|------|-----|------|-------|------|-----|
| 1882  | ..... | July | 27. | 1891 | ..... | July | 28. | 1900 | ..... | Aug. | 2.  |
| 1883  | ..... | Aug. | 10. | 1892 | ..... | Aug. | 7.  | 1901 | ..... | July | 29. |
| 1884  | ..... | July | 28. | 1893 | ..... | July | 17. | 1902 | ..... | Aug. | 10. |
| 1885  | ..... | Aug. | 8.  | 1894 | ..... | „    | 25. | 1903 | ..... | „    | 5.  |
| *1886 | ..... | —    |     | 1895 | ..... | Aug. | 5.  | 1905 | ..... | „    | 2.  |
| 1887  | ..... | Aug. | 7.  | 1896 | ..... | July | 18. | 1907 | ..... | „    | 11. |
| 1888  | ..... | „    | 21. | 1897 | ..... | Aug. | 1.  | 1909 | ..... | „    | 9.  |
| 1889  | ..... | „    | 6.  | 1898 | ..... | July | 27. |      |       |      |     |
| 1890  | ..... | „    | 8.  | 1899 | ..... | „    | 25. |      |       |      |     |

\* A few years have no record, due to no crop or absence from home of the recorder.

## RAINFALL TABLE FOR AUGUST, 1909.

| STATION.                           | COUNTY.              | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.    |              |
|------------------------------------|----------------------|------------|----------------------|--------------------------------|--------------------------|--------------|
|                                    |                      |            |                      |                                | Aver.<br>1870-99.<br>in. | 1909.<br>in. |
| Camden Square.....                 | London.....          | 51 32      | 0 8                  | 111                            | 2.33                     | 1.46         |
| Tenterden.....                     | Kent.....            | 51 4       | *0 41                | 190                            | 2.37                     | 2.42         |
| West Dean.....                     | Hampshire.....       | 51 3       | 1 38                 | 137                            | 2.60                     | 3.01         |
| Hartley Wintney.....               | ".....               | 51 18      | 0 53                 | 222                            | 2.09                     | 1.65         |
| Hitchin.....                       | Hertfordshire.....   | 51 57      | 0 17                 | 238                            | 2.26                     | 2.18         |
| Winslow (Addington).....           | Buckinghamsh. ....   | 51 58      | 0 53                 | 309                            | 2.53                     | 2.63         |
| Bury St. Edmunds (Westley).....    | Suffolk.....         | 52 15      | *0 40                | 226                            | 2.40                     | 2.41         |
| Brundall.....                      | Norfolk.....         | 52 37      | *1 26                | 66                             | 2.19                     | 1.80         |
| Winterbourne Steepleton.....       | Dorset.....          | 50 42      | 2 31                 | 316                            | 3.18                     | 3.62         |
| Torquay (Cary Green).....          | Devon.....           | 50 28      | 3 32                 | 12                             | 2.91                     | 1.82         |
| Polapit Tamar [Launceston].....    | ".....               | 50 40      | 4 22                 | 315                            | 3.19                     | 1.98         |
| Bath.....                          | Somerset.....        | 51 23      | 2 21                 | 67                             | 2.96                     | 3.22         |
| Stroud (Upfield).....              | Gloucestershire..... | 51 44      | 2 13                 | 226                            | 2.83                     | 2.66         |
| Church Stretton (Wolstaston).....  | Shropshire.....      | 52 35      | 2 48                 | 800                            | 3.24                     | 2.12         |
| Coventry (Kingswood).....          | Warwickshire.....    | 52 24      | 1 30                 | 340                            | 2.77                     | 1.54         |
| Boston.....                        | Lincolnshire.....    | 52 58      | 0 1                  | 25                             | 2.25                     | 2.76         |
| Worksop (Hodsock Priory).....      | Nottinghamshire..... | 53 22      | 1 5                  | 56                             | 2.31                     | 3.07         |
| Derby (Midland Railway).....       | Derbyshire.....      | 52 55      | 1 28                 | 156                            | 2.42                     | 2.45         |
| Bolton (Queen's Park).....         | Lancashire.....      | 53 35      | 2 28                 | 390                            | 4.36                     | 3.76         |
| Wetherby (Ribston Hall).....       | Yorkshire, W.R. .... | 53 59      | 1 24                 | 130                            | 2.59                     | 3.22         |
| Arneliffe Vicarage.....            | ".....               | 54 8       | 2 6                  | 732                            | 5.43                     | 5.92         |
| Hull (Pearson Park).....           | "..... E.R. ....     | 53 45      | 0 20                 | 6                              | 2.81                     | 5.86         |
| Newcastle (Town Moor).....         | Northumberland.....  | 54 59      | 1 38                 | 201                            | 3.14                     | 3.41         |
| Borrowdale (Seathwaite).....       | Cumberland.....      | 54 30      | 3 10                 | 423                            | 11.23                    | 8.46         |
| Cardiff (Ely).....                 | Glamorgan.....       | 51 29      | 3 13                 | 53                             | 4.52                     | 3.19         |
| Haverfordwest (High Street).....   | Pembroke.....        | 51 48      | 4 58                 | 95                             | 4.04                     | 1.75         |
| Aberystwyth (Gogerddan).....       | Cardigan.....        | 52 26      | 4 1                  | 83                             | 4.60                     | 2.75         |
| Llandudno.....                     | Carnarvon.....       | 53 20      | 3 50                 | 72                             | 2.86                     | 3.03         |
| Cargen [Duntries].....             | Kirkcubright.....    | 55 2       | 3 37                 | 80                             | 4.10                     | 2.21         |
| Hawick (Branxholm).....            | Roxburgh.....        | 55 24      | 2 51                 | 457                            | 3.33                     | 1.63         |
| Edinburgh (Royal Observatory)..... | Midlothian.....      | 55 55      | 3 11                 | 442                            | ...                      | 1.72         |
| Girvan (Pinnore).....              | Ayr.....             | 55 10      | 4 49                 | 207                            | 4.34                     | 3.41         |
| Glasgow (Queen's Park).....        | Renfrew.....         | 55 53      | 4 18                 | 144                            | 3.79                     | ...          |
| Inveraray (Newtown).....           | Argyll.....          | 56 14      | 5 4                  | 17                             | 5.60                     | 4.62         |
| Mull (Quinish).....                | ".....               | 56 36      | 6 13                 | 35                             | 4.84                     | 3.75         |
| Dundee (Eastern Necropolis).....   | Forfar.....          | 56 28      | 2 57                 | 199                            | 3.08                     | 1.78         |
| Braemar.....                       | Aberdeen.....        | 57 0       | 3 24                 | 1114                           | 3.83                     | 2.10         |
| Aberdeen (Cranford).....           | ".....               | 57 8       | 2 7                  | 120                            | 3.22                     | 2.17         |
| Cawdor.....                        | Nairn.....           | 57 31      | 3 57                 | 250                            | 3.07                     | 1.86         |
| Fort Augustus (S. Benedict's)..... | E. Inverness.....    | 57 9       | 4 41                 | 68                             | 3.35                     | 2.40         |
| Loch Torridon (Bendamph).....      | W. Ross.....         | 57 32      | 5 32                 | 20                             | 6.91                     | 4.82         |
| Dunrobin Castle.....               | Sutherland.....      | 57 59      | 3 56                 | 14                             | 2.65                     | 1.81         |
| Castletown.....                    | Caitness.....        | 58 35      | 3 23                 | 100                            | ...                      | 3.29         |
| Killarney (District Asylum).....   | Kerry.....           | 52 4       | 9 31                 | 178                            | 4.92                     | .89          |
| Waterford (Brook Lodge).....       | Waterford.....       | 52 15      | 7 7                  | 104                            | 3.71                     | .94          |
| Broadford (Hurdlestown).....       | Clare.....           | 52 48      | 8 38                 | 167                            | 3.79                     | 1.30         |
| Abbey Leix (Blandsfort).....       | Queens County.....   | 52 56      | 7 17                 | 532                            | 3.94                     | 1.86         |
| Dublin (Fitz William Square).....  | Dublin.....          | 53 21      | 6 14                 | 54                             | 3.02                     | 1.30         |
| Mullingar (Belvedere).....         | Westmeath.....       | 53 29      | 7 22                 | 367                            | 4.03                     | 1.08         |
| Ballinasloe.....                   | Galway.....          | 53 20      | 8 15                 | 160                            | 3.96                     | .89          |
| Crossmolina (Enniscroe).....       | Mayo.....            | 54 4       | 9 18                 | 74                             | 4.57                     | 2.49         |
| Collooney (Markree Obsy.).....     | Sligo.....           | 54 11      | 8 27                 | 127                            | 4.16                     | 2.50         |
| Seaforde.....                      | Down.....            | 54 19      | 5 50                 | 180                            | 3.52                     | 2.04         |
| Londonderry (Creggan Res.).....    | Londonderry.....     | 54 59      | 7 19                 | 320                            | 3.94                     | 4.04         |
| Omagh (Edenfel).....               | Tyrone.....          | 54 36      | 7 18                 | 280                            | 4.03                     | 2.53         |

RAINFALL TABLE FOR AUGUST, 1909—*continued.*

| RAINFALL OF MONTH ( <i>con.</i> ) |          |                   |             |                | RAINFALL FROM JAN. 1. |                  |          |     | Mean Annual 1870-1899. | STATION.           |
|-----------------------------------|----------|-------------------|-------------|----------------|-----------------------|------------------|----------|-----|------------------------|--------------------|
| Diff. from Av. in.                | % of Av. | Max. in 24 hours. | No. of Days | Aver. 1870-99. | 1909.                 | Diff. from Aver. | % of Av. |     |                        |                    |
|                                   |          | in. Date.         |             | in.            | in.                   | in.              | in.      | in. |                        |                    |
| - '87                             | 63       | '42               | 17          | 11             | 15'45                 | 16'49            | +1'04    | 107 | 25'16                  | Camden Square      |
| + '05                             | 102      | '88               | 24          | 11             | 16'18                 | 17'72            | +1'54    | 109 | 28'36                  | Tenterden          |
| + '41                             | 116      | 1'21              | 17          | 11             | 17'83                 | 17'53            | - '30    | 98  | 29'93                  | West Dean          |
| - '44                             | 79       | '60               | 17          | 10             | 16'06                 | 17'36            | +1'30    | 108 | 27'10                  | Hartley Wintney    |
| - '08                             | 96       | '50               | 1           | 14             | 15'07                 | 18'17            | +3'10    | 121 | 24'66                  | Hitchin            |
| + '10                             | 104      | 1'05              | 17          | 11             | 16'58                 | 16'85            | + '27    | 102 | 26'75                  | Addington          |
| + '01                             | 100      | '68               | 1           | 14             | 15'63                 | 16'07            | + '44    | 103 | 25'39                  | Westley            |
| - '39                             | 82       | '75               | 1           | 14             | 15'01                 | 14'01            | -1'00    | 93  | 25'40                  | Brundall           |
| + '44                             | 114      | 1'70              | 17          | 11             | 22'32                 | 22'41            | + '09    | 100 | 39'00                  | Winterbourne Spltn |
| -1'09                             | 63       | '61               | 24          | 11             | 20'69                 | 18'66            | -2'03    | 90  | 35'00                  | Torquay            |
| -1'21                             | 62       | '91               | 24          | 12             | 21'57                 | 19'74            | -1'83    | 92  | 38'85                  | Polapit Tamar      |
| + '26                             | 109      | 1'06              | 17          | 12             | 18'82                 | 16'60            | -2'22    | 88  | 30'75                  | Bath               |
| - '17                             | 94       | '64               | 1           | 12             | 18'56                 | 16'99            | -1'57    | 92  | 29'85                  | Stroud             |
| -1'12                             | 65       | '51               | 17          | 14             | 20'21                 | 18'70            | -1'51    | 93  | 33'04                  | Wolstaston         |
| -1'23                             | 56       | 1'02              | 17          | 10             | 18'08                 | 16'71            | -1'37    | 92  | 29'21                  | Coventry           |
| + '51                             | 123      | '77               | 1           | 12             | 14'45                 | 17'32            | +2'87    | 120 | 23'30                  | Boston             |
| + '76                             | 133      | 1'49              | 17          | 15             | 15'63                 | 17'54            | +1'91    | 112 | 24'70                  | Hodsock Priory     |
| + '03                             | 101      | '77               | 17          | 14             | 16'53                 | 16'04            | - '49    | 97  | 26'18                  | Derby              |
| - '60                             | 86       | '58               | 1, 20       | 19             | 25'23                 | 29'08            | +3'85    | 115 | 42'43                  | Bolton             |
| + '63                             | 124      | '90               | 17          | 17             | 16'83                 | 20'17            | +3'34    | 120 | 26'96                  | Ribston Hall       |
| + '49                             | 109      | 1'05              | 16          | 18             | 36'87                 | 41'86            | +4'99    | 114 | 60'96                  | Arnelife Vic.      |
| +3'05                             | 208      | 2'68              | 1           | 13             | 16'55                 | 21'49            | +4'94    | 130 | 27'02                  | Hull               |
| + '27                             | 109      | '84               | 16          | 21             | 17'40                 | 20'84            | +3'44    | 120 | 27'99                  | Newcastle          |
| -2'77                             | 75       | 1'48              | 15          | 21             | 77'96                 | 74'38            | -3'58    | 95  | 132'68                 | Seathwaite         |
| -1'33                             | 71       | '93               | 17          | 13             | 25'23                 | 19'96            | -5'27    | 79  | 42'81                  | Cardiff            |
| -2'29                             | 43       | '58               | 17          | 7              | 27'41                 | 22'05            | -5'36    | 80  | 47'88                  | Haverfordwest      |
| -1'85                             | 60       | '95               | 17          | 14             | 26'46                 | 23'30            | -3'16    | 88  | 45'41                  | Gogerddan          |
| + '17                             | 106      | '94               | 17          | 15             | 17'65                 | 18'15            | + '50    | 103 | 30'98                  | Llandudno          |
| -1'89                             | 54       | '41               | 28          | 15             | 26'15                 | ...              | ...      | ... | 43'43                  | Cargen             |
| -1'70                             | 49       | '31               | 1           | 16             | 21'33                 | 20'51            | - '82    | 96  | 34'80                  | Branxholm          |
| ...                               | ...      | '44               | 28          | 18             | ...                   | 18'72            | ...      | ... | ...                    | Edinburgh          |
| - '93                             | 79       | '85               | 29          | 20             | 28'46                 | 31'34            | +2'88    | 110 | 48'87                  | Girvan             |
| ...                               | ...      | ...               | ...         | ...            | 22'09                 | ...              | ...      | ... | 35'80                  | Glasgow            |
| - '98                             | 82       | '88               | 28          | 19             | 36'60                 | 37'62            | +1'02    | 103 | 57'90                  | Inveraray          |
| -1'09                             | 77       | '62               | 12          | 23             | 33'06                 | 29'06            | -4'00    | 88  | 57'53                  | Quinish            |
| -1'30                             | 58       | '78               | 28          | 12             | 18'20                 | 18'18            | - '02    | 100 | 28'95                  | Dundee             |
| -1'73                             | 55       | ...               | ...         | ...            | 21'66                 | 19'60            | -2'06    | 90  | 36'07                  | Braemar            |
| -1'05                             | 67       | '35               | 28          | 17             | 19'93                 | 22'47            | +2'54    | 113 | 33'01                  | Aberdeen           |
| -1'21                             | 61       | '83               | 24          | 13             | 18'33                 | 19'14            | + '81    | 104 | 29'37                  | Cawdor             |
| - '95                             | 72       | '66               | 19          | 19             | 25'75                 | 20'90            | -4'85    | 81  | 43'71                  | Fort Augustus      |
| -2'09                             | 70       | 1'44              | 19          | 20             | 49'41                 | 43'01            | -6'40    | 87  | 86'50                  | Bendamph           |
| - '84                             | 68       | '27               | 14          | 18             | 18'92                 | 19'43            | + '51    | 103 | 31'60                  | Dunrobin Castle    |
| ...                               | ...      | '71               | 24          | 23             | ...                   | 19'33            | ...      | ... | ...                    | Castletown         |
| -4'03                             | 18       | '19               | 24          | 15             | 34'90                 | 25'74            | -9'16    | 74  | 58'11                  | Killarney          |
| -2'77                             | 25       | '40               | 17          | 8              | 24'00                 | 20'57            | -3'43    | 86  | 39'30                  | Waterford          |
| -2'49                             | 34       | '40               | 29          | 13             | 20'85                 | 23'44            | +2'59    | 112 | 33'47                  | Huddlestown        |
| -2'08                             | 47       | '76               | 24          | 10             | 22'19                 | 21'94            | - '25    | 99  | 35'19                  | Abby Leix          |
| -1'72                             | 43       | '37               | 21          | 13             | 17'53                 | 16'67            | - '86    | 95  | 27'75                  | Dublin             |
| -2'95                             | 27       | '35               | 31          | 9              | 23'00                 | 21'31            | -1'69    | 93  | 36'48                  | Mullingar.         |
| -3'07                             | 22       | '25               | 28          | 12             | 23'19                 | 18'59            | -4'60    | 80  | 37'04                  | Ballinasloe        |
| -2'08                             | 54       | '63               | 28          | 20             | 29'90                 | 27'48            | -2'42    | 92  | 50'50                  | Ennisceoe          |
| -1'66                             | 60       | '70               | 28          | 18             | 25'32                 | 23'03            | -2'29    | 91  | 41'83                  | Markree Obsy.      |
| -1'48                             | 58       | '73               | 22          | 14             | 23'84                 | 25'07            | +1'23    | 105 | 38'61                  | Seaforde           |
| + '10                             | 102      | 1'06              | 28          | 22             | 24'48                 | 28'97            | +4'49    | 118 | 41'20                  | Londonderry        |
| -1'50                             | 63       | '72               | 22          | 13             | 23'28                 | 23'69            | + '41    | 102 | 37'85                  | Omagh              |

## SUPPLEMENTARY RAINFALL, AUGUST, 1909.

| Div.  | STATION.                    | Rain<br>inches | Div.   | STATION.                    | Rain-<br>inches |
|-------|-----------------------------|----------------|--------|-----------------------------|-----------------|
| II.   | Warlingham, Redvers Road    | 2.29           | XI.    | Rhayader, Tyrmynydd .....   | 2.97            |
| ..    | Ramsgate .....              | 2.90           | ..     | Lake Vyrnwy .....           | 2.90            |
| ..    | Steyning.....               | 3.07           | ..     | Llangyhanfal, Plás Draw.... | 3.36            |
| ..    | Hailsham .....              | 3.60           | ..     | Llwydiarth Esgob .....      | 2.49            |
| ..    | Totland Bay, Aston House.   | 2.86           | ..     | Snowdon, Cwm Dyli .....     | 3.72            |
| ..    | Stockbridge, Ashley .....   | ..             | ..     | Lligwy .....                | 2.20            |
| ..    | Grayshott.....              | 2.50           | ..     | Douglas, Woodville .....    | 2.36            |
| ..    | Reading, Calcot Place.....  | 2.27           | XII.   | Stoneykirk, Ardwell House   | 1.96            |
| III.  | Harrow Weald, Hill House.   | 2.36           | ..     | Dalry, The Old Garroch ...  | 2.57            |
| ..    | Oxford, Magdalen College..  | 3.37           | ..     | Langholm, Drove Road.....   | 2.96            |
| ..    | Pitsford, Sedgebrook .....  | 2.42           | ..     | Moniaive, Maxwellton House  | 1.93            |
| ..    | Huntingdon, Brampton .....  | 1.71           | XIII.  | N. Esk Reservoir [Penicuik] | 2.65            |
| ..    | Woburn, Milton Bryant.....  | 2.47           | XIV.   | Snowbole, Knockdon Farm..   | 2.75            |
| ..    | Wisbech, Monica Road.....   | 2.37           | XV.    | Campbeltown, Witchburn...   | 3.20            |
| IV.   | Southend Water Works.....   | 2.43           | ..     | Glenreadell Mains.....      | 3.64            |
| ..    | Colchester, Lexden.....     | 2.50           | ..     | Ballachulish House.....     | 4.83            |
| ..    | Newport, The Vicarage.....  | 2.42           | ..     | Islay, Fallabus .....       | 3.94            |
| ..    | Rendlesham .....            | 1.83           | XVI.   | Dollar Academy .....        | 3.56            |
| ..    | Swaffham .....              | 2.32           | ..     | Loch Leven Sluice .....     | 2.58            |
| ..    | Blakeney .....              | 1.89           | ..     | Balquhider, Stronvar .....  | 3.64            |
| V.    | Bishops Cannings .....      | 2.70           | ..     | Perth, The Museum .....     | 1.91            |
| ..    | Ashburton, Druid House ...  | 2.29           | ..     | Coupar Angus .....          | 1.39            |
| ..    | Honiton, Combe Raleigh ...  | 2.29           | ..     | Blair Atholl.....           | 1.74            |
| ..    | Okelhampton, Oaklands.....  | 2.17           | ..     | Montrose, Sunnyside Asylum  | 2.24            |
| ..    | Hartland Abbey .....        | 2.16           | XVII.  | Alford, Lynturk Manse ..... | 2.53            |
| ..    | Lynmouth, Rock House ...    | 1.97           | ..     | Keith Station .....         | 2.81            |
| ..    | Probus, Lamellyn .....      | 1.57           | XVIII. | N. Uist, Lochmaddy .....    | 3.69            |
| ..    | North Cadbury Rectory ..    | 2.52           | ..     | Alvey Manse .....           | 2.33            |
| VI.   | Clifton, Pembroke Road ...  | 2.79           | ..     | Loch Ness, Drumnadrochit.   | 1.62            |
| ..    | Ross, The Graig .....       | 2.02           | ..     | Glencarron Lodge .....      | 6.68            |
| ..    | Shifnal, Hatton Grange..... | 1.75           | ..     | Fearn, Lower Pitkerrie..... | 2.32            |
| ..    | Blockley, Upton Wold .....  | 2.85           | XIX.   | Invershin .....             | 2.39            |
| ..    | Worcester, Boughton Park.   | 1.60           | ..     | Altnaharra .....            | 3.08            |
| VII.  | Market Overton .....        | 2.87           | ..     | Bettyhill .....             | 3.70            |
| ..    | Market Rasen .....          | 4.07           | XX.    | Dunmanway, The Rectory..    | .32             |
| ..    | Bawtry, Hesley Hall.....    | 2.94           | ..     | Cork .....                  | .25             |
| ..    | Buxton.....                 | 2.69           | ..     | Mitchelstown Castle .....   | .68             |
| VIII. | Neston, Hinderton Lodge...  | 3.03           | ..     | Darrynane Abbey .....       | .84             |
| ..    | Southport, Hesketh Park...  | 3.00           | ..     | Glenam [Clonmel] .....      | .77             |
| ..    | Chatburn, Middlewood .....  | 2.73           | ..     | Nenagh, Traverstown.....    | 1.05            |
| ..    | Cartmel, Flookburgh .....   | 3.27           | ..     | Miltown Malbay.....         | 1.31            |
| IX.   | Langsett Moor, Up. Midhope  | 2.16           | XXI.   | Gorey, Courtown House ...   | 1.40            |
| ..    | Scarborough, Scalby .....   | 5.32           | ..     | Moynalty, Westland .....    | 1.38            |
| ..    | Ingleby Greenhow .....      | 4.60           | ..     | Athlone, Twyford .....      | 1.08            |
| ..    | Mickleton .....             | 2.42           | XXII.  | Woodlawn .....              | 2.06            |
| X.    | Bardon Mill, Beltingham ... | 2.72           | ..     | Westport, St. Helens .....  | 2.35            |
| ..    | Ewesley, Font Reservoir ... | 2.41           | ..     | Mohill .....                | 1.81            |
| ..    | Ilderton, Lilburn Cottage.. | 4.16           | XXIII. | Enniskillen, Portora .....  | ..              |
| ..    | Keswick, The Bank .....     | 4.01           | ..     | Dartrey [Cootehill].....    | 1.99            |
| XI.   | Llanfrechfa Grange.....     | 2.91           | ..     | Warrenpoint, Manor House    | 1.63            |
| ..    | Treherbert, Tyn-y-waun ...  | 3.05           | ..     | Banbridge, Milltown .....   | 1.90            |
| ..    | Carmarthen, The Friary..... | 2.14           | ..     | Belfast, Springfield .....  | 3.11            |
| ..    | Castle Malgwyn [Llechryd].  | 1.86           | ..     | Bushmills, Dundarave .....  | 3.00            |
| ..    | Plynlimon.....              | 8.70           | ..     | Sion House .....            | 2.54            |
| ..    | Crickhowell, Ffordlas.....  | 2.00           | ..     | Killybegs .....             | 5.51            |
| ..    | New Radnor, Ednol .....     | 1.84           | ..     | Horn Head .....             | 4.10            |

## METEOROLOGICAL NOTES ON AUGUST, 1909.

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 first half was fine, dry and hot, the shade max. exceeding  $80^{\circ}$  on 10 consecutive days, from 6th to 15th. Thereafter it was cloudy, showery and cooler, but with a fair amount of sunshine as a rule. TS on 25th. Duration of sunshine,  $189\cdot0^*$  hours, and of R  $36\cdot5$  hours. Mean temp.  $62^{\circ}\cdot8$ , or  $0^{\circ}\cdot7$  above the average. Shade max.  $86\cdot4$  on 12th; min.  $45^{\circ}\cdot1$  on 3rd. F 0, f 0.

TOTLAND BAY.—Duration of sunshine,  $249\cdot2^*$  hours. Mean temp.  $0^{\circ}\cdot4$  above the average. Shade max.  $80^{\circ}\cdot3$  on 9th, this being only the fourteenth occasion in 23 years when the temp. has risen to  $80^{\circ}$ ; shade min.  $49^{\circ}\cdot9$  on 5th. F 0, f 0.

WINTERBOURNE STEEPLTON.—Of the R,  $3\cdot51$  in. fell on eight consecutive days during mid-harvest, materially injuring the wheat crop. Extreme heat during the week ending on 14th, but otherwise decidedly cold. Shade max.  $85^{\circ}\cdot2$  on 11th; min.  $41^{\circ}\cdot9$  on 22nd. F 0.

TORQUAY.—Duration of sunshine,  $273\cdot3^*$  hours, or  $65\cdot3$  hours above the average. Mean temp.  $62^{\circ}\cdot6$ , or  $1^{\circ}\cdot1$  above the average. Shade max.  $81^{\circ}\cdot9$  on 9th, the highest yet recorded here; min.  $48^{\circ}\cdot7$  on 29th. F 0, f 0.

BUXTON.—Mean temp.  $57^{\circ}\cdot8$ , or  $1^{\circ}\cdot0$  above, and R  $1\cdot97$  in. below, the average of 35 years. Duration of sunshine  $188^*$  hours, or 45 hours above the average of 25 years. Shade max.  $79^{\circ}\cdot3$  on 9th; min.  $42^{\circ}\cdot1$  on 3rd. F 0, f 0.

BOLTON.—Duration of sunshine,  $147\cdot5^*$  hours, or  $27\cdot7$  above the average. Mean temp.  $57^{\circ}\cdot0$ , or  $0^{\circ}\cdot2$  above the average. Shade max.  $79^{\circ}\cdot1$  on 12th; min.  $44^{\circ}\cdot3$  on 3rd. F 0, f 0.

SOUTHPORT.—Duration of sunshine  $174\cdot0^*$  hours, or  $5\cdot5$  below, and R  $\cdot71$  in. below, the average. Duration of R  $51\cdot1$  hours. Mean temp.  $58^{\circ}\cdot3$ , or  $1^{\circ}\cdot2$  below the average. Shade max.  $71^{\circ}\cdot7$  on 15th; min.  $45^{\circ}\cdot0$  on 3rd and 7th. F 0, f 0.

HULL.—On 1st floods were caused, the R being  $2\cdot68$  in.; and on 16th there was a TS with heavy R and large H,  $\cdot60$  in. falling in 20 mins.; heavy R on 17th, when  $1\cdot35$  in. fell.

HAVERFORDWEST.—Duration of sunshine  $227\cdot6^*$  hours. Shade max.  $79^{\circ}\cdot0$  on 7th and 15th; min.  $39^{\circ}\cdot0$  on 28th. F 0, f 0.

LLANDUDNO.—Duration of sunshine  $201\cdot8^*$  hours. Shade max.  $75^{\circ}\cdot2$  on 12th; min.  $48^{\circ}\cdot0$  on 28th. F 0.

DOUGLAS.—August was a decided improvement on June and July, inasmuch as the first 16 days were almost rainless, and included some 10 days of warm summer weather. After 16th it was cold and wet. The R and temp. were below, but the duration of sunshine above, the average.

EDINBURGH.—Shade max.  $74^{\circ}\cdot9$  on 8th; min.  $44^{\circ}\cdot1$  on 30th. F 0, f 0.

COUPAR ANGUS.—Shade max.  $80^{\circ}\cdot0$  on 9th; min.  $34^{\circ}\cdot0$  on 26th. F 0, f 0.

FORT AUGUSTUS.—Shade max.  $70^{\circ}\cdot8$  on 10th; min.  $36^{\circ}\cdot8$  on 3rd. F 0.

CORK.—The driest August on record and probably unprecedented, the R being only one-fourteenth of the average. Shade max.  $79^{\circ}\cdot0$  on 12th; min.  $43^{\circ}\cdot0$  on 28th and 30th. F 0.

WATERFORD.—The driest August since 1884, and the second driest in 60 years. Shade max.  $80^{\circ}$  on 11th; min.  $42^{\circ}$  on 30th. F 0.

MILTOWN MALBAY.—The best August for harvesting since 1848. All crops were good and over the average, except hay.

DUBLIN.—The early part was dry, but after a fortnight of true summer the weather became changeable and cool, with TSS on 15th and 21st. Shade max.  $77^{\circ}\cdot1$  on 12th; min.  $45^{\circ}\cdot5$  on 30th. F 0, f 0.

BALLINASLOE.—The lowest August R for 38 years, being  $1\cdot41$  in. less than the previous lowest. Shade max.  $77^{\circ}\cdot0$  on 9th and 15th; min.  $37^{\circ}\cdot0$  on 17th. F 0.

MARKREE.—Shade max.  $75^{\circ}\cdot0$  on 14th and 15th; min.  $36^{\circ}\cdot0$  on 18th. F 0, f 1.

Climatological Table for the British Empire, March, 1909.

| STATIONS.<br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                |            |       |                 |
| London, Camden Square                                            | 60.5      | 29    | 18.5     | 5     | 45.3     | 34.2 | 37.8       | 86        | 98.0         | 17.2           | 2.84       | 25    | 7.9             |
| Malta ... ..                                                     | 63.7      | 8     | 47.0     | 19    | 60.5     | 52.4 | 49.4       | 79        | 135.2        | ...            | .94        | 8     | 5.5             |
| Lagos ... ..                                                     | 93.0      | 16    | 73.0     | 19†   | 88.9     | 77.2 | 75.3       | 75        | 160.0        | 70.0           | 3.36       | 7     | 8.1             |
| <i>Cape Town</i> ... ..                                          | 92.1      | 10    | 50.1     | 13    | 75.6     | 57.9 | 55.7       | 71        | ...          | ...            | 3.02       | 10    | 4.0             |
| <i>Durban, Natal</i> ... ..                                      | 88.5      | 24    | 59.8     | 14    | 80.1     | 66.2 | ...        | ...       | 143.0        | ...            | 2.80       | 13    | 5.4             |
| <i>Johannesburg</i> ... ..                                       | 75.8      | 27    | 49.8     | 17    | 68.4     | 54.5 | 54.6       | 84        | 141.6        | 47.5           | 4.72       | 14    | 6.4             |
| <i>Mauritius</i> ... ..                                          | 87.0      | 1     | 67.0     | 30    | 83.0     | 72.5 | 71.1       | 82        | 159.9        | 60.5           | 5.87       | 27    | 7.1             |
| Calcutta... ..                                                   | 102.7     | 26*   | 56.5     | 4     | 97.4     | 68.8 | 60.3       | 51        | 156.0        | 48.5           | .00        | 0     | 1.2             |
| Bombay... ..                                                     | 91.7      | 26    | 70.6     | 7     | 87.0     | 73.3 | 69.1       | 71        | 134.8        | 62.9           | .00        | 0     | 1.6             |
| Madras ... ..                                                    | 97.4      | 31    | 66.3     | 6     | 89.3     | 70.8 | 71.4       | 79        | 142.3        | 62.7           | .00        | 0     | 2.2             |
| Kodaikanal ... ..                                                | 72.7      | 9     | 48.9     | 26    | 68.8     | 51.2 | 40.9       | 51        | 139.7        | 34.2           | 4.84       | 14    | 3.7             |
| Colombo, Ceylon ... ..                                           | 91.4      | 14    | 72.3     | 15    | 89.1     | 74.8 | 73.1       | 76        | 156.8        | 69.7           | 3.59       | 13    | 5.4             |
| Hongkong ... ..                                                  | 77.8      | 12    | 53.0     | 14    | 67.6     | 60.8 | 58.8       | 81        | 128.1        | ...            | 2.35       | 10    | 9.2             |
| <i>Melbourne</i> ... ..                                          | 93.1      | 3     | 40.4     | 27    | 75.1     | 55.0 | 43.9       | 59        | 149.6        | 34.2           | 1.19       | 12    | 5.5             |
| <i>Adelaide</i> ... ..                                           | 103.1     | 3     | 48.7     | 26    | 79.5     | 58.5 | 50.0       | 54        | 162.7        | 39.6           | .66        | 7     | 4.6             |
| <i>Coolgardie</i> ... ..                                         | 100.4     | 21    | 48.0     | 29    | 84.4     | 56.9 | 49.6       | 47        | 167.0        | 45.0           | .18        | 2     | 2.5             |
| <i>Perth</i> ... ..                                              | 101.6     | 1     | 50.3     | 5     | 80.9     | 61.1 | 56.6       | 60        | 161.6        | 44.8           | .77        | 4     | 4.1             |
| <i>Sydney</i> ... ..                                             | 88.9      | 25    | 55.4     | 17    | 76.4     | 62.7 | 66.7       | 69        | 130.9        | 45.0           | 1.30       | 19    | 4.5             |
| <i>Wellington</i> ... ..                                         | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...        | ...   | ...             |
| <i>Auckland</i> ... ..                                           | 77.5      | 8     | 52.0     | 31    | 71.6     | 60.3 | 57.9       | 76        | 139.0        | 47.0           | 4.04       | 16    | 4.7             |
| Jamaica, Kingston ... ..                                         | 90.8      | 15    | 67.2     | 3     | 87.6     | 68.9 | 65.5       | 70        | ...          | ...            | .82        | 4     | 4.0             |
| Trinidad ... ..                                                  | 89.0      | 31    | 64.0     | 3‡    | 86.6     | 66.6 | 71.1       | 78        | 154.0        | 57.0           | 1.15       | 7     | ...             |
| Grenada ... ..                                                   | 86.0      | 21    | 70.0     | 12    | 83.3     | 73.1 | 68.6       | 73        | 143.0        | ...            | 1.02       | 12    | 5.0             |
| Toronto ... ..                                                   | 47.2      | 31    | 6.8      | 5     | 36.3     | 23.4 | ...        | ...       | 88.0         | 4.4            | ...        | ...   | 4.4             |
| Fredericton ... ..                                               | 43.0      | 20    | -7.8     | 2     | 35.1     | 17.0 | ...        | 78        | ...          | ...            | 4.71       | 9     | 5.8             |
| St. John's, N.B. ... ..                                          | 46.7      | 25    | 7.0      | 1     | 36.9     | 24.0 | ...        | ...       | ...          | ...            | 4.55       | 10    | 5.9             |
| Victoria, B.C. ... ..                                            | 55.8      | 24    | 30.5     | 9     | 50.4     | 36.0 | ...        | 85        | ...          | ...            | .73        | 9     | 6.0             |
| Dawson ... ..                                                    | 46.0      | 29    | -25.0    | 8     | 21.0     | 3.1  | ...        | ...       | ...          | ...            | 1.21       | 9     | 5.7             |

\* and 27. † and 31. ‡ and 10, 15.

|                     |          |       |        |      |        |      |      |      |    |       |      |      |   |     |
|---------------------|----------|-------|--------|------|--------|------|------|------|----|-------|------|------|---|-----|
| <i>Coolgardie</i>   | Jan. ... | 101.0 | 15     | 48.2 | 9      | 82.4 | 58.8 | 49.6 | 47 | 167.9 | 46.2 | 1.46 | 6 | 4.6 |
|                     | Feb. ... | 102.0 | 18, 19 | 51.0 | 23, 24 | 87.7 | 60.3 | 51.6 | 46 | 169.0 | 49.2 | .69  | 2 | 3.3 |
| <i>Perth</i> ... .. | Jan. ... | 103.8 | 17     | 55.3 | 3      | 86.5 | 63.3 | 56.5 | 53 | 165.0 | 51.9 | .22  | 1 | 2.9 |
|                     | Feb. ... | 102.4 | 27     | 54.3 | 11     | 86.5 | 64.1 | 58.0 | 55 | 154.8 | 49.6 | .70  | 1 | 3.2 |

MALTA.—Mean temp. of air 56°.1. Average sunshine 6.1 hours per day.

*Natal*.—Rainfall 2.00 in. below 35 years' average.

*Johannesburg*.—Bright sunshine 177.7 hours.

*Mauritius*.—Mean temp. of air 0°.3 below, of dew point 0°.5 above, and R 3.34 in. below, averages. Mean hourly velocity of wind 11.3 miles, or 0.9 above average.

KODAIKANAL.—Bright sunshine 256 hours.

COLOMBO.—Mean temp. of air 81°.2, or 0°.9 below, of dew point 0°.2 above, and R .88 in. below averages. Mean hourly velocity of wind 4.0 miles. TSS on 4 days.

HONGKONG.—Mean temp. of air 64°.1. Bright sunshine 64.2 hours. Mean hourly velocity of wind 16.5 miles.

*Melbourne*.—Mean temp. of air 0°.4 above, and R .94 in. below, averages.

*Sydney*.—Mean temp. of air 0°.3 above, and R 3.79 in. below, averages.

TRINIDAD.—R .80 in. below 46 years' average.



RAINFALL OF THAMES VALLEY-SEPTEMBER, 1909.



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

Symons's Meteorological Magazine.

Isobytals.

# Symons's Meteorological Magazine.

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## METEOROLOGICAL LUNCHEON AT WINNIPEG.

By E. GOLD, M.A.

THE outstanding feature of the proceedings at the British Association was the transmutation of the time-honoured "Meteorological Breakfast" into a "Luncheon." No one who experienced waiting at Winnipeg will cavil at the change. It had been desired and anticipated that the more arduous labours would have been ended, and the defeat of meteorological conundrum-makers achieved before the luncheon hour of 1.30 p.m. on Tuesday, but it was ruled otherwise. Nevertheless the luncheon was much more enjoyable than a breakfast, occupying the same time, could possibly have been. Mr. R. F. Stupart, Director of the Canadian Meteorological Service, presided over the forty distinguished scientists who honoured the occasion by their presence. Speeches were made by Mr. Stupart, Dr. Shaw and, on behalf of voluntary observers, by Sir John Moore.

The following were present at the luncheon :—

Mrs. Aikins.  
Prof. Frank Allen.  
Prof. H. T. Barnes.  
Dr. Bauer.  
Dr. R. Bell.  
Prof. E. W. Brown.  
Prof. A. H. R. Bullen.  
Mr. E. F. Burton.  
Mr. G. G. Chisholm.  
Rev. W. Cooke.  
Major Craigie.  
Mr. Crawley.  
Prof. Crew.  
Mr. A. S. Eddington.  
Prof. A. S. Eve.  
Mr. E. Gold.  
Dr. T. H. Havelock.  
Prof. Humphreys.  
Mrs. Humphreys.  
Sir. Joseph Larmor.  
Prof. Love.

Prof. MacLennan.  
Dr. Martin.  
Mr. Metcalfe.  
Sir John Moore.  
Lady Moore.  
Mr. Paterson.  
Prof. J. H. Poynting.  
Dr. A. A. Rambaut.  
Mr. Hugh Richardson.  
Prof. A. L. Rotch.  
The Archbishop of  
Ruperts Land.  
Prof. Rutherford.  
Dr. C. E. Saunders.  
Dr. W. Saunders.  
Dr. W. N. Shaw.  
Mrs. Shaw.  
Mr. R. F. Stupart.  
Sir J. J. Thomson.  
Lady Thomson.  
Prof. Zeleny.

Mr. Stupart had prepared, on Tuesday morning, a weather chart showing the distribution of atmospheric elements, at that time, over

North America. The chart, with its vicious looking "low" near the Gulf of Mexico, and a milder creation of the same type farther north, created considerable interest. As it was the first map of the kind constructed in Winnipeg it was felt desirable that it should be published, and it is believed to be on the way to that end.

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METEOROLOGY AT THE BRITISH ASSOCIATION, WINNIPEG, 1909.

By E. GOLD, M.A.

It was, of course, inevitable that meteorology should take a less prominent position in the proceedings of Section A than at Dublin last year. But those meteorologists who were fortunate enough to be present at Winnipeg, and to foregather with the meteorologists of Canada and the United States, will look back with pleasure to the discussions, both public and private, which arose for the broadening of their ideas, meteorological and meteorological if such an addition to a rather overwhelming vocabulary is permissible.

On Friday three papers of meteorological interest formed the central section of a thick sandwich of cosmical physics. Mr. Stupart, Director of the Canadian Meteorological Service, read a paper on the Distribution of Atmospheric Pressure in Canada. The chief points of the paper were (1) that the world charts of pressure distribution give an inadequate and even inaccurate representation of the pressure conditions in the Dominion, (2) that relatively high pressure in the north-west at Dawson City is accompanied by relatively mild winters, and low pressure by severe winters, a fact which is directly contrary to the prevailing idea that in winter the higher the pressure the lower the temperature over continental areas.

Dr. Shaw read a paper by Mr. Craig on the Surface Motion of Air in Certain Circular Storms. The paper dealt with the kinematical conditions in travelling storms. The paths of the air for particular cases were obtained from theoretical considerations and were compared with the paths deduced from actual observations. The results appear to imply that we may take the paths obtained from theoretical considerations for circular storms as approximate standards and that we must seek the causes of departure from these paths in local conditions.

Mr. J. W. Shipley showed photographs of large hailstones observed in Western Canada shortly before the meeting. In the centre of one of the stones he examined was a small fly which had apparently been carried upwards and had formed a nucleus of condensation.

After a lengthy discussion on Earth Tides, on Tuesday morning, the Section divided, and the meteorology of the upper air was discussed in the department of Cosmical Physics, the discussion being resumed on Wednesday morning. Prof. Humphreys, of the U.S. Weather Bureau, communicated a paper on Seasonal and Storm Vertical Temperature Gradients. The paper dealt mainly with results obtained by ballons sondes in Europe, and showed that in

regions of high pressure (pressure above 770 mm., or 30.30 in.) the mean temperature was higher than in regions of low pressure (pressure $<$ 750 mm., or 29.50 in.), both in summer and winter. This result is in agreement with that found from the manned balloon observations by von Bezold, and is corroborated by the results given by Gold and Harwood in their Report on the Present State of Our Knowledge of Upper Atmosphere. In this report the names "Advective" and "Convective" Regions are used to denote the upper and lower parts of the atmosphere, and H_c is used to denote the height at which the advective region begins.

The three sets of terms applied to the same phenomena are therefore :—

Isothermal Layer.	Adiabatic Atmosphere.
Strato-sphere.	Troposphere.
Advective Region.	Convective Region.

The European observations showed remarkable minima in the value of H_c in March and September, and an attempt was made in the Report to connect these with the general circulation of the atmosphere. The interesting law discovered by Egnell, $V\rho = \text{const.}$ where V is wind velocity and ρ air-density, was shown to be only approximately true and was proved to be a consequence of the difference in temperature between regions of high and low pressure.

On Wednesday morning Prof. Rotch gave an account of the highest balloon ascent in America. He found a remarkable result which occurred in at least two ascents, that the temperature *increased* in a cumulus cloud in passing from the base upwards. Considerable discussion took place, and some doubt was expressed as to the reality of the phenomenon, but Prof. Rotch stated that the observations were unexceptionable. The fact adds further difficulties to the explanation of the formation of clouds and their connection with atmospheric motion.

Dr. Shaw showed photographs of models illustrating the temperature distribution in the free atmosphere over the British Isles in the International Week, in July, 1908. The models show the gradual production, or pushing forward, of a wedge of cold air at a height greater than 10 km. The wedge had just reached Limerick on the first day, but two days later extended well over England. These models put into a speaking form the results of observations which might otherwise remain as columns of cold, meaningless figures, and they give great encouragement to the meteorologist who may have been inclined to think that all the hopes he entertained when upper air investigation began were being buried in a useless, unwieldy mass of observations. It may be noted that the construction of the models was only made possible by the observations obtained near Limerick, in Ireland, and the important information they convey ought to stimulate a Government, interested in Ireland and in the atmosphere, to promote a further and a continuous series of ascents into the latter over the former.

Prof. Humphreys described an arrangement by which he hoped it would be possible to get a record of the ultra violet part of the solar spectrum (below 0.2μ) at very great altitudes. He proposed to use a ground quartz plate for diffusing the incident solar beam so that a spectrum might be obtained whatever was the relative direction of the incident light.

The meeting closed with a paper by Mr. F. Denison Napier on the Connection Between Atmospheric Pressure and the Motion of the Horizontal Pendulum of the Milne Seismograph.

THE RAINFALL OF SEPTEMBER 27th—28th, 1909.

OWING to the accident that the heavy rainfall which produced great floods in Wales took place near the end instead of the beginning of the month, it is possible, within little more than ten days of the occurrence, to construct a map giving the approximate distribution of the widespread rain. Although drawn from a limited number of points of observation the features are sufficiently accurately marked to warrant a reproduction of the map did our space allow it; we are, however, obliged to confine ourselves to a description. The distribution of atmospheric pressure at the time was of a complex character, but broadly speaking it was under the influence of a shallow depression, of rather irregular shape, which advanced from the Atlantic in an easterly or north-easterly direction and spread over Ireland and the western part of England on the 28th, an anticyclonic system, then lying to the northward over Scandinavia, giving way before it. During the night of the 28th the centre of low pressure was transferred somewhat suddenly from the Irish Sea to the neighbourhood of the Scilly Islands, and it appears to have been during this southerly transition that the heavy rainfall over the whole of Wales took place. This is accordant with the observation that heavy rain frequently accompanies a sudden change in the course of an atmospheric depression. A good example of this was the great Irish rainfall of August 24th—26th, 1905, when the path of a depression was deflected from a northerly to an easterly direction when lying in the neighbourhood of Dublin, and an extraordinary rainfall took place over Ireland culminating in a fall of about six inches in the Wicklow Hills.*

In the north-west of England considerable rainfall occurred on September 27th, and although the Welsh deluge was due to the rain of the twenty-four hours ending at 9 a.m. on the 29th, a certain amount fell on the previous day, and since this was probably produced by the same atmospheric disturbance, the rain of both days was included in the map. The result is to show that whilst the north of Scotland and the extreme south-west of England escaped entirely without rain, an unbroken splash of heavy rainfall extended from the west coast of Ireland eastwards right across England,

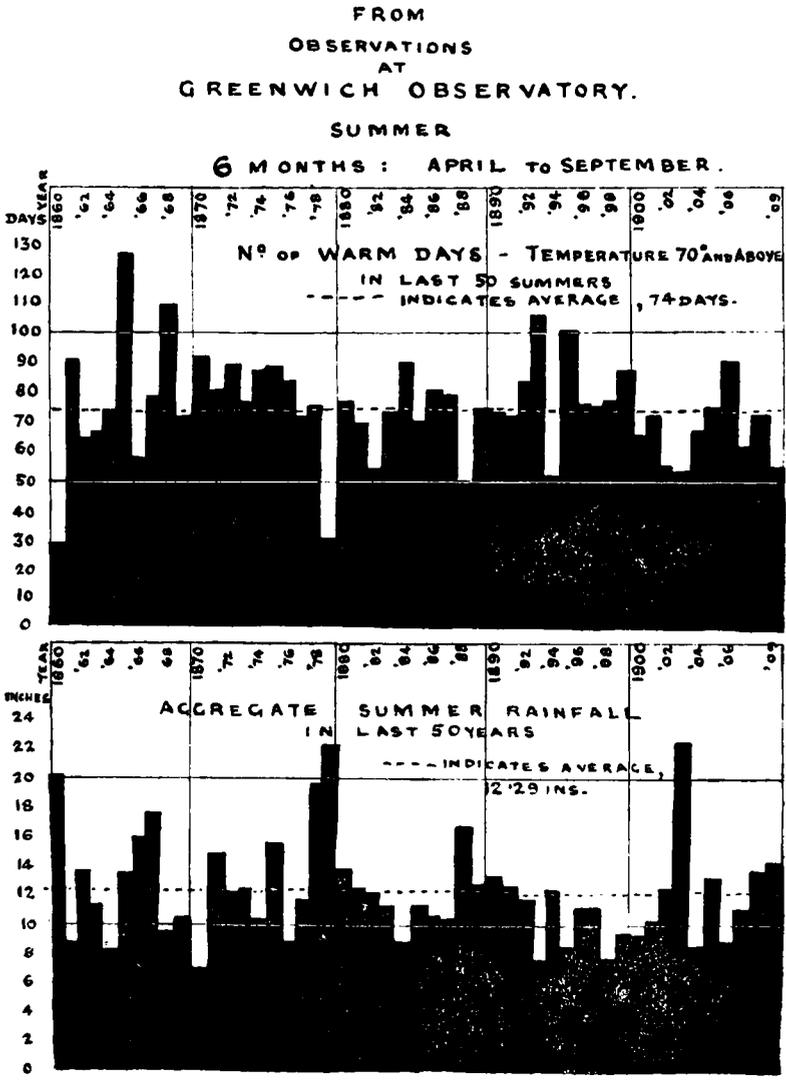
* See *British Rainfall*, 1905, p. [112].

expanding fan-wise to the southern uplands of Scotland on the north and to Exmoor and the Isle of Wight on the south. The eastern half of England, however, received less than half an inch of rain over a broad strip from Scarborough to London. The area with an inch or more stretched right across Ireland in a wide band which occupied most of the southern half of the island; it extended over the western half of England, including the whole of Wales, but excluding all but the extreme north of the Devon-Cornwall peninsula. This splash may be taken as probably embracing the Irish Sea and St. George's Channel, since all the coast stations bordering on these reported large falls on one or other of the days in question, and at least two inches fell in the Isle of Man, Anglesey, and at St. Ann's Head. The splash was thus of an unusual size, being, approximately, 400 miles in extent, from west to east, and about 250 miles from north to south, in its widest part. It is possible that when more data are available for revising the map it will be found that the main splash is broken up into a number of smaller ones, but this is by no means necessarily the case. More than two inches of rain also fell in County Clare, in Snowdonia, and a considerable part of North Wales, in the New Forest, and in a very large area covering the whole of South Wales, except, possibly, the north of Pembrokeshire and part of Cardigan. The north of Devonshire also fell within this splash. Several widely separated stations in South Wales received more than three inches, indicating that this amount probably fell over a large area. On the other side of the Bristol Channel practically three inches fell at Ilfracombe. The heaviest amount of which we have received any information was 3.95 ins. at Glyncoerrwg, of which 3.16 ins. fell on the 28th. The precise outline of the three inch splash cannot be defined without the fuller information which will not be available before the end of the year, but so far as we are able to ascertain the whole of the north of Glamorgan, the Brecon Beacons, and the greater part of Carmarthen lay within it. It is, however, possible to see that the distribution of the heaviest portion of the rainfall was such as to concentrate the bulk of the run-off in mountain streams, instead of discharging it into the larger rivers which drain eastward from the main watershed of England. The consequence of this was a remarkable series of disastrous floods in the valleys fed by the mountains of South Wales, particularly in the thickly populated vales of Glamorganshire. At Glyncoerrwg, where the rainfall seems to have culminated, the Corrwg stream rose seven feet in an hour, and the amount of damage done at Aberavon and Port Talbot on the low land at the mouth of that river, was enormous. At Neath and Swansea serious floods occurred, and this was also the case in the valleys draining to the eastward from the Glamorganshire plateau where the mining districts suffered severely. At Merthyr two deaths are reported owing to the floods. Extensive damage was also done by flooding in the south of Warwickshire, where the water caused much havoc among the standing crops.

FIFTY LONDON SUMMERS WEATHER RECORD.

By CHAS. HARDING, F.R.Met.Soc.

THE accompanying diagram has been prepared from the weather records made at the Greenwich Observatory during the last 50 years, and represents the weather experienced in London and the Suburbs. There were during the past summer, from April to September inclusive, only 53 days with the sheltered thermometer registering 70° or upwards, which is in exact agreement with the number of



equally warm days in 1903 which was a record wet year, and there were only 9 days with the thermometer above 80° . The hottest weather during the past summer occurred in August, when there were 20 days with the thermometer above 70° , and 6 days above 80° . There was only one day with a temperature of 70° in both April and September. It will be seen from the diagram that the greatest number of warm days during the last 50 years was 127 in 1865. The average number of warm days, temperature 70° and above, during the summer is 74. In August 1876 and 1887 the thermometer exceeded 70° every day during the month. The last ten years, with the exception of 1903, have been cool.

The rainfall for the past summer was not excessive, the aggregate measurement being only 1.80 in. more than the average of the last 50 years, which is 12.29 in. for the 6 months. There was an excess of rain in April, June, July and September, and a deficiency in both May and August. The total rainfall this summer was more than 8.00 in. less than in the summer of 1903.

THE WEATHER OF SEPTEMBER, 1909.

By FRED. J. BRODIE.

THE popular notion that a cool, changeable summer is usually succeeded by a fine warm September has been this year so completely discredited, that the most ardent believer in meteorological precedent must begin to look with some suspicion upon his facts and his figures. In any ordinary September one expects, at least, a few flashes of summer warmth as a reminder that one is, after all, only just entering the boundary of autumn. Last month these reminiscences of the previous season were almost entirely wanting, and among the few genial periods which were actually experienced a search through the records fails to discover one single instance in which the thermometer in any part of the United Kingdom rose much above 70° . At Greenwich the highest shade temperature recorded (on the 6th) was no higher than 71° , the reading being, as an absolute maximum, the lowest in September since 1897. At Westminster the highest reading observed was only 69° , and from the Meteorological Office record it would appear that this was the first September since 1887 in which the thermometer had failed to reach 70° . Further north the absence of warmth was even more marked. At Leith the thermometer never rose above 64° , the absolute maximum reading being lower than anything recorded in the Septembers of the previous 37 years.

The only periods of last month in which anything like genial weather was experienced occurred on the 6th, between the 17th and 19th, and between the 22nd and 25th. On the first occasion the thermometer rose to 70° , or very slightly above it at a few isolated places in the eastern and central parts of Great Britain; on the second

occasion, similar temperatures were recorded at several stations situated in the southern parts both of England and Ireland; while in the third instance a reading of 70° , or a little above, was experienced pretty generally over England, and locally in the west of Scotland, the thermometer on the 23rd reaching a maximum of 74° at Hillington. At nearly all other times in the month the maximum temperatures were considerably below the average, the coldest days occurring between the 7th and the 11th, when the thermometer over a large portion of the United Kingdom failed to reach 60° . Night frosts were experienced at various times during the month, the sharpest of all between the 14th and 16th, when the thermometer even in the shelter of the screen fell below the freezing-point in many parts of our northern and central districts, and reached 26° at Balmoral and 27° at West Linton. Ground frost was reported about the same time over a larger area, and was also experienced more or less commonly on the nights of the 1st, the 7th and 8th, the 18th to 21st, and the 27th to 29th.

In the south of Ireland, and in the Scilly and Channel Islands, the month was very dry (at Valencia the driest for at least 40 years past), but over England and Wales heavy falls of rain were frequent, the more general of such visitations occurring on the 10th, the 17th, the 23rd, the 24th, and the 27th and 28th, the storms of the last mentioned dates being sufficiently heavy to cause serious floods in Wales and some neighbouring parts of England. The heavy rains which occurred in the Thames Valley on the 17th, and over a larger portion of England on the 23rd—24th, were accompanied in many places by severe thunderstorms. The total duration of bright sunshine for the month was in excess of the average on the west coasts of Ireland and Scotland, but below the normal in nearly all other localities. In London (at Westminster) the aggregate of 93.5 hours was the smallest registered in September since the year 1896.



Correspondence.

To the Editor of Symons's Meteorological Magazine.

RAINING CATS AND DOGS.

WOULD you enquire through your Magazine for explanations of the following expressions that we often hear connected with rain:—Mist, Drizzle, Spitting, "Cats and Dogs," Downpour. The last is the only simple one that I can see the true meaning of.

Shenley, Herts, 10th October, 1909.

G. L. DASHWOOD.

A DAYLIGHT METEOR.

I SAW such a wonderful sight this morning, about 9.20, from my kitchen window, looking due north. The sky was absolutely cloudless, and the sunshine in consequence very brilliant. I suddenly looked up, to see for a second a white shining object sailing down to the N.W.—like a silver star. It left no track of light behind. I am so sorry I did not see from what point in the zenith it emanated, and it was so soon behind a group of trees I could only see it for such a moment. I send you this as I should like to hear if anyone else observed it. The sky was cloudless and of a brilliant blue.

The Mount, Witley, Surrey, 6th October, 1909.

J. FOSTER.

I SAW a very brilliant meteor this morning at 9.30, when I was walking in the garden, and, although the sun was shining, there was quite a flash of light for the moment. Its position was N.N.W., and its descent was apparently straight down and at the finish it was extremely brilliant. One would have liked to have seen it at night. I have never in my life seen anything like it in the day.

GEO PAYNE.

Abinger Hall Gardens, Dorking, Surrey, 6th October, 1909.

THE MAGNETIC STORM OF SEPTEMBER 25th.

IN connection with the magnetic storm of Saturday, September 25th, it may interest your readers to know that an aurora was observed at Guernsey (English Channel), at 8 p.m. on that day. I am induced to inform you of this because of published statements to the effect that, contrary to the usual experience, the disturbance appeared to have been accompanied by no auroral manifestation over the United Kingdom. I believe that had there been no moonlight or clouds, a good, if possibly short, display of the Northern Lights would have been witnessed in this island. However, as I watched, the rosy glow high up in the E.N.E. sky (to which my attention had been drawn while strolling in the garden at this place) flickered and brightened decidedly, then slowly faded. At 8.10 all trace of the aurora had vanished, but whether this was owing to clouds which were then encroaching upon that part of the sky, or not, I cannot positively say.

BASIL T. ROWSWELL.

Les Blanchés, Guernsey, 6th October, 1909.

The Editor, while on board the *Dunottar Castle* off the island of Majorca in the western Mediterranean, was informed by the captain that a brilliant display of aurora had been visible from about 8 to 8.15 p.m., the unusual circumstance of such an appearance so far south attracting his special attention.

SUNSPOTS AND SUNSHINE.

SUNSHINE-RECORDING is still young: the records are of no great length as yet. In the case of Kew we have data for 32 complete years (1877 to 1908). The following remarks on these are offered more by way of suggesting future observations than as proving anything.

The period covers three sunspot maxima (1883, '93 and 1905), and three minima (1878, '89 and 1901). Has it ever been noticed that, so far as these figures go, we have had considerably more sunshine about maxima than about minima?

Thus, taking the totals of three years about each maximum and minimum, we find this:—

Max.	hours.	Min.	hours.
1883 (3 years)	4,249	1878 (3 years)	3,736
1893 (")	4,551	1889 (")	3,766
1905 (")	4,698	1901 (")	4,533
	13,498		12,035

The difference, 1463 hours, is about 12 per cent. of the lower value.

We might deal with individual months in the same way, noting *i.e.* the sunshine in the three Januarys about each maximum and each minimum, the three Februarys, &c. Here is the table of totals (for nine months in each case). I indicate also the difference and the percentage (roughly), this is of the lower value.

	Max.	Min.	Diff.	p.c. of lower value.
January	383	369	+ 14	4
February	576	452	+124	29
March	1114	803	+311	39
April.....	1521	1181	+340	29
May	1811	1579	+232	15
June	1697	1572	+125	8
July	1819	1591	+228	14
August.....	1758	1594	+164	10
September	1205	1283	- 78	(7)
October.....	799	902	-103	(13)
November	505	431	+ 74	17
December.....	310	278	+ 32	11
	13,498	12,035		

It will be seen that maximum has an excess over minimum in each month except two, September and October. The most marked difference is in March and adjoining months.

It is a curious feature of March that in no case of the nine Marchs about minimum was the sunshine over average (109 hours). February again shows only one of the nine Februarys over average. Supposing the next minimum to be in 1912, it would be interesting to see if the three years, 1911-12-13, continued this feature of deficient sunshine in March.

The above figures relate to the Campbell-Stokes instrument.

ALEX. B MACDOWALL.

COLD SEPTEMBER 1st & 2nd.

You will no doubt have many notes on the low temperatures on the mornings of September 1st and 2nd. At Tunbridge Wells the thermometer on the 1st fell to 39°, and on the 2nd to 37°, at my station on the hill, and to 38° in the town itself.

At Worthing the temperature fell to 41° on the 1st and 43° on the 2nd.

These seem to me to be very low records for the beginning of September.

D. W. HORNER.

Worthing, September 9th.

LIGHTNING SEEN TO STRIKE.

THE storm of September 17th here was extremely violent on the electrical side although little rain fell, and has raised a curious question in my mind. Can lightning strike a wet field and leave no noticeable mark? On the 17th thunder was practically continuous from about 1.30 to 4 p.m., and from 3.10 to 3.30 there were about two peals per minute, under a five seconds interval. There were no low clouds, for there was a fair S.E. surface wind, but the clouds appeared almost stationary. Where could the lightning go to? Also my mechanic says he saw the fields in front struck twice, and sticks to it that he saw the flash with the Watlington trees as a background. People in Watlington also say that they saw the lightning repeatedly below the crust of the hill. A cottage was struck just on top, but that is the only point where any record is left.

W. H. DINES.

Watlington, Oxon., 1st October, 1909.

UNITS OF RAINFALL MEASUREMENTS.

By A. HAMPTON BROWN.

WHILE looking through the rainfall figures for October, 1908, the extraordinary differences in the number of rain days at adjacent stations seemed to me so unusual and inexplicable, that I was tempted to enquire more closely into the matter, to try and find a possible reason for the apparent discrepancies.

The appended table shows clearly the differences referred to, and is rather disquieting in its suggestion of a lamentable lack of uniformity in observers in general with respect to the smaller amounts of precipitation.

Why there should be only 13 rain days at Weymouth with one amount of .01, and 23 at Chickerell, only a few miles away, with 10 measurements of that figure; or why at Addington Hills 16 days should have a fall of .01, and at Malden none at all, and Beddington only 2, is not apparent.

With the exception of the tremendous downpour in the Weymouth and Portland district, Oct. 18-21, the month as a whole was extremely dry all over the kingdom, the deficit being as much as 52 per cent. over England and Wales (vide *British Rainfall*, 1908, p. [144]). But, on the other hand, the atmosphere was particularly damp and humid, very heavy dews and wet fogs being almost of nightly occurrence. And here, perhaps, lies the whole difficulty; for on looking at the table, it seems to be the smaller amounts resulting from the deposition of dew and fog that caused the differences.

The question of height above sea level, it was thought might have some bearing on the subject, for with the clear skies at night following warm sunny days, radiation would be very active, and in the low lying districts much fog and dew would be the inevitable result. But here again, curiously enough, it is the higher level stations that report the largest number of measurements, although there is not much variation in the elevation of the adjacent stations, with the exception of Addington.

On referring to the instructions to rainfall observers, it will be seen that the Royal Meteorological Society, the Meteorological Office and the British Rainfall Organization are all agreed that when the measurable quantity is less than .01 in., but more than half that amount, it should be entered as .01; and both the Meteorological Office and the British Rainfall Organization advocate throwing the few drops away when the amount is less than half of .01 (a rule which might very well be amended to one advising keeping the amounts in the measure until they reach .01).

There is also another instruction to rainfall observers which is too often overlooked, and that is—that the gauge should be visited *every* day. But the observer knows it has not rained, and why should he trouble to go to the gauge? In many cases, it may be, he is not taking the observations from personal interest, and as for instructions he often does not know that there are any, and why should he trouble about the slight wetting in the receiver? Fortunately, these dewy foggy months are not of frequent occurrence, otherwise observations of rain days would be in a sad plight. The point of the whole matter is, that observers of rainfall, and those who possess gauges but leave the observations to others, should see that the gauge is inspected every day, and not only looked into, in a casual way, but the deposit poured into the measuring glass. It is not sufficient to assume, because the presence of water is noticed, that the amount is .01 (it sometimes comes to more), and neither is it right to regard the precipitation as not worth pouring into the glass, but the instructions should be carefully followed. There would then be fewer stations with an excessive number of rain days, the observers of which, with perhaps pardonable zeal, having made rather too much of the kindly dews of night; and there would certainly be a still larger number whose records would be improved by additional entries to their otherwise meagre amounts.

October, 1908.

STATION.	Height above Sea Level.	Total Rainfall.	Rain Days.	Days with ·01 in.	Days with ·02 in.	Days with other amounts.
	feet.	in.				
Norwich.....	98	1·40	19	5	5	9
Lowestoft.....	82	1·17	9	3	0	6
Addington Hills.....	472	2·54	27	16	2	9
Malden (Worcester Park).....	119	2·15	7	0	0	7
Beddington.....	120	2·31	11	2	0	9
Maidenhead.....	170	2·47	24	11	4	9
Reading.....	151	1·45	14	3	3	8
Swarraton.....	310	1·82	24	12	3	9
Midhurst.....	489	2·92	8	0	1	7
Grayshott.....	660	2·96	19	8	2	9
Ditcham Park.....	540	3·12	17	7	1	9
Ventnor.....	80	1·64	11	6	0	5
Bournemouth.....	145	2·25	20	9*	3	8
Weymouth.....	22	6·50	13	1	2	10
Chickerell.....	112	4·76	23	10	3	10
Newquay.....	100	2·28	10	3	0	7
Falmouth.....	167	2·71	20	10†	1	9
Shoeburyness.....	13	1·22	21	10	3	8
Southend.....	100	1·28	8	0	1	7
Lewes.....	58	1·53	25	9	8	8
Brighton.....	31	1·29	10	1	1	8

* 7 readings marked as dew. † 8 readings marked as mist or dew.

By the elimination of the days with amounts up to ·02 in. the agreement between the stations is very striking.

[We are of opinion that the graduation of the rain glass has more to do with the variation in the number of rain days recorded by conscientious observers than any other factor.—Ed. S.S.M.]

MARSH VEGETATION AND EVAPORATION.

“ON stratification in the vegetation of a Marsh and its relations to evaporation and temperature” is the title of a paper published by Professor R. H. Yapp, in the *Annals of Botany*, Vol. 23, No. xc., April, 1909. The field work was carried out mainly at Wicken Fen, in Cambridgeshire, during the summers of 1907 and 1908. In considering the vertical distribution of the transpiring organs of the various species of plants in the marsh, the plants are grouped into five ecological types, depending to a large extent on the relative positions on the stem of the larger leaves. From this difference of ecological habit there results a marked stratification in the vegetation, which varies in height from two to five feet; at the same time, however, the great majority of the shoots of the different species attain to very much

the same height, giving rise to a fairly uniform "general vegetation or shoot level,"—a feature which is of service to the mixed assembly of plants as a mutual protection against excessive transpiration and the mechanical effects of wind. By placing an evaporimeter of special construction at different levels in the marsh vegetation, Professor Yapp found that the air *in* the vegetation is on the whole much more humid than that *outside* it, and also that the higher and denser the vegetation the greater are the differences in atmospheric humidity between the upper and lower strata. Temperature observations were made with freely exposed thermometers, and the results showed that the highest layers of the vegetation possess a greater diurnal range of temperature than either the free air above or the lower layers of the vegetation. In considering the relative efficiency of the causes which promote transpiration from plants, the amount of water evaporated from the evaporimeter was used as an index. Temperature, relative humidity, and direct insolation, are of course intimately concerned with evaporation.

Wind causes a high rate of evaporation from the vertical evaporating surfaces of Professor Yapp's evaporimeters. Dr. Mill, however, from observations at Camden Square, has found that the curve of wind-velocity has *apparently* little relation to that of evaporation from the horizontal surface of an evaporating tank, but in this case the air currents have not such free play as in Professor Yapp's experiments.

L.C.W.B.

THE RAINFALL OF SOUTHERN RHODESIA.

AN article upon the above subject appears in the "Geographical Teacher" for the Summer of 1909, No. 24, Vol. 5, Part 1. Being a very sparsely populated country the rainfall stations are few and far between, and even those that exist often furnish very incomplete records. At the Hope Fountain Mission Station in the Matoppos, ten miles south of Bulawayo, a record has been kept since July, 1888, but some of the figures are based upon estimates rather than upon daily observations, which have been destroyed in the wars. At Salisbury the records are under the Department of Agriculture, and at the Bulawayo Observatory the meteorological observations are made by the Rev. W. Goetz, S.J. The rain gauge of Messrs. C. E. and F. E. B. Fripp, the authors of the article under review, is situated 4496 ft. above sea-level, 300 miles away from the sea at Sofala, and half a mile from the crest of the Mlingwane Hills, which run to the south of it in a north and south direction, and at right angles to the Matoppo Hills.

In Matabeleland the rainy season lasts more or less from October till April, with a pronounced break somewhere about Christmas. From January, 1909, till the latter part of April, the rains in Matabeleland were abnormally heavy. At Messrs. Fripp's station

the rainfall for January was 12·47 in., 2·2 ins. falling on the 27th. "Such abnormal rains," to quote from the article, "as we have had this year not only directly increases the sickness which lies ever in wait for us—dysentery, blackwater, malaria, and pneumonia—but they cause badly flooded rivers cutting off all communication for days or even weeks; they hinder all surface work, whether transport, agricultural, or mining; and they cause flooded mines with great delays and expenses; and they do a vast amount of actual damage, not only to buildings and plant, but to life, both of stock and human beings."

L.C.W.B.

METEOROLOGICAL NEWS AND NOTES.

SNOW IN JOHANNESBURG is of such rare occurrence that Mr. R. T. A. Innes, who reports a fall of twelve inches on August 17th—18th last, adds that "no such fall has taken place since Johannesburg was founded, in 1886-7." Tradition tells of a similar visitation in the early eighties when, however, there was little but bare veldt to tell the tale. It should be borne in mind that August, which corresponds to February in the Northern Hemisphere, is ordinarily without precipitation of any kind in the Transvaal.

A NEW BRITISH ANTARCTIC EXPEDITION is being organized by Captain R. Scott, R.N., C.V.O., the leader of the expedition in the *Discovery*. Captain Scott has secured the *Terra Nova* as the ship of the expedition, and he hopes to sail in the summer of 1910, the plan being to have two bases for wintering, one on Ross Island, near the winter quarters of Mr. Shackleton's expedition, and of the *Discovery* expedition; the other at the eastern end of the Great Ice Barrier on King Edward Land. Meteorological observations kept up at these positions and on the two southward expeditions which are projected towards the South Pole, cannot fail to add very substantially to our knowledge of Antarctic conditions.

DR. H. R. MILL has arranged to lecture for the Gilchrist Trust, at Wexford on Monday, October 18th, at Kilkenny on Tuesday, 19th, Waterford on Wednesday, 20th, Limerick on Thursday, 21st, and Cork on Friday, 22nd. The subject of the lectures is Rain, and Dr. Mill hopes to be able to visit a number of the rainfall observers in the south of Ireland.

A PEERESS who has been in the habit of purchasing a copy of *British Rainfall* every year has expressed her regret that, in view of the impending Budget of Mr. Lloyd George, she is compelled to retrench by giving up the luxury of subscribing for the annual volume.

RAINFALL TABLE FOR SEPTEMBER, 1909.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99. in.	1909. in.
Camden Square.....	London.....	51 32	0 8	111	2'29	2'56
Tenterden.....	Kent.....	51 4	*0 41	190	2'62	2'90
West Dean.....	Hampshire.....	51 3	1 38	137	2'58	3'97
Hartley Wintney.....	".....	51 18	0 53	222	2'38	3'42
Hitchin.....	Hertfordshire.....	51 57	0 17	238	2'26	1'94
Winslow (Addington).....	Buckinghamsh..	51 58	0 53	309	2'38	2'40
Bury St. Edmunds (Westley).....	Suffolk.....	52 15	*0 40	226	2'49	3'11
Brundall.....	Norfolk.....	52 37	*1 26	66	2'57	1'49
Winterbourne Steepleton.....	Dorset.....	50 42	2 31	316	3'40	2'80
Torquay (Cary Green).....	Devon.....	50 28	3 32	12	3'05	1'49
Polapit Tamar [Launceston].....	".....	50 40	4 22	315	3'63	1'18
Bath.....	Somerset.....	51 23	2 21	67	2'89	3'12
Stroud (Upfield).....	Gloucestershire..	51 44	2 13	226	2'72	3'54
Church Stretton (Wolstaston).....	Shropshire.....	52 35	2 48	800	2'74	2'66
Coventry (Kingswood).....	Warwickshire.....	52 24	1 30	340	2'71	2'27
Boston.....	Lincolnshire.....	52 58	0 1	25	2'30	1'63
Worksop (Hodsock Priory).....	Nottinghamshire	53 22	1 5	56	2'18	2'25
Derby (Midland Railway).....	Derbyshire.....	52 55	1 28	156	2'32	2'31
Bolton (Queen's Park).....	Lancashire.....	53 35	2 28	390	4'38	3'18
Wetherby (Ribston Hall).....	Yorkshire, W.R.	53 59	1 24	130	2'53	1'65
Arncliffe Vicarage.....	".....	54 8	2 6	732	5'13	4'43
Hull (Pearson Park).....	"..... E.R.	53 45	0 20	6	2'40	1'36
Newcastle (Town Moor).....	Northumberland	54 59	1 38	201	2'36	1'82
Borrowdale (Seathwaite).....	Cumberland.....	54 30	3 10	423	12'76	5'58
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	4'08	3'67
Haverfordwest (High Street).....	Pembroke.....	51 48	4 58	95	4'21	2'86
Aberystwyth (Gogerddan).....	Cardigan.....	52 26	4 1	83	4'20	3'78
Llandudno.....	Carnarvon.....	53 20	3 50	72	2'92	3'21
Cargen [Dumtries].....	Kirkcudbright.....	55 2	3 37	80	3'71	2'60
Hawick (Branxholme).....	Roxburgh.....	55 24	2 51	457	2'80	2'14
Edinburgh (Royal Observy.).....	Midlothian.....	55 55	3 11	442	...	2'64
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	4'44	2'82
Glasgow (Queen's Park).....	Renfrew.....	55 53	4 18	144	3'34	1'59
Inveraray (Newtown).....	Argyll.....	56 14	5 4	17	6'08	2'91
Mull (Quinish).....	".....	56 36	6 13	35	5'47	2'41
Dundee (Eastern Necropolis).....	Forfar.....	56 28	2 57	199	2'55	1'41
Braemar.....	Aberdeen.....	57 0	3 24	1114	3'27	1'39
Aberdeen (Cranford).....	".....	57 8	2 7	120	3'04	1'88
Cawdor.....	Nairn.....	57 31	3 57	250	3'01	1'71
Fort Augustus (S. Benedict's).....	E. Inverness.....	57 9	4 41	68	3'93	1'69
Loch Torridon (Bendamph).....	W. Ross.....	57 32	5 32	20	8'28	4'10
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	2'71	2'04
Castletown.....	Caithness.....	58 35	3 23	100	...	2'47
Killarney (District Asylum).....	Kerry.....	52 4	9 31	178	4'67	2'10
Waterford (Brook Lodge).....	Waterford.....	52 15	7 7	104	3'08	2'84
Broadford (Hurdlestown).....	Clare.....	52 48	8 38	167	2'94	3'21
Abbey Leix (Blandsfort).....	Queen's County..	52 56	7 17	532	2'86	2'68
Dublin (Fitz William Square).....	Dublin.....	53 21	6 14	54	2'15	1'82
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	3'18	2'12
Ballinasloe.....	Galway.....	53 20	8 15	160	3'17	...
Crossmolina (Ennisco).....	Mayo.....	54 4	9 18	74	4'12	3'65
Collooney (Markree Obsy.).....	Sligo.....	54 11	8 27	127	3'85	3'45
Seaforde.....	Down.....	54 19	5 50	180	3'37	2'25
Londonderry (Creggan Res.).....	Londonderry.....	54 59	7 19	320	3'77	2'55
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	3'55	3'01

RAINFALL TABLE FOR SEPTEMBER, 1909—*continued.*

RAINFALL OF MONTH (<i>con.</i>)					RAINFALL FROM JAN. 1.				Mean Annual 1870-1899.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.		No. of Days	Aver. 1870-99. in.	1909. in.	Diff. from Aver. in.	% of Av.		
		in.	Date.							
+ .27	112	.39	28	21	17.74	19.05	+1.31	107	25.16	Camden Square
+ .28	111	.61	28	19	18.80	20.62	+1.82	110	28.36	Tenterden
+1.39	154	2.00	28	19	20.41	21.50	+1.09	105	29.93	West Dean
+1.04	144	.77	29	18	18.44	20.78	+2.34	113	27.10	Hartley Wintney
- .32	86	.29	2	19	17.33	20.11	+2.78	116	24.66	Hitchin
+ .02	101	.41	4	21	18.96	19.25	+ .29	102	26.75	Addington
+ .62	125	.62	28	20	18.12	19.18	+1.06	106	25.39	Westley
-1.08	58	.50	12	15	17.58	15.50	-2.08	88	25.40	Brundall
- .60	82	.88	10	17	25.72	25.21	- .51	98	39.00	Winterbourne Stpltn
-1.56	49	.69	10	14	23.74	20.15	-3.59	85	35.00	Torquay
-2.45	32	.33	4	15	25.20	20.92	-4.28	83	38.85	Polapit Tamar
+ .23	108	.98	28	21	21.71	19.72	-1.99	91	30.75	Bath
+ .82	130	1.12	28	18	21.28	20.53	- .75	96	29.85	Stroud
- .08	97	.64	27	16	22.95	21.36	-1.59	93	33.04	Wolstaston
- .44	84	.41	27	17	20.79	18.98	-1.81	91	29.21	Coventry
- .67	71	.35	6	21	16.75	18.95	+2.20	113	23.30	Boston
+ .07	103	.49	23	18	17.81	19.79	+1.98	111	24.70	Hodsock Priory
- .01	100	.40	28	17	18.85	18.35	- .50	97	26.18	Derby
-1.20	73	.99	27	18	29.61	32.26	+2.65	109	42.43	Bolton
- .88	65	.50	27	18	19.36	21.82	+2.46	113	26.96	Ribston Hall
- .70	86	1.05	5	15	42.00	46.29	+4.29	110	60.96	Arncliffe Vic.
-1.04	57	.40	12	17	18.95	22.85	+3.90	121	27.02	Hull
- .54	77	.58	27	18	19.76	22.66	+2.90	115	27.99	Newcastle
-7.18	44	1.75	5	12	90.72	79.96	-10.76	88	132.68	Seathwaite
- .41	90	1.75	28	13	29.31	23.63	-5.68	81	42.81	Cardiff
-1.35	68	1.44	28	10	31.62	24.91	-6.71	79	47.88	Haverfordwest
- .42	90	1.20	28	13	30.66	27.08	-3.58	88	45.41	Gogerddan
+ .29	110	1.27	27	15	20.57	21.36	+ .79	104	30.98	Llandudno
-1.11	70	.89	27	8	29.86	31.86	+2.00	107	43.43	Cargen
- .66	76	.85	27	14	24.13	22.65	-1.48	94	34.80	Branxholme
...	...	.66	27	16	...	21.36	...	...	...	Edinburgh
-1.62	64	.74	28	17	32.90	34.16	+1.26	104	48.87	Girvan
-1.75	48	.27	27	10	25.43	25.92	+ .49	102	35.80	Glasgow
-3.17	48	.71	3	13	42.68	40.53	-2.15	95	62.80	Inveraray
-3.06	44	.51	3	14	38.53	31.47	-7.06	82	57.53	Quinish
-1.14	55	.41	27	18	20.75	19.59	-1.16	94	28.95	Dundee
-1.88	42	...	...	...	24.93	20.99	-3.94	84	36.07	Braemar
-1.16	62	.35	21	18	22.97	24.35	+1.38	106	33.01	Aberdeen
-1.30	57	.70	21	6	21.34	20.85	- .49	98	29.37	Cawdor
-2.24	43	.33	3	11	29.68	22.59	-7.09	76	43.71	Fort Augustus
-4.18	50	1.19	6	14	57.69	47.11	-10.58	82	86.50	Bendamp
- .67	75	.43	3	15	21.63	21.47	- .16	99	31.60	Dunrobin Castle
...	...	.50	8	20	...	21.80	...	...	...	Castletown
-2.37	45	.37	27	15	39.57	27.84	-11.73	70	58.11	Killarney
- .24	92	.90	27	15	27.08	23.41	-3.67	86	39.30	Waterford
+ .27	109	1.59	27	18	23.79	26.65	+2.86	112	33.47	Hurdlestown
- .18	94	1.18	27	17	25.05	24.62	- .43	98	35.19	Abbey Leix
- .33	85	.64	27	15	19.68	18.49	-1.19	94	27.75	Dublin
-1.06	67	.68	23	12	26.18	23.43	-2.75	90	36.48	Mullingar.
...	...	...	...	...	26.36	...	...	...	37.04	Ballinasloe
- .47	89	.96	27	19	34.02	31.13	-2.89	91	50.50	Enniscoie
- .40	90	.73	5	16	29.17	26.48	-2.69	91	41.83	Markree Obsy.
-1.12	67	.98	27	13	27.21	27.32	+ .11	100	38.61	Seaford
-1.22	68	.45	6	19	28.25	31.52	+3.27	112	41.20	Londonderry
- .54	85	.87	27	16	26.83	26.70	- .13	100	27.85	Omagh

SUPPLEMENTARY RAINFALL, SEPTEMBER, 1909.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	3·87	XI.	Rhayader, Tyrmynydd	4·99
„	Ramsgate	2·28	„	Lake Vyrnwy	3·43
„	Steyning	3·61	„	Llangyhanfal, Plâs Draw....	2·88
„	Hailsham	3·07	„	Dolgelly Bryntirion	5·71
„	Totland Bay, Aston House.	4·16	„	Snowdon, Cwm Dyli	8·55
„	Stockbridge, Ashley	3·45	„	Lligwy	3·30
„	Grayshott	2·70	„	Douglas, Woodville	3·09
„	Reading, Calcot Place.....	3·24	XII.	Stoneykirk, Ardwell House	1·99
III.	Harrow Weald, Hill House.	3·21	„	Dalry, The Old Garroch ...	3·55
„	Oxford, Magdalen College..	2·86	„	Langholm, Drove Road.....	2·77
„	Pitsford, Sedgebrook	2·93	„	Moniaive, Maxwelton House	2·68
„	Huntingdon, Brampton	2·60	XIII.	N. Esk Reservoir [Penicuick]	3·20
„	Woburn, Milton Bryant.....	2·29	XIV.	Maybole, Knockdon Farm..	2·13
„	Wisbech, Monica Road.....	1·09	XV.	Campbeltown, Witchburn...	2·51
IV.	Southend Water Works....	1·98	„	Glenreadell Mains.....	2·14
„	Colchester, Lexden.....	1·87	„	Ballachulish House.....	3·10
„	Newport, The Vicarage.....	2·05	„	Islay, Eallabus	2·64
„	Rendlesham	1·75	XVI.	Dollar Academy	2·27
„	Swaffham	1·62	„	Loch Leven Sluice	2·38
„	Blakeney	1·84	„	Balquhidder, Stronvar	2·55
V.	Bishops Cannings	3·05	„	Perth, The Museum	1·49
„	Ashburton, Druid House ...	2·03	„	Coupar Angus	1·64
„	Honiton, Combe Raleigh ..	2·79	„	Blair Atholl.....	1·39
„	Okehampton, Oaklands.....	1·63	„	Montrose, Sunnyside Asylum	1·08
„	Hartland Abbey	2·07	XVII.	Alford, Lynturk Manse ...	2·52
„	Lynmouth, Rock House ...	3·11	„	Kilfr Station	3·41
„	Probus, Lamellyn	1·28	XVIII.	N. Uist, Lochmaddy	2·06
„	North Cadbury Rectory ..	3·07	„	Alvey Manse	2·13
VI.	Clifton, Pembroke Road ...	3·08	„	Loch Ness, Drumadrochit.	1·87
„	Ross, The Graig	2·72	„	Glencarron Lodge	3·38
„	Shifnal, Hatton Grange.....	3·04	„	Fearn, Lower Pitkerrie.....	1·97
„	Blockley, Upton Wold	3·83	XIX.	Invershin	1·96
„	Worcester, Boughton Park.	3·33	„	Altnaharra	2·17
VII.	Market Overton	3·00	„	Bettyhill	2·60
„	Market Rasen	1·42	XX.	Dunmanway, The Rectory..	·59
„	Bawtry, Hesley Hall.....	1·93	„	Cork	1·40
„	Buxton.....	3·25	„	Mitchelstown Castle	2·32
VIII.	Neston, Hinderton Lodge... 2·38	2·38	„	Darrynane Abbey	1·02
„	Southport, Hesketh Park... 2·47	2·47	„	Glenam [Clonmel]	2·15
„	Chatburn, Middlewood	2·73	„	Nenagh, Traverstown.....	3·28
„	Cartmel, Flookburgh	3·33	„	Miltown Malbay.....	4·53
IX.	Langsett Moor, Up. Midhope 3·07	3·07	XXI.	Gorey, Courtown House ...	1·70
„	Scarborough, Scalby	2·38	„	Moynalty, Westland	2·07
„	Ingleby Greenhow	2·97	„	Athlone, Twyford	2·90
„	Mickleton.....	1·72	XXII.	Woodlawn	3·31
X.	Bardon Mill, Beltingham ... 2·33	2·33	„	Westport, St. Helens	3·43
„	Ewesley, Font Reservoir ... 1·88	1·88	„	Mohill	2·95
„	Hlderton, Lilburn Cottage... 2·16	2·16	XXIII.	Enniskillen, Portora	3·13
„	Keswick, The Bank	2·97	„	Dartrey [Cootehill].....	2·39
XI.	Llanfrechfa Grange.....	4·59	„	Warrenpoint, Manor House	2·81
„	Treherbert, Tyn-y-waun ... 7·80	7·80	„	Banbridge, Milltown	1·80
„	Carmarthen, The Friary..... 5·30	5·30	„	Belfast, Springfield	2·14
„	Castle Malgwyn [Llechryd]. 3·14	3·14	„	Bushmills, Dundarave	2·64
„	Plynlimon.....	7·50	„	Sion House	2·17
„	Crickhowell, Ffordlas..... 4·50	4·50	„	Killybegs .....	...
„	New Radnor, Ednol	3·76	„	Horn Head	2·37

METEOROLOGICAL NOTES ON SEPTEMBER, 1909.

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, rainy and cold weather prevailed almost throughout with occasional bright, sunny days. Much gloom or fog was experienced during the last week. Duration of sunshine 100·6* hours, and of R 55·4 hours. Mean temp. 55°·6 or 2°·1 below the average. Shade max. 70°·2 on 6th; min. 39°·7 on 2nd. F 0, f 0.

TENTERDEN.—Duration of sunshine, 134·3† hours. Shade max. 72°·0 on 17th; min. 39°·0 on 2nd. F 0, f 0.

TOTLAND BAY.—The wettest September since 1896. Duration of sunshine, 132·8* hours, or 23 hours below the average. Shade max. 69°·3 on 21st; shade min. 44°·5 on 3rd. F 0, f 0.

PITSFORD.—R ·33 in. above the average. Mean temp. 54°·2. Shade max. 69°·7 on 6th; min. 37°·6 on 2nd. F 0.

TORQUAY.—Duration of sunshine, 148·7* hours, or 17·6 hours below the average. Mean temp. 56°·8, or 1°·5 below the average. Shade max. 68°·3 on 5th; min. 43°·9 on 9th. F 0, f 1.

NORTH CADBURY.—The cloudiest September in 13 years and with the lowest mean day temp. The last half was warmer than the first, especially at night. The greatest R since 1899, largely owing to a heavy downpour on 28th and 29th. Shade max. 75°·0 on 3rd; min. 39°·0 on 8th. F 0, f 0.

ROSS.—Shade max. 70°·8 on 19th; min. 33°·7 on 9th. F 0, f 1.

BOLTON.—Duration of sunshine, 69·7* hours, or 16·2 hours below the average. Mean temp. 52°·3, or 1°·6 below the average. Shade max. 65°·9 on 24th; min. 39°·1 on 15th. F 0, f 9.

SOUTHPORT.—R ·73 in. below the average of 35 years. Duration of sunshine 108·0* hours, or 31·9 hours below the average, and the least recorded in September except in 1896. Duration of R 47·7 hours. Mean temp. 53°·4, or 1°·9 below the average. Shade max. 65°·2 on 24th; min. 37°·9 on 2nd. F 0, f 6.

HULL.—Duration of sunshine, 59·4* hours. Shade max. 69°·0 on 3rd; min. 40°·0 on 9th. F 0, f 0.

HAVERFORDWEST.—Duration of sunshine 227·6* hours. Shade max. 67°·9 on 22nd; min. 38°·0 on 10th. F 0, f 1.

LLANDUDNO.—Shade max. 65°·5 on 17th; min. 40°·2 on 14th. F 0, f 0.

DOUGLAS.—Apart from the torrential R of 27th and 28th, the month was dry, fine, calm and sunny. No R fell from 10th to 22nd when fine harvesting weather was enjoyed. Temp. was below the average almost throughout.

CARGEN.—Shade max 69°·0 on 17th and 23rd; min. 35°·0 on 2nd and 14th.

EDINBURGH.—Shade max. 62°·8 on 17th; min. 39°·6 on 15th. F 0, f 2.

COUPAR ANGUS.—Brilliant weather and heavy night dews were experienced at the opening, and ideal harvest weather prevailed until 20th. Thereafter the R was generally light but persistent. Shade max. 72°·0 on 10th; min. 29°·0 on 14th.

FORT AUGUSTUS.—Shade max. 68°·0 on 10th; min. 31°·0 on 2nd. F 2.

CORK.—Shade max. 65°·0 on 5th; min. 37°·0 on 14th. F 0, f 0.

DUBLIN.—At the beginning R was frequent but not heavy. A dry period set in on 12th lasting with one or two slight interruptions until 27th when a shallow depression brought great gloom and heavy R. Mean temp. 53°·8, or 2°·1 below the average. Shade max. 64°·5 on 19th; min. 40°·7 on 14th. F 0, f 0.

MARKREE.—Shade max. 68°·4 on 19th; min. 30°·1 on 15th. F 2, f 5.

WARRENPOINT.—Shade max. 66°·0 on 5th; min. 39°·0 on 13th and 14th. F 0, f 0.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, April, 1909.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	70°6	11	28°5	2	60°4	39°9	41°7	75	116·6	23·6	1·90	12	4·7
Malta	72·0	28	47·7	4	64·3	55·4	55·4	81	141·1	...	1·57	3	5·2
Lagos	91·0	27*	72·0	3‡	87·8	76·4	75·3	76	161·0	70·0	5·52	12	8·0
Cape Town	88·3	11	41·9	29	73·4	56·3	55·0	73	...	...	·36	7	4·0
Durban, Natal	88·7	3	54·6	30	79·9	63·6	...	...	142·9	...	2·27	13	3·0
Johannesburg	74·6	20	37·1	30	68·6	51·4	50·8	75	141·7	33·8	·15	3	3·0
Mauritius	83·8	15	65·6	19	81·5	69·1	68·1	80	152·0	55·4	2·89	18	5·3
Calcutta... ..	100·2	8	67·2	13	92·9	73·1	71·3	73	158·1	63·3	5·95	11	5·1
Bombay... ..	94·0	30	73·3	3	88·9	76·8	72·9	74	135·2	65·7	·00	0	1·9
Madras	98·0	27	68·4	12	91·8	77·0	75·7	81	140·5	68·4	7·52	8	3·1
Kodaikanal	71·2	17	50·4	28	67·6	53·3	51·7	75	142·6	39·3	3·60	14	4·6
Colombo, Ceylon	92·8	20†	71·0	27	90·7	76·2	74·9	77	154·0	69·0	3·35	9	4·9
Hongkong	85·7	27	61·6	1	75·8	67·4	64·7	79	137·3	...	2·46	10	7·8
Melbourne	79·1	12	39·7	21‡	63·7	47·8	44·2	65	134·2	33·7	1·92	15	6·0
Adelaide	88·0	3	40·0	19	68·4	50·0	45·7	64	149·9	32·3	3·27	15	6·0
Coolgardie	95·0	2	38·0	30	71·5	50·8	47·5	61	157·0	35·2	·59	4	4·3
Perth	90·9	1	46·7	28	73·6	56·3	54·6	70	140·2	40·9	1·52	6	4·8
Sydney	89·0	4	46·0	24	70·8	55·4	50·7	68	125·7	33·3	1·03	18	4·5
Wellington ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Auckland	72·0	7	44·0	26	66·5	54·3	52·4	75	130·0	36·0	1·20	11	5·1
Jamaica, Kingston	89·5	4	66·2	8	87·7	70·5	77·7	72	...	...	1·61	5	3·9
Trinidad	89·0	sev.	66·0	5, 8	86·3	68·7	71·2	81	155·0	59·0	1·78	7	...
Grenada	86·0	1, 6*	68·6	8	83·4	72·4	70·0	76	144·0	...	3·82	24	5·0
Toronto	61·3	6	15·6	11	48·8	33·0	...	...	79·0	13·7	5·41	17	...
Fredericton	63·0	13	11·5	12	45·7	26·8	...	72	...	...	2·38	7	5·8
St. John's, N.B.	53·5	21	18·5	1	44·1	30·9	...	...	...	...	5·58	16	6·1
Victoria, B.C.	60·4	21	32·0	17	55·2	39·3	...	72	...	...	·61	5	5·0
Dawson	52·8	30	-15·0	15	35·3	8·8	...	...	...	...	·64	7	4·7

* and 28. † and 21. ‡ and 7, 30. § and 24.

MALTA.—Mean temp. of air 59°·2. Average bright sunshine 8·4 hours per day.

Johannesburg.—Bright sunshine 258·5 hours.

Mauritius.—Mean temp. of air 0°·6, of dew point 0°·7, and R 2·25 in., below averages. Mean hourly velocity of wind 9·3 miles or 1·2 below average. TSS 28th and 29th.

KODAIKANAL.—Bright sunshine 223 hours. TSS on 24 days.

COLOMBO.—Mean temp. of air 83°·8 or 1°·2 above, of dew point 0°·4 above, and R 6·93 in. below averages. Mean hourly velocity of wind 4·8 miles.

HONGKONG.—Mean temp. of air 71°·1. Bright sunshine 155·4 hours, or 51 hours above average. Mean hourly velocity of wind 14·1 miles. R 3·42 in. below average.

Melbourne.—Mean temp. of air 3°·8 below, and R ·46 in. below, averages.

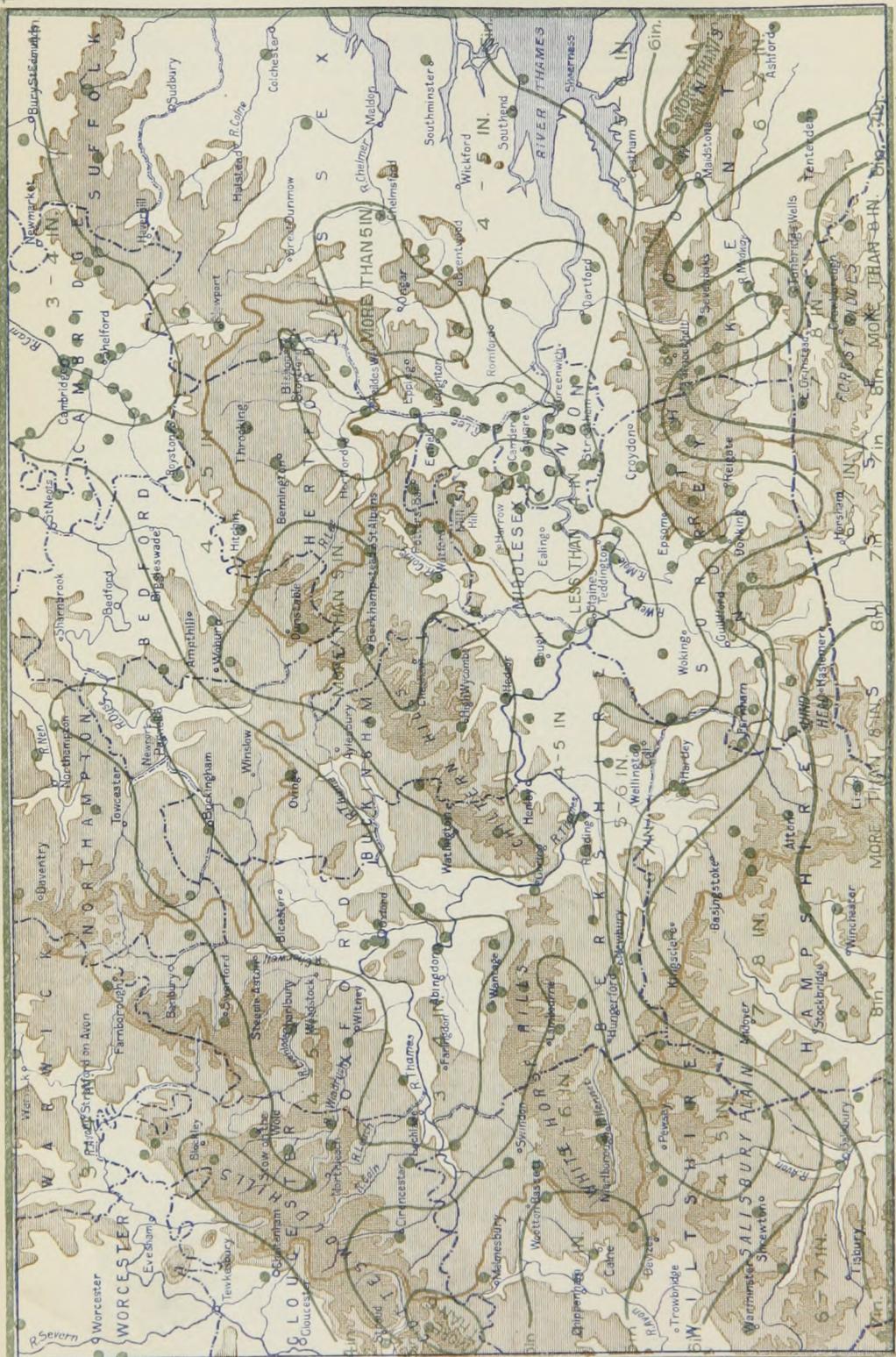
Adelaide.—Mean temp. of air 4·9 below, and R 1·41 in. above averages. Mean temp. the lowest on record in April.

Perth.—Rainfall ·14 in. above average.

Sydney.—Mean temp. 1°·5 below, and R 4·28 in. below, averages.

TRINIDAD.—R ·25 in. below 46 years' average.

RAINFALL OF THAMES VALLEY — OCTOBER 1909.



ALTITUDE SCALE

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

0 5 10 15 20

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

Symons's Meteorological Magazine.

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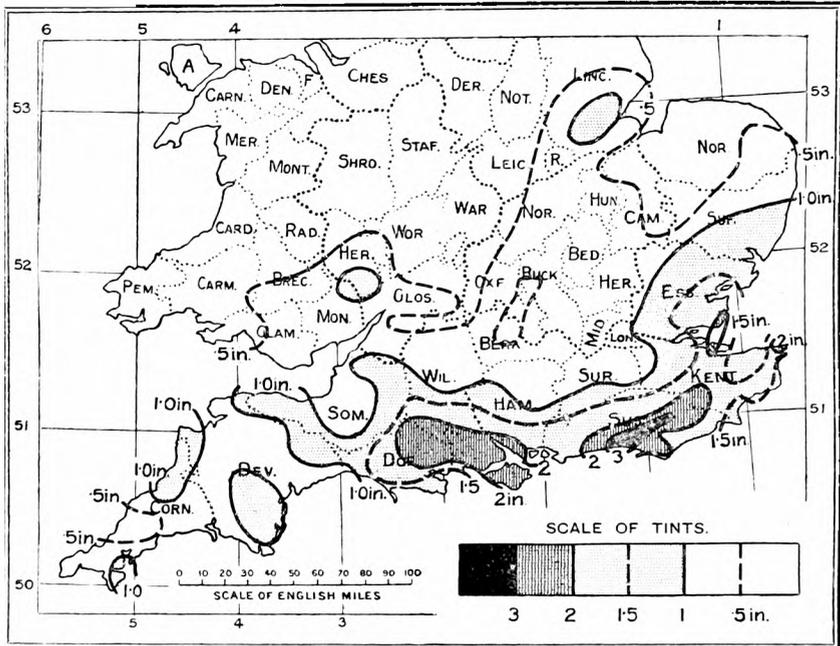
THE RAINFALL OF OCTOBER 26th-28th IN THE SOUTH OF ENGLAND.

FOR a considerable time before the end of October the British Isles had been subjected to the type of weather resulting from the passage of a series of depressions, following one another in succession from the Atlantic and passing away, as a general rule, in the direction of Scandinavia. The accompanying rainfall was usually persistent rather than heavy, though in the west considerable falls had taken place. On the evening of October 25th a rapid fall of pressure was proceeding over the extreme west of Europe, and by the following morning the centre of a deep depression was situated immediately to the south of Ireland. The system moved very slowly south-eastward for two days, travelling a distance of about five hundred miles across the mouth of the English Channel and the north of the Bay of Biscay. During the 28th a sudden change of direction took place, and the centre moved rather more rapidly in a north-easterly direction through the Netherlands to Denmark. The effect of this somewhat unusual course was to enclose the south of England between the south-east and north-east paths of the moving depression, thus keeping it always on the left side of the track. It is usually found that the area of heaviest precipitation accompanying a depression lies on the left of the track of the centre; and in this instance, the rainfall in France, lying almost entirely on the right side, does not appear to have been anywhere so heavy as in the south-east of England. Whilst the Brighton fall shown in the map took place during the passage of the cyclonic system from Cornwall to the coast of Brittany, the fall in Kent on the 28th was associated with its northerly movement immediately after the change of direction. Several instances suggest that there is an intimate connection between a sudden change of direction in a cyclone track and a subsequent intense downpour of rain. It would be interesting if a closer investigation of the barometric distribution could be made, to examine whether any similar occurrence took place on the 26th which would synchronize with the large downpour in Sussex.

We reproduce a sketch map, showing, so far as it is possible at present, the rainfall of the first of the three days in the south of

England. It is interesting to note the linear arrangement of the series of splashes of heavy rain over the whole breadth of the country. It will be observed that, commencing at Falmouth with a small patch with rain just exceeding an inch, the recurring splashes, which are grouped with an almost equal interval, are of increasing intensity until the culminating point at Brighton is reached. The falls of

RAINFALL OF OCTOBER 26TH, 1909.



over two inches at Margate, and 2.50 in. at Shoeburyness, suggest a further extension of the great rainfall to the east, where, however, we have no means of following it.

Maps of the rainfall of the two following days were also constructed and they present features of considerable interest. On the 27th, although rain was general over the whole area affected on the previous day, the amount was less than half an inch, except in the extreme south-east of England, and only exceeded an inch in a narrow strip occupying most of the northern half of Kent. Over 1.50 in., however, fell at Ramsgate and other places within this strip. On the 28th the precipitation was again very similar in its broad features, the line limiting the area on which any rain fell almost coinciding on all three days, but on this occasion the part of the country with more than half an inch was much larger, occupying the whole of the land south-east of a line drawn from Kings Lynn to Weymouth. The amount exceeded an inch generally in the east of Hampshire and Berkshire, over the Chiltern Hills, the greater part of Surrey and Kent and in some isolated patches in East Anglia.

A large part of Sussex, however, escaped with about three quarters of an inch. The extension of the heavy fall over the Chiltern Hills is peculiarly interesting, since unless the coincidence of the heavier rain with the more elevated land is one of pure chance, it presents the uncommon phenomenon of a normal long-period distribution manifested in the rainfall of a single wet day. As on the 26th so on the 28th the rainfall appears to have had a tendency to increase in intensity eastwards and more than two inches fell over the east of Kent from Margate to Dungeness. At Broadstairs and Folkestone the day's yield amounted to three inches. On the further side of the Strait of Dover 1.34 in. was measured at 7 a.m. on the 29th at Cape Griz Nez, and it therefore seems probable that the very intense splash was not of great extent, and lay entirely to the left of the cyclonic track which passed through Belgium. The Isle of Thanet and its immediate vicinity was the part of the country most severely visited on the whole three days, the total fall reaching, roughly, six inches in that period.

The following is a complete list of the records we have received from the south of England in which more than 2.50 in. fell in one day, or more than 4.00 in. in three consecutive days at the end of October, the readings unless otherwise noted being at 9 a.m. :—

STATION.	COUNTY.	OCTOBER, 1909.			
		26th.	27th.	28th.	26th —28th
		in.	in.	in.	in.
Maidstone, Mill Street	<i>Kent</i>	1.53	1.26	1.83	4.62
Detling, The Croft	„	1.50	1.43	1.44	4.37
Folkestone, Surrenden Road	„	1.87	.74	3.00	5.61
„ Capel Lodge	„	2.88	...	...	...
Ashford, Oakwood	„	1.72	.70	1.77	4.19
Canterbury	„	1.22	1.28	1.67	4.17
Bicknor Rectory	„	1.30	1.67	1.10	4.07
*Faversham, Colkins	„	1.41	1.42	1.51	4.34
Minster, Gas Works	„	1.38	1.37	2.06	4.81
Ramsgate, Southwood W. W.	„	1.42	1.62	2.96	6.00
Broadstairs, Providence Ho.	„	1.51	1.23	3.14	5.88
St. Peters	„	1.50	1.56	2.73	5.79
†Brighton	<i>Sussex</i>	3.60	...	...	...
„ „	„	3.32	...	...	...
† „ Preston, Ashford Rd.	„	3.35	...	...	...
„ „ Drove	„	3.15	.61	.89	4.65
„ „ Ditchling Rd.	„	3.48	.81	.98	5.27
Heathfield, The White Cott.	„	2.99	...	...	...
Tottingworth Park	„	2.73	.68	.65	4.06
Ticehurst, Myskins	„	2.78	.62	.96	4.36
Ryde, Beldornie Tower	<i>Hampshire, I. of W.</i>	2.43	.30	1.33	4.06
E. Cowes, Spring Hill	„	2.82	...	...	...
Shoeburyness	<i>Essex</i>	2.50	.54	.64	3.68
Ashmore Rectory	<i>Wiltshire</i>	2.90	.49	.30	3.69

* Read at 7.30 a.m.

† Read at 7 a.m.

For the purpose of comparison we have extracted from the section on maximum falls in twenty-four hours in the volumes of *British Rainfall* since 1864, a list containing all known instances* of falls of 3·00 in., or more, in the counties of Surrey, Kent, Sussex, Hampshire and Berkshire. The list consists of 69 entries, excluding 1909, comprising 26 different dates in the course of 45 years. Of these, no fewer than 60 instances on 22 dates fell within the summer half-year, from April to September, suggesting that on a great many of the occasions on which so large a daily fall has occurred the precipitation was due to thunderstorms. In two of the winter half-year instances the amount recorded reached just 3·00 in. at one station only, leaving no more than December 26th, 1886 (six stations), and October 30th, 1894 (3·56 in. at Sidcup), which may be said to have been more remarkable than October, 1909, in this respect for the time of year. It is interesting to note that, so far as the available records show, no previous daily fall of 3·00 in. had been observed within 20 miles of Brighton, where 3·60 in. was reported on October 26th, 1909, or within 40 miles of Broadstairs, where 3·14 in. fell on the 28th. The network of stations reporting to *British Rainfall* has become closer and closer each year, so that it is not impossible that a local downpour on a small area might have escaped detection in the earlier years.

In previous years rainfalls exceeding 3·50 in. in 24 hours were recorded as follows in the district under notice :—

*Rainfalls of 3·50 in., or more, in 24 hours, 1864–1908, in Surrey,
Kent, Sussex, Hampshire and Berkshire.*

1867.....	July 26th,	Deptford Creek	3·98 in.
„	„	Hartlip	4·78 „
1872.....	July 31st,	Liphook, Milland House ..	4·11 „
1886.....	Dec. 26th,	Idsworth House	3·65 „
1888.....	July 31st,	Sandhurst.....	3·50 „
1889.....	Sept. 2nd,	Wilmington	3·90 „
1894.....	Oct. 30th,	Sidcup	3·56 „
1901.....	July 12th,	Maidenhead, Lowood	3·63 „
„	„	Maidenhead, Castle Hill ...	4·24 „
1902.....	Sept. 10th,	Weybridge	3·80 „
„	„	Esher	3·51 „
1903.....	May 30th,	Beddington Corner.....	3·67 „
„	July 23rd,	Tunbridge Wells.....	3·77 „
„	„	Speldhurst	3·55 „
„	„	Farningham Hill.....	3·78 „
„	„	Southfleet	3·54 „
„	„	Wilmington	4·03 „
„	„	Sidcup	3·94 „
„	„	Dartford	4·41 „

It was fortunate from the point of view of damage by flooding that

* It must be remembered that if two or more falls of 3·00 in., or over, occurred in one year, only the largest would be recorded in the list; but the probability of more than one such fall in one year is very small.

the scene of the most severe of the storms lay on the sea coast, thus facilitating the escape of vast quantities of water into the sea without inundating any very large area. The valley of the Stour was, however, within the district very seriously affected, and a great amount of flooding took place, the river spreading itself out over the land for twenty miles of its course. Canterbury and Ashford, the two largest towns in the upper part of the valley, suffered badly, and many low-lying villages in the neighbourhood, notably Chartham and Wye, were completely isolated. Eye-witnesses speak of the scene as resembling an inland sea, hedges and fences being entirely submerged. Many thousand sheep were said to have been lost from Kentish pastures.

The very exceptional rains of the last week came at the close of a month the rainfall of which already exceeded the average, except at a few stations on the east coast, and the map of the Thames valley and surrounding country in the present issue shows an unusually heavy and irregular fall. It is seldom that so large an area has more than five inches of rain in any month and very rare indeed to find, as on the southern border of this map, a broad stretch of the south of England with more than seven and even more than eight inches. The month, over the country as a whole, was by no means so wet as October, 1903 (see this Magazine, 38, p. 169) but there were some pretty large figures reported from the west. The most remarkable was 56·54 inches at Llyn Llydaw on Snowdon, the largest fall ever recorded in a month in the British Isles, and one that we should like to see confirmed by a duplicate gauge. The next highest fall was at The Styne in Cumberland, 30·50 inches, a figure which has been exceeded several times at that station. We are only able to refer to a few of the very numerous letters we have received on the rainfall of October.

THE WEATHER OF OCTOBER, 1909.

By FRED. J. BRODIE.

UNTIL the closing week of last month, a current of mild humid air from south or south-west blew almost persistently over the United Kingdom, and kept the thermometer well above its average level for the time of year. Owing to a rather general deficiency in the amount of bright sunshine, the day temperatures were by no means remarkable, the excess of warmth being greater at night-time, when terrestrial radiation was effectually checked by the presence of a cloudy or overcast sky. The highest shade maxima occurred, as a rule, between the 2nd and 4th of the month, when the thermometer rose to 65° and upwards over a large portion of Ireland, England and the neighbouring parts of Scotland, and touched 70° at Bawtry on the 2nd and Scarborough on the 4th. The nights were at the same time

unusually mild, many places reporting minima appreciably above 55° ; at Westminster, the thermometer on the night of the 3rd did not fall below 60° , the reading being, as a minimum value, the highest recorded in London in October since the year 1876. Further touches of midday warmth were experienced between the 10th and 12th, and between the 18th and 20th, the thermometer on each occasion rising to 65° , and a trifle above it at many English stations. On the night of the 16th a minimum of 60° was again recorded at Westminster, so that in the course of the month there were in London two nights which ranked as the mildest in October for more than 30 years past. The excess of nocturnal warmth was, however, not maintained without interruption. On the 5th and 6th, the sheltered thermometer fell below 40° in several parts of Ireland and Scotland; while on the night of the 8th it fell below 35° in most English districts, a sharp ground frost being experienced on the latter occasion at several inland stations. Further touches of frost were reported in many parts of the kingdom between the 12th and 14th, and again in Ireland and Scotland between the 19th and 21st, and over England on the 22nd.

In the closing week the very gradual movement of a barometrical depression passing our south-west coasts and across France, was attended not only by a torrential downpour of rain over the south of England, but by a shift of wind over the entire kingdom, firstly to south-east and east, and afterwards to north-east and north. With this change, the thermometer fell steadily to quite a wintry level, the coldest weather occurring on the 29th and 30th, when the thermometer over a large portion of the country failed to reach a maximum of 45° . Sharp frosts were experienced very generally on the nights of the 28th and 29th, and still sharper ones on the nights of the 30th and 31st. On the two latter occasions the thermometer in the screen fell at least ten degrees below the freezing-point in many parts of Great Britain; a minimum as low as 16° being recorded at Balmoral and Llangammarch Wells, and a reading of 17° at West Linton. On the surface of the grass readings below 20° were registered somewhat extensively, the exposed thermometer getting below 15° at many northern stations, and reaching 11° at West Linton, and 12° at Crathes and Burnley.

The cold experienced in the concluding week was, however, insufficient to counterbalance the effect of the previous long spell of warmth, and the mean temperature of the month was, therefore, above the average over practically the whole kingdom. In Scotland and the north of Ireland the excess was small, but in the southern districts it was much larger, the departure from the normal exceeding 3° at some inland stations in the south of England. The total duration of bright sunshine was in most places in fair agreement with the normal, the general tendency being for a slight excess. In London (at Westminster) the aggregate of 75 hours was 6 in excess of the average, but was smaller than in any of the four Octobers 1905 to 1908.

NEW METEOROLOGICAL STATION AT HAMPSTEAD.

THE Hampstead Scientific Society has, after overcoming many difficulties, established an astronomical observatory and Second Order Meteorological Station on the highest part of Hampstead. Our readers will recollect that the Society had obtained permission from the London County Council to erect the necessary structures in the Flagstaff enclosure on Hampstead Heath, but in consequence of the vehement opposition of the dwellers on the margin of the Heath, who questioned the right of the Council to permit any use to be made of the Heath except for the purposes of recreation, the consent was withdrawn. Fortunately another and less timorous public body, the Metropolitan Water Board, was induced to promote science by granting a site for the observatory, at a very moderate rent, on the highest position in the Borough of Hampstead. This is the top of the covered reservoir at the junction of Heath Street with the road skirting the south side of the Heath, and there a small astronomical observatory, with a revolving dome, has been erected, and an adjacent enclosure fitted up as a meteorological station, the height above sea-level being 450 feet. It may be recalled that the Meteorological Office station in St. James's Park is 27 feet above sea-level, Kew Observatory 18 feet, the Camden Square station 111 feet, and Greenwich Observatory 155 feet. The new observatory has cost the Society about £250 to build and equip, irrespective of the cost of an eight-inch reflecting telescope presented by Dr. F. Womack, a sidereal clock presented by Mr. Duveen, and a Robinson anemometer presented by Mr. Hawke.

Mr. P. E. Vizard, vice-president, presided over a meeting of the Hampstead Scientific Society, held at Heath Mount School on November 6th, when Dr. Womack formally declared the Observatory open, and gave an address on the astronomical side of the work to be carried on at it. Dr. H. R. Mill gave a short address on the meteorological side of the work. He laid stress on the importance of studying the climates of London, and pointed out that the only way this could be done effectively was by establishing meteorological records which could reasonably be expected to be permanent, the quasi-immortality of a scientific society furnishing a sort of guarantee that the work should not lapse by any ebb in the tide of interest or the risks of human life. The unique position of the new station should make the observations of duration of sunshine especially extremely interesting. The instruments provided are of the best patterns, the exposure is perfect, and the Society could be trusted to make a worthy use of them. He thought that special thanks were due to the honorary secretary, Mr. C. O. Bartrum, for the persistence with which he had pressed forward the establishment of the observatory, in the face of the most determined and totally unforeseen opposition.

Sir Samuel Wilks proposed a vote of thanks to the speakers, and expressed his own warm interest in the new departure in the work of the Society. The audience, which numbered about 100, then visited the observatory.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

HEAVY OCTOBER RAINFALL.

SOME particulars of the recent heavy rainfall here may be of interest.

Monday, October 25th, was fine, wind N.W.; the evening was clear. Rain began to fall early in the morning of the 26th, and the wind was then S.E. At 9 a.m. on the 26th .06 in. was measured. The rain was not remarkable before mid-day, but increased as the day went on, and was very heavy about 9.45 p.m. The wind had backed slowly and was then E.N.E. Rain continued through the night, and at 9 a.m. on the 27th 2.10 in. was recorded; the wind was then N.E.

Not much rain fell in the morning of the 27th, but there were some drizzling showers, one about 10.30 a.m. heavier. Rain set in again at 2 p.m. and continued falling, heavily at first, into the night. The wind continued N.E. At 9 a.m. on the 28th .81 in. was measured, and the wind had backed to N.N.E.

During the 28th no rain fell except a few spots now and then until 3.45 p.m. when gentle rain began to fall and was continuing at night. On the morning of the 29th the wind was N.N.W., and .41 in. was measured at 9 a.m. Rain ceased at 10.30 a.m. and the rest of the day was fine. On the morning of the 30th .03 in. was measured. The wind at one time attained gale force.

Thus the rain produced here by the storm system was as follows:—

October 25th	in	.06
„ 26th	2.10	
„ 27th .....	.81	
„ 28th .....	.41	
„ 29th .....	.03	
	<hr/>	3.41

There has been serious flooding in the valley of the River Teise, and a conservative estimate puts the maximum rise of water at 12 feet.

F. DRUCE.

Gore Court, Goudhurst, Kent, 31st October, 1909.

RAINING CATS AND DOGS.

WITH reference to your correspondent's query as to the origin of the above very well-known popular saying, I find the following explanation of it given in Dr. Brewer's "Dictionary of Phrase and Fable":—

"A perversion of the word *catadupe* (a waterfall). It is raining catadupes or cataracts. Mr. Ford ingeniously, though not with much probability, suggests the Greek *cata doxas* (contrary to experience), *i.e.*, in an unusual manner. Dean Swift, describing a fall of rain, says the kennels were overflowed, and that—

' Dead puppies, stinking sprats, all drenched in mud ;
 Drowned cats, and turnip tops, come tumbling down the flood.
' A City Shower.'

The above appears under the heading of "Cat and Dog." In a later part of the Dictionary, under "Rain," the saying is again referred to as below :—

" In Northern mythology the cat is supposed to have great influence on the weather, and English sailors still say, ' the cat has a gale of wind in her tail,' when she is unusually frisky. Witches that rode upon the storms were said to assume the form of cats ; and the stormy north-west wind is called the *cat's-nose* in the Harz even at the present day.

"The dog is a signal of *wind*, like the wolf, both which animals were attendants of Odin, the storm-god. In old German pictures the wind is figured as the ' head of a dog or wolf,' from which blasts issue.

"The *cat* therefore symbolises the down-pouring rain, and the *dog* the strong gusts of wind which accompany a rain-storm ; and a ' rain of cats and dogs ' is a heavy rain with wind."

As to the other " expressions " quoted by Mr. Dashwood, I can say nothing ; but they hardly seem to me to belong to the same class as the above.

BASIL T. ROWSWELL.

Les Blanchés, Guernsey, 4th November, 1909.

UNITS OF RAINFALL MEASUREMENT.

It occurs to me that a possible explanation of the discrepancy between small rainfall measurements (Magazine, No. 525, p. 165) may be due to the fact that one observer places his measuring glass inside the receiver, and so lets the rain run into the glass, thus losing not a drop. The tin receiver must of necessity " absorb " some small amount of rain, and so when the rain is poured into the glass there is rather less to show.

I always let the rain run into the glass, and in cases where there has been a lot of rain during the day I measure it also at 6 p.m., or take the glass out.

I think this difference of plan would account for the difference of " rain days."

JAMES CROSS.

Bailie House, Wimborne, 1st October, 1909.

I HAVE read with interest the article with the above title by Mr. A. Hampton Brown in the October number of this Magazine ; having myself noticed within the limited area for which I tabulate the rainfall returns of about 35 observers (*i.e.*, S.W. Wilts, N.W. Dorset and most of Somerset) the great discrepancies in the number of rain days recorded, and having further the advantage of some personal knowledge of many of the observers. Such experience as I have had

goes to show that these discrepancies are *partly* due to the localities. Thus at one station only three miles from my home every shower, however small, that may be about, will really produce measurable rain; while other stations within easy distance seem generally to escape. But I feel quite certain that the discrepancies are much more largely due to the personal equation of the observers themselves. Some—to use Mr. Brown's language—"with pardonable zeal make rather too much of the kindly dews of night"; others won't trouble themselves at all about dews or the very small rains.

But is not the definition of a rain day itself at fault? For myself I confess that after a heavy dew it is with the greatest possible repugnance that I put down as a rain day one that has been absolutely cloudless for the whole 24 hours. I *don't* do it if the dew amounts to less, say, than .008 in.; perhaps not even when it is more.

But if the definition of a rain day were altered so as to exclude these tiny falls of .01 in. and .02 in., then, as Mr. Brown points out in his valuable table, the discrepancies would almost disappear. These small amounts would still be measured and duly entered, but we should no longer be obliged to reckon an absolutely cloudless day as a rain day. Undoubtedly to draw the line at .03 in. would be arbitrary, but it must be drawn *somewhere*; and to draw it at .01 in. is arbitrary also, and open to the grave objections set out so forcibly by Mr. Brown.

H. A. BOYS, F.R.Met.Soc.,

Secretary of Mid-Wessex Rainfall Association.

North Cadbury Rectory, Oct. 27th, 1909.

In the Table of Rainfall for October, 1908, given on p. 167, I notice Malden (Worcester Park) is mentioned as having no small falls of .01 or .02 in., but having a total of 2.15 in. On looking up my own record for New Malden (Edenfield)—which is only $1\frac{1}{2}$ or 2 miles away—I find October, 1908, had 16 rain days, 8 days with .01 in., none with .02 in., 8 days with other amounts, and a total fall of 2.10 in., agreeing very nearly with Worcester Park record.

I would suggest that frequently small amounts of .005 in. or a trifle over are allowed to evaporate, or perhaps in being spread over the dry surface and sides of the receiving can (in emptying into glass measure) appear less than .005 in., and in consequence are treated as *nil*. I prefer to keep the measuring glass in the gauge except during severe frosty weather; in this way every drop of a small fall is secured for record.

There is always an extraordinary difference between New Malden Sewage Works' record and my own, which I can never understand, considering we are only about half a mile apart. The difference for 1908 being as much as $2\frac{1}{2}$ inches, the Sewage Works *less* than Edenfield.

W. J. CARTER.

Edenfield, Montem Road, New Malden, Surrey, 4th Nov., 1909.

IN the last number of the Magazine there is an article on discrepancies in the number of rain days at adjoining stations. Perhaps my humble experience can throw a little light on the matter. At one time I had under observation two gauges, one an ordinary japanned one standing upon short grass, the other a copper Snowdon, partly sunk in gravel. The latter was in much the more misty situation, yet I constantly found that the gauge on grass would have $\cdot 01$, $\cdot 02$, or even $\cdot 03$ in. of dew in it when the gauge partly sunk in the ground had none. I presume the warmth of the ground kept the sunk gauge above the dew point, while the chilling contact with the short grass cooled the other far below it. Probably in case of a thaw after a long frost the converse would have been the case. Perhaps an examination of the gauges referred to in the Magazine in the light of this experience might explain the discrepancies.

F. J. WARDALE.

Shrewton, Wilts, 3rd Nov., 1909.

HIGH OCTOBER MINIMA.

THE present month has been remarkable for high nocturnal temperature, but I think the minimum for to-day (October 17th), $58^{\circ}\cdot 5$, is unprecedented, while yesterday's reading (October 16th) was $56^{\circ}\cdot 5$.

On going through the Greenwich records back to 1841, the nearest approach is 58° on October 22nd, 1898; and to find a higher minimum than that of to-day one must go back to 1859, when $59^{\circ}\cdot 5$ was recorded on the 7th, ten days earlier than the record of to-day.

There has also been great uniformity in the maxima this month, the highest being $63^{\circ}\cdot 2$ and the lowest 60° , during the last eight days.

H. K. G. ROGERS.

"Glenart," Weybridge, 17th October, 1909.

DAYLIGHT METEOR, OCTOBER 6th, 9.34 a.m.

THE daylight fireball, described by your correspondents in Surrey, was observed by many others in Sussex, Norfolk, Northampton, Gloucester, Somerset, Devon, etc., etc. It was a fine object, and furnished a rare spectacle to all those spectators who were fortunate enough to get a glimpse of it. A man may look upwards at the blue sky on sunshiny days more than ten thousand times and never see a meteor fall; in fact, the spectacle must be accounted one of the most novel of celestial pictures.

The meteor passed over central England, from nearly S. to N., and in the region north-west of Northampton caused a loud detonation—for here its disruption evidently occurred—doors creaked, windows shook, and there were all the attributes of an earthquake, so that the people were alarmed and ran out of their houses for safety.

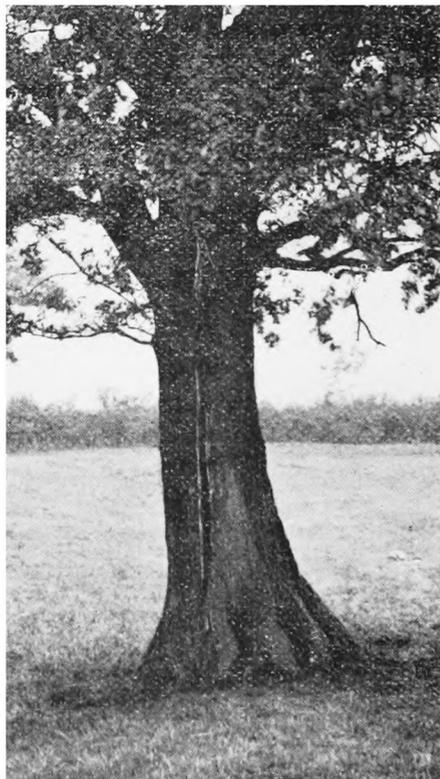
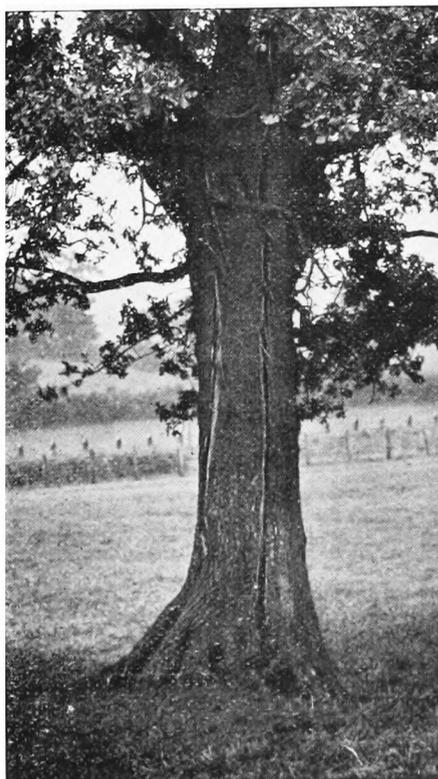
The meteor had a height of from about 75 to 30 miles, and a

velocity between 15 and 20 miles per second. But the observations are not sufficiently exact for very precise deductions to be made. At night it is comparatively easy to record a meteor's flight; but in sunshine the absence of visible reference stars occasions a difficulty. The radiant of the recent meteor was in Leo, where no October meteor showers are known. There were large daylight fireballs probably in 1900, January 9th (from Aquila), and in 1894, February 8th (from Hercules), at 2.55 and 0.28 p.m., respectively.

W. F. DENNING, F.R.A.S.

LIGHTNING SEEN TO STRIKE.

MR. W. H. DINES refers in the last number of this Magazine to the thunderstorm in the Thames Valley of September 17th. The two photographs below represent an oak tree struck by lightning during this storm. The tree stands by itself in a field, about 150 yards south-west of Stow-on-the-Wold station, Gloucestershire. It was struck just at 4 p.m. The storm was violent from 3.45 p.m. to 5 p.m., but rain lasted longer than this. At the village of Lower Slaughter, some two miles from the tree, 1.53 in. was measured, but no other gauge in the vicinity appears to have received so much as an inch.



The first photograph is from the N.W., and shows two "seams"; the other, from the S.E., shows one "seam." There was no sign of burning on the tree, which did not appear injured, except for the stripping of the bark down the "seams." This stripping is very apparent in the second photograph, in the upper part of the tree. Bark, some in long strips, was scattered about. A pony was killed in the same field in the storm; when found, it was lying fifty yards from the tree. Perhaps readers of this Magazine can say whether it is probable that the three "seams" were made by one flash, or by more than one. One only was seen to strike likely to cause the damage.

F. DRUCE.

IN reply to the letter of Mr. W. H. Dines in your last issue, I can corroborate the statement of his mechanic who asserts that he saw lightning strike the fields, but no mark of anything struck was to be found. About ten years ago, when I was at Church Stretton, in the course of a cricket match we were compelled to take shelter in the pavilion during a rather bad thunderstorm. The cricket field is situated in the valley alongside the railway, about half a mile on each side the hills rise up to 1,200 ft. on the east and 1,500 ft. on the west. As I was in the pavilion watching the storm, I saw a flash come straight down and strike the grass in the cricket field, about 100 yards from the pavilion, and only about 20 yards from a railway telegraph post. I distinctly saw the grass smoke where the lightning struck. Without diverting my eyes from the spot, and although it was still raining fairly heavily, I ran out to see if anything was to be seen. Unless I had marked the exact spot I should never have found it, for to an unobservant eye there was nothing to be seen, though there was a strong sulphurous smell. Looking carefully down I saw lines in the grass radiating from a centre as if a piece of cord had been dragged through the grass; there was no hole even in the centre, but just a small spot which was bare of grass. On getting back my fellow cricketers asked me if I had found the thunderbolt; I replied that I did not go to search for one.

R. P. DANSEY.

Kentchurch Rectory, Hereford, October 18th, 1909.

THE STANDARDIZATION OF SUNSHINE RECORDERS.

By R. H. CURTIS.

SOME important points in connection with the registration of sunshine are raised by letters which have appeared in recent numbers of this Magazine; and although these points, or at any rate most of them, have already been dealt with elsewhere, it may not be amiss, in view of the importance and widespread interest which now attaches to observations of this element, to give in these pages a brief account

of the development of the Sunshine Recorder, and of the steps which have been taken for the purpose of standardizing the instrument and its records.

Fifty-six years have now elapsed since the late Mr. J. F. Campbell began to register the duration of sunshine, and for that purpose set up in Whitehall the first sunshine recorder; and thirty years have passed since the *daily* registration of the incidence and duration of sunshine became possible as an element of ordinary meteorological observation. For some years prior to the year 1880 what may be termed a seasonal record had been obtained, first at Westminster and then, from the year 1875, at the Kew Observatory, by the use of the hemispherical bowls of hard wood introduced by Mr. Campbell. In the centre of the bowl was placed the lens, which in the earliest stage of the instrument was a hollow glass sphere filled with water—for it was not until 1857 that it became possible to obtain a suitable lens of solid glass, and the record was obtained by the charring of the interior of the bowl by the focussed rays of the sun. Each bowl received the record of six months' insolation, from solstice to solstice; but as the declinational change in the path of the sun's image is very gradual and slow, it was never possible to ascertain how much of the total result was due to the sunshine of relatively short intervals, or to differentiate between the effect due to *intensity* and to *frequency*. The negative record of a dull week sandwiched between two brilliant weeks would be absorbed by its brighter neighbours and disappear altogether; a sufficiently prolonged spell of sunless weather would, however, tell its tale by a strip of relatively uncharred wood left outstanding from the generally scorched surface; and, again, a period of continuous or of unusually hot sunshine would leave its signature engraved as a deeply bitten groove in the surface of the bowl. But it is obvious that from such a record it was only possible to draw conclusions of a general character as to the abundance or otherwise of sunshine during the six months, and nothing like accurate quantitative measurements of duration or intensity were possible either for part or for the whole of the record.

Quite early in the history of his instrument Mr. Campbell had attempted to get a *daily* record of sunshine, but not very successfully; and it was not until the year 1876 that a regular daily record was begun at Greenwich by the use of a metal bowl, made and presented to the Observatory for the purpose by Sir William Armstrong, and "a ball of good glass cast and polished by Mr. Chance of Birmingham." In this bowl a narrow strip of blackened card was laid each day along the path the sun's image would follow, and upon this card the focussed rays of the sun left their record as they traversed the bowl from side to side.

The adjustment of such a strip of card with the necessary accuracy upon a concave spherical surface is, however, not a particularly easy task to accomplish. At the Greenwich Observatory there would be little difficulty about it, but to the ordinary meteorological observer

it presented difficulties sufficient to put the daily registration of sunshine beyond his reach.

The difficulty was, however, soon met by the introduction in 1879 by the late Professor Stokes of a modification of Campbell's bowl. In place of the complete hemispherical bowl Sir George Stokes took but a portion of it, and divided a vertical arc of about 48° into three overlapping zones, each provided with grooves undercut in the surface, into which strips of card rather more than an inch wide could be easily slid and securely held in position. Each of these strips is wide enough to receive the sun's record for an interval of several weeks, but by using a fresh card every day a daily record of the duration, and to some extent of the intensity, of bright sunshine can be obtained and preserved. Since its introduction this form of recorder, known as the "Campbell-Stokes Sunshine Recorder," has had added to it a few simple arrangements intended to facilitate the operations of adjusting it and setting it in position, and for making it useable in low latitudes under a more or less vertical sun; but these are outside the instrument itself, which remains to-day practically as Sir George Stokes left it.

Although the value in many directions of a record of so powerful a climatic factor as direct sunshine was quickly appreciated, the use of the instrument became developed at first somewhat slowly. This was probably because it is somewhat expensive to purchase, and is besides one of those things that are never wholly paid for, since the yearly cost of the cards is a not inconsiderable item of maintenance; but, besides the question of cost, the instrument demands an exposure such that the sun's rays can reach it from sunrise to sunset, and this is a condition which cannot always be met even in cases where the question of expense needs not to be considered.

It was largely to meet the matter of cost that in 1885 Mr. J. B. Jordan introduced his photographic recorder, a very simple but very ingenious little instrument, which may be described as a pin-hole camera so contrived as to photograph continuously the sun's image whenever the sun was shining. The prime cost of this recorder as well as the cost of its upkeep was considerably less than that of the Campbell-Stokes recorder just described, but the necessity of providing an unobstructed view of the sun throughout its course was the same in both cases.

Very soon after the introduction of this instrument the discovery was made that the records obtained by the two forms of recorder frequently differed considerably, and it came to be pretty generally accepted that the Campbell-Stokes type gave as a rule a lower record than the other. It was not at once generally recognised that the two forms of instrument were not registering precisely the same thing, but that whilst the burning recorder was giving a record of the sun's *heat*, as shown by the power of its focussed rays to burn a strip of card under given conditions arbitrarily fixed, the photographic recorder was registering the *actinic* power of the sun's rays

as manifested in the chemical change they were able to produce on a strip of sensitized paper, prepared again in accordance with an arbitrarily selected formula ; and the overlooking of this fact led to some confusion of thought, and to the hasty adoption of positions which were not tenable.

The commercial value of the sunshine recorder as a means of advertising the pre-eminence in the matter of sunshine of nearly every watering-place in the Kingdom, was very early perceived and turned to account, and it was perhaps only natural that those whose chief interest in the matter lay in that direction should have favoured the type of instrument which was thought to register the biggest totals. In tabulating the records, too, every man was a law to himself, and in some cases a very liberal interpretation was placed upon the record. In this way some rather wild statements found a considerable circulation, and it soon became necessary to institute a careful and unprejudiced comparison of the records yielded by the two types of instrument when exposed under identical, and as nearly as possible perfect, conditions.

Such a comparison was carried out with the co-operation of the Royal Meteorological Society in 1896-7.* A recorder of each type was exposed side by side with an absolutely clear horizon, both instruments being carefully observed every day for twelve months, and the conclusions arrived at were briefly these :—

(1) The records of the burning recorder are capable of being more satisfactorily measured than those of the photographic instrument ; and (2) When the traces of both instruments are properly measured the photographic record is not upon the whole in excess of that of the burning instrument ; occasionally large differences occur, but they are not always in the same direction, and over such periods as a month the amounts by the two instruments agree fairly well.

The report then says :—“The burning recorder possesses a great advantage over photographic instruments in that given certain conditions as to lens and mounting, the records obtained with it from different observatories are absolutely comparable with each other ; and also that it is possible to fix a distinct standard, which can be easily recognised, as the inferior limit of what should be regarded as ‘bright sunshine.’ If it is agreed to define that limit as the degree of solar radiation which when concentrated upon a bluish tinted card, by a spherical crown glass lens 4 inches in diameter, is competent to produce a brown mark upon the card, I do not think it possible that any sunshine, the warmth of which is able to produce an appreciable effect upon either animal or vegetable life, is likely to escape registration. The instrument was not intended to be an actinometer, and the registration of the duration of *light* is not its function ; it is only intended to act when the sun’s rays have attained a certain degree of heat-power.”

* *Quarterly Journal*, Vol. 24, p. 1.

Following upon this the Report proceeds to point out the necessity for adopting a definite specification for all burning recorders, and suggests one which with slight variation has since been officially accepted by the Meteorological Office, and is fully set out in *The Observer's Handbook*.* Its chief points are briefly as follows:—

Cards.—These are to be 0·02 in. thick. The straight or equinoctial cards are to be 1·56 in. wide, and the curved cards used in summer and winter 1·26 in. wide. The time scale on the equatorial card 12 hours = 9·00 in. in length.

Bowl.—Its diameter measured from 6 a.m. to 6 p.m. of an equatorial card must be 5·73 in., and the centre line of that card must lie equidistant from the top and bottom flanges of the bowl; the distance between the exposure edges of these flanges should be 2·47 in.

Lens.—Is to be of crown glass, colourless, or of a pale yellow tint; its diameter such that whilst it shall pass through a ring 4·01 in. in diameter, it shall not be able to pass through a similar ring 3·99 in. in diameter. Its weight must be 4 pounds, and its focal length 2·98 in.

(To be continued.)

METEOROLOGICAL OBSERVATIONS AT PEMBA, EAST AFRICA.

THE following summary of nine years' meteorological observations at Banani in the Island of Pemba, near Zanzibar, has been kindly sent to us by Mr. T. P. Newman. The observations were taken by Mr. Theodore Burt, of the Society of Friends' Industrial Mission. Details of the monthly values in some years have appeared in our pages from time to time.

Year.	Mean Max.	Mean Min.	Absolute Max.	Absolute Min.	Extreme Range.	Rainfall.	Rain Days.
1899.....	83·3	70·2	92·0	65·0	27·0	105·24	149
1900.....	83·5	71·3	95·0	66·0	29·0	90·35	160
1901.....	81·8	70·4	90·5	65·0	25·5	92·78	166
1902.....	82·8	71·4	91·0	67·0	24·0	68·72	132
1903.....	82·3	71·3	91·5	66·0	25·5	63·24	136
1904.....	81·0	70·4	90·5	65·0	25·5	86·23	156
1905.....	81·6	71·3	90·5	64·0	26·5	101·28	153
1906.....	81·4	70·5	92·0	64·0	28·0	108·58	175
1907.....	81·5	70·2	89·0	63·0	26·0	76·23	177
Average of 9 years.	82·1	70·8	95·0	63·0	32·0	88·07	156

* The Observer's Handbook. Meteorological Office, 1908, pp. 87-88.

RAINFALL TABLE FOR OCTOBER, 1909.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99. in.	1909. in.
Camden Square.....	London.....	51 32	0 8	111	2'85	4'16
Tenterden.....	Kent.....	51 4	*0 41	190	3'60	5'97
West Dean.....	Hampshire.....	51 3	1 38	137	3'53	7'60
Hartley Wintney.....	".....	51 18	0 53	222	3'08	5'25
Hitchin.....	Hertfordshire.....	51 57	0 17	238	2'72	4'58
Winslow (Addington).....	Buckinghamsh.	51 58	0 53	309	2'89	3'83
Bury St. Edmunds (Westley).....	Suffolk.....	52 15	*0 40	226	2'66	3'81
Brundall.....	Norfolk.....	52 37	*1 26	66	2'98	3'62
Winterbourne Steepleton.....	Dorset.....	50 42	2 31	316	4'33	9'90
Torquay (Cary Green).....	Devon.....	50 28	3 32	12	4'09	6'64
Polapit Tamar [Launceston].....	".....	50 40	4 22	315	4'97	7'45
Bath.....	Somerset.....	51 23	2 21	67	3'22	4'56
Stroud (Upfield).....	Gloucestershire.....	51 44	2 13	226	3'10	4'45
Church Stretton (Wolstaston).....	Shropshire.....	52 35	2 48	800	3'99	4'28
Coventry (Kingswood).....	Warwickshire.....	52 24	1 30	340	3'18	3'71
Boston.....	Lincolnshire.....	52 58	0 1	25	2'62	3'54
Worksop (Hodsock Priory).....	Nottinghamshire.....	53 22	1 5	56	2'77	2'52
Derby (Midland Railway).....	Derbyshire.....	52 55	1 28	156	2'77	3'51
Bolton (Queen's Park).....	Lancashire.....	53 35	2 28	390	4'72	6'59
Wetherby (Ribston Hall).....	Yorkshire, W.E.....	53 59	1 24	130	3'18	2'16
Arncliffe Vicarage.....	".....	54 8	2 6	732	6'55	9'86
Hull (Pearson Park).....	"..... E.R.....	53 45	0 20	6	3'26	2'84
Newcastle (Town Moor).....	Northumberland.....	54 59	1 38	201	2'94	2'18
Borrowdale (Seathwaite).....	Cumberland.....	54 30	3 10	423	13'35	21'14
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	4'81	7'24
Haverfordwest (High Street).....	Pembroke.....	51 48	4 58	95	5'63	7'65
Aberystwyth (Gogerddan).....	Cardigan.....	52 26	4 1	83	5'58	8'04
Llandudno.....	Carnarvon.....	53 20	3 50	72	4'08	4'83
Cargen [Dumtries].....	Kirkcudbright.....	55 2	3 37	80	4'39	11'30
Hawick (Branxholme).....	Roxburgh.....	55 24	2 51	457	3'42	6'09
Edinburgh (Royal Observy.).....	Midlothian.....	55 55	3 11	442	...	4'49
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	5'42	8'26
Glasgow (Queen's Park).....	Renfrew.....	55 53	4 18	144	3'36	5'39
Inveraray (Newtown).....	Argyll.....	56 14	5 4	17	6'34	10'99
Mull (Quinish).....	".....	56 36	6 13	35	6'09	7'99
Dundee (Eastern Necropolis).....	Forfar.....	56 28	2 57	199	2'71	3'56
Braemar.....	Aberdeen.....	57 0	3 24	1114	4'05	5'89
Aberdeen (Cranford).....	".....	57 8	2 7	120	3'18	2'41
Cawdor.....	Nairn.....	57 31	3 57	250	2'85	4'38
Fort Augustus (S. Benedict's).....	E. Inverness.....	57 9	4 41	68	4'38	7'80
Loch Torridon (Bendamph).....	W. Ross.....	57 32	5 32	20	9'98	11'84
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	3'32	3'71
Castletown.....	Caitness.....	58 35	3 23	100	...	3'71
Killarney (District Asylum).....	Kerry.....	52 4	9 31	178	6'05	8'03
Waterford (Brook Lodge).....	Waterford.....	52 15	7 7	104	4'00	7'28
Broadford (Hurdlestown).....	Clare.....	52 48	8 38	167	3'12	6'69
Abbey Leix (Blandsfort).....	Queen's County.....	52 56	7 17	532	3'45	6'16
Dublin (Fitz William Square).....	Dublin.....	53 21	6 14	54	3'08	2'61
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	3'41	4'47
Ballinasloe.....	Galway.....	53 20	8 15	160	3'45	4'35
Crossmolina (Enniscoo).....	Mayo.....	54 4	9 18	74	5'04	8'17
Collooney (Markree Obsy.).....	Sligo.....	54 11	8 27	127	4'54	6'82
Seaforde.....	Down.....	54 19	5 50	180	3'82	5'86
Londonderry (Creggan Res.).....	Londonderry.....	54 59	7 19	320	4'45	4'67
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	3'72	4'85

RAINFALL TABLE FOR OCTOBER, 1909—continued.

RAINFALL OF MONTH (con.)					RAINFALL FROM JAN. 1.				Mean Annual 1870-1899.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.		No. of Days	Aver. 1870-99.	1909.	Diff. from Aver. in.	% of Av.		
		in.	Date.						in.	in.
+1.31	146	.91	28	22	20.59	23.21	+2.62	113	25.16	Camden Square
+2.37	166	1.98	26	24	22.40	26.59	+4.19	119	28.36	Tenterden
+4.07	215	1.68	26	30	23.94	29.10	+5.16	121	29.93	West Dean
+2.17	170	1.22	28	31	21.52	26.03	+4.51	121	27.10	Hartley Wintney
+1.86	168	.89	28	28	20.05	24.69	+4.64	123	24.66	Hitchin
+ .94	133	.55	26	28	21.85	23.08	+1.23	106	26.75	Addington
+1.15	143	.93	28	20	20.78	22.99	+2.21	111	25.39	Westley
+ .64	122	.94	28	20	20.56	19.12	-1.44	93	25.40	Brundall
+5.57	228	1.69	26	27	30.05	35.11	+5.06	117	39.00	Winterbourne Stpltn
+2.55	162	.85	26	28	27.83	26.79	-1.04	96	35.00	Torquay
+2.48	150	.80	12.25	27	30.17	28.37	-1.80	94	38.85	Polapit Tamar
+1.34	142	1.03	26	25	24.93	24.28	- .65	97	30.75	Bath
+1.35	144	.66	23	29	24.38	24.98	+ .60	102	29.85	Stroud
+ .29	107	.53	23	25	26.94	25.64	-1.30	95	33.04	Wolstaston
+ .53	117	.46	23	25	23.97	22.69	-1.28	95	29.21	Coventry
+ .92	135	1.11	26	24	19.37	22.49	+3.12	116	23.30	Boston
- .25	91	.32	15	22	20.58	22.31	+1.73	108	24.70	Hodsock Priory
+ .74	127	.58	23	26	21.62	21.86	+ .24	101	26.18	Derby
+1.87	140	.99	3	25	34.33	38.85	+4.52	113	42.43	Bolton
-1.02	68	.35	3	22	22.54	23.98	+1.44	106	26.96	Ribston Hall
+3.31	151	1.86	23	27	48.55	56.15	+7.60	116	60.96	Arncliffe Vic.
- .42	87	.47	3	22	22.21	25.69	+3.48	116	27.02	Hull
- .76	74	.57	23	23	22.70	24.84	+2.14	109	27.99	Newcastle
+7.79	159	4.15	19	24	104.07	101.10	-2.97	97	132.68	Seathwaite
+2.43	150	.97	15	26	34.12	30.87	-3.25	90	42.81	Cardiff
+2.02	136	1.14	12	25	37.25	32.56	-4.69	87	47.88	Haverfordwest
+2.46	144	1.02	23	24	36.24	35.12	-1.12	97	45.41	Gogerdan
+ .75	118	1.21	3	25	24.65	26.19	+1.54	106	30.98	Llandudno
+6.91	257	2.34	12	23	34.25	43.16	+8.91	126	43.43	Cargen
+2.67	178	.89	12	25	27.55	28.74	+1.19	104	34.80	Branxholme
...	...	1.02	23	22	...	25.85	...	...	...	Edinburgh
+2.84	152	1.25	24	25	38.32	42.42	+4.10	111	48.87	Girvan
+2.03	160	.88	14	22	28.79	31.31	+2.52	109	35.80	Glasgow
+4.65	173	1.31	2	24	49.02	51.52	+2.50	105	62.80	Inveraray
+1.90	131	.89	14	25	44.62	39.46	-5.16	88	57.53	Quinish
+ .85	131	.81	23	21	23.46	23.15	- .31	99	28.95	Dundee
+1.84	145	...	...	...	28.98	26.88	-2.10	93	36.07	Braemar
- .77	76	.59	23	21	26.15	26.76	+ .61	102	33.01	Aberdeen
+1.53	154	.75	13	14	24.19	25.23	+1.04	104	29.37	Cawdor
+3.42	178	1.40	14	23	34.06	30.39	-3.67	89	43.71	Fort Augustus
+1.86	119	2.43	14	23	67.67	58.95	-8.72	87	86.50	Bendamph
+ .39	112	.52	3	18	24.95	25.18	+ .23	101	31.60	Dunrobin Castle
...	...	.65	13	28	...	25.51	...	...	...	Castletown
+1.98	133	.89	22	30	45.62	35.87	-9.75	79	58.11	Killarney
+3.28	182	1.05	19	21	31.08	30.69	- .39	99	39.30	Waterford
+3.57	214	1.19	19	26	26.91	33.34	+6.43	124	33.47	Hurdlestown
+2.71	179	1.09	17	26	28.50	30.78	+2.28	108	35.19	Abbey Leix
- .47	85	.49	23	24	22.76	21.10	-1.66	93	27.75	Dublin
+1.06	131	1.02	19	24	29.59	27.90	-1.69	94	36.48	Mullingar.
+ .90	126	.77	19	24	29.81	25.27	-4.54	85	37.04	Ballinasloe
+3.13	162	1.12	2	28	39.06	39.30	+ .24	101	50.50	Enniscoe
+2.28	150	1.06	23	24	33.71	33.30	- .41	99	41.83	Markree Obsy.
+2.04	153	1.04	23	20	31.03	33.18	+2.15	107	38.61	Seaforde
+ .22	105	.49	24	27	32.70	36.19	+3.49	111	41.20	Londonderry
+1.13	130	.52	23	23	30.55	31.55	+1.00	103	37.85	Omagh

SUPPLEMENTARY RAINFALL, OCTOBER, 1909.

Div.	STATION.	Rain inches	Div.	STATION.	Rain- inches
II.	Warlingham, Redvers Road	6·11	XI.	Rhayader, Tyrmynydd	9·99
„	Ramsgate	7·80	„	Lake Vyrnwy	4·56
„	Steyning	9·77	„	Llangyhanfal, Plâs Draw ...	9·06
„	Hailsham	6·52	„	Dolgelly Bryntirion	15·15
„	Totland Bay, Aston House.	9·12	„	Snowdon, Cwm Dyli	6·45
„	Stockbridge, Ashley	7·73	„	Lligwy	8·16
„	Grayshott	8·00	XII.	Douglas, Woodville	7·33
„	Reading, Calcot Place.....	4·66	„	Stoneykirk, Ardwell House ..	12·33
III.	Harrow Weald, Hill House.	4·42	„	Dalry, The Old Garroch ...	9·65
„	Oxford, Magdalen College...	3·62	„	Langholm, Grove Road.....	10·15
„	Pitsford, Sedgebrook	3·00	„	Moniaive, Maxwelton House ..	4·80
„	Huntingdon, Brampton.....	3·46	XIII.	N. Esk Reservoir [Penicuick]	6·86
„	Woburn, Milton Bryant.....	5·71	XIV.	Maybole, Knockdon Farm..	5·16
„	Wisbech, Monica Road.....	3·25	XV.	Campbeltown, Witchburn...	6·78
IV.	Southeast Water Works.....	4·56	„	Glencreadell Mains	11·41
„	Colchester, Lexden	4·15	„	Ballachulish House	6·88
„	Newport, The Vicarage.....	4·31	„	Islay, Fallabus	4·12
„	Rendlesham	4·78	XVI.	Dollar Academy	5·03
„	Swaffham	3·89	„	Loch Leven Sluice	14·05
„	Blakeney	4·42	„	Balquhiddier, Stronvar	4·28
V.	Bishops Cannings	4·58	„	Perth, The Museum	4·16
„	Ashburton, Druid House ...	10·60	„	Coupar Angus	6·43
„	Honiton, Combe Raleigh	6·24	„	Blair Atholl	2·88
„	Okehampton, Oaklands.....	8·53	„	Montrose, Sunnyside Asylum	2·71
„	Hartland Abbey	6·45	XVII.	Alford, Lynturk Manse ...	3·75
„	Lynmouth, Rock House ...	8·30	„	Keith Station	6·75
„	Probus, Lamellyn	6·40	XVIII.	N. Uist, Lochmaddy	4·47
„	North Cadbury Rectory ..	5·50	„	Alvey Manse	5·69
VI.	Clifton, Pembroke Road ...	6·06	„	Loch Ness, Drumnadrochit.	10·82
„	Ross, The Graig	4·18	„	Glencarron Lodge	2·90
„	Shifnal, Hatton Grange.....	2·79	„	Fearn, Lower Pitkerrie.....	4·47
„	Blockley, Upton Wold	4·59	XIX.	Invershin	5·81
„	Worcester, Boughton Park.	3·11	„	Altnaharra	5·05
VII.	Market Overton	3·40	„	Bettyhill	10·74
„	Market Rasen	3·57	XX.	Dunmanway, The Rectory..	5·72
„	Bawtry, Hesley Hall.....	2·08	„	Cork	6·75
„	Buxton.....	6·69	„	Mitchelstown Castle	8·75
VIII.	Neston, Hinderton Lodge...	3·25	„	Darrynane Abbey	7·57
„	Southport, Hesketh Park...	4·64	„	Glenam [Clonmel]	5·75
„	Chatburn, Middlewood	4·95	„	Nenagh, Traverstown.....	5·02
„	Cartmel, Flookburgh	7·31	„	Miltown Malbay.....	5·34
IX.	Langsett Moor, Up. Midhope	4·51	XXI.	Gorey, Courtown House ...	3·95
„	Scarborough, Scalby	3·42	„	Moynalty, Westland	6·07
„	Ingleby Greenhow	3·22	„	Athlone, Twyford	7·31
„	Mickleton.....	2·34	XXII.	Woodlawn	5·21
X.	Bardon Mill, Beltingham ...	2·81	„	Westport, St. Helens	5·68
„	Ewesley, Font Reservoir ...	3·57	„	Mohill	5·71
„	Ilderton, Lilburn Cottage...	12·27	XXIII.	Enniskillen, Portora	5·22
„	Keswick, The Bank	7·73	„	Dartrey [Cootehill].....	5·33
XI.	Llanfrechfa Grange.....	19·24	„	Warrenpoint, Manor House ..	5·83
„	Treherbert, Tyn-y-waun ...	9·03	„	Banbridge, Milltown	3·33
„	Carmarthen, The Friary....	7·77	„	Belfast, Springfield	6·18
„	Castle Malgwyn [Llechryd].	14·20	„	Bushmills, Dundarave	8·34
„	Plynlimon.....	8·00	„	Sion House	6·58
„	Crickhowell, Ffordlas.....	6·15	„	Killybegs	6·58
„	New Radnor, Ednol		„	Horn Head	

METEOROLOGICAL NOTES ON OCTOBER, 1909.

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.—Almost throughout the weather was of a gloomy nature, with great persistency of E. Temp. was unusually high, except during the last week, 60° or above being registered daily to 23rd, but from 26th to the close the temp. never reached 50°. Duration of sunshine 68·8* hours, and of R 86·4 hours. Mean temp. 53°·2 or 3°·4 above the average. Shade max. 67°·1 on 5th; min. 29°·1 on 30th. F 1, f 3.

TENTERDEN.—Temp. exceeded 60° on 21 days, and the weather was generally wet, excessively so from 26th to 28th. There were severe floodings in the Rother valley, and the railway was submerged and traffic stopped on the Robertsbridge line. Duration of sunshine, 98·3† hours. Shade max. 66°·0 on 2nd; min. 28°·0 on 30th. F 1, f 3.

TOTLAND BAY.—Duration of sunshine, 97·3* hours, or 13·5 hours below the average. A few flakes of S fell on 26th. Shade max. 64°·3 on 2nd; min. 33°·0 on 30th. F 0, f 4.

PITSFORD.—Mean temp. 48°·6. Shade max. 66°·4 on 4th; min. 28°·2 on 26th. F 4.

TORQUAY.—Duration of sunshine, 118·7* hours. Mean temp. 54°·0, or 1°·9 above the average. Shade max. 67°·3 on 1st; min. 31°·3 on 31st. F 2, f 8.

ASHBURTON, DRUID HOUSE.—The wettest October since observations began in 1866, with the exception of 1875, 1891 and 1903. Shade max. 66°·5 on 1st; min. 34°·2 on 31st. F 0.

ROSS.—Shade max. 64°·6 on 2nd and 18th; min. 24°·9 on 31st. F 2, f 6.

BOLTON.—Duration of sunshine, 79·2* hours, or 21·7 hours above the average. Mean temp. 48°·3, or 0°·9 above the average. Shade max. 64°·0 on 2nd; min. 28°·6 on 31st. F 2, f 15.

SOUTHPORT.—R 77 in. above the average of 35 years. Duration of sunshine 105·3* hours, or 9·8 hours above the average. Duration of R 70·0 hours. Mean temp. 50°·8, or 2°·2 above the average. Shade max. 65°·2 on 2nd; min. 27°·1 on 31st. F 3, f 5.

HULL.—Duration of sunshine, 80·7* hours. Shade max. 68°·0 on 2nd; min. 28°·0 on 31st. F 3, f 4.

HAVERFORDWEST.—Duration of sunshine 103·7* hours. Shade max. 63°·9 on 5th; min. 26°·7 on 31st. F 1, f 4.

LLANDUDNO.—Shade max. 64°·8 on 2nd; min. 29°·2 on 31st. F 1.

DOUGLAS.—The wettest October in 35 years, excepting only 1903, when 8·95 in. was recorded. Heavy R fell almost daily to 24th, accompanied by strong winds and low bar., and TSS occurred in the night of 12th. The temp., for the first time for several months, was above the average. The last week was fine, with cold E. winds and slight ground frosts.

CARGEN.—The wettest October since observations commenced in 1860. Floods, gales, and absence of sunshine, were accountable for great damage to agriculture. Shade max 63°·0 on 2nd; min. 23°·0 on 30th. F 2.

EDINBURGH.—Shade max. 63°·9 on 3rd; min. 30°·1 on 29th. F 4, f 6.

COUPAR ANGUS.—R fell persistently to 24th, but did not cause any flooding. The wet weather was detrimental to harvest work, and many places suffered damage and loss. Shade max. 65°·0 on 4th; min. 18°·0 on 31st.

FORT AUGUSTUS.—Shade max. 59°·7 on 7th; min. 19°·9 on 28th. F 5.

CORK.—Shade max. 64°·0 on 3rd and 4th; min. 26°·0 on 30th. F 3, f 4.

DUBLIN.—Wild, windy and showery to 24th, and very cold in the last week. Mean temp. 51°·3. Shade max. 66°·7 on 3rd; min. 30°·0 on 30th. F 3, f 4.

MARKREE.—Shade max. 64°·8 on 4th; min. 21°·5 on 29th. F 4, f 10.

WARRENPOINT.—Shade max. 64°·0 on 2nd and 4th.; min. 27°·0 on 29th. F 5, f 6.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, May, 1909.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.									
London, Camden Square	83°·7	22	33°·5	16	65°·0	42°·8	44°·8	71	128°·4	27°·2	1·80	9	3·8
Malta	77°·9	27	51°·6	18	70°·0	59°·7	55°·9	73	143°·0	...	·77	4	6·1
Lagos	90°·0	1	73°·0	18†	87°·9	76°·0	75°·8	76	160°·0	71°·0	7·08	18	8·1
Cape Town	87°·5	3	41°·4	28	69°·2	50°·1	51°·2	76	...	...	1·92	6	5·1
Durban, Natal	90°·2	27	54°·0	26‡	75°·5	58°·6	...	...	139°·3	...	5·82	11	4·5
Johannesburg	69°·3	16	39°·0	19	62°·1	46°·0	41°·5	69	129°·5	35°·2	1·08	5	3·7
Mauritius	82°·3	3	55°·8	11	78°·0	63°·1	62°·9	78	146°·8	45°·8	2·20	15	4·9
Calcutta... ..	98°·6	7, 25	71°·3	21	95°·3	78°·2	76°·5	75	158°·7	69°·4	4·52	6	3·2
Bombay... ..	94°·6	31	79°·4	2	92°·1	81°·8	76°·2	72	137°·3	73°·8	·00	0	2·8
Madras	106°·1	30	74°·2	5	97°·4	80°·2	76°·1	75	143°·6	74°·1	9·49	4	3·6
Kodaikanal	71°·2	2	49°·5	4	66°·7	54°·7	52°·8	78	140°·5	37°·2	8·17	20	5·8
Colombo, Ceylon	90°·0	15	74°·0	4	87°·7	78°·5	76°·1	80	154°·0	73°·0	5·91	22	6·6
Hongkong	85°·5	6	62°·0	1	78°·6	71°·5	69°·5	83	137°·1	...	6°·70	16	8·5
Melbourne	65°·4	28	40°·0	20	59°·2	47°·4	45°·5	75	114°·9	34°·4	3·14	17	7·2
Adelaide	73°·0	4	43°·3	25	64°·0	50°·4	48°·6	75	139°·0	32°·6	4·02	15	6·4
Coolgardie	83°·2	2	35°·0	31	68°·7	45°·4	43°·8	61	145°·3	30°·0	·77	4	3·4
Perth	82°·5	2	41°·2	31	67°·8	52°·6	52°·1	75	134°·8	37°·0	5·60	15	6·4
Sydney	75°·9	14	43°·9	5	65°·7	51°·1	48°·0	75	104°·6	30°·1	1·25	20	4·6
Wellington ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Auckland	70°·0	2	42°·0	16	63°·1	54°·1	53°·1	80	120°·0	39°·0	4·72	18	5·6
Jamaica, Kingston	91°·6	7	67°·7	3	88°·4	72°·3	70°·5	70	...	...	1·50	5	1·5
Trinidad	90°·0	12*	67°·0	3	87°·8	69°·7	75°·3	87	159°·0	60°·0	3·87	13	...
Grenada	88°·0	21	72°·0	1	84°·4	74°·1	71°·5	77	143°·2	...	5·79	26	5·5
Toronto	82°·2	29	30°·6	1	62°·7	44°·8	...	...	106°·2	29°·7	3·79	16	6·9
Fredericton	76°·0	27	29°·0	26	60°·9	38°·8	...	66	...	...	2·11	8	6·2
St. John's, N.B.	69°·0	28	32°·7	1	56°·3	41°·8	...	...	...	...	2·15	17	5·7
Victoria, B.C.	71°·7	31	34°·3	21	60°·7	43°·6	...	74	...	...	·96	10	6·0
Dawson	81°·0	17	23°·0	7	59°·2	33°·3	...	...	...	...	·81	4	5·3

* and 19. † and 22. ‡ and 28.

MALTA.—Mean temp. of air 65°·0. Average bright sunshine 8·3 hours per day.

Natal.—Rainfall 4·15 in. above average.

Johannesburg.—Bright sunshine 240·2 hours.

Mauritius.—Mean temp. of air 2°·1, of dew point 2°·4, and R 1·54 in., below averages. Mean hourly velocity of wind 8·1 miles or 2·2 below average.

KODAIKANAL.—Bright sunshine 189 hours. TSS on 23 days.

COLOMBO.—Mean temp. of air 81°·6 or 0°·7 below, of dew point 0°·8 above, and R 5·34 in. below, averages. Mean hourly velocity of wind 7·6 miles.

HONGKONG.—Mean temp. of air 74°·8. Bright sunshine 113·9 hours, or 40 hours below average. Mean hourly velocity of wind 13·4 miles. R 5·60 in. below average.

Melbourne.—Mean temp. of air 0°·7 below, and R 1·03 in. above, averages.

Adelaide.—A wet and rather cold month. R 1·28 in. above average.

Perth.—Rainfall ·65 in. above average.

Sydney.—Mean temp. of air 0°·1 below, and R 3·80 in. below, averages.

TRINIDAD.—R ·04 in. below 46 years' average.

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VOL. XLIV.

Sir Arthur Mitchell, K.C.B., M.D.

19TH JANUARY, 1826—12TH OCTOBER, 1909.

ALTHOUGH the great services to humanity, which were the main purpose of his life, lay in the study of mental diseases and the amelioration of the lot of the insane, and although the main study of his leisure was the archæology of Scotland, on which he wrote largely, Sir Arthur Mitchell did so much in the study of meteorology that his name would be remembered even if his fifty years' labours as a Commissioner in Lunacy, and his innumerable contributions to the earliest history of his country, had never been.

Sir Arthur Mitchell was the President of the Scottish Meteorological Society at the time of his death, and he was the last of the original members who founded the Society in 1855. He was on the Council of the Society in 1860, and continued for 49 years to take a leading part in its work as honorary secretary, vice-president and president. In this capacity he frequently suggested lines of research which were carried out by Dr. Buchan, his life-long friend. The two collaborated in several important pieces of work bearing on the relation of weather and disease, dealing in turn with general mortality, and with particular outbreaks of the plague, small-pox and influenza. Only last year, Sir Arthur dealt with the relation of weather and scarlet fever in Scotland.

At no time was Sir Arthur Mitchell more prominent in promoting meteorological research, than in the years of effort which resulted in the establishment of the Ben Nevis Observatory, and he was foremost in supporting all the work of the Society, of which, after the death of Dr. Buchan, he was the most experienced and the most indefatigable friend.

Sir Arthur Mitchell was a man of the kindest disposition, always ready to advise and encourage those who were taking up the studies in which he was a master, and we cherish many pleasant memories of his helpful advice.

THE BAROMETRIC DEPRESSION OF DEC. 2nd—3rd.

IN the issue of this Magazine for February, 1907, we published a set of isobaric charts showing what was probably the highest recorded barometric pressure for Western Europe, the steep gradients around which produced a memorable gale. We give this month a map taken from the *Daily Weather Report*, modified by the *Weekly Weather Report*, of one of the deepest depressions observed in recent years, and also accompanied by a gale of extraordinary severity, which caused damage and loss of life in shipwreck on the west coast.

The week before the great depression appeared had been characterized by a slow procession eastward of ill-defined low pressure systems, which, gaining in strength, had gradually overcome and pushed away to the south the anticyclone which had covered our islands during the bright and dry month of November. These systems were marked by barometer readings below 29 inches, but were not very deep, the gradients being as a rule moderate; but on the evening of the 2nd a new centre was observed to be forming on the west of Ireland, with readings as low as 28·6 inches, and greatly steepened gradients. During the night this centre moved eastward, crossing Ireland and England, and became considerably deeper, the lowest points observed being 28·03 in. at Spurn Head and 28·09 in. at North Shields. The track appears to have crossed somewhere between these two points, and the *Daily Weather Report* shows it somewhat farther to the north than the *Weekly Weather Report*, in which the centre is indicated as lying near Grimsby. By the evening of the 3rd the system had moved to South Scandinavia, and later it travelled slowly northwards and gradually filled up. A small secondary depression crossed the south of England on the 4th, following the track of the main depression.

The gradients of the cyclone of the 3rd were steepest in the rear of the centre, but were steep in all parts, and disastrous gales were experienced in the British Isles, Norway, Sweden, France and Germany.

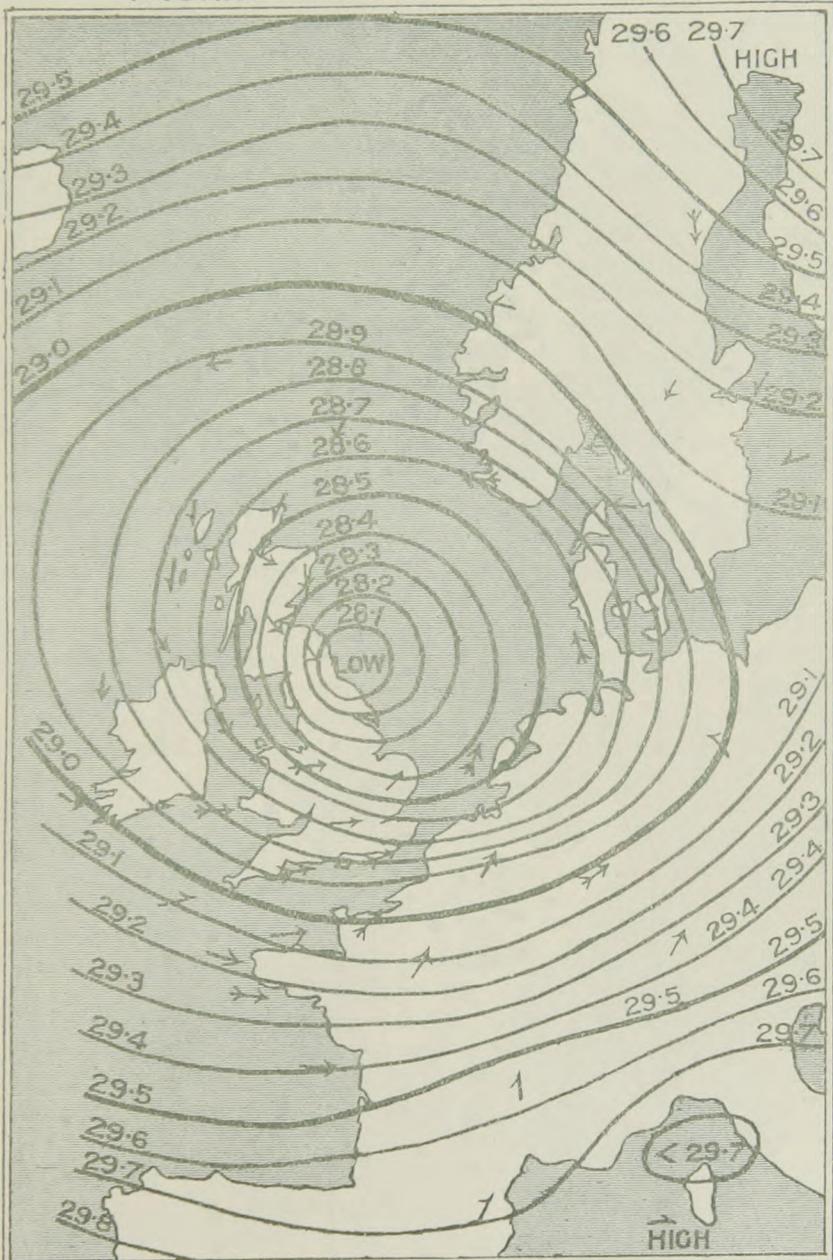
Some particulars of low readings of the barometer will be found in the Correspondence. It is unfortunate that the Redier barograph at Camden Square has too restricted a range to record a low minima of pressure, and the minimum passed over London during the night. There is reason to believe that it was by no means so low as many previous records, and did not approach the figure of 28·295 inches noted on December 9th, 1886.

THE WEATHER OF NOVEMBER, 1909.

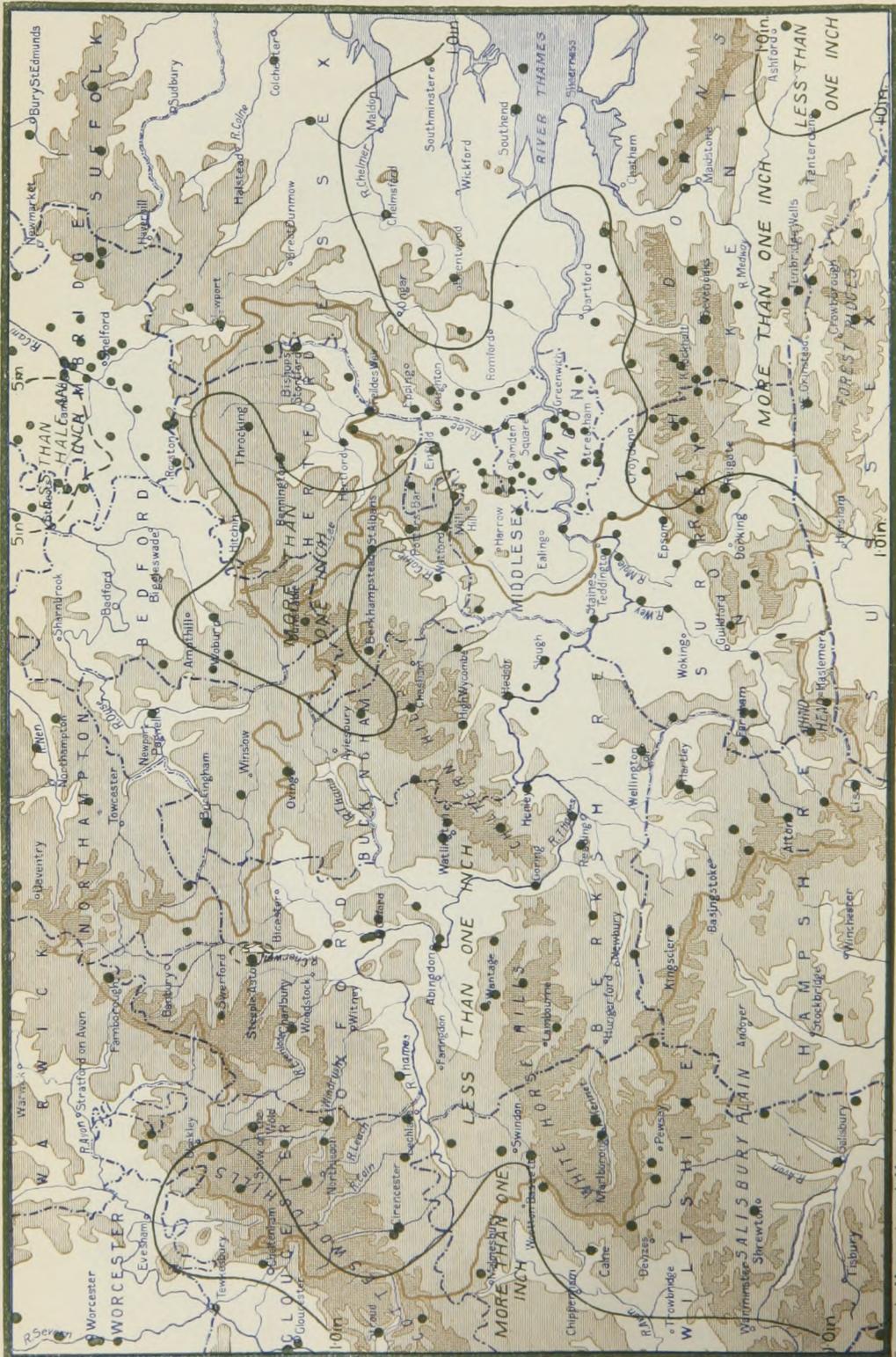
By FRED. J. BRODIE.

AN autumn month, in which the United Kingdom was exposed almost entirely to the influence of cyclonic systems, was followed this year by one in which the anticyclone was even more strikingly in evidence. The contrast between the weather of October and November was,

ISOBARS AT 7 A.M. DEC. 3RD. 1909.



RAINFALL OF THAMES VALLEY, NOVEMBER, 1909.



ALTITUDE SCALE

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

SCALE OF MILES



therefore, very marked, the one month being for the most part mild and wet, the other cold and exceedingly dry. Had it not been for the change which occurred after the 25th of the month, the rainfall of November would, in fact, have been phenomenally small, and as it was the month ranked in many parts of the country as one of the driest Novembers on record.

The month opened with a sharp frost in Ireland, and with the gradual extension of a large anticyclone from the Atlantic over nearly the whole of Western Europe. After the 2nd, however, when the central portion of the high pressure system began to drift eastwards, a light breeze from south and south-west set in over our western and northern districts, and temperature rose above the normal. Later on the equatorial current became more general, and between the 3rd and 6th the daily maxima were well above 55° in most districts, readings as high as 60 degrees being recorded in several parts of Scotland and Ireland, and readings of 61° at Crieff and at Waterford and Roche's Point.

After the 6th, when a new anticyclone spread in from the Atlantic, the wind shifted temporarily to north and north-west, with colder weather, and on the night of the 7th and 8th a sharp frost occurred very generally. In the screen the thermometer fell at least 10° below the freezing point in many parts of the country, readings as low as 18° being recorded at Balmoral and West Linton; while on the surface of the grass the minima were below 15° at several northern and central stations, and as low as 12° at West Linton, Southport and Hereford. On the 9th the anticyclone receded to the south-westward, and the country was influenced for a time by large cyclonic disturbances moving from Iceland to Norway, and causing a general backing of the wind to the westward, with milder and rather changeable weather. Little rain fell, however, in any district, excepting the north of Scotland, where the passage of a small secondary depression from the Faeröe to the North Sea was accompanied on the 11th and 12th by an exceedingly heavy downpour, resulting in serious local floods.

Towards the middle of the month an anticyclone of increasing size and intensity extended from the Icelandic region; the wind became variable or easterly, and a frost of almost unprecedented severity for November was experienced in all the more western and northern parts of the kingdom. Between the 16th and 19th the thermometer in the screen fell below 15° in several Irish and Scottish districts, a reading of 10° being recorded at West Linton, and a reading of 3° at Balmoral. On the grass the minima were below 10° at many northern stations; at Balmoral the exposed thermometer sank to zero, while at Crathes it fell 5° below zero. Over eastern, central and southern England the frost was less severe than in the west and north, few places recording, by the sheltered thermometer, a reading as low as 20° . A light westerly breeze which sprang up in the north on the 18th and 19th caused a change

to milder weather, but between the 22nd and 24th, when the central portion of the Icelandic anticyclone drifted slowly southwards across the United Kingdom, a sharp frost occurred very generally, the cold being greatest in the western districts where the thermometer in the screen again passed below 20° ; at Markree Castle and Llangammarch Wells the minimum on the 23rd was as low as 15° .

After the 25th the anticyclonic period came to an end, and for the remainder of the month the extension of a large barometrical depression from the upper part of the Atlantic was accompanied by mild wet weather in all districts, the thermometer rising on the 28th and 29th to 55° , or a trifle above it in many parts of the country.

Over England the mean temperature of the month, though considerably below the average, was higher than in some recent years, and much higher than in 1901. In central Ireland the month was the coldest November since that of 1896, while in many parts of eastern and central Scotland it was the coldest since that of 1878. The record of bright sunshine was unusually good, nearly all places reporting more than the normal duration, and some of the western and southern stations a very large excess. In London (at Westminster) the total of 45 hours was 18 more than the average, but was a trifle smaller than in 1908, and much smaller than in 1894.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

LOW BAROMETER OF DECEMBER 2nd—3rd.

BELOW please find a few particulars of the barometric depression of December 2nd—3rd, 1909. Only once in 30 years has this low point been passed, viz., on December 8th, 1886, when the glass fell to 27.794 in. All readings are from a Standard Fortin barometer, corrected for temperature and reduced to sea-level.

	in.			in.
December 2nd, 8 p.m.	28.581		December 3rd, 1 a.m.	28.270
" 9 " 	28.503*		" 2 " 	28.198*
" 10 " 	28.411		" 3 " 	28.116
" 11 " 	28.347		" 3.20 a.m.	28.112
" Midnight ...	28.335*		" 9 " 	28.469

I took many more readings; from them and my Redier barograph those marked with an asterisk are interpolated.

The barometer remained steady at 28.112 in. from 3.20 a.m. to 4.50 a.m. There was little wind except between 11 p.m. and 12.30 a.m., when there was a moderate gale; but I am informed that after the rise began there was a severe gale, which certainly subsided before 9 a.m. Rainfall, noon on 2nd to 9 a.m. on 3rd, 1.71 in.

My own barograph trace and another one I have received from a neighbour agree in showing that the descent of the barometer was

arrested from about 11.30 p.m. to 0.30 a.m., at the time the wind increased ; also that the barometer remained stationary at its lowest point for about 1½ hours from 3.20 a.m. to 4.50 a.m.

List of Readings below 28·500 in. in 30 years.

	in.	
1880, November 16, 12.30 p.m.	28·460	
1884, January 26, 9.0 ,,	28·250 (about)	
1886, December 8, 7-9 ,,	27·794	
1891, November 11, afternoon	28·350 (about)	
1899, December 29, 10 p.m.	28·380	
1909, December 3, 3.20 to 4.50 a.m.	28·112	

CHARLES LEWIS BROOK.

Harewood Lodge, Meltham, December 7th, 1909.

I THINK the readings of my standard barometer on the night of December 2nd to 3rd are worth recording. Each reading is corrected for temperature and reduced to sea-level :—

	in.	
December 2nd, 9 a.m.	29·337	Just beginning to fall.
,, 3 p.m. ...	29·081	
,, 6 ,, ...	28·822	
,, 9 ,, ...	28·544	
,, midnight	28·405	
December 3rd, 1 a.m. ...	28·338	
,, 2 ,, ...	28·257	
,, 3 ,, ...	28·185	
,, 3.15 a.m.	28·178	Lowest point reached.
,, 3.30 ,,	28·201	Rising.
,, 9 ,,	28·526	

The night was rough, with heavy showers of rain and sleet. The rain for the first three days of the month was very heavy. Rainfall :—

December 1st	·96
,, 2nd	1·34
,, 3rd	·26
	2·56

G. C. LAWSON.

Mayfield House, near Ashbourne, Derbyshire, December 5th, 1909.

[We have received many letters on the subject of the low barometer which we would gladly print, but the writers have omitted to state whether the barometer they read is mercurial or aneroid, or whether it is corrected for temperature and reduced to sea-level or not, or else they state that it is uncorrected and give no data by which the readings can be made comparable with those of other Observers, and therefore the figures given are deprived of their full significance.—Ed. *S.M.M.*]

RAINFALL MEASUREMENTS.

THE statement by two correspondents in the current (November) number of the Magazine, to the effect that they use the measuring glass to receive the rain which falls into the gauge has surprised me considerably. I had always been under the impression that it was

the invariable rule to use a bottle capable of holding two or three inches of rain. When the measure overflows during heavy rainfalls, as it must sometimes do, the contents of the can must need very careful emptying not to lose any of the water, so much so that a large bottle with small neck seems to me by far the simpler and safer receptacle.

As regards the discrepancies observed in the number of rain days recorded at stations in close proximity to one another (see the October Magazine, pages 165-167), I cannot help thinking that the personal equation has as much to do with it as negligence—perhaps even more. And in this connection I should like to make a suggestion. While acknowledging the importance of recording the total number of days on which rain (either truly such or dew) falls, would it not be an improvement to note in addition, and in parallel columns, how many of the falls so recorded were of $\cdot 02$ in. or less. The number of small measurements specially noted in this way, when deducted from the larger number, would, if I mistake not, be found to smooth down the discrepancies materially, besides including very nearly every instance probably of the occurrence of dew. This method appears to me preferable to that suggested by Mr. Boys of ignoring altogether as rain days falls of less than $\cdot 03$ in.

With reference to the question of returning to the gauge or throwing away amounts of $\cdot 004$ in. and less, referred to by Mr. Brown in the October Magazine, I am of opinion that there should be perfect uniformity of action amongst observers. Personally, I throw all such small amounts away unrecorded, and the same rule is observed at the stations over which I have control. But I have heard of cases in the island where the opposite is done, and unmeasured small amounts returned to the gauge. The instructions of the Rainfall Organization appear to be hardly definite enough on this point; it being left to the wisdom of the observer to do either the one thing or the other.

BASIL T. ROWSWELL.

Les Blanchés, Guernsey, 2nd December, 1909.

WEATHER IN WINTER.

IN this north-western district of Furness, there is a very general impression among country people who are weather-wise—farmers and such-like especially—that if there is much winter weather, as hard frost and snow, before Christmas, there will be very little after.

This opinion we find is almost universal among our country people here, and skaters will tell us the same thing in another way, that is, if they have any skating before Christmas they do not have any after.

One would like to know if there is any foundation in fact for these opinions. Our own observations of temperature, etc., only go back for about twelve years, so we cannot pronounce on the subject. Are the same ideas to be found in the Midlands or in the south?

In this district the belief has found expression in the old, rather rough, Cumbrian couplet :—

“ If Martinmas ice will carry a duck,
There'll be nothing after but slush and muck.”

CHAS. P. CHAMBERS.

Orchard Head, Broughton-in-Furness, Dec. 3rd, 1909.

LIGHTNING STROKES.

YOUR readers may perhaps be interested to compare Mr. Druce's account, in the October number, of the effect of lightning on the oak tree at Stow-on-the-Wold, with my letter in Vol. 33 of the Magazine, p. 136, followed by one from Mr. Llewellyn Evans on p. 154, as to a parallel case at Charlton Kings in 1898. The similarity of the effects in the two cases is most marked, such as the stripping of the bark in one case in three separate grooves or seams ; in the other, in two such grooves extending separately from the top of the branches to the ground ; and the absence of burning or scorching. Like Mr. Druce I was left in doubt whether the tree had been struck by one, or by more than one, flash.

JAMES G. WOOD.

RESPONSE OF WELLS TO RAINFALL.

It is so very seldom that one can get a clear idea of how soon rain really affects the level of my well, 125 feet in the chalk, that I send a few readings taken this autumn. From July 5th to August 31st there had been a steady fall of level in the well from 13 ft. to 12 ft. 2 in., on September 6th it read 12 ft. 1 in., and then rose thus:—

Weekly Readings of Level of Well.

		Level.	Rise.			Level.	Rise.				
		ft.	in.			ft.	in.				
September 6	12	1	—	October 25	.....	12	4	—		
„ 13	12	1	—	November 1	.....	12	5	0	1	
„ 20	12	1	—	„ 8	.....	12	11	0	7	
October 4	12	2	0	1	„ 15	14	10	1	11
„ 11	12	4	0	2	„ 22	16	4	1	6
„ 18	12	4	—	„ 29	.....	18	0	1	8	

I think we may conclude that the heavy fall in the last week in October made itself felt between 7 and 14 days after the fall occurred. The rainfall was as follows :—

October 26	.....	1.50 in.	October 29	.....	.03 in.
„ 27	.....	1.43 „	„ 30	.....	.01 „
„ 28	.....	1.44 „	„ 31	.....	.40 „

From November 1st to 13th inclusive there only fell a total of .06 in. Perhaps we should be safe to say the heavy rain was certainly felt within a fortnight, though a daily plumbing would probably have shown a rise in level a little before November 8th.

RICHARD COOKE.

The Croft, Detling, Maidstone, December 6th, 1909.

THE STANDARDIZATION OF SUNSHINE RECORDERS.

By R. H. CURTIS.

(Continued from p. 191.)

In the specification given in the *Observer's Handbook*, however, three important points connected with the cards are not referred to, namely (1), the *colour* of the card. Originally the card adopted by Prof. Stokes was a purplish grey, but very soon this colour was changed to blue. There are, however, many shades of blue, and it is known that depth of tone affects the readiness with which the card burns. I have been told by Dr. Chree, the Superintendent of the Observatory Department of the National Physical Laboratory, that when a sunshine recorder is sent to the Kew Observatory for verification it is usual for the maker of the instrument to send with it a number of cards for use in comparing the traces got from the instrument with those obtained from the observatory recorder; and there is sometimes a considerable difference in the colour of the cards sent by different makers, and a corresponding difference in the results obtained which is not due to any fault in the instrument itself, and disappears when cards of standard tint are used.

(2) There is also, judging by some specimens of cards which have passed through my hands, a possibility of difference in the *texture* and quality of the cards, and this is a point which it is less easy to detect than is the case with departure from the standard tint.

(3) A third point which is still less capable of being dealt with by the majority of observers who use the cards arises from a sort of tradition—for after enquiry I can find no better authority for the belief—that the card before being printed upon is specially treated chemically with a view to the prevention of undue smouldering.

Neither of these points are, as I have said, mentioned in the *Observer's Handbook*; but as regards colour, the importance of having a uniform tint is fully appreciated at the Meteorological Office, where for some years a standard for colour as well as for shape, size and substance, has been kept for reference whenever new supplies are ordered.

There is reason, however, for thinking that at any rate most of the cards used in the British Isles, though obtained by the users from various sources, have a common origin; and if that be so there ought not to be the wide range of tint and difference of texture which one occasionally meets with, and to prevent which it would be wise for observers who buy direct from opticians to provide themselves with standard samples, and see to it that every fresh supply complies therewith.

Some two or three years ago the Meteorological Office found that some cards they were then using smouldered very freely, causing the trace to be very broad and irregular, and that occasionally the burn spread out on the card in a large round splash of black scorch. The makers of the cards were communicated with and were asked whether

any special treatment was applied to the card, and whether any variation in that treatment was responsible for the unusual readiness of the card to burn. The reply was that the matter would be enquired into, but the result of the enquiry, whatever it was, was not made known. There is, however, this obvious objection to the use of such a special treatment, that without great care in its application there would always exist a danger of variation in the burning capacity of the card arising from some designed or accidental modification of the formula employed.

This risk constitutes one of the greatest objections to the use of the photographic recorder. I have been assured by an optician who had prepared and sold large quantities of charts for these recorders that in spite of every precaution, such as buying the chemicals required from the same makers, and of the same quality, and the strictest adherence to the adopted formula, it was impossible to be sure of getting two batches of papers made at an interval of a few weeks of the same degree of sensitiveness; and without such extraordinary care, which is probably more than many would bestow upon the work, a large range of sensitiveness would be certain to occur.

To summarize:—The *lens* is the most important section of the instrument, because its diameter and focal length govern the dimensions of the bowl; and uniformity of burning power is practically ensured by the stipulation respecting weight and quality of glass.

The *bowl* ought to present no difficulty to makers who possess an acquaintance, however elementary, with the character of the diurnal and seasonal movements of the sun. Experience, however, has shown that even here a standard specification is necessary if uniformity is to be ensured; and it has also proved the necessity for seeing that the specification has been adhered to before accepting an instrument as satisfactory.

The *card* is an appendage to the recorder, and in that sense is outside the instrument itself. It is, however, indispensable; and if uniformity of result is sought, its conformity to a standard in respect of its colour and quality is perhaps as important as the conformity of the lens to the conditions laid down for it.

The capability of recorders to yield comparable results has been frequently tested, and indeed a part of the Kew test of a recorder is to compare its records with those of the Observatory instrument. When such tests have been carried out with instruments and cards which have conformed to the specifications quoted above, they have always yielded results which could be strictly compared with each other; and results such as those quoted by Mr. Wannery (p. 56, Vol. 44) have always been found to result from some grave departure from standard conditions. Sometimes the diameter of the bowl has been unsuitable to the time-scale on the card which has been used with it; at other times the fault has been found to lie in the size of the lens or to defective burning power; but as a rule the records of the two instruments under comparison are *fac simile* of each other.

I have already referred to the commercial use which is made of this element of meteorological observation. To that use there can, of course, be no objection; and indeed in the fact that so many public bodies have instituted systematic climatological observations, there is much cause for congratulation; but it is important that the sunshine recorder, as well as the thermometer and the rain gauge, should conform to such conditions as are necessary to ensure comparable results, and before concluding this article a word may be added respecting the measures taken to ensure uniformity in the *measurement* of the record of the Campbell-Stokes instrument, which is now the only form of recorder recognised by the Meteorological Office. The rule for measurement laid down by the Office is briefly as follows:—When the scorch is *faint* measure the whole of the trace *as far as it can FAIRLY be seen*. When the sun shines *brightly* but *intermittently* a slight allowance should be made for smouldering, and the measurement should not in such cases be carried to the extreme limit of each of the burns.

It is a stipulation of the Office that the cards from all stations for which statistics of sunshine are published shall be sent to the Office monthly for examination. Every card is looked at, and a selection of seven cards is made for re-measurement in the Office, the result being compared with the original measures made at the station. The degree of precision with which the traces can be measured is remarkable, and may be gathered from the fact that there are many observers whose measurements of the totals on individual cards rarely differ more than a tenth of an hour from the Office measurement; and since the differences which do occur are sometimes plus and at others minus, the difference between the total for the seven days is commonly within two-tenths of an hour. There are others, of course, which show larger differences but still within quite reasonable limits; and a very few whose tendency to exaggerate—or, shall I say, inability to make exact measures—proves the wisdom of the rule which insists upon an inspection of the cards—a rule which has now resulted in securing practical uniformity in method and result amongst the entire body of observers.*

* The following are the mean differences obtained from six stations of each of these classes for the same three months of the past autumn, the differences are shown in percentages of the totals:—

Group (1)	0·4%	(2) 1·6%	(3) 2·7%
	0·4	1·3	3·3
	0·3	2·2	3·1
Mean	0·4	1·7	3·0

NOTE.—On page 191, owing to a misprint, the weight of the lens is given as 4 pounds; it should be 3 pounds.



ON RAINFALL IN RELATION TO WIND-DIRECTION.

By L. C. W. BONACINA.

It is becoming more and more recognised as a meteorological fact that in London and, presumably, also in all parts of England except the wet hill-districts, in all parts, that is to say, where the rainfall is not enormously increased and the precipitation conditions altogether complicated by orographical features, the most persistent rains and in general the foulest weather and most leaden skies occur when the wind is in the east. Premising, in the first instance, that we are dealing with cyclonic or otherwise rain-bearing types of atmospheric circulation, the following generalizations, based upon personal experience, concerning rainfall in relation to wind-direction may be fairly established:—(1) When the wind is S.W., or, say, between S. and W., the rainfall is usually intermittent and apt to be broken by bright intervals, and it is very variable in both intensity (*i.e.*, rate of fall) and quality (*i.e.*, size of drops and mode of fall). It is indeed seldom that the rain continues for more than about six hours without a break, or that the amount measured in twenty-four hours exceeds half an inch. Corresponding to the intermittent character of the precipitation, with strong S.W. winds, the sky is very changeable, being alternately broken and overcast. Very heavy showers separated by very fine intervals are, further, a not uncommon accompaniment of W. or S.W. winds in rain-bearing atmospheric depressions.

(2) The east-wind rain, on the contrary, or more properly the rain that falls when the wind is in the opposite quarter of the compass, that is between E. and N., is very persistent and much less variable in both quality and intensity than the west-wind rain. The rain usually falls incessantly for any period between twelve and forty-eight hours, whilst the amount normally recorded in twenty-four hours varies between half an inch and two inches. Even should the rainfall be more intermittent than usual, the sky remains obstinately overcast and intensely gloomy, without a single patch of blue or gleam of sunshine so long as the atmosphere remains under the influence of the rainy cyclonic depression.

Another point of distinction which may often be noticed between the east- and west-wind rains is this, that the former falls arrow-like to the ground, whereas the latter seems to grow out of the air and fall in beautifully curved paths. Having established the facts, I will endeavour to offer some suggestion which may shed some light on the causes of some of the phenomena. At first, I was tempted to ascribe the persistent nature of east-wind precipitation to the east-wind itself bringing conditions peculiarly favourable to persistent and heavy rainfall, and, but for a very curious fact discovered by Dr. Mill, I should hardly have sought for an explanation in any other way. Dr. Mill, however, has found, and he offers examples of the relation in the annual volumes of *British Rainfall*, that the heaviest precipitations—the largest measurements in 24 hours—almost

invariably occur in that portion of a cyclonic depression which lies on the left of the path of the centre, and this *irrespective of the direction in which the depression is travelling*, so that should a depression so alter its course as to describe a looped curve, as happened during the deluge of June, 1903, and also during the huge snowfall of April, 1908, a particular area may receive an unduly large rainfall as a result of being situated constantly in the left of the depression.

It would appear, therefore, that the large measurements of rain or snow associated with E. or N.E. winds are merely, as it were, an accident, dependent upon the fact that the great majority of our rain-producing cyclones travel towards the east, causing easterly winds to prevail to the north or left of the track, and westerly winds to the south or right.

Dr. Mill's discovery will, of course, need as much further confirmation as it can get, and whenever at rare intervals a typical cyclone is caught moving towards the west it should be very carefully studied in relation of rain to wind-direction. Now, why should the heaviest precipitation occur to the left of a cyclone track? I will suggest an explanation in this article, and test it more rigorously in a future one. The suggested explanation rests upon the well-founded assumption that the air in a cyclonic depression is not appreciably, at all events in the lower levels of the atmosphere, affected by the motion of translation of the depression, that is to say, it is not to any great extent carried forward by the system in its progress, but has simply a rotational velocity directed towards the centre of low pressure. The grounds for this assumption are these: First, if the air were carried forward by the cyclone in its progress there would be observed throughout the entire system what never is observed, namely, a westerly component in the winds of an eastward moving cyclone, which would have the effect of accelerating the velocity of the westerly wind on the right of the track, diminishing the velocity of the easterly wind on the left, and of occasioning a westerly wind in place of a calm in the central area of the cyclone; from the fact that there is no evidence of this westerly component, we need not be afraid to draw the obvious conclusion; in the second place, it is very difficult to conceive of a cyclonic eddy, in a compressible fluid like air, which could carry the same masses of air for any considerable distance, and yet preserve for any length of time the actual weather conditions which we know to be characteristic of such an eddy. As a matter of fact, the air is theoretically supposed to find its way to the centre of low pressure and to rise into the upper levels of the atmosphere, its place being taken by air flowing in from every direction outside the cyclonic system; thus the cyclone would always in its advance be affecting fresh masses of air. This reasoning, be it noted, does not hold in the case of a practically incompressible fluid like water. A water-eddy, or water-cyclone, to all appearances surrounds a water-vacuum, and such being the case there is no inherent difficulty presented to the imagination in regarding such an

eddy as being translated or carried along in *substance* consisting always of the same water particles, and not propagated like an air-eddy or air-cyclone as a kind of wave disturbance. Presuming, therefore, that cyclonic systems are transmitted as a sort of wave disturbance, without carrying the air with them at least for any great distance, how does the conception help us to explain the precipitation peculiarity referred to above, namely, the heavier rain in the left of a depression? It seems commonsense reasoning, which will no doubt be borne out by more thorough knowledge of the abstruse laws of hydro-dynamics, that a given mass of air which is travelling towards a cyclonic disturbance, that is to say, which is moving in an opposite direction to, or meeting the disturbance, will remain on the wave theory of cyclonic propagation a shorter time under the influence of the disturbance than the same quantity of air moving in the opposite direction, or with the cyclone. In our eastward moving cyclones, therefore, the winds blowing from an easterly direction should remain a shorter time within the cyclonic system than the winds blowing from a westerly direction, which would tend to get transported or dragged along with the system on account of the difficulty encountered by the disturbing influence in drawing in new masses of air to form a westerly wind, the old masses of air being liable to be taken up again.* If this is really the case, it is not difficult to account for the normally larger twenty-four hour records of rain brought with the easterly winds of eastward-moving depressions than with the westerly winds. A place experiencing an easterly wind in such conditions will be perpetually under the influence of nearly saturated surface air entering the cyclone, with the result that precipitation over that place will be heavy and persistent so long as the existing conditions last; but a place experiencing a westerly wind will be receiving, in a given time, a quantity of air which has remained for a relatively very long time within the cyclonic influence, and thus subject to the condensation of its moisture, with the consequence that having been thus more or less drained of its moisture, precipitation is on the whole less heavy and constant, and the twenty-four hour measurements smaller than at the place on the other side of a cyclone track where the easterly wind prevails. To summarise, then, this conclusion in a few words—precipitation is heavier on the left of the path of a depression because in that part of a depression the winds† are more or less meeting the disturbing

* This, be it carefully observed, is no refutation of the former conclusion, that the cyclone does not travel forward as a rigid system carrying the air with it.

† In considering wind-direction more importance has been given in this article to the E. and W. directions, than to the N. and S. The reason for this is that our eastward moving cyclones are on an average oval rather than circular, the average ratio of the largest to the shortest diameter being 1.78, and that the longest diameter lies in a very large majority of cases in a nearly W.S.W. to E.N.E. direction (see Dr. H. N. Dickson's "Meteorology," page 60).

influence. Typical westward moving cyclonic depressions are rare ; but it would be most interesting to see whether the precipitation conditions accompanying the *westerly* winds of a *westward* moving cyclone were always analagous to those accompanying the *easterly* winds of an ordinary eastward moving one. It may, of course, be that the heavy rain brought with the easterly winds of ordinary cyclones are partly due to the E. wind itself. Easterly winds are usually relatively cold and dense, and it is possible that they may sometimes in a cyclonic system have a warm south-westerly wind climbing over them, the slow commingling of the two currents at a certain level being responsible for heavy precipitation. I have not made any calculation for ideal conditions as to how much water an ascending current of given strength, temperature, etc., is capable of sending down, but am disposed to think that while the rapid ascent of moist air into the upper regions is adequate for the initial stages of condensation—the formation of cloud and light rain—something more is needed in the shape of the mixing of currents of different temperatures to produce our heavy downpours of rain, whether these be associated with small thunderstorm depressions or big cyclonic systems.



ROYAL METEOROLOGICAL SOCIETY.

THE first meeting of this Society for the present session was held on November 17th at the Institution of Civil Engineers, Mr. H. Mellish, President, in the chair.

Mr. C. J. P. Cave gave an account of the methods which he employed for observing the pilot balloons used for investigating the currents of the upper atmosphere. Two theodolites are used at the ends of a measured base-line, and observations of the balloon are taken by both each minute from the liberation of the balloon. The readings are subsequently worked out and plotted graphically, when the height, direction and rate of travel of the balloon during its course are determined. The best time for observing balloons is shortly before sunset, as the sky will be becoming dark when the balloon reaches its greatest height, and continuing to be illuminated by direct sunlight, shines like a star. Mr. Cave has seen a balloon burst at a distance of 40 miles under these conditions. The rate of ascent of balloons is found to vary considerably near the ground, and in cloudy weather, particularly when there is cumulus cloud, but higher up the rate of ascent remains fairly uniform up to great heights.

Mr. W. Marriott read a paper on "Registering Balloon Ascents at Gloucester, June 23rd and 24th, 1909." During the Royal Agricultural Society's recent Show the author sent up ballons-sondes with recording instruments on three consecutive days. Two of the meteorographs, dropped when the balloons fell, were found and returned. The balloon on the 23rd fell 37 miles south-east, and that

on the 24th fell 43 miles north of Gloucester. The records showed that the temperature decreased pretty uniformly up to between five and six miles; above that height the temperature increased somewhat, and then kept nearly stationary up to the highest point reached by the balloons, about 12 miles. The temperature recorded on the 23rd was higher than that recorded on the 24th, and the point of change or the so-called "isothermal layer" was about half a mile lower in altitude. This was probably due to the balloon on the 23rd having ascended on the eastern side of the centre of a cyclone, while that on the 24th ascended on the western side of the centre.

Mr. R. Corless, on behalf of Dr. W. N. Shaw, showed two very interesting models illustrating the temperature distribution in the free atmosphere up to a height of 14 miles over the British Isles on July 27th and 29th, 1908.

Mr. Dines, Mr. Gold, Mr. Bryant, Mr. Bayard, Mr. Cave and Mr. Marriott took part in the discussion.

A paper on "Winter Temperatures on Mountain Heights," by Mr. W. Piffe Brown, was read by the Secretary. In 1867 the author placed a minimum thermometer on the summit of Y Glyder-fach, a mountain near Snowdon, and 3262 feet above sea-level, and this has been regularly observed and the lowest winter readings recorded each year. The author gives the readings in full.

Mr. E. Gold also presented a mathematical discussion of "The Semi-Diurnal Variation of Rainfall." The results of his investigation seem to indicate that the upward motion associated with the semi-diurnal variation of pressure is the probable cause of the semi-diurnal variation of rainfall in the tropical belt.

The following gentlemen were elected Fellows of the Society:—
Mr. S. S. Ahmad, B.A., Dr. J. T. Ashton, Khan K. M. Azam, Mr. F. R. Bader, Assoc.M.Inst.C.E., Mr. F. A. Carpenter, Capt. T. H. Chudley, Capt. T. P. Fisher, Mr. F. J. V. Guy, Mr. E. L. Hawke, Mr. A. M. Hay, Mr. A. M. Huntington, Mr. D. P. James, Mr. W. L. Lindsay, Lieut. H. Phillips, R.N.R., Mr. F. E. Stokes, Capt. W. Trew, Capt. W. H. Wilkes, Dr. J. P. C. C. Williams, and Mr. J. H. Willis.

METEOROLOGICAL NEWS AND NOTES.

THE SYMONS GOLD MEDAL has been awarded by the Council of the Royal Meteorological Society to Dr. W. N. Shaw, F.R.S., in recognition of the valuable work which he has done in connection with meteorological science.

THE ROYAL METEOROLOGICAL SOCIETY is making a new departure, which should be appreciated by Fellows of the Society who rarely visit London. This takes the form of a provincial meeting to be held in the first instance at Manchester early next year. The meeting will take place in the University, at 5 p.m., on Wednesday, February 23rd, 1910, and papers on local and general meteorology will probably be read.

RAINFALL TABLE FOR NOVEMBER, 1909.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99. in.	1909. in.
Camden Square.....	London.....	51 32	0 8	111	2'45	'74
Tenterden.....	Kent.....	51 4	*0 41	190	3'22	'87
West Dean.....	Hampshire.....	51 3	1 38	137	3'25	'58
Hartley Wintney.....	".....	51 18	0 53	222	3'03	'54
Hitchin.....	Hertfordshire.....	51 57	0 17	238	2'56	'99
Winslow (Addington).....	Buckinghamsh.	51 58	0 53	309	2'63	'69
Bury St. Edmunds(Westley).....	Suffolk.....	52 15	*0 40	226	2'50	'82
Brundall.....	Norfolk.....	52 37	*1 26	66	2'71	1'34
Winterbourne Steepleton.....	Dorset.....	50 42	2 31	316	4'82	'93
Torquay (Cary Green).....	Devon.....	50 28	3 32	12	3'71	1'08
Polapit Tamar [Launceston].....	".....	50 40	4 22	315	4'29	1'92
Bath.....	Somerset.....	51 23	2 21	67	3'06	1'21
Stroud (Upfield).....	Gloucestershire.....	51 44	2 13	226	2'99	1'20
Church Stretton (Wolstaston).....	Shropshire.....	52 35	2 48	800	3'18	'84
Coventry (Kingswood).....	Warwickshire.....	52 24	1 30	340	2'80	'80
Boston.....	Lincolnshire.....	52 58	0 1	25	2'14	'66
Worksop (Hodsock Priory).....	Nottinghamshire.....	53 22	1 5	56	2'10	'27
Derby (Midland Railway).....	Derbyshire.....	52 55	1 28	156	2'28	'50
Bolton (Queen's Park).....	Lancashire.....	53 35	2 28	390	3'91	1'87
Wetherby (Ribston Hall).....	Yorkshire, W.R.	53 59	1 24	130	2'23	'65
Arnlcliffe Vicarage.....	".....	54 8	2 6	732	6'00	3'95
Hull (Pearson Park).....	"..... E.R.	53 45	0 20	6	2'45	'58
Newcastle (Town Moor).....	Northumberland.....	54 59	1 38	201	2'65	'85
Borrowdale (Seathwaite).....	Cumberland.....	54 30	3 10	423	13'91	8'64
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	4'26	1'67
Haverford west(High Street).....	Pembroke.....	51 48	4 58	95	5'41	2'17
Aberystwyth (Gogerddan).....	Cardigan.....	52 26	4 1	83	4'68	2'27
Llandudno.....	Carnarvon.....	53 20	3 50	72	3'38	1'48
Cargen [Dumtries].....	Kirkcudbright.....	55 2	3 37	80	4'50	2'03
Hawick (Branxholme).....	Roxburgh.....	55 24	2 51	457	3'71	1'14
Edinburgh (Royal Observy.).....	Midlothian.....	55 55	3 11	442	...	'85
Girvan (Pimmore).....	Ayr.....	55 10	4 49	207	5'31	1'81
Glasgow (Queen's Park).....	Renfrew.....	55 53	4 18	144	3'48	2'35
Inveraray (Newtown).....	Argyll.....	56 14	5 4	17	6'41	6'12
Mull (Quinish).....	".....	56 36	6 13	35	6'43	4'51
Dundee (Eastern Necropolis).....	Forfar.....	56 28	2 57	199	2'76	'31
Braemar.....	Aberdeen.....	57 0	3 24	1114	3'94	1'20
Aberdeen (Cranford).....	".....	57 8	2 7	120	3'47	1'65
Cawdor.....	Nairn.....	57 31	3 57	250	2'65	1'72
Fort Augustus(S. Benedict's).....	E. Inverness.....	57 9	4 41	68	4'52	3'66
Loch Torridon (Bendamph).....	W. Ross.....	57 32	5 32	20	9'79	9'98
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	3'26	3'54
Castletown.....	Caithness.....	58 35	3 23	100	...	7'84
Killarney (District Asylum).....	Kerry.....	52 4	9 31	178	5'85	2'31
Waterford (Brook Lodge).....	Waterford.....	52 15	7 7	104	3'91	'88
Broadford (Hurdlestown).....	Clare.....	52 48	8 38	167	3'19	2'12
Abbey Leix (Blandsfort).....	Queen's County.....	52 56	7 17	532	3'21	1'97
Dublin(FitzWilliamSquare).....	Dublin.....	53 21	6 14	54	2'60	1'43
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	3'44	2'36
Ballinasloe.....	Galway.....	53 20	8 15	160	3'60	2'33
Crossmolina (Enniscoie).....	Mayo.....	54 4	9 18	74	5'63	4'05
Collonoy (Markree Obsy.).....	Sligo.....	54 11	8 27	127	3'93	3'00
Seaforde.....	Down.....	54 19	5 50	180	3'94	'93
Londonderry (Creggan Res.).....	Londonderry.....	54 59	7 19	320	4'19	2'77
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	2'52	2'17

RAINFALL TABLE FOR NOVEMBER, 1909—continued.

RAINFALL OF MONTH (con.)					RAINFALL FROM JAN. 1.				Mean Annual 1870-1899.	STATION.
Diff. from Av. in.	o/o of Av.	Max. in 24 hours.		No. of Days	Aver. 1870-99. in.	1909. in.	Diff. from Aver. in.	o/o of Av.		
		in.	Date.							
-1.71	30	.35	29	11	23.04	23.95	+ .91	104	25.16	Camden Square
-2.35	27	.39	14	11	25.62	27.46	+1.84	107	28.36	Tenterden
-2.67	18	.33	29	9	27.19	29.68	+2.49	109	29.93	West Dean
-2.49	18	.26	29	10	24.55	26.57	+2.02	108	27.10	Hartley Wintney
-1.57	39	.49	14	12	22.61	25.68	+3.07	114	24.66	Hitchin
-1.94	26	.28	14	11	24.48	23.77	- .71	97	26.75	Addington
-1.68	33	.23	16	11	23.28	23.81	+ .53	102	25.39	Westley
-1.37	49	.24	16.21	18	23.27	20.46	-2.81	88	25.40	Brundall
-3.89	19	.37	29	12	34.87	36.04	+1.17	103	39.00	Winterbourne Stpltn
-2.63	29	.54	29	8	31.54	27.87	-3.67	88	35.00	Torquay
-2.37	45	.37	29	13	34.46	30.29	-4.17	88	38.85	Polapit Tamar
-1.85	40	.54	29	12	27.99	25.49	-2.50	91	30.75	Bath
-1.79	40	.31	29	14	27.37	26.18	-1.19	96	29.85	Stroud
-2.34	26	.21	27	11	30.12	26.48	-3.64	88	33.04	Wolstaston
-2.00	29	.20	16	11	26.77	23.49	-3.28	88	29.21	Coventry
-1.48	31	.17	29	17	21.51	23.15	+1.64	108	23.30	Boston
-1.83	13	.11	28	10	22.68	22.58	- .10	100	24.70	Hodsock Priory
-1.78	22	.12	27	12	23.90	22.36	-1.54	94	26.18	Derby
-2.04	48	.38	28	17	38.24	40.72	+2.48	106	42.43	Bolton
-1.58	29	.20	27	12	24.77	24.63	- .14	99	26.96	Ribston Hall
-2.05	66	.95	27	16	54.55	60.10	+5.55	110	60.96	Arneliffe Vic.
-1.87	24	.15	22	14	24.66	26.27	+1.61	107	27.02	Hull
-1.80	32	.22	21.22	14	25.35	25.69	+ .34	101	27.99	Newcastle
-5.27	62	2.01	28	15	117.98	109.74	-8.24	93	132.68	Seathwaite
-2.59	39	.45	27	13	38.38	32.54	-5.84	85	42.81	Cardiff
-3.24	40	.41	27	11	42.66	34.73	-7.93	81	47.88	Haverfordwest
-2.41	49	.28	26	16	40.92	37.39	-3.53	91	45.41	Gogerddan
-1.90	44	.40	30	15	28.03	27.67	- .36	99	30.98	Llandudno
-2.47	45	.43	28	10	38.75	45.19	+6.44	117	43.43	Cargen
-2.57	31	.34	28	11	31.26	29.88	-1.38	96	34.80	Branxholme
...	...	.35	27	9	...	26.70	...	...	...	Edinburgh
-3.50	34	.30	28	16	43.63	44.23	+ .60	101	48.87	Girvan
-1.13	68	.78	29	13	32.27	33.66	+1.39	104	35.80	Glasgow
- .29	95	2.07	28	20	55.43	57.64	+2.21	104	62.80	Inveraray
-1.92	70	.72	29	19	51.05	43.97	-7.08	86	57.53	Quinish
-2.45	11	.10	28	6	26.22	23.46	-2.76	89	28.95	Dundee
-2.74	30	...	...	...	32.92	28.08	-4.84	85	36.07	Braemar
-1.82	48	.35	11	15	29.62	28.41	-1.21	96	33.01	Aberdeen
- .93	65	.35	13	10	26.84	26.95	+ .11	100	29.37	Cawdor
- .86	81	1.30	28	14	38.58	34.05	-4.53	88	43.71	Fort Augustus
+ .19	102	1.39	29	24	77.46	68.93	-8.53	89	86.50	Bendamph
+ .28	109	1.14	11	14	28.21	28.72	+ .51	102	31.60	Dunrobin Castle
...	...	2.72	11	25	...	33.35	...	...	...	Castletown
-3.54	40	.60	30	18	51.47	38.18	-13.29	74	58.11	Killarney
-3.03	22	.25	30	10	34.99	31.57	-3.42	90	39.30	Waterford
-1.07	66	.41	28	15	30.10	35.46	+5.36	118	33.47	Hurdlestown
-1.24	61	.45	13	15	31.71	32.75	+1.04	103	35.19	Abbey Leix
-1.17	55	.66	13	14	25.36	22.53	-2.83	89	27.75	Dublin
-1.08	69	.48	13	12	33.03	30.26	-2.77	92	36.48	Mullingar.
-1.27	65	.50	26	15	33.41	27.60	-5.81	83	37.04	Ballinasloe
-1.58	72	.64	30	21	44.69	43.35	-1.34	97	50.50	Enniscoe
- .93	76	.90	1	16	37.64	36.30	-1.34	96	41.83	Markree Obsy.
-3.01	24	.36	30	8	34.97	34.11	- .86	98	38.61	Seaforde
-1.42	66	.57	30	22	36.89	38.96	+2.07	106	41.20	Londonderry
-1.36	61	.46	30	13	34.08	33.72	- .36	99	37.85	Omagh

SUPPLEMENTARY RAINFALL, NOVEMBER, 1909.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	1·22	XI.	Rhayader, Tyrmynydd	2·94
„	Ramsgate	·36	„	Lake Vyrnwy	3·16
„	Steyning	1·42	„	Llangyhanfal, Plâs Draw....	1·33
„	Hailsham	1·39	„	Dolgelly Bryntirion	3·78
„	Totland Bay, Aston House.	·77	„	Snowdon, Cwm Dyli .....	...
„	Stockbridge, Ashley	·61	„	Lligwy	1·95
„	Grayshott	·68	„	Douglas, Woodville	1·32
„	Reading, Calcot Place.....	·72	XII.	Stoneykirk, Ardwell House	2·76
III.	Harrow Weald, Hill House.	·80	„	Dalry, The Old Garroch ...	3·38
„	Oxford, Magdalen College..	·75	„	Langholm, Grove Road.....	2·18
„	Pitsford, Sedgebrook	·68	„	Moniaive, Maxwellton House	2·27
„	Huntingdon, Brampton	·47	XIII.	N. Esk Reservoir [Penicuick]	1·40
„	Woburn, Milton Bryant.....	1·15	XIV.	Maybole, Knockdon Farm..	2·10
„	Wisbech, Monica Road.....	·61	XV.	Campbeltown, Witchburn...	1·99
IV.	Southend Water Works.....	1·46	„	Glenreasdell Mains	2·83
„	Colchester, Lexden	·83	„	Ballachulish House	7·53
„	Newport, The Vicarage.....	·69	„	Islay, Eallabus	4·10
„	Rendlesham	·86	XVI.	Dollar Academy	1·42
„	Swaffham	·88	„	Loch Leven Sluice	·85
„	Blakeney	1·12	„	Balquhidder, Stronvar	5·03
V.	Bishops Cannings	·50	„	Perth, The Museum	·53
„	Ashburton, Druid House ...	1·83	„	Coupar Angus	·48
„	Honiton, Combe Raleigh ...	1·20	„	Blair Atholl	1·77
„	Okehampton, Oaklands.....	2·16	„	Montrose, Sunnyside Asylum	·91
„	Hartland Abbey	1·78	XVII.	Alford, Lynturk Manse ...	1·86
„	Lynmouth, Rock House ...	2·60	„	Keith Station	4·02
„	Probus, Lamellyn	1·52	XVIII.	N. Uist, Lochmaddy	3·80
„	North Cadbury Rectory ...	·76	„	Avey Manse	1·66
VI.	Clifton, Pembroke Road ...	1·56	„	Loch Ness, Drumnadrochit.	2·33
„	Ross, The Graig	·89	„	Glencarron Lodge	9·38
„	Shifnal, Hatton Grange	·70	„	Fearn, Lower Pitkerrie.....	1·68
„	Blockley, Upton Wold	1·10	XIX.	Invershin	3·75
„	Worcester, Boughton Park.	·90	„	Altnaharra	6·19
VII.	Market Overton	·64	„	Bettyhill	5·7
„	Market Rasen	·39	XX.	Dunmanway, The Rectory..	1·80
„	Bawtry, Hesley Hall.....	·23	„	Cork	·76
„	Buxton.....	1·57	„	Mitchelstown Castle	1·08
VIII.	Neston, Hinderton Lodge... 1·06	1·06	„	Darrynane Abbey	2·38
„	Southport, Hesketh Park ...	1·70	„	Glenam [Clonmel]	·71
„	Chatburn, Middlewood	2·28	„	Nenagh, Traverstown.....	1·87
„	Cartmel, Flookburgh	2·00	„	Miltown Malbay.....	2·84
IX.	Langsett Moor, Up. Midhope	1·63	XXI.	Gorey, Courtown House ...	1·68
„	Scarborough, Scalby	1·95	„	Moynalty, Westland	1·52
„	Ingleby Greenhow	1·80	„	Athlone, Twyford	2·24
„	Mickleton.....	·98	XXII.	Woodlawn	2·52
X.	Bardon Mill, Beltingham ...	1·19	„	Westport, St. Helens	3·07
„	Ewesley, Font Reservoir ...	·54	„	Mohill	1·95
„	Ilderton, Lilburn Cottage... 1·05	1·05	XXIII.	Enniskillen, Portora	2·53
„	Keswick, The Bank	2·98	„	Dartrey [Cootehill].....	1·58
XI.	Llanfrechfa Grange.....	2·76	„	Warrenpoint, Manor House	1·02
„	Treherbert, Tyn-y-waun ...	4·26	„	Banbridge, Milltown	1·11
„	Carmarthen, The Friary....	1·81	„	Belfast, Springfield	1·45
„	Castle Malgwyn [Llechryd].	2·10	„	Bushmills, Dundarave	1·78
„	Plynlimon.....	6·00	„	Sion House	2·29
„	Crickhowell, Ffordlas.....	1·90	„	Killybegs	5·40
„	New Radnor, Ednol	2·11	„	Horn Head	3·99

METEOROLOGICAL NOTES ON NOVEMBER, 1909.

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 outstanding feature of the month was its low R, following, as it did, an unusually wet October. Of the total fall, .35 in., or 47 per cent., fell on 29th. The weather was generally of a cloudy type, but on several days considerable sunshine was recorded. Duration of sunshine, 59.0* hours, and of R 18.6 hours. Mean temp. 41.5 or 1.5 below the average. Shade max. 54.9 on 3rd; min. 29.1 on 21st. F 10, f 21.

TENTERDEN.—Duration of sunshine, 117.8† hours. Shade max. 58.0 on 6th; min. 25.5 on 26th. F 12, f 17.

TOTLAND BAY.—Duration of sunshine, 127.6* hours, or 47 hours above the average and 11.7 hours above the previous record for November. Shade max. 55.5 on 6th; min. 29.9 on 19th. F 8, f 16.

PITSFORD.—R 1.74 in. below the average. Mean temp. 39.8. Shade max. 55.6 on 4th; min. 26.5 on 14th. F 15.

WINTERBOURNE STEEPLETON.—Cold and dry and very similar to November, 1901. Mean temp. 41.2. Shade max. 57.0 on 4th; min. 24.0 on 24th. F 13, f 16.

NORTH CADBURY.—Dry and remarkably sunny. The roads were astonishingly clean for November, almost throughout. Shade max. 59.0 on 5th; min. 23.5 on 23rd. F 12, f 18.

ROSS.—Shade max. 55.8 on 3rd; min. 23.6 on 23rd. F 15, f 19.

HODSOCK PRIORY.—The driest November for at least 30 years. Shade max. 59.3 on 4th; min. 23.5 on 14th. F 13, f 23.

BOLTON.—Duration of sunshine, 54.7* hours, or 29.7 hours above the average. Mean temp. 40.4, or 2.4 below the average. Shade max. 52.9 on 3rd; min. 28.9 on 14th. F 11, f 25.

SOUTHPORT.—R 1.54 in. below the average of 35 years. Duration of sunshine 80.4* hours, or 30.8 hours above the average, and the greatest recorded for November. Duration of R 42.0 hours. Mean temp. 41.3, or 2.0 below the average. Shade max. 53.4 on 5th; min. 25.4 on 16th. F 12, f 18.

HULL.—Duration of sunshine, 52.9* hours. Shade max. 58.0 on 4th; min. 26.0 on 14th. F 7, f 18.

HAVERFORDWEST.—Duration of sunshine 109.7* hours. Shade max. 54.8 on 3rd; min. 21.0 on 23rd. F 11, f 17.

LLANDUDNO.—Shade max. 49.0 on 5th; min. 28.5 on 16th. F 5.

DOUGLAS.—Almost rainless to 25th with a wonderful excess of brilliant sunshine. The last 5 days were wet and stormy with H showers and some S on the hills. Temp. below the average throughout. Shade max. 56.0 on 3rd; min. 31.0 on 8 days. F 8.

CARGEN.—A sharp spell of frost from 13th to 26th occasioned a serious loss to farmers, through loss of unlifted potatoes and turnips. Shade max. 57.0 on 3rd; min. 19.0 on 16th. F 17.

EDINBURGH.—Shade max. 56.2 on 2nd; min. 24.1 on 16th. F 11, f 16.

COUPAR ANGUS.—The driest November in 30 years' record. The mean temp., 36.9, was 3.0 below the average, and was reduced by a severe spell of low temp. after 13th. Shade max. 59.0 on 5th; min. 10.0 on 17th.

FORT AUGUSTUS.—Shade max. 55.0 on 4th; min. 15.0 on 17th. F 16.

WATERFORD.—The driest November since 1879 when .56 in. was recorded. Shade max. 60.0 on 3rd; min. 23.0 on 24th. F 12.

DUBLIN.—Cool and generally fine. Mean temp. 43.0. On the morning of 15th two inches of S fell. Shade max. 56.8 on 3rd; min. 28.2 on 16th. F 6, f 14.

MARKREE.—Shade max. 55.8 on 3rd; min. 13.4 on 16th. F 17, f 23.

WARRENPOINT.—Shade max. 59.0 on 3rd; min. 23.0 on 14th and 15th. F 8, f 14.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, June, 1909.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	75°·1	17	39°·0	11	63°·9	48°·5	49°·0	0-100 81	119°·5	34°·0	inches 3·79	17	8·7
Malta	85·6	27	61·1	2	76·6	66·0	62·1	73	145·0	...	·08	2	2·3
Lagos	89·0	16	70·0	12†	84·7	74·0	74·5	79	159·0	68·0	19·55	20	8·3
Cape Town	79·2	2, 11	38·8	14	66·7	43·3	49·9	78	...	...	1·76	10	6·2
Durban, Natal	80·8	14	51·5	9	74·7	55·8	...	...	128·5	...	2·56	4	1·6
Johannesburg	66·9	23	36·4	11	60·1	42·1	40·6	70	119·6	32·0	·00	0	0·8
Mauritius	77·7	2, 3	58·0	14	74·8	64·3	62·9	81	145·6	48·7	7·57	22	7·0
Calcutta... ..	95·2	20	74·8	22	89·3	78·2	78·2	87	156·8	72·6	22·63	22	8·2
Bombay... ..	95·4	2	74·4	4	87·9	79·9	77·6	82	135·5	71·8	16·63	23	7·8
Madras	102·9	9	69·5	15	98·1	79·9	72·2	67	144·0	69·5	1·65	9	5·9
Kodaikanal	70·2	19	50·8	27	64·4	53·6	50·8	78	138·8	38·1	3·63	17	7·4
Colombo, Ceylon	87·2	18	72·8	26	86·1	77·8	75·0	80	149·6	72·4	3·64	18	6·5
Hongkong	89·7	19	73·6	1	86·3	78·6	75·4	81	141·5	...	7·39	18	7·8
Melbourne	64·8	1	32·7	30	55·2	44·9	43·9	80	100·8	27·5	3·27	23	7·8
Adelaide	67·0	17	38·5	30	59·5	46·4	46·6	81	132·2	29·9	2·24	14	6·0
Coolgardie	70·3	9	33·0	25	60·5	42·9	43·3	71	134·0	29·0	2·18	12	5·8
Perth	77·1	9	41·0	23	64·5	48·8	48·4	74	119·9	35·9	8·34	14	5·3
Sydney	72·9	24	41·9	17	61·5	49·1	36·6	78	101·1	28·9	4·27	22	5·5
Wellington	60·2	5*	40·0	9, 25	56·9	47·9	43·3	71	102·0	29·0	2·50	14	7·3
Auckland	65·0	14	44·0	30	59·8	51·5	50·7	84	114·0	41·0	3·24	22	6·4
Jamaica, Kingston	91·7	4	68·8	28	89·0	73·6	73·0	75	...	...	4·74	8	...
Trinidad	88·0	sev.	67·0	14‡	86·1	70·1	74·0	87	155·0	63·0	8·31	23	...
Grenada	86·0	7	70·4	1, 19	82·7	73·7	71·9	79	135·6	...	12·20	27	5·5
Toronto	90·4	21	42·9	18	75·4	55·5	...	...	109·0	40·3	1·21	6	...
Fredericton	89·0	25	28·5	2	73·8	48·3	...	66	...	...	5·40	6	5·6
St. John's, N.B.	79·5	26	38·7	2	65·5	50·0	...	...	...	...	1·75	11	5·1
Victoria, B.C.	75·8	8	42·2	25	67·4	48·5	...	68	...	...	·47	6	4·0
Dawson	86·0	30	29·0	2	70·2	42·7	...	...	...	...	2·66	12	5·7

* and 14, 19. † and 13. ‡ and 15, 20.

MALTA.—Mean temp. of air 71°·2. Average bright sunshine 10·3 hours per day.

MAURITIUS.—Mean temp. of air 0°·2, of dew point 1°·8, and R 5·46 in., above averages. Mean hourly velocity of wind 10·7 miles or 0·5 below average.

KODAIKANAL.—Bright sunshine 144 hours.

COLOMBO.—Mean temp. of air 79°·4 or 1°·6 below, of dew point 0°·8 above, and R 4·01 in. below, averages. Mean hourly velocity of wind 8 miles. TS on 12th.

HONGKONG.—Mean temp. of air 81°·8, or 1°·1 above. Bright sunshine 230·3 hours, or 74 hours above average. Mean hourly velocity of wind 12·5 miles. R 9·00 in. below average.

MELBOURNE.—Mean temp. of air 0°·2 below, and R 1·18 in. above, averages.

ADELAIDE.—Mean temp. of air 0°·4 below, R 78 in. below, averages.

PERTH.—Rainfall 1·72 in. above average.

SYDNEY.—Mean temp. of air 1°·0 above, and R 1·04 in. below, averages.

WELLINGTON.—Bright sunshine 122·0 hours.

AUCKLAND.—Rainfall 1·50 in. below, and mean temp. of air 2°·0 above, averages.

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THE RAINFALL OF 1909.

For the third time since the full discussion of annual rainfall made the determination possible, the rainfall of the year for the whole of the British Isles considered together comes out as within one per cent. of the thirty years' average. The former occasions were in 1906 and 1907; but on each of the three occasions a large part of the country had a rainfall in excess of the average, and a large part of the country had a rainfall less than the average. The last column but one in the Table on p. 241 gives the percentage of the average rainfall experienced by 53 stations for 1909, and combining these with about 50 additional records for which it was possible to calculate the averages we are able to express the rainfall of various divisions and of the country as a whole in the following summary where 100 represents the local average in each case:—

England, South.	Wales.	England, North.	England and Wales.	Scotland.	Ireland.	BRITISH ISLES.
102	95	107	103	99	95	100

The districts of excessive and deficient rainfall were arranged in a form somewhat similar to that experienced in other recent years. There were two conspicuous dry areas in which the rainfall was more than 10 per cent. below the average. One was the extreme south-west of Ireland, Wales and England, where for the last five years the annual rainfall has always been deficient, and here in 1909 the deficiency culminated with more than 20 per cent. below the average at Cork Harbour and Tresco Abbey, Scilly. The other was in the north-west of Scotland, but its limits are not clearly defined, as so few long records of rainfall exist in that region. The distinctly wet regions where the rainfall was more than 10 per cent. above the average surrounded the south and east of Great Britain, one area lying along the south and south-east of England, culminating in a patch round the Thames estuary, where the excess at Shoeburyness was more than 20 per cent. of the average. The region of lowest actual rainfall had thus the greatest excess when compared with its average. The second area with more than 10 per cent. of rain was in Lincoln, the east and north of Yorkshire and Lancashire, and there were also four

small patches with an equal excess near (1) Newcastle, (2) the margin of the Moray Firth, (3) in Galloway, and (4) in the west of Donegal. The extreme dryness of the north-west of Scotland and the wetness of the south-east of England in the month of June was certainly brought about by a northern anticyclone clearing the sky for sunshine on the north-west coast, while a procession of small cyclones running up the Channel brought gloom and showers to the south-east. The wettest month for the British Isles was March; and in that month great stretches of the south and east coasts had more than twice their average rainfall; but the same month was, as we have shown on p. 45, exceedingly dry in the extreme west of Scotland, thus showing the same distribution of wet and dry areas as June. These two months impressed their character on the year, the marked excesses in the south and east being accentuated also by the great falls in Sussex, Kent and Essex in October and December. November was the driest month of the year, the average being hardly reached at any point, and over very large areas the rainfall was less than one-third of the normal.

THE WEATHER OF DECEMBER, 1909.

By FRED. J. BRODIE.

THE closing month of 1909 was marked by weather of an extremely changeable character. With the exception of a brief period about the middle of the month, the type of pressure distribution was almost invariably cyclonic, many of the centres of disturbance passing directly over the United Kingdom. Rain was therefore frequent, and in some cases very heavy; and at the close of the third week, snowstorms were experienced over a large portion of north Britain.

Owing to the frequent changes in wind direction which attended the movements of the various barometric minima, the fluctuations in temperature were considerable. In the rear of a very deep depression which moved eastwards across the country on the 3rd, when severe gales were experienced in nearly all parts of England and Ireland, a cold wind spread down from the north-westward, and in the course of the ensuing night a sharp frost occurred in all our more western and northern districts.

Still colder weather was reported with the variable winds which set in a day or two later, the lowest readings being observed between the 6th and 8th in Ireland and north Britain, but on the 9th and 10th over eastern, central and southern England. In the latter districts the frost was not very severe, few stations reporting a minimum temperature below 20° , but in Scotland and the north-west of England readings as low as 15° were experienced in many places. At Kilmarnock the sheltered thermometer fell to 12° , and at West Linton the readings were as low as 6° in the screen and 4° on the grass, while at Balmoral both shade and grass thermometers sank to zero.

On the 9th, when a large cyclonic system appeared over the

Iceland-Faeröe region, a mild breeze spread in from the south-westward, and on the 10th and 11th the thermometer rose above 50° in all districts, excepting the south-east of England, readings of 55° or a trifle higher being recorded at many western and northern stations. After this a large anticyclone extended down from northern Europe, and for the next few days the wind was in the east, and temperature fell to a rather low level, though with no sharp frost.

On the 15th a large area of low pressure began to spread over western Europe from the southern portions of the Atlantic, and in the course of the next few days the development of definite baric minima in the neighbourhood of our own islands resulted in a long spell of extremely unsettled weather, with a general prevalence of winds from some polar quarter. The lowest temperatures of the whole month were recorded between the 20th and 22nd, when the sheltered thermometer fell below 15° at a large number of stations situated in nearly all parts of the kingdom, and to 10° and less at many places in the west and north. On the grass and on the surface of the snow (which fell in large quantities on the 19th and 21st), the readings were as low as 5° at Buxton and 4° at Balmoral, while at Worksop on the morning of the 21st, the exposed thermometer fell to 7° below zero. A deep depression, which appeared off our south-west coasts on the evening of the same day, occasioned strong gales from the south-eastward over nearly the whole country, with heavy rain in the south of England, and much snow followed by rain in the north. Next morning the centre of the disturbance moved northwards along the west coasts of Ireland, the gale subsided quickly and the wind veered to south and south-west, with a rapid rise of temperature, the maxima on the 22nd and 23rd being above 50° in many parts of England and Ireland. In the closing week, the south-westerly current was supreme, and the weather was therefore very mild, the highest temperatures of the whole month occurring very commonly on the 26th and 27th, when the thermometer rose to 55° and upwards in all districts, including the north of Scotland, and reached a maximum of 57° at Cirencester and Markree Castle. The temporary extension of a large anticyclone from the southward on the 29th and 30th was, however, accompanied by rather sharp night frosts, the thermometer on the grass falling below 20° in many English districts, and touching 12° at Greenwich.

Over the entire northern half of the United Kingdom, the mean temperature of December was below the average, the deficit in central Scotland amounting to between $3^{\circ}5$ and 4° . In the eastern, central and south-eastern parts of England, there was a slight excess of warmth. In spite of its generally unsettled character, there were many intervals of fair weather, and the duration of bright sunshine was nearly everywhere in excess of the normal. This was especially the case in London, the total amount of sunshine at Westminster, over 29 hours, was more than double the average, and larger than in any December of the previous 26 years, with the single exception of 1893.

A METEOROLOGICAL EXCURSION IN WALES.

By E. ANTONY LEES.

THE annual Committee vacation of a great city is useful, not only as providing for the holidays of the members of the Committee and of the officials, but also as affording opportunities for extended excursions to the Works with the conduct of which the Committees are charged, or to kindred undertakings; useful and indeed necessary proceedings for which the time cannot be found when meetings are frequent.

An excursion of the kind was undertaken on August 25th and 26th last, when a tour of inspection was made of the rain gauges established on the great gathering ground of the Birmingham Waterworks in the valleys of the rivers Elan and Claerwen, on the borders of the counties of Radnor and Brecknock.

In order to understand the purpose and results of this expedition it is necessary to go back a little. At the time when the Birmingham Corporation obtained their Act authorising the construction of the Welsh works, the only direct data of rainfall were furnished by a gauge which had been kept for some years by Mr. R. Lewis Lloyd, of Nantgwyllt, and on the data furnished by that gauge the engineer to the scheme, the late Mr. James Mansergh, F.R.S., worked out the capacities of the reservoirs required for the proper utilisation of the gathering ground. Up to the present the river Elan only has been dealt with. Three reservoirs have been constructed, one of which, Caban Côch, extends also into the Claerwen valley. The full scheme provides for three additional reservoirs on the Claerwen, to be constructed as they are found necessary. As regards the water drawn off from the watershed, the full amount of compensation water required by Parliament to be sent into the river, 27 million gallons per day, is being given regularly from the Caban Côch reservoir. The draught for consumption is only one-third of what the ground will ultimately yield; and, while the tunnel and cut-and-cover portions of the aqueduct have been constructed of sufficient capacity to convey the full ultimate yield, the syphon sections will require six lines of pipes, two of which only are at present provided, and when the time comes for the provision of additional pipes, those then responsible for the undertaking will be faced with the problem of what additional reservoirs will be required. With a view to providing in advance, data on which the solution to this problem must be based, the Water Committee have established a sufficient number of rain gauges over their gathering ground to enable accurate estimates to be made of the rainfall for a term of years.

In a matter of this kind, the locating of the gauges is very important, and the advice of Dr. H. R. Mill was sought on the subject. He selected fifteen positions, fairly distributed over the whole 71 square miles within the watershed, and chiefly situated on the summits of the level-topped moors, of which the gathering ground in great part consists.

All of these gauges were in working order by 1st January, 1908, but on an examination of the records for the completed year the figures in some cases appeared to be somewhat inconsistent between themselves, and also as compared with the records of other similarly placed gauges kept by other observers.

As, of course, rain gauges are of no use at all unless they are as nearly perfect as experience can make them, it was decided to take an opportunity during the vacation for Dr. Mill to visit the gauges in company with the officials directly concerned; and in pursuance of this plan we foregathered on the evening of August 24th, and started for the two days' trip on the morning of the 25th. The party comprised Dr. Mill, the Superintendent of the local works, the Observer, the Secretary of the undertaking (the present writer), and a student. As it was necessary that we should sleep out one night, and it was more than probable that at the end of the first day's tramp a change of clothing would be not only a luxury, but a necessity, well-furnished portmanteaux were sent on direct to the pre-arranged camping ground.

The weather at the time was very broken, and during the night before the start rain fell in torrents, but when we assembled for an early breakfast the sun was shining pleasantly, and our hopes rose correspondingly. We were conveyed by motor car to the limits of civilisation, in other words, to the extent of the made roads, inspecting two of the low-level rain gauges *en route*. Having arrived at the end of the roadway, we were met by a farmer, who brought two mountain ponies for the use of the party. The burden of the ponies was at first restricted to the wraps and other impedimenta, but before very long the significance of the provision became apparent to us, as we found the first considerable stream crossing our track to be so swollen by the previous night's rain as to be impassable on foot. We then had to work out our own solution of the old puzzle of the fox, goose and man with only one boat, so as to provide for the passage of the party of five with only two ponies, and this means of negotiating the streams had to be adopted many times in the course of the day.

The weather during the earlier part of the day was thoroughly enjoyable, and continued so up till the interval for lunch by the side of one of the streams. Never were sandwiches more welcome, and as for the drinks, the amount of previous night's rain, .84 in., was found to be a fair measure for each round as we drank out of the rain glass, the number of rounds, however, not being strictly regulated.

No sooner had we started on the second half of the day's tramp, than the entire suitability of the region as a water supply gathering ground was exemplified uncomfortably, and for a couple of hours we struggled bravely through a storm of wind, rain and mist. The rain of the previous days, and the preceding night especially, had made the ground very soft, and as the storm found us in rather an unfavourable tract of country, the experience of those two hours is more pleasant to look back upon than it was to endure. Happily

the storm blew over, and the light first breaking on the distant hills and rapidly surrounding us was a glorious as well as a welcome sight.

The flutter of a flag on the sky-line, with a wreath of smoke from the angler's hut near by, told us that we were approaching our camping ground, and that the advance party responsible for the commissariat had arrived, and that the preparations for our reception were well in hand. Nor were our highest anticipations disappointed, as we were met with hot cups of tea, and very soon were enjoying the satisfied feeling which comes only after a long tramp, followed by abundant ablutions, dry clothes, and the immediate prospect of dinner.

The camping ground was near two mountain lakes, the Llynau Cerigllwydion, and adjoining an old monks' road, which before the dissolution of the monasteries connected the Abbey of Strata Florida in Cardiganshire with the Abbey Cwmhir; while our camp comprised a fishing hut kindly placed at our disposal, supplemented by bell tents. The moor at this point is 1500 feet above sea-level.

During the evening the regular observer told us stories of some of his adventures when reading the monthly gauges on the last day of each month; and the onerous character of the duty involved in reading these gauges was brought home to us by the fact that he has to sleep in the hut on the last night of every month. Fancy, for instance, each 31st December, after a tramp of 18 miles, finishing up where we then were, "and letting in the New Year" in the out-of-the-world place, to be followed on the next day by a similar tramp home again, whatever the weather may be. To illustrate the remoteness and loneliness of the spot, we may recall the anecdote that when the hut was being built a tramp strolled by; whence he came or whither going is not stated:—

Tramp to Builder: "What are yer doin'?"

Builder: "Buildin' a hut."

Tramp: "What for?"

Builder: "Oh, for somebody to sleep in."

Tramp: "Good Lord! what's he done?"

After a stormy night the morning broke fair. It had been arranged that some of us should visit one of the rain gauges before breakfast, and after a hasty cup of tea we set out, leaving behind one of our party to catch a dish of trout for the morning meal. As we reached the crest overlooking the lake after a couple of hours' tramp out and home, through miles of quaking bog, we saw our friend some yards from the shore whipping the water. As he caught sight of us he turned into the hut, and by the time we reached the camp our ears were greeted by the sound of the brown beauties frying over the fire. Breakfast, packing, and the despatch of the carriers with the portmanteaux, quickly followed.

The day opened out gloriously, and never shall we forget the splendid tramp over the moors with glimpses of the bird, plant and insect life of the moorlands. Most curious of the finds to meet our

eye were numerous fragments of exploded shells, a reminder that this had been selected a few years ago as the most desolate part of Wales for the purpose of experiments with new projectiles. Several lines of pools, now filled with water, marked the scoops of turf made by the larger fragments of the shells as they burst. Views of far off hills enabling us to trace the general line of the previous day's journey, and at last the lovely valley of the Elan, in which are now embosomed the beautiful reservoirs looking like natural lakes which have been there from the beginning of all things, formed a series of pictures which remain photographed on the memory.

The actual results of the 36 miles' tramp covered in the two days are, first, the satisfaction of knowing that the rain gauges as a whole are well placed and efficiently maintained and read; and, second, the decision to establish two additional gauges to illustrate the difference between the rainfall in valleys and on adjoining hills, and a third to provide a check upon a particular gauge which had exhibited vagaries in its readings. But, above all, there is the satisfaction of knowing that the data in future will be as accurate as care and experience can make them, and that future calculations of yield will not be based upon guess-work but upon ascertained facts.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on December 15th at the Institution of Civil Engineers, Mr. H. Mellish, President, in the chair.

Dr. W. N. Shaw, F.R.S., read a paper on "The Variations of Currents of Air indicated by simultaneous records of the Direction and Velocity of the Wind." He said that in order to form a mental picture of air flowing past an anemometer, we need to take into account the changes of direction as well as the changes in velocity. He described how he had endeavoured to combine these in a vector diagram, and he pointed out some interesting results obtained from such diagrams.

Capt. D. Wilson-Barker, Mr. W. B. Tripp, Mr. W. W. Bryant, Mr. R. Inwards, Mr. W. H. Dines, and the President, took part in the discussion, and Dr. Shaw replied.

Two practical and interesting papers by Mr. W. G. Reed, junr., were read by the Secretary. These formed part of the work done in the course of Climatological Research given in Harvard University, Mass., U.S.A., under the direction of Prof. R. de C. Ward. The first paper was "A Critical Examination of South American Rain-fall Types," the author's object being to make a simple yet accurate map showing the seasonal distribution of rainfall in South America. The second paper was on "The Study of Phenomenal Climatology." The suggestion has several times been made that the treatment of weather elements by days and months is arbitrary and unnatural for places not within the tropics. The author pointed out

that in latitudes subject to cyclones the distribution of weather elements depends largely upon the relation of cyclones and anti-cyclones, and he therefore suggested that the cyclone is a more rational unit than the day or the month.

The following ladies and gentlemen were elected Fellows of the Society:—Mr. R. F. Bryant, Mr. R. Corless, B.A., Mr. R. F. Griffiths, Mr. C. J. Grist, M.A., Dr. W. J. Lewis, Mr. W. F. Masterman, Miss A. H. T. P. Parker, Mr. Y. B. Petley, and Mrs. E. M. Sutton.

SCOTTISH METEOROLOGICAL SOCIETY.

THE annual business meeting of the Society was held at 5, St. Andrew's Square, Edinburgh, on 8th December, 1909, Sir Archibald Buchan-Hepburn, Bart., in the chair.

The report from the Council referred to the great loss sustained by the death, on 12th October, of Sir Arthur Mitchell, K.C.B., the distinguished President of the Society. Sir Arthur had been associated with the Society since its foundation in 1855, and had been a member of Council since 1860. From 1888 until 1903 he was Honorary Secretary, in 1904 he was elected Vice-President, and in 1908 President. Memorial notices of Sir Arthur have been published in the Journal, Lady Frances Balfour dealing with his personal qualities and his remarkable career as a public man, and Mr. R. T. Omond with his many services to the Society and his contributions to medical climatology.

The Honorary Treasurer was able to communicate an extremely satisfactory financial statement. The Council having given up all hope of making good from public sources heavy obligations for which they had to assume responsibility when the Ben Nevis Observatories were closed in 1904, had recently put the whole matter before the members. The response had been of a most generous character. One anonymous donor had himself paid off a bank overdraft of £113, and there was every probability that a loan of £300 made by the Society to the Observatory Fund would be made good. Two-thirds of that amount had been already received.*

Professor A. Crum Brown, F.R.S., was appointed President; Sir A. Buchan-Hepburn, Bart., and Mr. J. Mackay Bernard of Dunsinnan, Vice-Presidents; Mr. R. T. Omond and Mr. E. M. Wedderburn, Honorary Secretaries; and as members of Council, Mr. Ralph Richardson, Dr. John Aitken, F.R.S., Mr. James Macdonald, Secretary Highland and Agricultural Society, Dr. C. G. Knott, Sir David Paulin, Mr. Gilbert Thomson, Professor F. W. Dyson, F.R.S., Mr. H. M. Cadell, of Grange, and Captain H. G. Lyons, F.R.S.

Professor Crum Brown was welcomed to the presidential chair, and delivered an address on "The Functions and Use of a Meteorological Society."

* The whole amount has since been paid off by the members.—ED., S.M.M.

Prince Yamashina,

3rd July, 1876—2nd May, 1908.

H.I.H. PRINCE YAMASHINA of Japan was educated at the Naval Academy in Kiel, and entered the Japanese Navy, where he held the rank of Captain at the time of his death. He was much interested in meteorology and seismology, and during the last two years his work has become familiar to European meteorologists from the volumes of observations at the First Order Meteorological Stations which he founded in Japan. These consisted of an observatory on the summit of the isolated volcanic peak of Mt. Tsukuban, and a low-level station near its base. The observations made at these stations were published by the Prince, and distributed to all meteorological institutions.

Capt. Henry Toynbee,

22nd October, 1819—29th March, 1909.

THIS genial old sailor and meteorologist died in his ninetieth year. He commenced life in the British Mercantile Marine in 1833 or 1834 as a midshipman on board the ship "Dunvegan Castle," and sailed for Calcutta. Some years later he entered the employment of Messrs. T. & W. Smith, who then owned a fine line of frigate-built passenger ships engaged principally in the East India trade, his first appointment being as third officer of the "Duke of Argyll." Toynbee in course of time commanded successively the "Ellenborough," "Gloriana," "Marlborough" and "Hotspur." He was a religious man, insisted on a full muster at Church-parade every Sunday, and always took a great interest in the welfare of sailors afloat and ashore.

His lifelong interest in scientific work, and especially meteorology, was greatly stimulated by his marriage in 1854 to a daughter of Admiral W. H. Smyth, F.R.S. His wife accompanied him on many voyages, and his meteorological logs illustrated by her sketches were remarkably complete.

After the death of Admiral FitzRoy, the Meteorological Office was transferred from the Board of Trade to the newly-formed Meteorological Committee of the Royal Society. This Committee on January 3rd, 1867, appointed Capt. Toynbee as Marine Superintendent; he held this post until his retirement in June, 1888; during this long period he was in charge of the oceanic meteorological discussions. In addition to writing reports for the Meteorological Office, he read papers bearing on Marine Meteorology, before several scientific societies; and in 1890 he published a little book on "Weather Forecasting for the British Islands by means of a barometer, the direction and force of wind, and cirrus clouds."

Correspondence.

To the Editor of Symons's Meteorological Magazine.

UNITS OF RAINFALL MEASUREMENT.

I THINK many of the discrepancies between neighbouring rain-gauges may be accounted for by their being constructed of different metals. For the last 10 months I have had a copper Snowdon gauge, and I have compared its records with those of my old gauge, which was of black japanned metal. At first they were side by side, but latterly in different positions about 200 yards apart, both placed on short grass. I have very rarely found any dew recorded in the copper gauge, but frequently in the japanned one. Another fact that I have noticed is, that the amounts in the japanned gauge are very frequently $\cdot 01$ or $\cdot 02$ in. higher than in the copper gauge.

GEORGE SHEDDEN.

Spring Hill, East Cowes, I.W., December 19th, 1909.

[From an interesting paper, which goes with great detail into the methods of making the experiments referred to, we extract the following.]

I HAVE two gauges, the receiver of one being $4\frac{1}{2}$ inches in diameter, and that of the other $2\frac{5}{8}$ inches. I experimented with both to find the deficit between the amount of rain run into each and the amount as poured out into the measuring glass. Water was run into the dry receivers from a suitably graduated burette, and then poured from the receiver back into the burette. The experiments showed that the deficit was greater in the large than in the small receiver, and that in order to pour out from the large receiver $\cdot 005$ of rain there had to be poured into it $\cdot 0067$ in., or to measure $\cdot 01$ in. poured from the receiver $\cdot 013$ would have to be poured in. The deficit with half-an-inch of rain is nearly $\cdot 005$ in. Obviously then there will be an appreciable difference in the reading according as the rain is collected directly into the measuring glass or not.

Although the difference in practice that I have investigated may account for some apparent inconsistencies between the results at neighbouring stations, I think it is probably quite the least important cause. Few people who have not been used to scientific work realize how important it is to hold a measuring glass level; and here is, I expect, one fruitful source of errors in rain gauge reading. There are also inconsistencies in reading the top or bottom of the meniscus, and many other possibilities of making small errors. For these reasons, and because of the comparative frequency of dews of $\cdot 01$ in., I cordially agree with Mr. Boys that $\cdot 01$ in. is a most unsatisfactory point at which to draw the "rain-day" line. I think that $\cdot 02$ would in the main, be the most satisfactory line of demarcation. My experience of rainfall measuring is of only five years, and in this one place, so I speak with all reserve, but it seems to me that the limit of $\cdot 02$ in. would exclude most dews and include most rains.

ERNEST H. CARTWRIGHT.

Myskyns, Ticehurst, Sussex, 13th December, 1909.

We have given liberally of our space to a discussion which we believed would be welcome to a small number of rainfall observers whose love of accuracy and conscientious zeal deserves every consideration, recognition and encouragement. But we were somewhat doubtful as to the wisdom of printing Mr. Hampton Brown's article, and we decided to do so only in the hope that the discussion to which it was bound to give rise would draw fresh attention to the importance of accuracy and uniformity, and enable us to give emphasis to our total disagreement with any suggestion of tampering with the generally accepted definition of a rain-day. What is measured by a rain gauge is not "rain" in the sense of drops of water falling from the clouds, but "total aqueous precipitation," including all that is condensed from the aqueous vapour of the atmosphere in such a form as to be collectable by a rain gauge. Most of it falls as "rain" in the narrow sense, and "rain" is used for convenience to express the whole, exactly as chemists use the word "chlorides" in determining the salinity of sea-water, although the actual precipitate includes small amounts of bromides and iodides as well. It would be excellent if dew-days, snow-days, hail-days and hoar-frost days could be counted and classified; but if this could be done it could only be done by a few persons possessed of exceptionally good instruments and almost incredible watchfulness. *In all that is written of the measurement of rain the word rain includes all forms of precipitation*, so that "rain-day" includes a day when there was heavy dew. This being made clear much of the difficulty vanishes.

The choice of .01 in. as the unit of rainfall measurement was made after careful enquiry and the weighing, amongst others, of all the arguments put forward in the recent correspondence, all of which are as old at least as *British Rainfall*. The experience of 50 years in thousands of places confirms the wisdom of the rule. The Editors of *British Rainfall* have laboured incessantly towards the elimination of those diversities in instruments, exposures, hours of observation, and methods of reading the rain glass that give rise to discrepancies, and after half a century the result is that the numbers of rain days quoted have now some physical significance. In the earlier years they were of moral import only, the more rain-days reported the more conscientious the observer in the matter of daily readings. There are many very badly graduated rain-glasses in the market, and no glass should ever be used without the maker's name upon it, while no glass should be fully trusted without a certificate of accuracy. The correspondence impels us the more earnestly to insist on the need of observing No. 11 of the Rainfall Rules with scrupulous exactness.

Small Amounts.—If the gauge contains less than one hundredth (.01) of an inch but more than half that amount, it should be entered as .01, while if there is less than half that amount the few drops may be thrown away, and the day entered as if no rain had fallen.

THE EDITOR.

STANDARDIZATION OF SUNSHINE RECORDERS.

REFERRING to Mr. Curtis's valuable article on the Standardization of Sunshine Recorders in the *Meteorological Magazine* for November, he states that "56 years have now elapsed since the late Mr. J. F. Campbell began to register the duration of sunshine, and for that purpose set up in Whitehall *the first sunshine recorder.*" I do not think that it is generally known that the first application of photography for the purposes of self-registering meteorological instruments was by the late Mr. T. B. Jordan, in the year 1838. He was then a mathematical and philosophical instrument maker, residing at Falmouth, and was the Secretary of the Royal Cornwall Polytechnic Society. A description of the instruments he designed will be found on pages 184 to 187 of the 6th Annual Report of that Society. There is a diagram of his Barograph, which is almost identical with the one now in use. Mr. Jordan also describes a new instrument, which he proposes to call "the Heliograph;" its object being "to yield an accurate account of the intensity of the light for every minute of the day, and permanently to register its indications. It consists of a light cylinder of metal, with a similar cylinder revolving about it, once in 24 hours on a screwed axis. The inner and fixed cylinder is covered with a sheet of the prepared paper, and the outer or revolving one (connected with a clock) has a small hole in it, through which the light shines on the paper. The axis of the cylinder and the position of the hole is so adjusted, that the hole shall at all times be opposite to the place of the Sun, and may, therefore, be considered as its picture, travelling over the paper; it is found that the muriate of silver with which the paper is covered, takes different tints in proportion to the intensity of the light to which it is exposed, provided that the times of exposure be equal." From the above it would appear that the late Mr. T. B. Jordan is entitled to the credit of inventing "the first Sunshine Recorder" rather than Mr. J. F. Campbell.

WILSON L. FOX.

Falmouth, 25th November, 1909.

THE brief historical sketch of the Sunshine Recorder which I gave in my paper on the Standardization of that instrument, was intended to trace the development of the Campbell-Stokes Recorder—the instrument with which the article is almost exclusively concerned. In a former paper, which may be found in Vol. 24. of the *Quarterly Journal* of the Royal Meteorological Society, I have given a brief description of Mr. T. B. Jordan's instrument, and I added: "This plan appears never to have come into use."

That statement was the result of enquiries I had made in order to ascertain the stage to which the instrument had ever advanced. I could not definitely find that it had ever been actually made; but at any rate, it seemed never to have got beyond the experimental

stage, and I could find no evidence at all that it had been set up for the regular registration of sunshine.

The instrument which Mr. Campbell set up in Whitehall in 1853, was, I believe, the first sunshine recorder ever used for the systematic registration of the duration of sunshine, and "*systematic registration*" was the point I wished to bring out.

Of the priority of Mr Jordan's plan there can, of course, be no doubt; but as will be seen from the quotation given by Mr. Fox from the Report of the Royal Cornwall Polytechnic Society, the instrument was intended "to yield an accurate account of the *intensity of the light for every minute of the day*," and the incidence of direct sunshine was to have been inferred from the tint taken by the paper, through the intensity of the light acting upon the muriate of silver with which the paper was covered. It seems proper, therefore, to classify it rather as an Actinometer than as a Sunshine Recorder; the latter instrument is intended to record *only* the direct rays of the sun, and the difficulty with all photographic sunshine recorders lies in deciding how far weak records have been due to these rays or to the actinic power of diffused light.

R. H. CURTIS.

LOW BAROMETER OF DECEMBER 2nd—3rd, 1909.

I GATHER from the last issue of *Symons's Meteorological Magazine* that the remarkable depression of December 2nd—3rd, 1909, passed unrecorded barometrically at Camden Square.

The following are the standard barometer readings during its progress as recorded here, supplemented by two readings taken from a barograph which was in exact agreement with the standard barometer. The readings are corrected to sea level, and reduced to 32° F. :—

Thursday, Dec. 2nd.	8.30 p.m.....	28.792 inches.
	9. 0 ,,	28.762 ,,
	10. 0 ,,	28.725 ,,
	10.30 ,,	28.699 ,,
	11. 0 ,,	28.673 ,,
	11.30 ,,	28.642 ,,
	12. 0 a.m.	28.611 ,,
Friday, Dec. 3rd.	2. 0 ,,	28.553 ,,
	4. 0 ,,	28.465 ,, (minimum).

E. L. HAWKE, F.R.Met.Soc.

2, Akenside Road, Hampstead, 2nd January, 1910.

SUDDEN THAW ON DECEMBER 22nd.

No doubt you will have many letters about the night of the 21st—22nd. Here the temperature at 7.30 a.m. on the 21st was 25° F., and at 7.30 a.m. on the 22nd it was 51° F.

At 10.30 p.m., 21st, I drove home in a motor, a clear frosty night ;

by 9 a.m., 22nd, '56 in. rain had fallen, and as it could not sink into the ground at all it caused considerable floods.

There was a ball near here that night, and when the guests started to leave none of the motor cars could move, even with Parsons chains, and the people had to wait till morning. This means a very unusual condition of road surface.

J. M. ROGERS, LT.-COL.

Riverhill, Sevenoaks, 23rd December, 1909.

ON COMPENSATION IN WEATHER.

WHEN we have had a great deal of one kind of weather, we naturally look in a vague way for a return of the opposite—a swing of the pendulum in the other direction; but the whole subject of compensation is too obscure at present to afford much help in weather prediction.

There are some facts about our winters that are, I think, interesting in this connection. Taking the Greenwich record (1841-1908), consider all cases of 30 consecutive winters, *i.e.*, the 30 ending in 1871, '72, '73, &c. Ascertain how many mild winters (mean temp. over average) each group had. We find there were either 14, or 15, or 16, or 17. Next, let us ask, What kind of winter came after each group having 14 mild winters, each group having 15, &c? We may measure these following winters by the number of frost days (Dec.-Feb.); the average is 33. Here, then, is the reply, and I characterise winters as m. (mild) or s. (severe).

Groups with 14 m. winters.	15 m. winters.	16 m. winters.	17 m. winters.
5 cases { 5 m. 0 s.	16 cases { 10 m. 5 s. 1 av.	11 cases { 2 m. 9 s.	6 cases { 3 m. 3 s.

We may discern a tendency for the colder groups of 30 (few mild winters) to be followed by mild winters, and the milder groups by severe. Taking the groups with 14 and 15 together, we have 15 mild and 5 severe winters following; and after the groups with 16 and 17, 5 mild and 12 severe winters.

We have now to do with the group ending in 1909, and it had 15 mild winters. I may say that the only very severe winter following such a group previously was the anomalous winter '94-5, with 54 frost days. None of the others were over 38. Thus, if we are guided by these data, an extremely severe winter, at least, would seem rather unlikely in 1909-10.

It is instructive to make out a series of 12 curves from averages of the mean temp. of each month in 30 years ending '70, '71, '72, &c. Certain gradual changes are thus revealed. The case of November is one of the most interesting. Its average temperature curve has been gradually rising on the whole since 1880, *i.e.*, in the 30 Novembers ending with '80. The following figures will give some idea of this rise:—

30 years ending			
1880	.....	42° 39'	°
'85	.....	42° 77'	+·38
'90	.....	43° 13'	+·36
'95	.....	43° 48'	+·35
1900	.....	43° 94'	+·46
'05	.....	44° 05'	+·11
'08	.....	44° 32'	+·27

The mean temp. for Nov. is 43°·21. The further development of this long wave may be watched with interest.

April shows an opposite variation. Its average curve has gone down on the whole since '83. October and December are alike in showing a long descent to '96, and a rise since that date. Thus we see a process of gradual change going on in individual months; but there is no reason to think such change is of a permanent character—compensation comes sooner or later.

ALEX. B. MACDOWALL.

8, Marina Crescent, Folkestone, Dec. 3rd, 1909.

CORRELATIONS OF CLIMATIC CHANGES.

HAVING taken into consideration the yearly mean temperatures of the years 1891 to 1900, and having discarded all doubtful records, I have drawn maps representing the geographical distribution of annual departures from the normal temperatures, the means of ten years' observations being considered as normal values. On these annual maps, I call thermopleions, or simply pleions, the areas occupied by positive departures; antipleions, those of negative departures. The pleions and antipleions are bounded by the quasi-normal line. On this line the departures are *nil*, the values being equal to the ten years' means. The lines of equal positive and negative departures I call hypertherms and hypotherms. The pleions represent inflections of the isotherms toward the pole, or more properly speaking, towards the regions of colder climate. The antipleions, on the contrary, characterize a local abnormal descent of the isotherms toward the equator. The maps of successive years for the same country, and those of different countries for the same year, show remarkable correlations of the distributions of the departures. A pleion, in most cases, exists during several years, moving from place to place. When one compares the different maps, and especially those of European and Asiatic Russia, one is led to believe that the pleions are produced by immense positive and negative waves intercrossing. It seems that for the whole world the years are either too warm or too cold, following the predominance of pleions or antipleions. For example the year 1893 was exceptionally cold, and 1900, on the contrary, was too warm. The temperature of the Earth's atmosphere was at least half a degree centigrade higher during the year 1900 than during 1893. It is a notable fact that neither the Alps, the Caucasus or the Rocky Mountains form barriers;

not even the Himalayas interrupt the progress of a pleion or anti-pleion. This demonstrates the fact that the thermopleions and the antipleions are products of temporary alterations of the general circulation of our atmosphere. A full discussion of the question of which this is but a short summary, is to be found in my memoir, "L'Enchaînement des Variations Climatiques," published recently by the Belgian Astronomical Society. I am working at present on the dynamical problems connected with the results I have already obtained, and hope to be able, in a short time, to propose a method of research by which it will be possible to predict successfully several months in advance the climatic anomalies of the different seasons of the year. In connection with this study I intend to examine the yield of cotton and grain.

HENRYK ARCTOWSKI.

1006, Park Road, Washington, D.C.

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### WEATHER REFERENCES IN OLD PARISH REGISTERS.

ON the remote chance that you may not have seen the little book quoted from, I send you the few extracts relating to weather from "Parish Registers in England" by R. E. Chester Waters, B.A., published by F. J. Roberts in 1883. I also prefix Bishop White Kennett's remarks on entries in registers by the clergy; it may be that in his diocese his remarks were attended to, and that entries of interest relating to weather as well as other matters were entered.

The last remark of the author, "and his palace was blown down," must, I presume, relate to a part of it—as there is considerable part of the old work standing at Wells—unless the author refers to some other palace than that of Wells.

RICHARD COOKE.

*The Croft, Detling, Maidstone.*

Page 69.—"So far from being under any obligation to keep a mere dry record of dates and names, the Parson was encouraged by his Bishop to take pride in making his parish register a *Chronicon mirabile*. That learned prelate, Dr. White Kennett, Bishop of Peterborough (1718-28), took occasion in his charge at his first visitation to say to his clergy:—

"One thing more I would intimate to you that you are not only obliged to enter the day and year of every christening, wedding or burial, but it is left to your discretion to enter down any notable incident of times and seasons especially relating to your own parish and the neighbourhood of it, such as storms and lightning, contagion and mortality, drought, scarcity plenty, longevity, robbery, murders, or the like casualties. . . . You have had precedents of this kind in parochial registers within this diocese, and they have been cited to very good purpose by our worthy brother (Dr. T. Morton), the author of the Natural History of this County of Northampton."—*Lansdowne MSS. in British Museum, No. 957.*

Precedents can be found in different registers of all the subjects enumerated by the Bishop; and I have selected, as examples, entries of the

great snow of 1615 and the drought which followed it, of the scarcity of 1587 and 1621, of the plenty of 1620, the frost of 1684, and the storm of 1703.

“YOULDGRAVE, DERBYSHIRE, 1614-15.—Jan. 16th began the greatest snow which ever fell upon the earth within man's memorye. It cover'd the earth fyve quarters (*sic*) deep upon the playne. And for heapes and drifts of snow, they were very deep, so that passengers, both horse and foot passed over gates, hedges and walls. It fell at ten several times, and the last was the greatest, to the greate admiration and feare of all the land, for it came from the foure p<sup>ts</sup>. of the world, so that all c'ntryes were full, yea, the south p'te as well as these mountaynes. It continued by daily encreasing untill the 12th day of March (without the sight of any earth eyther uppon hilles or valleyes) upon wch daye, beinge the Lorde's day, it began to decrease: and so by little and little consumed and wasted away, till the 28th day of May, for then all the heapes and drifts of snow were consumed, except uppon Kinder-Scout, wch lay to Witson week.

“The name of the Lord be prayed.”

“There fell also ten lesse snowes in April, some a foote deep, some lesse, but none continued long. Uppon Mayday in the morning, instead of fetching in flowers, the youths brought in flakes of snow, which lay above a foot deep uppon the moores and mountayns.”

The great snow was followed by a drought. “1615. There was no rayne fell upon the earth from the 25th day of March till the 2nd day of May and then there was but one shower, after which there fell none tyll the 18th day of June, and then there fell another: after yt there fell none at all till the 4th day of August, after which tyme there was sufficient rayne uppon the earth: so that the greatest pt of this land, especially the south pts, were burnt upp both corne and hay. An ordinary sumer load of hay was at £2, and little or none to be gott for money. This pt of the peake was very sore burnt upp, onely Lankishyre and Cheshyre had rayne ynough all sumer: and both corne and hay sufficient. There was very little rayne fell the last winter but snowe onely.”

“HOLY-ROOD CHURCH, SOUTHAMPTON.—1683-4. This yeare was a great Frost, which began before Christmasse, so that ye 3rd and 4th dayes of this month of February, ye river of Southampton was frossen all over and covered with ice from Calshott Castle to Redbride and Tho: Martaine mar of a vessell went upon ye ice from Berry near Marchwood to Millbrook-point. And ye river at Ichen Ferry was so frossen over that severall persons went from Beauvois-hill to Bittern Farme forwards and backwards.”

“ST. OSWALD'S, DURHAM.—1703. Mem. that on ye 27th Nov. was ye greatest hurricane and storme that ever was knowne in England: many churches and houses were extreamely shattered and thousands of trees blown down: 13 or more of her Maj'tyes men of war were cast away, and above 2000 seamen perished in them. N.B.—The storme came no further north than Yarmouth.”

This is the storm to which Addison alludes in his famous comparison of Marlborough on the battlefield of Blenheim to an angel guiding the whirlwind. No such tempest was ever known in our latitude. It was long remembered as a national calamity, and was the occasion of a public fast, which was solemnly kept by the Queen's proclamation on January 19th, 1704. Amongst other lives which were lost, the Bishop of Bath and Wells was killed in his bed, and his palace blown down.

## REVIEWS.

*A Barometer Manual for the use of Seamen ; with an Appendix on the Thermometer, Hygrometer and Hydrometer.* Issued by the Authority of the Meteorological Committee. Sixth edition, extensively revised. London : printed for H.M. Stationery Office, 1909. Size  $9\frac{1}{2} \times 6$ . Pp. 68. Plates. Price 3d.

*Meteorological Observations at Stations of the Second Order for the year 1906.* With frontispiece map. Published by Authority of the Meteorological Committee. London : printed for H.M. Stationery Office, 1909. Size  $12 \times 10$ . Pp. x. + 162. Price 17s. 6d.

*The Free Atmosphere in the Region of the British Isles.* Contributions to the investigation of the Upper Air, comprising a Report by W. H. DINES B.A., F.R.S., on Apparatus and Methods in use at Pyrtton Hill, with an Introduction and a Note on the Perturbations of the Stratosphere by W. N. SHAW, Sc.D., F.R.S., Director of the Meteorological Office. Published by the Authority of the Meteorological Committee. London : printed for H.M. Stationery Office, 1909. Size  $12 \times 10$ . Pp. iv + 56. Price 2s. 6d.

A GOODLY portion of the work of the Meteorological Office is included in the works cited above. The annual report noticed on p. 144 detailed a vast amount of solid work in connection with the routine of preparing weather reports and forecasts, and also in meteorological research. The re-arrangement of the publications now forming the British Meteorological Year Book is complete, and the Year Book for 1909 will in a few weeks include the Weekly Weather Report, the Monthly Weather Report, the Second Order Observations (the volume of which for 1906 named above completes, we believe, the working up of arrears), and the hourly readings at the four Observatories.

The Barometer Manual has been improved and augmented, the description and charts of the distribution of pressure over the Earth's surface forming the most complete and recent epitome of the groundwork of distributional meteorology which can be procured, and the almost nominal price of this important manual should secure for it a sale amongst students and private meteorological observers as well as amongst the sea-captains for whom it is primarily intended.

The work on the free atmosphere gives a brief summary of the history of upper air investigations, full particulars of the ingenious and effective methods introduced by Mr. Dines for simplifying and improving the accuracy of the observations, and a preliminary discussion of the results of meteorological kite and balloon ascents in the British Isles. It has been considered expedient to use the Absolute scale of temperature in centigrade degrees (*i.e.*,  $-273^{\circ}$  C. =  $0^{\circ}$  A.), and to express the pressure in megadynes per square centimetre, or rather in fractions of that somewhat elephantine unit. We cannot profess to find either comfort or inspiration in these figures, and we venture to think that the majority even of scientific men

would prefer the more familiar units. There is no doubt that a unit which dispenses with the negative sign is an immense convenience (it is the strongest argument for the use of Fahrenheit degrees in the meteorology of an equable climate like ours), but the same reasoning would suggest that a unit which introduces a decimal point into every reading like the megadyne is a step backwards (the one advantage of the millimetre over the inch in rainfall measurement is that whole numbers suffice for all practical purposes). To a certain extent new units assist a new development of science by removing from it old associations which might lead one astray. In Dr. Shaw's concluding paper on the perturbations of the stratosphere he definitely adopts the name of troposphere for the portion of the atmosphere, usually within 11 kilometres (we venture to interpolate 7 miles) of the surface within which temperature falls as height increases, and the name stratosphere for the region above in which the temperature changes little if at all with increase of height, a very much better term than "isothermal layer," which we hope to see no more. He points out that while in the troposphere the temperature layers are stratified like the coats of an onion, in the stratosphere (despite its name) the temperature structure is columnar; but this is modified in a footnote to an "isothermal mass disturbed by an intrusive 'bed' of cold air." The paper gives a mathematical discussion of the perturbations of the stratosphere produced by the passage through the troposphere beneath it of V-shaped depressions which accompany in the upper atmosphere the movement of a cyclone over the surface. It is shown that the passage of a depression produces a horizontal difference of temperature in the stratosphere which retains its "columnar" thermal structure. A horizontal difference of temperature in the stratosphere of  $20^{\circ}$  C. corresponds to a local depression of the boundary of the troposphere of 1.4 miles.

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*L'Enchaînement des Variations Climatiques* (The chain of climatic variations), par Henryk Arctowski. Bruxelles. Société Belge d'Astronomie. 1909. Size  $10 \times 6\frac{1}{2}$ . Pp. vi. + 136.

THIS is a remarkable investigation which appears to point the way to important advances in the interpretation of meteorological phenomena. Attention is being more and more concentrated on the existence of simultaneous changes of climate in opposite directions in distant places. M. Teisserenc de Bort's treatment of action centres, Dr. Shaw's discovery of the coincidences between St. Helena wind force and the rainfall of the south of England, and Sir Norman Lockyer's discussion of the barometric see-saw between opposite regions of the Earth, all deal with facts of the kind, and Mr. Arctowski shows that the relations of temperature are, if possible, even more striking and interesting. One point of his memoir is stated in the letter on "Co-relations of Climate," which we publish in this issue; and the pamphlet itself is so well summarized in a

review by M. F. de Roy in a Belgian journal, that we print the following abstract of a translation of the article which M. Arętowski has been good enough to send us.

The activity of certain phenomena, occurring on the surface of the sun, continually increases or decreases. The eleven-year periods of sunspots is very well known, but there are shorter and longer periods as well, which characterize the variations of the sun's eruptive and electro-magnetic activity, and the quantities of energy radiated through space in the form of heat, vary slightly from year to year, and more considerably in the course of centuries. These far away manifestations are felt on the surface of the Earth, and cause the climatic changes.

If the solar heat acted in a regular and uniform way over the surface of the Earth, seasonal forecasts would be relatively simple, but this is not the case, the atmosphere surrounding the globe moves, the oceans have currents, and icebergs drift from the ice deserts of the poles, these factors, and perhaps others that we are ignorant of, make it impossible to attack the problem in its essence. We must unite a considerable number of observations, and try to draw from the study of the results a general law governing the distributions of climatic changes on the globe, if such a law there be.

These complicated researches have already been approached by several savants—Köppen, Bigelow, Merecki, Otto Pettersson, Gregory, Hann, Dove, and quite recently by Hildebrandsson—but none of them seem to have attacked the question on so large a basis as Dr. Arętowski, the meteorologist of the *Belgica* South Polar Expedition, who has given much time to a very remarkable work, "L'Enchaînement des variations climatiques."

Having discovered in the antarctic regions moraines and other traces of the great ice age, Dr. Arętowski was led to investigate the problem of climatic variations, which, after a preliminary study, proved so interesting that he resolved to start afresh and give himself wholly to this work. As temperature plays an essential part in climatic problems, Dr. Arętowski decided to attack this part of the question first; and, to begin with, the annual means only. He has investigated the question of change of climate from a very large point of view, and, in fact, while all his predecessors have drawn their deductions from fragmentary and widely separated observations, our author decided to unite the known facts in one great whole. At the beginning, Dr. Arętowski saw the impossibility of going very far back, although the thermometrical observations made in Europe give a long and relatively homogeneous series, the same cannot be said of those taken in the other continents, and so in order to be more complete it was impossible to go back farther than 1891, and he considers the ten years, 1891-1900. For these years he gives the annual mean temperatures of nearly all the localities where precise observations have been taken, a herculean labour which necessitated long research among thousands of documents, the writing of hundreds of letters for information, and visits to the great libraries of Paris and London.

His memoir contains the thermometric data already mentioned, divided into 63 tables for 804 stations, of which 490 are in Europe, 97 in Asia, 38 in Africa, 134 in the two Americas, 45 in Australia, and these tables contain more than twenty-thousand figures. For each year and for each station he

takes the departures which exist between the mean annual temperature and the mean normal temperature. On placing these differences, either negative or positive, on maps, and by joining the points which represent the same departures by lines, one sees immediately that the areas where there are excesses or deficiencies of heat do not fall accidentally here and there, following no law, but form vast zones, which Dr. Aręowski calls thermopleions and anti-pleions. He gives more than 150 of these maps, and has found that the temperature of the Earth's atmosphere has been higher during the years 1896 to 1900 than between 1891 to 1895, and that this positive excess for the whole globe is between  $0^{\circ}\cdot 2$  and  $0^{\circ}\cdot 5$  C. ( $0^{\circ}\cdot 4$ — $0^{\circ}\cdot 9$  F.) The displacement of the annual pleions and anti-pleions seems to be very irregular. In certain cases they seem to remain over the same regions during several successive years, then without apparent reason they change their positions. In 1896, '97 and '98, for example, all the north of Europe was covered by a pleion, that is to say, an excess of temperature was registered. In 1899 a notable change took place, the pleion was found on eastern Russia, and Scandinavia was lacking in heat.

There seem to exist, however, real centres from which the variations originate. To know better the mechanism of the formation of pleions, to find the laws governing their displacement, to learn to predict the regions which will be visited by excesses or deficiencies of heat, and where the crops will consequently be inferior or abundant, it is necessary to improve the method of investigation; monthly means of temperature will have to be taken into consideration as well as the atmospheric pressure. Dr. Aręowski aims to do this. He has recently gone to America in order to continue his work at the Weather Bureau in Washington, where there is a great abundance of data to help him in his researches.

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*Bulletin of the Central Observatory of Japan. No. 2. Tokio, 1909.*

Size  $8\frac{1}{2} \times 12$ , pp. 58, one plate.

THIS memoir is composed of five articles on Japanese meteorology, dealing respectively with the local cyclones of Central Japan, the earth temperature of Osaka, the frequency and distribution of graupel, the hourly observations of barometric pressure, and the velocity of falling rain drops. The data utilized are the observations subsequent to 1896, and apparently only a part of these have been completely analysed. The examination of the local cyclones seems to us an investigation of considerable importance; the author introduces the somewhat novel suggestion that the formation of these small depressions is the result of the peculiar configuration of the district in which they originate.

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*The Rains of the Nile Basin and the Nile Flood, 1907 and 1908.* By

CAPT. H. G. LYONS, F.R.S. Cairo, 1909. Size  $7\frac{1}{2} \times 11$ , pp. 60 and 69, plates.

THE annual reports of the Nile Rains and Floods for 1907 and 1908, both published during 1909, are the last of this series issued under

the direction of Captain Lyons, and afford ample testimony of the great advance in our knowledge of the conditions governing the Nile inundations, which has taken place during his energetic administration. The flood of 1907 is described as very weak throughout, but of average date. This was the lowest of a series of poor floods, which had not reached the average since 1898, and now fell as low as 40 per cent. below it. A full though not excessive flood occurred however in 1908, in response to heavier rainfalls in the upper basin, principally in Abyssinia and the plains of the Blue Nile.

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### METEOROLOGICAL NEWS AND NOTES.

A MILD DECEMBER IN SWITZERLAND brought much discomfort in the shape of unseasonable thaws to the throngs who sought the Alps for the enjoyment of winter sports. In the lower parts of the country the mildness was extraordinary, as the following notes show. A correspondent states that at Montreux, 3,200 feet above sea level, heavy rain and a high temperature prevailed from December 21st to 31st, and old residents declared that such a state of things had not occurred in December since 1842. The well known limnologist, M. Delebecque, writes from Geneva that snow and ice had disappeared from the mountains up to 4,000 feet on Christmas Day, and he quotes the following temperature readings at Geneva, as an example of a winter föhn, which in the opinion of sporting visitors "had carried the joke a little too far":—Minimum temperature 39°·0 on December 22nd, 52°·5 on the 23rd; maximum temperature 68°·0 on December 22nd, and 69°·4 on the 23rd; the latter extraordinary warmth occurring at 3.30 a.m.

THE ROYAL METEOROLOGICAL SOCIETY has issued a circular to its Fellows pointing out how desirable it is that the membership of the Society should be substantially increased. The association of persons interested in meteorology in such a Society, which can give collective expression to a wide-spread interest in the science of the area, cannot but be helpful to all concerned, and it will give the Editor of this Magazine much pleasure to hear from any of his readers who are disposed to join the Society.

CAPTAIN R. SCOTT, R.N., C.V.O., has received a grant of £20,000 from the Government towards the expenses of his expedition to the Antarctic regions which is to leave England in the summer of 1910. We understand that the scientific staff will include Dr. G. C. Simpson, of the Indian Meteorological Service, as Physicist and Meteorologist.

DR. H. R. MILL has arranged to lecture for the Gilchrist Educational Trust on "Climate as a bond of union," at Widnes on Monday, February 14th, and on the four following days at Ashton-in-Makerfield, Crompton, Clayton-le-Moors, and Barnoldswick.





## THE RAINFALL MAPS OF THE THAMES VALLEY.

THE rainfall from a considerable number of stations in the middle belt of southern England, which includes the Thames Valley, has been recorded each month on a map published in this Magazine, sometimes without comment, sometimes accompanied by remarks on the conditions of a particular month. The groundwork of the map shows the principal rivers in blue, and the height of the land is indicated in shades of brown. A black dot stands on the position of each station from which a report was received, and lines are drawn limiting the areas within which the rainfall had a particular value. These isohyets are usually drawn for each inch, as in the December map opposite. On this map it is seen that the driest parts were two broad strips, each with less than 3 inches of rain, one lying north-west of the Chiltern and East Anglian Hills, the other south-east of that range and continuing eastward to the sea. Along the Cotteswold Hills there extends an area with more than four inches of rain, and the whole of the south of the Thames valley shows more than four inches also, with a chain of "splashes" of more than five inches. A four-inch area also appears in the extreme north-east of the map. On some of the maps where the differences in rainfall are slight lines are drawn for every half inch. As an example of a uniform distribution of rainfall, we may refer to the map of February, facing p. 21, where but for the half-inch line there would have been practically nothing to draw. The maps of June and July (facing p. 103 and p. 123) illustrate the extreme irregularity produced by the thunderstorm rains of summer; while that of October, the wettest month, facing p. 176, shows the effect of a succession of heavy cyclonic rains along the southern border where the isohyet of eight inches appears in two places. The following Table shows the general rainfall of the Thames Valley for each month, and the difference from the average of 25 years, an average which we may mention is probably below the true average which would be yielded by, say, 35 or 40 years.

| MONTH.<br>1909. | Total Depth.<br>inches. | Difference from Average<br>inches. |
|-----------------|-------------------------|------------------------------------|
| January.....    | ·99                     | — 1·18                             |
| February .....  | ·52                     | — 1·35                             |
| March .....     | 3·50                    | + 1·63                             |
| April .....     | 2·02                    | + ·40                              |
| May .....       | 1·66                    | — ·30                              |
| June.....       | 4·10                    | + 1·94                             |
| July .....      | 2·71                    | + ·48                              |
| August .....    | 2·71                    | + ·30                              |
| September.....  | 3·05                    | + 1·06                             |
| October .....   | 4·89                    | + 1·75                             |
| November.....   | ·76                     | — 1·98                             |
| December .....  | 3·55                    | + 1·06                             |
| YEAR.....       | 30·46                   | + 3·81                             |

## RAINFALL TABLE FOR DECEMBER, 1909.

| STATION.                           | COUNTY.              | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.    |              |
|------------------------------------|----------------------|------------|----------------------|--------------------------------|--------------------------|--------------|
|                                    |                      |            |                      |                                | Aver.<br>1870-99.<br>in. | 1909.<br>in. |
| Camden Square.....                 | London.....          | 51 32      | 0 8                  | 111                            | 2'12                     | 2'79         |
| Tenterden.....                     | Kent.....            | 51 4       | *0 41                | 190                            | 2'74                     | 5'38         |
| West Dean.....                     | Hampshire.....       | 51 3       | 1 38                 | 137                            | 2'74                     | 3'57         |
| Hartley Wintney.....               | ".....               | 51 18      | 0 53                 | 222                            | 2'55                     | 3'24         |
| Hitchin.....                       | Hertfordshire.....   | 51 57      | 0 17                 | 238                            | 2'05                     | 3'13         |
| Winslow (Addington).....           | Buckinghamsh. r.     | 51 58      | 0 53                 | 309                            | 2'27                     | 2'79         |
| Bury St. Edmunds (Westley).....    | Suffolk.....         | 52 15      | *0 40                | 226                            | 2'11                     | 4'19         |
| Brundall.....                      | Norfolk.....         | 52 37      | *1 26                | 66                             | 2'13                     | 4'67         |
| Winterbourne Steepleton.....       | Dorset.....          | 50 42      | 2 31                 | 316                            | 4'13                     | 7'78         |
| Torquay (Cary Green).....          | Devon.....           | 50 28      | 3 32                 | 12                             | 3'46                     | 5'91         |
| Polapit Tamar [Launceston].....    | ".....               | 50 40      | 4 22                 | 315                            | 4'39                     | 5'78         |
| Bath.....                          | Somerset.....        | 51 23      | 2 21                 | 67                             | 2'76                     | 4'49         |
| Stroud (Upfield).....              | Gloucestershire..... | 51 44      | 2 13                 | 226                            | 2'48                     | 4'08         |
| Church Stretton (Wolstaston).....  | Shropshire.....      | 52 35      | 2 48                 | 800                            | 2'92                     | 4'71         |
| Coventry (Kingswood).....          | Warwickshire.....    | 52 24      | 1 30                 | 340                            | 2'44                     | 3'06         |
| Boston.....                        | Lincolnshire.....    | 52 58      | 0 1                  | 25                             | 1'79                     | 3'71         |
| Worksop (Hodsock Priory).....      | Nottinghamshire..... | 53 22      | 1 5                  | 56                             | 2'02                     | 5'25         |
| Derby (Midland Railway).....       | Derbyshire.....      | 52 55      | 1 28                 | 156                            | 2'28                     | 4'35         |
| Bolton (Queen's Park).....         | Lancashire.....      | 53 35      | 2 28                 | 390                            | 4'19                     | 8'33         |
| Wetherby (Ribston Hall).....       | Yorkshire, W. R.     | 53 59      | 1 24                 | 130                            | 2'19                     | 4'24         |
| Arnliffe Vicarage.....             | " " E. R.            | 54 8       | 2 6                  | 732                            | 6'41                     | 9'93         |
| Hull (Pearson Park).....           | " " E. R.            | 53 45      | 0 20                 | 6                              | 2'36                     | 4'56         |
| Newcastle (Town Moor).....         | Northumberland.....  | 54 59      | 1 38                 | 201                            | 2'64                     | 4'09         |
| Borrowdale (Seathwaite).....       | Cumberland.....      | 54 30      | 3 10                 | 423                            | 14'70                    | 18'88        |
| Cardiff (Ely).....                 | Glamorgan.....       | 51 29      | 3 13                 | 53                             | 4'43                     | 7'66         |
| Haverford west (High Street).....  | Pembroke.....        | 51 48      | 4 58                 | 95                             | 5'22                     | 6'50         |
| Aberystwyth (Gogerddan).....       | Cardigan.....        | 52 26      | 4 1                  | 83                             | 4'49                     | 6'36         |
| Llandudno.....                     | Carnarvon.....       | 53 20      | 3 50                 | 72                             | 2'95                     | 4'22         |
| Cargen [Dumries].....              | Kirkcudbright.....   | 55 2       | 3 37                 | 80                             | 4'68                     | 7'46         |
| Hawick (Branxholme).....           | Roxburgh.....        | 55 24      | 2 51                 | 457                            | 3'54                     | 3'37         |
| Edinburgh (Royal Observatory)..... | Midlothian.....      | 55 55      | 3 11                 | 442                            | ...                      | 2'87         |
| Girvan (Pinmore).....              | Ayr.....             | 55 10      | 4 49                 | 207                            | 5'24                     | 6'35         |
| Glasgow (Queen's Park).....        | Renfrew.....         | 55 53      | 4 18                 | 144                            | 3'53                     | 4'60         |
| Inveraray (Newtown).....           | Argyll.....          | 56 14      | 5 4                  | 17                             | 7'37                     | 10'81        |
| Mull (Quinish).....                | ".....               | 56 36      | 6 13                 | 35                             | 6'48                     | 5'49         |
| Dundee (Eastern Necropolis).....   | Forfar.....          | 56 28      | 2 57                 | 199                            | 2'73                     | 2'85         |
| Braemar.....                       | Aberdeen.....        | 57 0       | 3 24                 | 1114                           | 3'15                     | 2'62         |
| Aberdeen (Cranford).....           | ".....               | 57 8       | 2 7                  | 120                            | 3'39                     | 4'95         |
| Cawdor.....                        | Nairn.....           | 57 31      | 3 57                 | 250                            | 2'53                     | 1'74         |
| Fort Augustus (S. Benedict's)..... | E. Inverness.....    | 57 9       | 4 41                 | 68                             | 5'13                     | 3'39         |
| Loch Torridon (Bendaniph).....     | W. Ross.....         | 57 32      | 5 32                 | 20                             | 9'04                     | 6'76         |
| Dunrobin Castle.....               | Sutherland.....      | 57 59      | 3 56                 | 14                             | 3'39                     | 2'73         |
| Castletown.....                    | Cairness.....        | 58 35      | 3 23                 | 100                            | ...                      | 3'94         |
| Killarney (District Asylum).....   | Kerry.....           | 52 4       | 9 31                 | 178                            | 6'64                     | 5'21         |
| Waterford (Brook Lodge).....       | Waterford.....       | 52 15      | 7 7                  | 104                            | 4'31                     | 5'10         |
| Broadford (Hurdlestown).....       | Clare.....           | 52 48      | 8 38                 | 167                            | 3'37                     | 4'60         |
| Abbey Leix (Blandsfort).....       | Queen's County.....  | 52 56      | 7 17                 | 532                            | 3'48                     | 3'58         |
| Dublin (Fitz William Square).....  | Dublin.....          | 53 21      | 6 14                 | 54                             | 2'39                     | 4'41         |
| Mullingar (Belvedere).....         | Westmeath.....       | 53 29      | 7 22                 | 367                            | 3'45                     | 4'40         |
| Ballinasloe.....                   | Galway.....          | 53 20      | 8 15                 | 160                            | 3'63                     | 4'07         |
| Crossmolina (Ennisceoe).....       | Mayo.....            | 54 4       | 9 18                 | 74                             | 5'81                     | 6'29         |
| Collooney (Markree Obsy.).....     | Sligo.....           | 54 11      | 8 27                 | 127                            | 4'19                     | 4'42         |
| Seaforde.....                      | Down.....            | 54 19      | 5 50                 | 180                            | 3'64                     | 4'55         |
| Londonderry (Creggan Res.).....    | Londonderry.....     | 54 59      | 7 19                 | 320                            | 4'31                     | 4'31         |
| Omagh (Edenfel).....               | Tyrone.....          | 54 36      | 7 18                 | 280                            | 3'77                     | 4'04         |

RAINFALL TABLE FOR DECEMBER, 1909—continued.

| RAINFALL OF MONTH (con.) |          |                   |        |             | RAINFALL FROM JAN. 1. |           |                      |          | Mean Annual 1870-1899. | STATION.           |
|--------------------------|----------|-------------------|--------|-------------|-----------------------|-----------|----------------------|----------|------------------------|--------------------|
| Diff. from Av. in.       | % of Av. | Max. in 24 hours. |        | No. of Days | Aver. 1870-99. in.    | 1909. in. | Diff. from Aver. in. | % of Av. |                        |                    |
|                          |          | in.               | Date.  |             |                       |           |                      |          |                        |                    |
| + .67                    | 132      | .44               | 2      | 24          | 25.16                 | 26.75     | +1.59                | 106      | 25.16                  | Camden Square      |
| +2.64                    | 196      | 1.11              | 21     | 23          | 28.36                 | 32.84     | +4.48                | 116      | 28.36                  | Tenterden          |
| + .83                    | 130      | 1.48              | 21     | 20          | 29.93                 | 33.25     | +3.32                | 111      | 29.93                  | West Dean          |
| + .69                    | 127      | .70               | 21     | 18          | 27.10                 | 29.81     | +2.71                | 110      | 27.10                  | Hartley Wintney    |
| +1.08                    | 153      | .49               | 21     | 22          | 24.66                 | 28.81     | +4.15                | 117      | 24.66                  | Hitchin            |
| + .52                    | 123      | .44               | 21     | 21          | 26.75                 | 26.56     | — .19                | 99       | 26.75                  | Addington          |
| +2.08                    | 199      | .60               | 2      | 22          | 25.39                 | 28.00     | +2.61                | 110      | 25.39                  | Westley            |
| +2.54                    | 219      | .56               | 10     | 20          | 25.40                 | 25.13     | — .27                | 99       | 25.40                  | Brundall           |
| +3.65                    | 198      | 1.53              | 21     | 25          | 39.00                 | 43.82     | +4.82                | 112      | 39.00                  | Winterbourne Stptn |
| +2.45                    | 171      | 2.02              | 21     | 21          | 35.00                 | 33.78     | —1.22                | 97       | 35.00                  | Torquay            |
| +1.39                    | 132      | 1.20              | 21     | 24          | 38.85                 | 36.07     | —2.78                | 93       | 38.85                  | Polapit Tamar      |
| +1.73                    | 163      | .93               | 2      | 23          | 30.75                 | 29.98     | — .77                | 98       | 30.75                  | Bath               |
| +1.60                    | 165      | .94               | 21     | 24          | 29.85                 | 30.26     | + .41                | 101      | 29.85                  | Stroud             |
| +1.79                    | 161      | 1.12              | 2      | 23          | 33.04                 | 31.19     | —1.85                | 94       | 33.04                  | Wolstaston         |
| + .62                    | 125      | .66               | 2, 21  | 18          | 29.21                 | 26.40     | —2.81                | 90       | 29.21                  | Coventry           |
| +1.92                    | 207      | .53               | 21     | 22          | 23.30                 | 26.86     | +3.56                | 115      | 23.30                  | Boston             |
| +3.23                    | 260      | .91               | 21     | 25          | 24.70                 | 27.83     | +3.13                | 113      | 24.70                  | Hodssock Priory    |
| +2.07                    | 190      | .74               | 2      | 27          | 26.18                 | 26.71     | + .53                | 102      | 26.18                  | Derby              |
| +4.14                    | 199      | 1.55              | 2      | 25          | 42.43                 | 49.05     | +6.62                | 116      | 42.43                  | Bolton             |
| +2.05                    | 193      | .85               | 2      | 22          | 26.96                 | 28.87     | +1.91                | 107      | 26.96                  | Ribston Hall       |
| +3.52                    | 155      | 1.76              | 2      | 23          | 60.96                 | 70.03     | +9.07                | 115      | 60.96                  | Arnccliffe Vic.    |
| +2.20                    | 193      | .83               | 21     | 22          | 27.02                 | 30.83     | +3.81                | 114      | 27.02                  | Hull               |
| +1.45                    | 155      | 1.26              | 6      | 18          | 27.99                 | 29.78     | +1.79                | 106      | 27.99                  | Newcastle          |
| +4.18                    | 128      | 4.61              | 9      | 23          | 132.68                | 128.62    | —4.06                | 97       | 132.68                 | Seathwaite         |
| +3.23                    | 173      | 1.37              | 21     | 23          | 42.81                 | 40.20     | —2.61                | 94       | 42.81                  | Cardiff            |
| +1.28                    | 124      | 1.10              | 10, 21 | 22          | 47.88                 | 41.23     | —6.65                | 86       | 47.88                  | Haverfordwest      |
| +1.87                    | 142      | 1.11              | 10     | 24          | 45.41                 | 43.75     | —1.66                | 96       | 45.41                  | Gogerddan          |
| +1.27                    | 143      | .78               | 2      | 22          | 30.98                 | 31.89     | + .91                | 103      | 30.98                  | Llandudno          |
| +2.78                    | 159      | 1.76              | 9      | 13          | 43.43                 | 52.65     | +9.22                | 121      | 43.43                  | Cargen             |
| — .17                    | 95       | .82               | 2      | 16          | 34.80                 | 33.25     | —1.55                | 96       | 34.80                  | Branxholme         |
| ...                      | ...      | .64               | 2      | 16          | ...                   | 29.57     | ...                  | ...      | ...                    | Edinburgh          |
| +1.11                    | 121      | 1.70              | 10     | 23          | 48.87                 | 50.58     | +1.71                | 103      | 48.87                  | Girvan             |
| +1.07                    | 130      | .87               | 9      | 15          | 35.80                 | 38.26     | +2.46                | 107      | 35.80                  | Glasgow            |
| +3.44                    | 147      | 3.31              | 9      | 21          | 62.80                 | 68.45     | +5.65                | 109      | 62.80                  | Inveraray          |
| — .99                    | 85       | 1.39              | 9      | 18          | 57.53                 | 49.46     | —8.07                | 86       | 57.53                  | Quinish            |
| + .12                    | 104      | .67               | 2      | 21          | 28.95                 | 26.31     | —2.64                | 91       | 28.95                  | Dundee             |
| — .53                    | 83       | ...               | ...    | ...         | 36.07                 | 30.70     | —5.37                | 85       | 36.07                  | Braemar            |
| +1.56                    | 146      | 1.80              | 11     | 18          | 33.01                 | 33.36     | + .35                | 101      | 33.01                  | Aberdeen           |
| — .79                    | 69       | .42               | 10     | 8           | 29.37                 | 28.69     | — .68                | 98       | 29.37                  | Cawdor             |
| —1.74                    | 66       | .88               | 9      | 21          | 43.71                 | 37.44     | —6.27                | 86       | 43.71                  | Fort Augustus      |
| —2.28                    | 75       | 2.19              | 9      | 22          | 86.50                 | 75.69     | —10.81               | 87       | 86.50                  | Bendauph           |
| — .66                    | 81       | .60               | 3      | 15          | 31.60                 | 31.45     | — .15                | 100      | 31.60                  | Dunrobin Castle    |
| ...                      | ...      | .58               | 18     | 28          | ...                   | 37.29     | ...                  | ...      | ...                    | Castletown         |
| —1.43                    | 78       | .79               | 2      | 25          | 58.11                 | 43.39     | —14.72               | 75       | 58.11                  | Killarney          |
| + .79                    | 118      | 1.61              | 21     | 23          | 39.30                 | 36.67     | —2.63                | 93       | 39.30                  | Waterford          |
| +1.23                    | 137      | .60               | 2      | 23          | 33.47                 | 40.06     | +6.59                | 120      | 33.47                  | Hurdlestown        |
| + .10                    | 103      | 1.00              | 2      | 16          | 35.19                 | 36.33     | +1.14                | 103      | 35.19                  | Abbey Leix         |
| +2.02                    | 185      | 1.03              | 5      | 21          | 27.75                 | 26.94     | — .81                | 97       | 27.75                  | Dublin             |
| + .95                    | 128      | .70               | 27     | 13          | 36.48                 | 34.66     | —1.82                | 95       | 36.48                  | Mullingar.         |
| + .44                    | 112      | .80               | 2      | 21          | 37.04                 | 31.67     | —5.37                | 86       | 37.04                  | Ballinasloe        |
| + .48                    | 108      | 1.13              | 2      | 23          | 50.50                 | 49.64     | — .86                | 98       | 50.50                  | Enniscoe           |
| + .23                    | 105      | 1.00              | 2      | 23          | 41.83                 | 40.72     | —1.11                | 97       | 41.83                  | Markree Obsy.      |
| + .91                    | 125      | .91               | 2      | 20          | 38.61                 | 38.66     | + .05                | 100      | 38.61                  | Seaforde           |
| .00                      | 100      | .73               | 2      | 22          | 41.20                 | 43.27     | +2.07                | 105      | 41.20                  | Londonderry        |
| + .27                    | 107      | .77               | 2      | 21          | 37.85                 | 37.76     | — .09                | 100      | 37.85                  | Omagh              |

## SUPPLEMENTARY RAINFALL, DECEMBER, 1909.

| Div.  | STATION.                     | Rain<br>inches | Div.   | STATION.                     | Rain.<br>inches |
|-------|------------------------------|----------------|--------|------------------------------|-----------------|
| II.   | Warlingham, Redvers Road     | 4·44           | XI.    | Rhayader, Tyrmynydd .....    | 9·36            |
| „     | Ramsgate .....               | 3·91           | „      | Lake Vyrnwy .....            | 9·01            |
| „     | Steyning .....               | 6·15           | „      | Llangyhanfal, Plâs Draw....  | 4·70            |
| „     | Hailsham .....               | 6·11           | „      | Dolgelly Bryntirion .....    | 7·60            |
| „     | Totland Bay, Aston House.    | 3·91           | „      | Snowdon, Cwm Dyli .....      | ...             |
| „     | Stockbridge, Ashley .....    | 3·92           | „      | Lligwy .....                 | 4·86            |
| „     | Grayshott .....              | 4·96           | „      | Douglas, Woodville .....     | 6·92            |
| „     | Reading, Calcot Place.....   | 2·95           | XII.   | Stoneykirk, Ardwell House    | 5·30            |
| III.  | Harrow Weald, Hill House.    | 2·79           | „      | Dalry, The Old Garroch ...   | 8·93            |
| „     | Oxford, Magdalen College...  | 2·88           | „      | Langholm, Drove Road.....    | 6·56            |
| „     | Pitsford, Sedgebrook .....   | 3·78           | „      | Moniaive, Maxwellton House   | 6·58            |
| „     | Huntingdon, Brampton.....    | 3·27           | XIII.  | N. Esk Reservoir [Penicuick] | 4·00            |
| „     | Woburn, Milton Bryant.....   | 2·90           | XIV.   | Snowdon, Knockdon Farm..     | 4·60            |
| „     | Wisbech, Monica Road.....    | 3·47           | XV.    | Campbeltown, Witchburn...    | 5·47            |
| IV.   | Southend Water Works.....    | 2·89           | „      | Glenreadell Mains.....       | ...             |
| „     | Colchester, Lexden.....      | 3·81           | „      | Ballahulish House.....       | ...             |
| „     | Newport .....                | 3·54           | „      | Islay, Eallabus .....        | 4·43            |
| „     | Rendlesham .....             | 4·29           | XVI.   | Dollar Academy .....         | 5·96            |
| „     | Swaffham .....               | 4·52           | „      | Loch Leven Sluice .....      | 5·35            |
| „     | Blakeney .....               | 4·11           | „      | Balquhidder, Stronvar .....  | 7·44            |
| V.    | Bishops Cannings .....       | 4·13           | „      | Perth, The Museum .....      | 3·36            |
| „     | Ashburton, Druid House ...   | 8·38           | „      | Coupar Angus .....           | 3·12            |
| „     | Honiton, Combe Raleigh ..    | 5·45           | „      | Blair Atholl.....            | 2·33            |
| „     | Okehampton, Oaklands.....    | 7·17           | „      | Montrose, Sunnyside Asylum   | 3·31            |
| „     | Hartland Abbey .....         | 5·35           | XVII.  | Alford, Lynturk Manse ...    | 3·04            |
| „     | Lynmouth, Rock House ...     | 6·49           | „      | Keith Station .....          | 3·12            |
| „     | Probus, Lamellyn .....       | 5·76           | XVIII. | N. Uist, Lochmaddy .....     | 4·48            |
| „     | North Cadbury Rectory ...    | 4·56           | „      | Alvey Manse .....            | 1·79            |
| VI.   | Clifton, Pembroke Road ...   | 5·25           | „      | Loch Ness, Drumnadrochit.    | 2·08            |
| „     | Ross, The Graig .....        | 4·78           | „      | Glencarron Lodge .....       | 6·21            |
| „     | Shifnal, Hatton Grange.....  | 4·49           | „      | Fearn, Lower Pitkerrie.....  | 1·65            |
| „     | Blockley, Upton Wold .....   | 3·78           | XIX.   | Invershin .....              | 1·89            |
| „     | Worcester, Boughton Park.    | 3·83           | „      | Altnaharra .....             | 3·44            |
| VII.  | Market Overton .....         | 4·64           | „      | Bettyhill .....              | 3·40            |
| „     | Market Rasen .....           | ...            | XX.    | Dunmanway, The Rectory..     | 7·41            |
| „     | Bawtry, Hesley Hall.....     | 4·62           | „      | Cork .....                   | 3·49            |
| „     | Buxton.....                  | 9·98           | „      | Mitchelstown Castle .....    | 4·49            |
| VIII. | Neston, Hinderton Lodge...   | 5·26           | „      | Darrynane Abbey .....        | 6·04            |
| „     | Southport, Hesketh Park...   | 5·94           | „      | Glenam [Clonmel] .....       | 4·99            |
| „     | Chatburn, Middlewood .....   | 6·57           | „      | Nenagh, Traverstown.....     | 4·67            |
| „     | Cartmel, Flookburgh .....    | 7·50           | „      | Miltown Malbay.....          | 4·41            |
| IX.   | Langsett Moor, Up. Midhope   | 7·82           | XI.    | Gorey, Courtown House ...    | 5·50            |
| „     | Scarborough, Scalby .....    | 5·29           | „      | Moynalty, Westland .....     | 6·02            |
| „     | Ingleby Greenhow .....       | 4·46           | „      | Athlone, Twyford .....       | 3·83            |
| „     | Mickleton.....               | 3·22           | XXII.  | Woodlawn .....               | 4·06            |
| X.    | Bardon Mill, Beltingham ...  | 3·75           | „      | Westport, St. Helens .....   | 4·02            |
| „     | Ewesley, Font Reservoir ...  | 3·04           | „      | Mohill .....                 | 4·51            |
| „     | Ilderton, Lilburn Cottage... | 3·12           | XXIII. | Enniskillen, Portora .....   | ...             |
| „     | Keswick, The Bank .....      | 8·43           | „      | Dartrey [Cootehill].....     | 4·30            |
| XI.   | Llanfrechfa Grange.....      | 8·56           | „      | Warrenpoint, Manor House     | 4·87            |
| „     | Treherbert, Tyn-y-waun ...   | 17·12          | „      | Banbridge, Milltown .....    | 2·69            |
| „     | Carmarthen, The Friary.....  | 8·88           | „      | Belfast, Springfield .....   | 4·07            |
| „     | Castle Malgwyn [Llechryd].   | 6·19           | „      | Bushmills, Dundarave .....   | 3·05            |
| „     | Plynlimon.....               | 16·20          | „      | Sion House .....             | 4·24            |
| „     | Crickhowell, Ffordlas.....   | 8·90           | „      | Killybegs .....              | 5·65            |
| „     | New Radnor, Ednol .....      | 7·67           | „      | Horn Head .....              | 4·84            |

## METEOROLOGICAL NOTES ON DECEMBER, 1909.

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 or overcast skies with frequent but not heavy R prevailed almost throughout the month. Violent squalls from W. and S.W. occurred in the night of the 2nd—3rd. Duration of sunshine, 30·0\* hours, and of R 64·1 hours. Mean temp. 40·5 or 1·3 above the average. Shade max. 53·7 on 22nd; min. 23·2 on 21st. F 12, f 23.

TENTERDEN.—The wettest December since 1876. A violent gale occurred on the night of 2nd—3rd. Duration of sunshine, 54·6† hours. Shade max. 53·0 on 22nd; min. 22·5 on 21st. F 12, f 19.

TOTLAND BAY.—Duration of sunshine, 74·5\* hours, and the greatest amount ever registered in December. Shade max. 52·3 on 2nd; min. 26·2 on 21st. F 4, f 23.

PITSFORD.—R 1·66 in. above the average. Mean temp. 38·1. Shade max. 51·6 on 27th; min. 20·1 on 22nd. F 13.

WINTERBOURNE STEEPLTON.—R greater than in any December during the previous 16 years. Shade max. 51·8 on 26th; min. 18·1 on 21st. F 15, f 19.

NORTH CADBURY.—Temp. was slightly below, but wind movement slightly above, normal. A month of remarkable changes in which the bar. range was very large and its oscillations many and great. Shade max. 54·0 on 23rd; min. 22·5 on 21st. F 10, f 19.

ROSS.—Shade max. 54·8 on 28th; min. 19·4 on 21st. F 10, f 21.

HODSOCK PRIORY.—The wettest December since 1876. S on 19th and 20th to a depth of 8 inches. Between 5 and 6 p.m. on 21st a temp. of  $-4^{\circ}5$  was recorded on the S, but it had risen to  $32^{\circ}$  by midnight.. Shade max. 53·9 on 27th; min. 2·9 on 22nd. F 12, f 23.

SOUTHPORT.—R 2·96 in. above the average of 35 years, and the greatest amount recorded in December in 39 years. Duration of sunshine 42·8\* hours, or 10·9 hours above the average. Duration of R 117·2 hours. Mean temp. 39·4. The land to E. and S.E., for several miles, was almost covered by a single sheet of water. Shade max. 52·2 on 10th and 28th; min. 18·0 on 21st. F 10, f 18.

HULL.—Changeable with heavy R. Gales on 3rd and 22nd. Duration of sunshine, 10·4\* hours. Shade max. 53·0 on 28th; min. 12·0 on 21st. F 13, f 19.

HAVERFORDWEST.—Duration of sunshine 64·8\* hours. Shade max. 55·4 on 3rd; min. 18·8 on 21st.

LLANDUDNO.—Shade max. 55·2 on 10th and 28th; min. 26·2 on 21st. F 4.

DOUGLAS.—Exceedingly wild, stormy month with heavy R and S, alternating with brilliantly fine, frosty days. Temp. for the most part was considerably below the mean and there was more fog than usual.

CARGEN.—The weather was marked by constant and violent changes of temp., bar., and wind pressure. The land was much flooded during last week. Shade max. 53·0 on 11th; min. 19·0 on 8th and 21st. F 13.

EDINBURGH.—Shade max. 54·9 on 10th; min. 21·9 on 7th. F 12, f 20.

COUPAR ANGUS.—Shade max. 52·0 on 10th; min. 13·0 on 7th. F 5.

FORT AUGUSTUS.—Shade max. 51·0 on 10th; min. 11·5 on 19th. F 19.

WATERFORD.—Shade max. 52·5 on 2nd; min. 19·0 on 21st. F 12.

DUBLIN.—The heaviest December R since 1876. Mean temp. 41·4 or 0·5 below the average. Shade max. 56·3 on 10th; min. 19·5 on 21st. F 19, f 14.

MARKREE.—Shade max. 57·0 on 27th; min. 16·5 on 21st. F 16, f 23.

SION MILLS.—Shade max. 50·0 on 10th and 27th.; min. 13·0 on 20th. F 16, f 22.

\* Campbell-Stokes.

† Jordan.

## Climatological Table for the British Empire, July, 1909.

| STATIONS.<br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                |            |       |                 |
| London, Camden Square                                            | 77·6      | 18    | 44·1     | 1     | 70·4     | 53·1 | 53·3       | 77        | 128·9        | 40·3           | 3·49       | 18    | 7·1             |
| Malta ... ..                                                     | 91·4      | 27    | 64·0     | 15    | 80·0     | 69·1 | 63·9       | 70        | 145·0        | ...            | ·00        | 10    | 1·4             |
| Lagos ... ..                                                     | 85·2      | 19    | 71·0     | 25    | 82·7     | 74·1 | 73·7       | 82        | 155·0        | 69·0           | 5·63       | 18    | 8·5             |
| Cape Town ... ..                                                 | 79·4      | 21    | 35·7     | 19    | 67·4     | 46·9 | 47·0       | 75        | ...          | ...            | 2·41       | 8     | 4·5             |
| Durban, Natal ... ..                                             | 85·5      | 27    | 46·8     | 29    | 74·8     | 54·6 | ...        | ...       | 132·2        | ...            | 1·81       | 5     | ...             |
| Johannesburg ... ..                                              | 67·4      | 27    | 28·0     | 29    | 60·1     | 41·8 | 35·8       | 63        | 117·2        | 26·9           | ·39        | 1     | 2·2             |
| Mauritius ... ..                                                 | 76·4      | 4     | 54·7     | 29    | 75·0     | 62·0 | 61·7       | 80        | 147·4        | 46·2           | 8·01       | 23    | 6·7             |
| Calcutta... ..                                                   | 92·3      | 6     | 76·4     | 22    | 88·5     | 78·3 | 77·7       | 87        | 158·6        | 75·5           | 9·94       | 23    | 8·5             |
| Bombay... ..                                                     | 86·8      | 3     | 75·3     | 17    | 83·4     | 77·1 | 76·3       | 88        | 125·7        | 73·8           | 31·37      | 30    | 9·3             |
| Madras ... ..                                                    | 102·2     | 18    | 71·7     | 23    | 94·7     | 77·5 | 73·2       | 74        | 142·2        | 70·3           | 4·86       | 16    | 6·8             |
| Kodaikanal ... ..                                                | 66·6      | 19    | 48·9     | 18    | 62·0     | 52·1 | 51·0       | 84        | 134·1        | 40·0           | 3·49       | 19    | 8·1             |
| Colombo, Ceylon ... ..                                           | 86·3      | 21    | 70·6     | 4     | 84·9     | 75·6 | 74·2       | 82        | 158·0        | 72·0           | 10·32      | 24    | 7·4             |
| Hongkong ... ..                                                  | 90·5      | 30    | 74·3     | 15    | 86·5     | 78·2 | 75·8       | 82        | 144·5        | ...            | 12·83      | 22    | 7·0             |
| Melbourne ... ..                                                 | 59·9      | 25    | 33·3     | 13    | 54·1     | 41·2 | 40·6       | 77        | 100·0        | 28·2           | 1·20       | 17    | 6·8             |
| Adelaide ... ..                                                  | 61·0      | 5     | 34·9     | 2     | 56·7     | 42·9 | 44·0       | 83        | 129·1        | 26·0           | 3·51       | 22    | 6·7             |
| Coolgardie ... ..                                                | 70·0      | 31    | 32·0     | 18    | 59·5     | 37·7 | 37·6       | 66        | 132·2        | 27·0           | ·78        | 7     | 2·5             |
| Perth ... ..                                                     | 67·9      | 22    | 39·8     | 18    | 61·9     | 45·1 | 45·6       | 75        | 119·5        | 33·8           | 4·98       | 16    | 5·3             |
| Sydney ... ..                                                    | 66·1      | 25    | 38·9     | 18    | 57·9     | 43·9 | 39·9       | 76        | 106·3        | 26·0           | ·83        | 21    | 4·0             |
| Wellington ... ..                                                | 61·8      | 21    | 35·0     | 15    | 52·8     | 45·7 | 40·2       | 67        | 100·0        | 28·0           | 6·45       | 23    | 8·0             |
| Auckland ... ..                                                  | 62·0      | 5, 7  | 42·0     | 13    | 58·4     | 49·2 | 50·7       | 89        | 112·0        | 38·0           | 5·32       | 20    | 6·4             |
| Jamaica, Kingston ... ..                                         | 92·9      | 12    | 70·0     | 13    | 89·5     | 73·0 | 72·3       | 78        | ...          | ...            | 1·60       | ...   | 3·6             |
| Trinidad ... ..                                                  | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...        | ...   | ...             |
| Grenada ... ..                                                   | 36·0      | 4, 7  | 72·0     | 30    | 83·8     | 74·8 | 70·9       | 78        | 136·2        | ...            | 12·42      | 28    | 4·5             |
| Toronto ... ..                                                   | 86·9      | 8     | 47·6     | 4     | 77·9     | 57·5 | ...        | ...       | ...          | ...            | 3·47       | 16    | 4·1             |
| Fredericton ... ..                                               | 88·0      | 28    | 44·4     | 5     | 75·4     | 54·7 | ...        | 76        | ...          | ...            | 3·00       | 14    | 5·8             |
| St. John's, N.B. ... ..                                          | 80·2      | 14    | 48·7     | 8     | 67·5     | 54·1 | ...        | ...       | ...          | ...            | 2·61       | 14    | 5·5             |
| Victoria, B.C. ... ..                                            | 78·0      | 2     | 44·9     | 2     | 67·6     | 51·6 | ...        | 75        | ...          | ...            | ·92        | 7     | 4·0             |
| Dawson ... ..                                                    | 83·0      | 10    | 37·0     | 21    | 72·6     | 48·3 | ...        | ...       | ...          | ...            | 2·10       | 14    | 5·7             |

MALTA.—Mean temp. of air 74°·3. Average bright sunshine 12·8 hours per day.

Johannesburg.—Bright sunshine 264·2 hours.

Mauritius.—Mean temp. of air 0°·6, of dew point 2°·3, and R 5·77 in., above averages. Mean hourly velocity of wind 9·4 miles or 2·6 below average.

KODAIKANAL.—Bright sunshine 102 hours.

COLOMBO.—Mean temp. of air 78°·0 or 2°·5 below, of dew point 0°·8 above, and R 5·71 in. above, averages. Mean hourly velocity of wind 6·8 miles.

HONGKONG.—Mean temp. of air 81°·9. Bright sunshine 252 hours. Mean hourly velocity of wind 14·1 miles.

Melbourne.—Mean temp. of air 0°·9 below, and R ·65 in. below, averages.

Adelaide.—Mean temp. of air 1°·7 below, and R ·94 in. above, averages.

Perth.—Rainfall 1·90 in. below average.

Sydney.—Mean temp. of air 1°·4 below, and R 3·71 in. below, averages.

Wellington.—Bright sunshine 91·6 hours. T and L on the 29th.