

{[Photograph by The Editor.]

THE CHASM OF THE VICTORIA FALLS OF THE ZAMBESI
SHOWING THE RIVER AT A MINIMUM TOWARDS THE END
OF THE DRY SEASON, ON 12TH SEPTEMBER, 1905. IN THE
WET SEASON THE ENORMOUS VOLUME OF WATER WOULD
MAKE IT IMPOSSIBLE TO OBTAIN SUCH A VIEW ON ACCOUNT
OF SPRAY, OR TO REACH THE STANDPOINT FROM WHICH IT
WAS TAKEN. THE CHASM IS 400 FT. DEEP AND A MILE LONG.

SYMONS'S
METEOROLOGICAL
MAGAZINE.

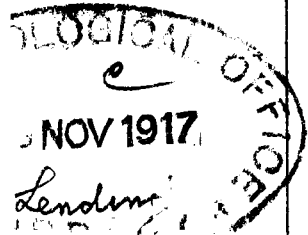
Edited by HUGH ROBERT MILL, D.Sc., LL.D.

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Symons's Meteorological Magazine.

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FEBRUARY, 1905.

VOL. XL.

OUR NEW VOLUME.

THE commencement of the fortieth annual volume of a magazine devoted to any branch of science is an occasion of some interest, not diminished by the fact that the magazine really began under a different name three years before the issue of the first number bearing its present title. Mr. Symons issued his first "Monthly Rainfall Circular" of 2 pp. in 1863, increased its size to 4 pp. in 1865, and developed it into "Symons's Meteorological Magazine" in 1866, though the transition was less abrupt than might be supposed, for the Magazine at first consisted of only eight pages. In 1868 the number of pages was increased to sixteen, and this remained the minimum until in 1904 it was increased to twenty pages.

The Magazine has always been an organ of independent opinion and impartial information regarding the progress of the scientific study of the atmosphere. We believe that it fills a useful if unobtrusive place by the punctual publication of meteorological news, and by affording a common meeting ground for the amateur observer and the scientific student. The climatology of the United Kingdom and of the British Dominions beyond the Sea has always been a special feature, though the world-wide interests of meteorology are not neglected. We believe that the utility and interest of the Magazine will still increase, and that the greater attention now being paid to meteorology in English-speaking countries will bring more contributions to our pages alike from observers and students.

Not the least interesting fact about the publications of the British Rainfall Organization is that, though in recent years there have been three changes in editorship, continuity has been preserved unbroken—the same publisher and the same printer having continued to issue them during the forty-five years of their existence. How great the services of a printer can be when his heart is in his work none but

an editor can understand, and on the occasion of the commencement of this volume, we have asked our esteemed friend and printer, Mr. Shield, to contribute a few words of reminiscence.

I became acquainted with Mr. Symons in the year 1858, on the occasion of his reading a paper to the Young Men's Association connected with the Presbyterian Church in Chelsea, of which I was a member. The exact title of his paper I am unable to verify, but it contained some interesting particulars in connection with Rainfall, and I think it is not improbable that it formed the basis of the treatise which he subsequently published under the title of "Rain: How, When, Where, and Why it is Measured." The acquaintance then formed with Mr. Symons ripened into friendship, and in 1860 he entrusted me with the printing of his first leaflet of rainfall statistics from 168 stations in England and Wales. Under his able and painstaking editorial guidance, the little leaflet gradually expanded into the annual volume of "British Rainfall," with returns from 3400 stations in every part of the United Kingdom; and it has been my pleasure to take a humble but necessary part in the production of every annual volume.

The *Meteorological Magazine* was started in 1866, and in conducting it Mr. Symons was an ideal editor from a printer's point of view—his copy was always supplied in good time; he had a keen eye for the detection of errors, typographical or other; and an apparently intuitive ingenuity in fitting in any alterations required in proof to avoid "over-running." The Magazine continues to pursue the "even tenour of its way," gradually increasing in size and circulation; and I have literally had a "hand" in the composition of every number from its first appearance to the present time.

G. W. C. SHIELD.

THE HIGH BAROMETER OF JANUARY, 1905.

THE anticyclone which spread over the British Isles in the last week of January led to some very high barometer readings in the south of England and Ireland, and we have received a large amount of correspondence on the subject, a selection of which is quoted below.

The barometer in London on January 27th and 28th has only twice been surpassed since any record has been kept, viz., on January 9th, 1825, when 30·958 in. was recorded by Belville at Greenwich, and on January 18th, 1882, when 30·975 in. was observed at Camden Square, the readings quoted being corrected to 32° and sea-level, but not reduced to standard gravity.

Unfortunately, the Redier mercurial barograph at Camden Square has a range too limited to take account of extremely high readings, and for 77 hours from 4 p.m. on January 26th to 9 p.m. on January 29th the float in the short arm of the syphon was aground on the bend of the tube. During the whole of that time the barometer was continuously above 30·820 in. The standard Fortin barometer was read at frequent, though necessarily irregular, intervals, and the results were as follows:—

Jan.	in.	Jan.	in.	Jan.	in.
26th— 9.0 p.m....	30·849	28th—10.15 a.m..	30·914	29th— 1.0 a.m....	30·954
11.10 „ ...	·854	11.0 „ „ ...	·910	4.15 „ „ ...	·926
27th— 9.0 a.m....	·927	12.0 noon .	·897	9.0 „ „ ...	·952
10.30 „ „ ...	·913	3.15 p.m..	·871	10.20 „ „ ...	·947
4.30 p.m..	·893	5.45 „ „ ...	·901	1.0 p.m....	·905
9.0 „ „ ...	·885	7.0 „ „ ...	·912	2.0 „ „ ...	·896
10.0 „ „ ...	·894	9.0 „ „ ...	·933	4.15 „ „ ...	·875
11.0 „ „ ...	·904	10.15 „ „ ..	·948	9.0 „ „ ...	·834
12.0 mid...	·896	11.0 „ „ ...	·955		
28th— 9.0 a.m....	·915	12.0 mid...	·955		

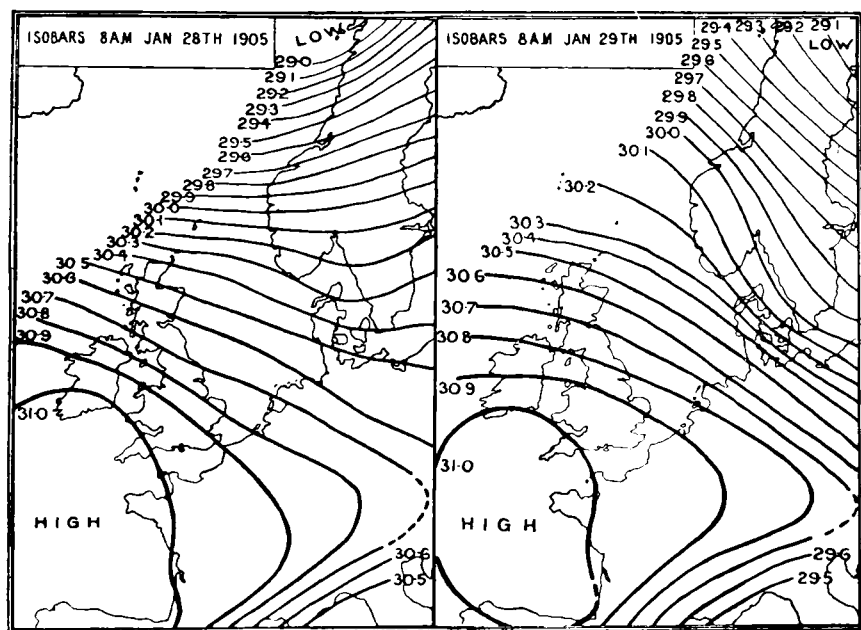
The mercury has now exceeded 30·900 in. on four occasions since the record commenced in 1858. The maxima were:—

Jan. 18th, 1882—10.30 a.m. ...	in. 30·975	Jan. 30th, 1896—11 a.m.....	in. 30·927
Jan. 9th, 1896—9 p.m.....	30·934	Jan. 28th, 1905—11 p.m.&mid.	30·955

In January, 1902, when the highest recorded pressure in the British Isles, 31·113 in., was attained at Aberdeen, the south of England lay outside the area of maximum pressure; but, as was stated in this Magazine for February, 1902 (Vol. 37, p. 5), the maximum at Camden Square was 30·874 in. The tendency of abnormally high pressures to occur in pairs, separated by about three weeks, which was pointed out by Mr. C. L. Brook on that occasion (Vol. 37, p. 6 and p. 23), has been exemplified in the present instance by the maxima at Camden Square—

Jan. 1st, 1905—7.30 p.m.	in. 30·790	Jan. 28th—11 p.m.	in. 30·955
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The 1902 maximum was certainly the more remarkable because



the area with pressures over 31 in. was larger than in 1905 and occurred in a part of the country where the pressure is normally lower than in the south-west.

The general distribution of pressure over north-western Europe is very clearly shown in the two charts we copy from the *Daily Weather Report* of the 28th and 29th—the one before, the other after, the highest pressure occurred. The extension of the Atlantic anticyclone, it will be observed, spread over our islands from the Bay of Biscay on the south, and the pressure appears to have exceeded 31·000 in. only in the south of Ireland, the south-west of England and Wales, and the west of France. So far as we have been able to ascertain, the highest recorded was 31·097 inches at Falmouth Observatory ; but higher readings may have been obtained in Ireland or on vessels near the mouth of the English Channel. The unusual range in pressure of 2 in. of mercury between Ireland and the north of Norway occurred on the 28th. As on previous occasions when an anticyclone with exceptionally high pressures was experienced, the weather throughout was fine, clear, and comparatively warm.

THE following is a selection from the large and interesting correspondence that has reached us on the subject of the high barometer, and the two weather-charts reproduced on the previous page are in close accord with the figures cited below :—

To the Editor of Symons's Meteorological Magazine.

For the fourth time in my record of 26 years the barometer has exceeded 30·900 in.

On January 29th, from 9 a.m. to 10 a.m., the reading was **30·923 in.**, having previously attained almost, if not quite, the same height from 3 a.m. to 5 a.m.

The three other occasions were—

1882.	January 18th	.....	9.45 a.m.	.....	in. 30·928
1896.	„ 9th	.....	1-1.45 p.m.	.....	31·021
1902.	„ 31st	.....	11 a.m.	.....	30·951

CHARLES L. BROOK.

Harewood Lodge, Meltham. February 2nd, 1905.

The barometer here gave the following readings :—

		9 a.m. in.		9 p.m. in.
January 27th	.....	30·926	.....	30·887
„ 28th	.....	30·910	.....	30·920
„ 29th	.....	30·940	.....	30·835

30·940 in. at 9 a.m. on January 29th was the actual maximum, though the mercury remained at that height till about 10 a.m., and was as high at the previous midnight. The readings are corrected for temperature and reduced to sea-level.

G. SEARLE.

30 Edith Road, West Kensington, January 31st, 1905.

The sea-level pressure here at the end of last month was without precedent in a record of 32 years :—

On the 27th at 9 a.m. it was	in. 30·93	.....	at 9 p.m.	in. 30·96
„ 28th „ 9 a.m. „	30·98	.....	„ 9 p.m.	30·98
			„ 10.30 p.m.	31·002
„ 29th „ 9 a.m. „	30·993	.....	„ 4 p.m.	30·92
			„ 9 p.m.	30·87

From 6 a.m. on the 27th to 6 p.m. on the 29th, a period of 60 consecutive hours, it was continuously above 30·90 in.

Mine is a standard barometer, Kew pattern, and is verified.

FREDK. SLADE.

Beckford, Tewkesbury, 2nd February, 1905.

The reading of the Kew verified Fortin standard barometer, corrected to 32° and sea-level, was :—

January 27th	.....	9 a.m.	.....	in. 30·988
		10 a.m.	.....	30·991
„ 28th	.....	9 a.m.	.....	31·010
		10.30 a.m.	.....	31·015
		9 p.m.	.....	31·005
		11 p.m.	.....	31·017
		11.30 p.m.	.....	31·021
„ 29th	.....	9 a.m.	.....	31·011 (bar. falling)

E. L. M. COLVILLE.

Kempsey, Bournemouth, January 31st, 1905.

My barometer is exceptionally high ; this morning **31·03** in., and yesterday 31·02 in. The highest recorded before was 30·90 in. on 16th January, 1902.

E. PIRIE-GORDON.

Guernvale, Crickhowell, S. Wales, 28th January, 1905.

I enclose observations for the late high barometer, unprecedented at least in S. Devon, where I have resided since September, 1876. The previous maxima which I have observed were 30·980 in. at 11 a.m. on January 18th, 1882, at Babbacombe, Torquay, and 30·940 in. at 11 p.m. on January 29th, 1896, at Rose Villa, Tavistock.

The highest and lowest pressures recorded on each day are alone transcribed :—

		Highest. in.	.....		Lowest. in.
January 27th,	11 p.m.,	31·050	.....	2.40 p.m.,	30·961
„ 28th,	11 a.m. & midnt.,	31·054	.....	8 p.m.,	31·017
„ 29th,	0.40 a.m.,	31·067	.....	11.20 p.m.,	30·898

The barometer was above 31·00 in. continuously from 9.17 p.m. on the 27th until noon on the 29th, a period of 39 hours.

EDWIN E. GLYDE.

Statsford, Whitchurch, Tavistock, February 3rd, 1905.

I am sending you a selection of the tabulated hourly values of the barograph at the Falmouth Observatory on the 28th instant.

The abnormally high reading of **31·097** in. at 11 a.m. is the highest recorded here since the barograph was fixed in 1870. The nearest approach was on the 18th of January, 1882, when it reached 30·981 in.

The readings have been corrected and reduced to 32° at mean sea-level. The weather on the 28th was mild, with uninterrupted sunshine, and light airs from the N.N.W. to N.W.

The barograph belongs to the Meteorological Council.

Falmouth Observatory.—Tabulated Hourly Values of the Barograph at certain hours on the 28th of January, 1905.

	in.			in
9 a.m.	31·062		Noon	31·086
10 a.m.	31·095		1 p.m.	31·068
11 a.m.	31·097		2 & 3 p.m.	31·046
From which point the mercury rose to at			10 p.m.	31·069
			11 p.m.	31·081
			Midnight	31·091

Falmouth, 31st January, 1905.

W. L. FOX.

Correspondence.

A PARALLEL.

DURING the days of abnormally high pressure at the end of January references have been frequent to the high pressure of January 9th, 1896.

Will you allow me to point out that the resemblance between the January, 1896, and January, 1905, extends much beyond this?

Not only was the average barometer reading for the whole month exceedingly high in each case, but each of those months saw *two* waves of extraordinarily high pressure—the *first* culminating in 1896 on the 9th, and in 1905 on the 1st and again in less degree on the 10th; the *second* culminating in 1896 on the 29th, and in 1905 on the 27th, 28th and 29th.

Further, each of those Januaries saw one, and only one, considerable depression, on the 16th in each case. In each month the rainfall was very low; the wind average, as might be expected, also very low; and each month, though seasonable and fairly warm, was free from extremes of temperature.

February, 1896, had a barometer average all but equal to that of the January preceding; had *no* deep depression, and very few days with even moderately low readings; very small rainfall, and the same seasonable weather without extremes.

It will be interesting to see whether February, 1905, follows this pattern. To say so much is not to make a prediction that it *will* do so.

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

North Cadbury Rectory, Somerset, Feb. 1st, 1905.

THE GREAT PROBLEM OF METEOROLOGY.

BY L. C. W. BONACINA.

ALL who take an intelligent interest in the weather—that is to say, all who remember its varying phenomena accurately—will be aware, though they may not directly recognise the fact, that each succeeding season, each succeeding month, and each succeeding day, possesses its own distinctive meteorological character. The weather, in other words, is in reality infinitely varied, by which we mean that the movements of the atmosphere, unlike those of many of the heavenly bodies or of certain involuntary muscles like the heart, do not represent a cycle of changes, but are of such a nature that the atmospheric conditions of the globe at each instant of time differ from those of any past and of any future time.

But this infinite variety of atmospheric conditions is intimately associated with another most important aspect of weather changes—namely, the Recurrence of Type. The same type of weather conditions is, as is well known, constantly recurring, but identical conditions, so far as we can tell, never do. Now it must be clearly understood upon what authority we make this assertion. As it was pointed out in a former article,* the precise distribution of atmospheric pressure that prevails at any instant of time over the Earth's surface must be regarded as the product of certain main factors, the differences in the weather of corresponding dates of different years being ascribed to the dependence of existing conditions upon previous conditions. It is, of course, quite within the sphere of possibility, that at some two points of time in the history of the globe, atmospheric conditions may have been identical, inasmuch as they are often very similar, but the chances in favour of such a contingency must be extremely small, and we are accordingly justified in assuming that identical atmospheric conditions have never occurred and never will.† This is, after all, a principle of widespread significance in nature. Consider the impressive and sublime spectacle of a wild and stormy sea beating against a rugged coast line; never do the waves strike the cliffs in exactly the same manner, and never is the surface of the sea exactly the same with regard to its motion.

Or reflect, again, upon the behaviour of a moorland stream as it leaps irregularly over a ledge of rock. Now, though the force of gravity is constant, the water will always at any particular time fall

* See this Magazine for May, 1904, p. 62.

† In the present state of our knowledge of the dynamics of moving fluids, it would be presumptive to declare that different atmospheric conditions *could not lead* to identical ones, but if this ever were to happen, a cycle of weather changes would at once be born. Such an occurrence, however, is, as we have observed above, immensely improbable, the atmospheric conditions at any moment over the globe always apparently leading to others which from the point of view of their *minutiae* are such as have never before obtained.

over the ledge in a somewhat different manner, and this will be the case even if the amount of water leaving the tarn remains unaltered ; in the latter case there is obviously only one cause to which we can attribute the ever-varying mode of fall of the water over the ledge of rock—namely, the dependence of the movements of the water at one moment upon those at the previous moment. But as soon as the outflow of water from the tarn begins to increase or decrease, an extra and all-important cause of variation in the manner in which the water will behave in its subsequent course down the fell-side commences to operate.*

As the Earth's position in the Solar System—turning once more to the main subject—remains as it must do constant, and as the amount of solar radiation received by the Earth from year to year also remains practically constant, there can only be one cause responsible for the diverse weather conditions of corresponding seasons that form so interesting and puzzling a characteristic of the climatology of, for instance, the British Isles, and this cause is the dependence of one type of weather upon another. Blizzard conditions may usher in the first of January in England one year, a mild and humid atmosphere will as likely as not mark its entry the next.

Why should atmospheric conditions so different prevail on two corresponding dates ? Because on these two occasions the distribution of atmospheric pressure has been different. But what is the origin of this difference in the distribution of atmospheric pressure ? This then is the x , the unknown quantity in meteorological problems, and until the value of x has been deduced all attempts to forecast the weather for more than a short period in advance must be futile.

All scientific men know that the movements of the atmosphere are the result of solar radiation, that all meteorological phenomena have their ultimate origin in the same source, and that whatever type of weather may be dominating the atmosphere over any given area of the Earth's surface as the result of secondary causes, this very type of weather is itself modified by the amount of heat received by this area at the time.

The real problem at issue, then, is—given an atmosphere set in motion by the Sun's rays, how do its movements as a whole govern those of its various parts ? We possess a tolerably clear conception of the nature of the influence of solar and terrestrial radiation upon the atmosphere, so that the thermo-dynamic aspect of the problem may therefore for the present be disregarded. We also know how

* This principle, of course, does not apply to a fluid *commencing* to move from a state of rest ; the force remaining constant it will always respond to its action in the same manner ; it is motion once established that affects subsequent motion. Thus in a cistern, natural or artificial, filling at intervals to overflowing, each overflow will be alike, because we may regard the body of water in the cistern as being in a state of rest so long as there is no violent internal agitation.

axial rotation modifies atmospheric circulation. Accordingly x represents the unknown laws which govern the internal motion of a circulating fluid. Let us turn for a moment to some of the recent synoptic charts of the Meteorological Office.

At 8 a.m. on November 24th, 1904, we find that atmospheric pressure was high to the west of Ireland, low over southern Sweden; over central England temperature was very low, 17° F. at Oxford, 15° F. at Nottingham; snow had fallen generally, in very large quantities in the bleak moorland districts of Scotland and the north of England. If now we turn to the chart for 8 a.m. on December 5th, 1904, we find the centre of a deep cyclonic disturbance situated north of Scotland; temperature was everywhere relatively high and rain had fallen heavily in the north of Scotland. We simply refer to these two charts (we might have taken any two) to illustrate what appears to us a fundamental truth, that the severe frost of the morning of November 24th was *à priori* related to the wet, mild and stormy weather of December 5th, and that had a different type of weather prevailed on November 24th, the deep depression of December 5th would either not have appeared when and where it did, or else would have appeared in a modified form—that is to say, it would have been of different size, shape, depth and intensity. We perceive the relation between the weather of those two dates, but are unable at present to ascertain its nature.

Now so long as we have to profess nescience concerning the nature of this fundamental principle underlying the sequence of meteorological phenomena, we might as well while, for instance, admiring some fine specimen of sylvan growth, attempt to predict from the health of the tree and the force and direction of the wind how, when and where each of its leaves will fall to the ground as attempt to infer from present atmospheric conditions what these will be a month hence. How then are we to determine the relation subsisting between different types of weather, and to solve the great problem of meteorology? It behoves theory to advance side by side with observation and experiment. The mathematician and physicist applying the methods of the calculus will have to show us how the gaseous envelope of the Earth, excited by thermal agency into activity, modified by axial rotation, breaks up at any instant into a system of eddies, how this system of eddies leads to others, and so on for all time. On the other hand, it is incumbent upon the practical geographer to remove as far as possible the great difficulties which prohibit meteorological observations from being received from all quarters of the globe, for obviously mathematical and physical knowledge would be of little avail in forecasting future states of weather if the existing state were unknown.

If it were occasionally possible to obtain simultaneous meteorological observations (ignoring local time) from various parts of the globe, so that charts could be constructed showing the atmospheric conditions prevailing both at sea level and at some suitable fixed

altitude above it, and if the nature of atmospheric circulation were at the same time thoroughly understood, the present empirical method of long-period weather forecasting which, it will be unnecessary to remark, is altogether worthless, would soon become resolved into one involving the scientific processes of inference and deduction.

AUTUMN RAINFALL AND YIELD OF WHEAT.†

BY W. N. SHAW, SC.D., F.R.S.

IN the course of an inquiry into the distribution of rainfall and other meteorological elements in the seasons of the last 21 years, a relationship has been disclosed between the autumn rainfall and the subsequent yield of wheat, which is so remarkable, that it deserves special notice. For the purpose of this comparison "autumn" must be understood to mean the period from the 36th to the 48th week (both inclusive) of the year, as dealt with in the *Weekly Weather Report*. The 13 weeks cover approximately the months of September, October, and November, and the rainfall is that given in the *Weekly Report* for the "Principal wheat-producing districts." The figures for each year are shown in the following table; the year given is the year in which the crop was gathered, the corresponding rainfall is that of the previous autumn. The figures for the yield of wheat express in bushels per acre the average yield for England as given in the annual returns of the Board of Agriculture, rounded off to the nearest half-bushel.

Year.	Yield of Wheat.	Previous Autumnal Rainfall.	Year.	Yield of Wheat.	Previous Autumnal Rainfall.
	Bushels per Acre.	inches.		Bushels per Acre.	inches.
1884	30	8·5	1896 ...	*34	7·9
1885	31·5	5·2	1897 ...	29	10·0
1886	27	10·2	1898 ...	35	5·0
1887	*32	7·8	1899 ...	*33	7·5
1888	*28	7·0	1900	28·5	8·0
1889	30	7·0	1901 ...	31	7·2
1890	31	6·5	1902	33	5·8
1891	31·5	6·6	1903 ...	*30	5·5
1892	26	9·7	1904	26·5	10·4
1893	*26	9·0	1905 ...	—	4·2
1894	30·5	6·9			
1895	*26	7·9	Mean ...	30·0	7·8

* Anomalous years.

The obvious general conclusion to be drawn from this table may be briefly stated; disregarding for a moment the figures marked with an asterisk, the yield of wheat goes up as the autumn rainfall goes down, and *vice versa*.

† Reprinted from *The Times* of 7th February, 1905.

But the relation indicated is much more specific than a mere general statement would imply. It may be put into a more precise form, as follows:—With certain exceptions every inch of autumn rainfall involves a diminution of the yield of wheat for the following year by a bushel and a quarter per acre. It may be premised that the extreme variation of yield was from 26 bushels in 1892, 1893, and 1895, to 35 bushels in 1898. If the yield be computed from the autumn rainfall by subtracting from the *datum* of 39·5 bushels per acre a bushel and a quarter for every inch of autumn rainfall, the “computed yield” obtained in this way shows an astonishing agreement with the actual yield given in the official returns.

In seven years out of the twenty-one the agreement is within half a bushel. But perhaps the general accuracy of the relationship is more strikingly manifest if the years when the calculation fails most signally to give the yield are considered. In seven of the years the actual yield differed from the computed yield by as much as 2·5 bushels or more, on the one side or the other. These are the years marked with an asterisk in the table. Two of the seven years were 1888 and 1903, when the crops were flooded by summer rains amounting to upwards of 10 in., and the yield fell below the computed value by 2·5 bushels in each case. The two exceptional years 1887 and 1899, when the crops exceeded the computed yield by 2·5 and 3 bushels respectively, are very interesting, for, although the autumn rainfall came up to the average as regards amount, it was so irregularly distributed that there were eight weeks out of the thirteen in the one case, and ten weeks in the other, when the rainfall was less than the 20 years' average, the amount for the quarter being brought up to the average by exaggerated rainfall in a few weeks. These might, therefore, be called dry autumns from a certain point of view, in spite of their having the average total rainfall, and the yield corresponds with the results for dry autumns rather than one with average rainfall. The two consecutive years 1895 and 1896 are also interesting; 1895 is memorable as the year of the extremely cold February, a truly anomalous year. Its yield of wheat was 3·5 bushels below the computed amount, but, strange to relate, the following year, which had in addition the advantage of a very dry winter, gave a yield above the computed return by 4·5 bushels per acre, as though the unused productive power of 1895 had not been lost in consequence of the exceptional cold, but stored. The two years taken together would agree admirably with the rule. The remaining exceptional year is 1893, a year of phenomenal drought.

Thus every year when the difference between the computed and actual yield is more than two bushels is otherwise conspicuously anomalous, except the years 1887 and 1899, and for those years the divergencies have been already, to some extent, explained. In the remaining seven years the computed yield differs from the actual yield by an amount between half a bushel and two bushels. An examination of the details of the statistics does not diminish the evidence of correspondence between the two sets of figures, but we need not consider the details here.

Various reasons may be given for regarding the autumn rainfall as likely to influence the yield of wheat; the washing of nitrates from the soil by the rain or the postponement of sowing to the spring on account of the wet are, no doubt, effective, but that all causes should combine to make the dryness

of autumn the dominant factor in determining the yield, as it clearly is, is very remarkable.

The averages both of yield and of rainfall are taken over large areas ; the figures are, in fact, the only ones immediately available for the purpose of such a comparison in the returns of the Board of Agriculture and the Meteorological Office respectively. What modification the induction would suffer if the inquiry were to be pursued for separate districts or individual fields has yet to be determined.

In the meantime the relationship clearly indicates a clue to such a phenomena as the deficiency of yield in 1904, after the favourable seasons of that year, in the excessive autumn rainfall of 1903 ; and it is sufficiently remarkable that when I first computed the yields on the principle of deducting from 39·5 a bushel and a quarter for each inch of autumn rainfall, and extended the calculation to the years 1904 and 1905, without knowing at the time the wheat yield of either year, the computed yield for 1904, 26·5 bushels per acre, was subsequently found to agree with the actual yield, which is entered at 26·52 bushels in the official returns. This agreement at once raises the interesting speculation whether the exceptionally large yield of 34·5 bushels per acre for 1905, computed from the small autumn rainfall of 1904, will be borne out to the same degree of accuracy. At any rate, it seems clear that in the absence of some extraordinary abnormality of the seasons between now and next September the yield of wheat for England must be unusually large.



ROYAL METEOROLOGICAL SOCIETY.

THE annual general meeting of this Society was held on Wednesday evening, January 18th, at the Institution of Civil Engineers, Great George Street, Westminster, Captain D. Wilson-Barker, President, in the chair.

Mr. F. C. Bayard read the Report of the Council, in which reference was made to the honour which H.R.H. the Prince of Wales had conferred on the Society by consenting to become its Patron. The work in connection with the exploration of the upper atmosphere had been continued. During the summer the Admiralty placed H.M.S. *Seahorse* at the disposal of the Kite Committee for the purpose of carrying on the kite observations off Crinan, under the direction of Mr. Dines. The average height attained by the kites was about one mile. The Society's Howard Silver Medal, annually awarded to the cadets of H.M.S. *Worcester*, had been gained by Cadet E. J. A. Lawson for the best essay on "The Barometric Conditions over the Oceans."

The Report having been adopted, votes of thanks were passed to the Council for their services during the past year, and also to the President and Council of the Institution of Civil Engineers for giving the use of the rooms of the Institution for the meetings.

The President then delivered an address on "The Connection of Meteorology with other Sciences." He said that Meteorology and

Astronomy were doubtless the first of the sciences to attract the attention of men; which of the two exerts most influence in the well-being of humanity is a matter dependent on one's position on the globe. In many regions people are but slightly affected by the weather, while the heavenly bodies, particularly the sun, exert an enormous influence on human life. Everywhere in Nature we find the effects of meteorological agencies. After speaking upon the effects of evaporation, winds, rain, ice, snow, and pointing out the influence of weather on animal life, vegetation, health, &c., Captain Wilson-Barker said that Meteorology is a science deserving more attention than it receives. He thought it ought to be recognised as a preliminary to the studies of geography, geology, and kindred subjects; and he was of opinion that meteorological observatories might very well be fitted up in schools and pupils taught to observe. This could be done at small cost of time or money. The tendency at present is to particularize in all scientific work, but the true path to progress lies in keeping a comprehensive outlook on the whole field of investigation. It is to be regretted that official help and encouragement is so deficient in this country. The difficult and baffling nature of meteorological problems should but serve as an incentive to their elucidation. The persistent observer gains much, not only in knowledge of the subject, but in the habits of close and accurate investigation which he insensibly acquires; and all workers in this field learn to appreciate the difficulties which confront their fellow-labourers and to recognise the value of what has been done by the meteorological organizations of the world.

On the motion of Dr. H. R. Mill, seconded by Mr. R. Inwards, a hearty vote of thanks was accorded to Captain Wilson-Barker for his services as President during the past year, during which he had done much to continue the usefulness and uphold the dignity of the Society, and also for his Address.

The following gentlemen were elected the Officers and Council :—

President—Mr. Richard Bentley. *Vice-Presidents*—Mr. F. Druce, Mr. J. Hopkinson, Mr. H. Mellish, and Captain D. Wilson-Barker. *Treasurer*—Dr. C. Theodore Williams. *Secretaries*—Mr. F. Campbell Bayard and Dr. H. R. Mill. *Foreign Secretary*—Dr. R. H. Scott, F.R.S. *Council*—Captain W. F. Caborne, C.B., Mr. R. H. Curtis, Dr. H. N. Dickson, Mr. W. H. Dines. Mr. W. Ellis, F.R.S., Capt. M. W. C. Hepworth, C.B., Mr. R. Inwards, Mr. Baldwin Latham, Mr. E. Mawley, Sir J. W. Moore, M.D., Dr. W. N. Shaw, F.R.S., and Mr. C. T. R. Wilson, F.R.S.

The Annual General Meeting was preceded by a brief Ordinary Meeting, at which the following gentlemen were elected Fellows :—Mr. P. A. Cunningham, Mr. C. C. James, M.Inst.C.E., Dr. J. Arnallt Jones, Mr. J. Owen Jones, Mr. C. J. Thompson, Dr. G. T. Walker, F.R.S., and Mr. E. F. White, F.R.A.S.



METEOROLOGICAL NEWS AND NOTES.

THE METEOROLOGICAL OFFICE is to be congratulated on the extremely important relationship worked out by Dr. Shaw between the autumnal rainfall and the following wheat harvest, which we print on another page. Mr. A. D. Hall, of the Rothamsted experimental farm, points out that the winter rainfall also is an important factor, and it is we believe not too much to hope that many farmers will be induced to keep rain gauges and study for themselves the applicability to special cases of the general results.

MR. R. C. MOSSMAN, after remaining for two complete years at the meteorological station established by the Scottish Antarctic Expedition in the South Orkney Islands, has now completed his work and reached Buenos Aires on February 8th on his way home. The results he has secured cannot fail to be profoundly interesting.

PROFESSOR H. H. HILDEBRANDSSON'S remarkable discussion of the international cloud observations, of which an abstract appeared in this Magazine for 1903 (vol. 38, p. 122), has been translated in full by Mr. R. G. K. Lempfert and published with the original plates in the *Quarterly Journal* of the Royal Meteorological Society. We believe that the expense of the translation and the production of the plates was borne by the Meteorological Council, a proof of that cordial co-operation between the different Meteorological organizations which it is always a pleasure to recognize.

DUST FALLS may be expected to occur at any time within the next two months, and our readers should be on the watch for any unusual haze or the appearance of coloured dust on trees or windows. For the last three or four years there has been a widespread fall of African dust in Europe at some date between January and March.

OUR RAINFALL AVERAGES.

THE proper use of an average is to serve as a standard which makes it easy to compare one month or year with another, and for this purpose it is well to take the average of a period so long that the addition of the wettest year or of the driest year would not greatly disturb the value. For instance, if the average rainfall of 10 years happened to be 30·00 in., the addition of a very wet year, say, with 45·00 in., would alter the average to 31·36; but if the average of 30 years happened to be 30·00 in., the addition of a year with 45·00 in. would alter the average to 30·48 only, and if the average of 100 years had given the value 30·00 the addition of the wet year supposed would merely alter it to 30·15. It is impossible to obtain averages so long as a century, and undesirable to use averages so short as ten years, but the average of 30 years is a useful figure to employ. While the average of one period of 30 years is very like the average of another period of the same duration, it is satisfactory

in comparing the records of a number of stations to refer them to their average for one and the same period. In *British Rainfall* the average for the 30 years 1870-99 has been used for some time, and it is convenient to have the same standard in these pages also. The chief difficulty in the way of doing so is that a good many of the stations quoted in our tables were not established in 1870; but in most cases this difficulty can be overcome. It will not do to piece together the records at two different stations, even though these are not very far apart, for every place has its own rainfall due to a number of local conditions. The way in which the long-period average is calculated for a station with a short record is by comparison with a station not very far away, or perhaps with several stations which have been in action for the longer period. Thus we will suppose that a station which we may call A was established in 1895, and another which we may call B, a few miles distant, was established in 1870. To find the average annual rainfall at A for the period 1870-99 we first deal with B. Supposing that the arithmetical average for the 30 years 1870-99 at B is 35.00 in. and the average for the 10 years 1895-1904 at the same station is 32.50 in., we find that if 32.50 is expressed as 100, 35.00 would be expressed as 107.7; in other words, the average of the shorter period must be increased by 7.7 per cent. in order to make it equal to the average of the longer period. Since the stations A and B are near together, it is safe to assume that, though their actual rainfalls may differ slightly, the same ratio will hold good for both stations; so that, supposing the 10 years' average at A was 32.75 in., we have only to increase that figure by 7.7 per cent. in order to yield the number 35.27, which corresponds to the 30 years' average required.

The average monthly falls are not so easily calculated. The reason is that while it is very rare for the wettest year to be more than 50 per cent. above the average or for the driest year to be more than 30 per cent. below the average, the wettest month may be 300 per cent. or more above the average, and the driest may be 100 per cent. below the average—in other words, the month may be quite without rain. In view of this great variability, 30 years is too short a time by which to determine the average distribution of the mean annual rainfall throughout the months of a year. If, for instance, half a dozen wet Januaries occurred in consecutive years once in a century, the 30 years' average containing that run of wet Januaries would give far too high a value for that month, and any period of 30 years not containing the group would give too low a value. Though we cannot eliminate this uncertainty at present, we can take comfort in the thought that the monthly distribution of rainfall in 30 years is much more than three times as satisfactory as the monthly distribution in ten years.

The table on p. 16 is calculated on the 30 years' means 1870-99, wherever it was possible to do so; and thus it is a distinct improvement on former tables of the kind.

RAINFALL AND TEMPERATURE, JANUARY, 1905.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.]	RAINFALL.				Days on which 101 or more fell.	TEMPERATURE.						No. of Nights below 32°.	
		Total Fall.	Diff. from average, 1870-9.	Greatest in 24 hours.			Max.		Min.		Shade	Glass		
				Depth.	Date.		Deg.	Date.	Deg.	Date.				
		inches.	inches.	in.										
I.	London (Camden Square) ...	1·34	-- '55	·60	16	8	54·3	6	21·2	16	17	24		
II.	Tenterden.....	1·15	-- 1·21	·59	16	12	53·5	6, 7	15·0	2	15	24		
	Hartley Wintney	·72	-- 1·98	·36	16	9	57·0	8	19·0	2, 27	21	23		
III.	Hitchin... ..	1·13	-- '68	·55	16	9	52·0	6	20·0	15	17	...		
	Winslow (Addington)	·84	-- 1·21	·19	16	12	53·0	6	18·0	19, 27	19	25		
IV.	Bury St. Edmunds (Westley) ...	1·19	-- '51	·45	16	10	51·0	6	20·0	2	20	...		
	Brundall	·93	-- '74	·47	16	15	52·0	6	21·4	2	17	24		
V.	Alderbury	·61	-- 2·06	·25	16	8	52·0	29	19·0	27	28	...		
	Winterborne Steepleton	1·42	-- 2·48	·85	16	15	54·9	7	20·0	27	19	21		
	Torquay (Cary Green)	1·42	-- 1·77	·82	16	10	54·8	7	29·4	27	3	15		
	Polapit Tamar [Launceston] ...	2·44	-- 1·43	·54	16	19	52·1	8	18·2	27	11	13		
	Bath	·61	-- 1·91	·17	4	12	54·2	7	19·0	27	17	25		
VI.	Stroud (Upfield)	·68	-- 1·78	·22	8	9	52·0	6, 7	23·0	18	20	...		
	Church Stretton (Woolstaston) ...	·70	-- 2·11	·16	8	15	52·0	6	20·0	17	16	...		
	Bromsgrove (Stoke Reformatory) ...	·77	-- 1·14	·28	8	7	51·0	6	15·0	17	20	...		
VII.	Boston	·81	-- '78	·24	9	11	50·9	9	22·0	19	19	...		
	Workshop (Hodsock Priory) ...	·52	-- 1·21	·17	16	10	52·9	6	13·4	20	17	24		
	Derby (Midland Railway) ...	·80	-- 1·15	·21	16	15	51·0	6, 7	17·0	18, 19	18	...		
VIII.	Bolton (The Park)	2·23	-- 1·15	·38	5	20	49·7	9	22·9	17	13	20		
IX.	Wetherby (Ribston Hall) ...	·99	-- '90	·46	11	8	...	...	...	...	...	...
	Arncliffe Vicarage	3·35	-- 2·98	1·00	11	20	...	...	...	...	...	...
	Hull (Pearson Park)	·62	-- 1·18	·15	11	12	54·0	6	21·0	20	15	22		
X.	Newcastle (Town Moor) ...	·44	-- 1·52	·12	23	10	...	...	...	...	...	...
	Borrowdale (Seathwaite) ...	9·15	-- 5·56	1·32	11	20	50·5	6	24·7	17	7	...		
XI.	Cardiff (Ely)	1·64	-- 2·21	·44	16	16	...	...	...	...	...	...
	Haverfordwest (High St.) ...	2·70	-- 2·43	·53	16	16	52·6	6	24·4	27	8	14		
	Aberystwith (Gogerddan) ...	3·05	-- '82	·83	8	13	55·0	5	20·0	19	11	...		
	Llandudno	2·20	-- '37	·41	5	16	53·0	8	25·5	16	4	...		
XII.	Cargen [Dumfries]	2·33	-- 2·21	·61	17	13	52·0	28	25·0	22, 26	13	...		
	Lilliesleaf (Riddell)	1·15	-- 1·45	·40	11	14	52·0	6	17·0	16	16	21		
XIII.	Edinburgh (Royal Observatory) ...	·76	...	·27	11	11	50·4	6	25·6	17	8	21		
XIV.	Colmonell	2·98	-- 1·54	·47	4	18	49·0	3, 5, 28	28·0	25	7	...		
XV.	Tighnabruach	5·34	-- '52	·98	17	24	47·0	29	27·0	16, 25	15	15		
	Mull (Quinish)	4·29	-- 1·56	·61	8	24	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis) ...	·35	-- 1·75	·10	3	11	55·9	6	27·0	19	11	...		
XVII.	Braemar	1·61	-- 1·30	·26	7	16	49·2	30	19·2	19	16	...		
	Aberdeen (Cranford)	·73	-- 1·59	·20	16	13	54·0	28a	25·0	18	13	...		
	Cawdor (Budgate)	2·05	-- '09	·34	11	15	...	...	...	...	...	...
XVIII.	Invergarry	7·55	+ '92	1·30	8	15	...	...	...	...	...	...
	Bendampy	8·51	-- '24	1·02	8	24	...	...	...	...	...	...
XIX.	Dunrobin Castle	3·38	+ '76	·65	11	14	54·5	8	26·5	10, 26	6	...		
	Castletown	3·60	...	·63	31	22	52·0	30	26·0	25, 26	16	...		
XX.	Killarney	4·52	-- 2·05	·86	15	18	53·5	15	32·0	18, 26	2	...		
	Waterford (Brook Lodge) ...	2·73	-- 1·33	·71	16	18	53·0	5, 6	24·6	26	8	...		
	Broadford (Hurdlestown) ...	2·56	-- '42	·59	14	18	52·0	5, 10	29·0	25	6	...		
XXI.	Carlow (Browne's Hill)	2·40	-- '75	·71	16	16	...	...	...	...	...	...
	Dublin (Fitz William Square) ...	1·90	-- '26	·59	16	14	53·9	6, 8	29·9	26	2	9		
XXII.	Ballinasloe	2·26	-- 1·23	·47	16	22	60·0	1, 30	25·0	13, 26	9	...		
	Clifden (Kylemore House) ..	6·08	-- 1·78	·81	14	18	...	...	...	...	...	...
XXIII.	Seaforde	1·85	-- 1·78	·59	16	13	52·0	5	26·0	18	4	11		
	Londonderry (Creggan Res.) ...	3·08	-- '48	·49	5	24	...	...	...	...	...	...
	Omagh (Edenfel)	3·30	-- '04	·52	16	22	51·0	5	28·0	25	6	16		

+ Shows that the fall was above the average; — that it was below it. a—and 29 30.

SUPPLEMENTARY RAINFALL, JANUARY, 1905.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	1·57	XI.	New Radnor, Ednol	1·70
„	Ramsgate, West Cliff.....	·94	„	Rhayader, Nantgwillt	3·71
„	Hailsham	1·30	„	Lake Vyrnwy	2·73
„	Crowborough	1·68	„	Ruthin, Plás Drâw.....	·99
„	Osborne	1·02	„	Criccieth, Talarvor.....	1·89
„	Emsworth, Redlands.....	1·16	„	Anglesey, Lligwy	1·63
„	Alton, Ashdell	·97	„	Douglas, Woodville	1·76
„	Newbury, Welford Park ...	·67	XII.	Stoneykirk, Ardwell House	1·47
III.	Harrow Weald	1·35	„	Dalry, Old Garroch	4·93
„	Oxford, Magdalen College...	·74	„	Langholm, Drove Road.....	2·66
„	Banbury, Bloxham.....	·78	„	Moniaive, Maxwellton House	2·73
„	Pitsford, Sedgebrook	·86	XIII.	N. Esk Reservoir [Penicuik]	2·05
„	Huntingdon, Brampton.....	1·11	XIV.	Maybole, Knockdon Farm..	2·94
„	Wisbech, Bank House	·98	„	Glasgow, Queen's Park	1·87
IV.	Southend	·85	„	Campbeltown, Redknowe...	4·04
„	Colchester, Lexden	·81	XV.	Inveraray, Newtown.....	7·12
„	Saffron Walden, Newport...	1·26	„	Ballachulish House.....	9·44
„	Rendlesham Hall	·96	„	Islay, Eallabus	4·53
„	Swaffham	1·03	XVI.	Dollar	1·55
„	Blakeney	·82	„	Loch Leven Sluices	1·40
V.	Bishop's Cannings	·70	„	Balquhidder, Stronvar	5·43
„	Ashburton, Druid House ...	2·58	„	Coupar Angus Station	·44
„	Okehampton, Oaklands.....	2·74	„	Blair Atholl.....	1·37
„	Hartland Abbey	1·60	„	Montrose, Sunnyside	·72
„	Lymmouth, Rock House ...	2·08	XVII.	Alford, Lynturk Manse ...	·92
„	Probus, Lamellyn	2·78	„	Keith	1·57
„	Wellington, The Avenue ...	·90	XVIII.	N. Uist, Lochmaddy.....	3·02
„	North Cadbury Rectory ...	·91	„	Aviemore, Alvey Manse ...	1·84
VI.	Clifton, Pembroke Road ...	·68	„	Loch Ness, Drumnadrochit.	3·12
„	Moreton-in-Marsh, Longboro'	1·07	„	Glencarron Lodge	13·39
„	Ross, The Graig	1·23	„	Fearn, Lower Pitkerrie.....	1·61
„	Shifnal, Hatton Grange.....	·68	XIX.	Invershin	4·55
„	Wem Rectory	·72	„	Altnaharra	6·06
„	Cheadle, The Heath House.	1·41	„	Bettyhill	4·05
„	Coventry, Kingswood	·84	„	Watten	2·33
VII.	Market Overton	·94	XX.	Cork, Wellesley Terrace ...	3·46
„	Market Rasen	·63	„	Darrynane Abbey	4·22
„	Bawtry, Hesley Hall.....	·47	„	Glenam [Clonmel]	3·22
VIII.	Neston, Hinderton.....	·92	„	Ballingarry, Gurteen	2·21
„	Southport, Hesketh Park...	1·65	„	Milton Malbay.....	3·31
„	Chatburn, Middlewood	2·49	XXI.	Gorey, Courtown House ...	1·20
„	Cartmell, Flookburgh	2·20	„	Moynalty, Westland	1·81
IX.	Langsett Moor, Up. Midhope	2·27	„	Athlone, Twyford	2·05
„	Scalby, Silverdale	·80	„	Mullingar, Belvedere.....	2·40
„	Ingleby Greenhow	·51	XXII.	Woodlawn	2·79
„	Middleton, Mickleton	1·28	„	Westport, Murrisk Abbey..	4·57
X.	Beltingham	·88	„	Crossmolina, Enniscoe	4·70
„	Font Reservoir, Fallowlees.	·99	„	Collooney, Markree Obsy...	3·41
„	Ilderton, Lilburn Cottage...	·59	XXIII.	Enniskillen, Portora	2·27
„	Keswick, The Bank	3·00	„	Warrenpoint	2·14
XI.	Llanfrechfa Grange.....	1·42	„	Banbridge, Milltown	1·97
„	Treherbert, Tyn-y-waun ...	3·36	„	Belfast, Springfield	2·61
„	Carmarthen, Friary	1·84	„	Bushmills, Dundarave	2·74
„	Castle Malgwyn	2·72	„	Stewartstown	2·39
„	Plynlimon	8·95	„	Killybegs	3·26
„	Tallyllyn	1·40	„	Horn Head	3·72

METEOROLOGICAL NOTES ON JANUARY, 1905.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—The first 10 days were inclement with little sunshine, but no great amount of rain. From the 10th fine dry weather set in, changing to severe frost which culminated on 16th. On that day the temp. did not rise above 23° until the evening, when there was a driving shower of icy sleet followed by glazed frost and heavy R. The latter part of the month was fine, and beautiful sunny weather accompanied the remarkable barometric conditions of the last week (see p. 2). Duration of sunshine 38·7 hours,* and of R 29·1 hours. Mean temp. $38^{\circ}0$, or 0·1 below the average.

TENTERDEN.—Showery and dull till 11th. Much sleet and R on 16th, making the roads sheets of ice. Then dry and cold till 30th, but with no severe frost. Duration of sunshine 78·3 hours.† Violent N.W. gale on 6th and 7th.

CROWBOROUGH.—Cold but yet genial, considerable bright sunshine and R below the average. Frost on 14 nights, the min. temp. falling to $17^{\circ}8$ on 2nd. Mean temp. $37^{\circ}3$.

HARTLEY WINTNEY.—A black January, the chief features being dryness and absence of wind. Hazy windless atmosphere from 21st to 25th. The last week was sunny. Ozone on 18 days; mean 4·1.

HITCHIN.—The bar. readings were: 27th, $30^{\circ}85$ in.; 28th, $30^{\circ}85$ in.; and 29th, $30^{\circ}90$ in. These readings are unprecedented since October 29th, 1849.

BURY ST. EDMUNDS.—Violent barometric oscillations, the pressure ranging from $29^{\circ}15$ in. on 17th to $30^{\circ}95$ in. on 27th. Very fine weather from 17th. Westerly winds on 22 days.

BRUNDALL.—Fine with seasonable frosts, but little S. Mean temp. $0^{\circ}4$ above the average, constituting the eighth successive January with mean temp. above the average.

TORQUAY.—Duration of sunshine 87·3 hours,* or 25·9 hours above the average. Mean temp. $42^{\circ}8$, or $0^{\circ}5$ above the average. Mean amount of ozone 4·6; max. 8·0 on 15th with S.E. wind; min. 2·0 on 8 days.

WELLINGTON.—Exceedingly dry, the R being about one-third of the average. The temp. was very equable after 8th, not varying much from the normal. Violent E.S.E. gale on 14th. On 28th the bar. rose to slightly above $31^{\circ}00$ in.

NORTH CADBURY.—Altogether pleasant and not unseasonable, with the smallest R and least cloud in nine years. Cool but not cold, with many but very slight frosts. The first half was windy, the second very calm.

CLIFTON.—The driest January in 49 years, with the single exception of 1896 when only ·60 in. of R fell. Frost from 15th to 28th, and very fine weather with cloudless skies from 25th to 29th. Bar. on 29th, $30^{\circ}96$ in., the highest reading in 55 years. About one and a half inches of S fell on 16th.

ROSS.—Warm from 2nd to 12th and from 28th to 31st, but thick S covering the ground for 12 days from 15th. This was the eleventh month in succession with R below the average, and on 350 days ending on February 1st only 17·41 in. had fallen.

WORKSOP.—The first fortnight was mild, followed by a fortnight's frost. Bitterly cold wind on 16th with S in evening. Only 1880 and 1898 had a smaller January R in the past 29 years.

BOLTON.—Bar. much above the average, the reading of $30^{\circ}924$ on 28th having been exceeded only once since 1886. Temp. fairly normal. Duration of sunshine 9 hours* below the average. Predominant winds westerly. Mean amount of ozone 2·3.

SOUTHPORT.—Decidedly dry, with very high bar., but nevertheless stormy generally. Mean temp. $0^{\circ}4$ above the average. Duration of sunshine 1 hour* below the average. R $1^{\circ}04$ in. below the average. Underground water level unprecedentedly low for January. Total depth of S $1^{\circ}5$ in.

NEWCASTLE-ON-TYNE.—The smallest R in January since observations were commenced in 1868.

HAVERFORDWEST.—Stormy and wet till 17th, and from 13th to 17th one continuous gale. Cold and changeable from 17th to the end. Unusually high bar. from 26th to 29th, reaching 31·053 at 11.30 a.m. on 28th, the highest reading during 56 years. Duration of sunshine 66·2 hours.*

DOUGLAS.—The first three weeks presented an almost unbroken series of gales, with showery and very cold weather. From 16th to 18th a violent E. gale blew for some 50 hours, with a heavy fall of S. From 24th to 30th was bright, calm and mild. R the least, except 1880 and 1881, in any January recorded.

SCOTLAND.

LANGHOLM.—R 2·02 in. below the average of 29 years. Gales were frequent and the temp. fluctuated a great deal.

COLMONELL.—Mostly strong winds from 6th to 16th, especially from 13th to 16th. Light S on 9th, 15th and 16th. T on 12th.

MULL, QUINISH.—Stormy weather, beginning on 5th, culminated in a hurricane from E. to S.E. on 16th, which did considerable damage. The month otherwise was fine and very mild.

COUPAR ANGUS.—R 1·83 in. below the average. Mean temp. 36°·2, or about one degree above the average. Generally open and mild, with no extremely low temp.

ABERDEEN.—Very mild, with little frost or S, but many gales, one of which blew for 50 hours from S.W.

DRUMNADROCHIT.—Characterized by a series of severe storms of wind, high bar. pressure and generally favourable weather. R '63 in., and rainy days 16, below the average of 19 years. Mavis and blackbird first heard on 29th.

WATTEN.—Cloudy, fresh and open. A series of storms of wind accompanied by R at the beginning and end.

CASTLETOWN.—The first 12 days were cold, wet and cloudy, with westerly winds and N.W. gale on 6th. From 13th to 23rd was dry and clear with strong S. and S.E. winds. Thence to the end was changeable. Practically no S fell.

IRELAND.

DARRYNANE ABBEY.—Fairly dry, the R being 10·5 per cent. below the average of 25 years. Very mild, with several quite springlike days towards the end.

DUBLIN.—Open, but dull, with W., S.W., and S.S.E. winds. Severe storm of R and sleet on 15th and 16th. Remarkable anticyclone from 25th to 28th, the bar. rising to 30·999 in. at 9 p.m. on 28th at Fitzwilliam Square, and to 31·007 in. at Trinity College.

MILTOWN MALBAY.—Cold and generally wet, though the R fell in small quantities. The weather was stormy, and for many weeks the sun was not seen until it burst out on the 25th.

BELFAST.—A satisfactory month, with R '86 in. below the average. The S did not stay long.

OMAGH.—The first half was unsettled and inclement, culminating in a blizzard of remarkable severity on 16th, but thence to the end, with a gradually rising bar. (reaching 30·7 in. on 27th), the month was fine and generally mild, the min. temp. only once reaching 28°. This formed the tenth mild January in succession.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, August, 1904.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
°		°		°	°	°	0-100	°	°	inches			
London, Camden Square	91·0	4	44·3	21	73·6	52·7	55·1	79	135·9	37·7	1·59	9	4·4
Malta	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	81·2	17	42·5	25	61·3	48·9	49·8	82	...	...	4·64	11	6·1
Durban, Natal	83·9	30	49·7	13	76·4	55·5	...	...	138·3	...	·18	3	1·8
Johannesburg	76·9	30	32·5	23	65·5	44·3	34·2	52	...	32·0	·02	1	4·4
Mauritius	78·5	15	55·1	19	75·5	59·8	59·2	76	139·3	45·8	·98	15	5·7
Calcutta	92·4	18	76·9	6	88·8	79·1	77·8	84	157·0	74·8	10·11	16	8·3
Bombay	86·8	1	75·0	25	84·8	77·6	75·3	82	137·9	72·8	5·72	23	8·4
Madras	101·4	28	75·3	4	96·0	78·3	71·2	67	146·9	74·1	2·55	7	5·8
Kodaikanal	67·2	12	49·0	22	64·2	51·6	51·3	81	141·6	35·5	2·53	14	6·9
Colombo, Ceylon	87·4	29	75·8	24	85·2	77·4	73·3	80	150·0	71·2	·36	4	6·0
Hongkong	90·0	18	72·9	11	86·0	77·2	74·9	83	147·2	...	27·64	16	6·8
Melbourne	62·8	22	34·0	26	69·1	33·5	42·1	75	125·3	27·0	3·28	13	7·1
Adelaide	68·4	22	38·1	16	60·9	45·6	44·0	74	125·8	32·6	1·98	16	6·5
Coolgardie	76·0	24	35·6	8	65·3	42·3	42·1	64	140·6	27·6	·24	5	3·6
Sydney	70·5	13	42·0	2	62·1	47·2	44·2	77	104·5	33·9	1·33	17	4·3
Wellington	59·8	14	33·1	2	54·3	42·2	39·6	73	108·0	30·0	3·49	14	5·2
Auckland	61·0	27	37·0	5	56·3	45·6	44·0	78	118·0	32·0	3·57	18	5·7
Jamaica, Negril Point.	89·9	5	69·3	1	87·0	72·0	73·4	80	...	...	4·07	12	...
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	87·4	10	70·0	18	84·1	74·2	70·4	76	152·0	...	10·78	27	2·7
Toronto	84·2	1	45·0	9	75·3	54·3	56·4	77	116·5	40·2	4·56	10	4·5
Fredericton	85·7	1	38·5	30	74·2	50·6	50·8	59	...	...	3·85	11	4·7
Winnipeg	84·0	26	35·5	29	72·5	49·6	...	...	...	...	1·62	10	4·9
Victoria, B.C.	82·2	4	45·9	11	66·8	51·3	...	...	...	...	·50	2	2·2
Dawson	80·0	9	30·0	26	64·7	42·2	...	...	...	...	1·66	9	4·6

Mauritius.—Mean temp. of air $0^{\circ}8$, dew point $0^{\circ}3$, and rainfall 2·18 in., below averages. Mean hourly velocity of wind 9·8 miles, or 2·5 miles below average, prevailing direction E. by S.

MADRAS.—Bright sunshine 163·8 hours, or 42·3 per cent. of possible. R 2·00 in. below average.

KODAIKANAL.—Bright sunshine 158 hours.

COLOMBO.—Mean temp. of air $81^{\circ}0$, or $0^{\circ}2$ above, of dew point $0^{\circ}1$ above, and R 3·41 in. below, averages. Mean hourly velocity of wind 8·9 miles; prevailing direction S.W.

HONGKONG.—Mean temp. of air $80^{\circ}8$. Sunshine 172·6 hours. Mean hourly velocity of wind 13·2 miles; direction E. by S.

Adelaide.—Mean temp. of air $0^{\circ}7$ below and R ·35 in. below, averages.

Sydney.—Mean temp. of air $0^{\circ}1$ below, R 1·89 in. below, and humidity 2·5 above, averages.

Wellington.—Mean temp. of air $0^{\circ}2$ above, and R 1·45 in. below, averages.

Auckland.—Mean temp. of air $2^{\circ}0$ below the average, and R ·75 in. below the average of previous 36 years.

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THE RAINFALL OF THE SIX MONTHS, September, 1904—February, 1905.

It very rarely happens that the general rainfall of the country remains below the average every month for six consecutive months; and although there is nothing unprecedented in the circumstance it is sufficiently interesting to induce us to summarise the condition of things in a special table, setting forth the monthly rainfall since September with the percentage of the average for as many stations as could be compressed into a page by the ingenuity of the printer.

For each of the 55 stations employed the average rainfall of the thirty years 1870–99 is known or has been computed. That is the average used in the following tables, and it is probably within 2 per cent. of the average of a much longer period, say 50 years.

To avoid confusion, the word average is used with regard to time only, the expression “general rainfall” being employed to convey a similar idea with regard to space. Thus the general rainfall of England and Wales for any period means the mean depth of rain which has fallen in that period over the whole surface. The fifty-five stations the records of which are employed are so uniformly distributed over the country that it is safe to generalise from them as to the general conditions.

It is obvious that a deficiency of one inch of rain in a place like London where the average annual fall is 25 inches is a much more serious matter than a deficiency of an inch at a station, say in Wales, with an average annual fall of 100 inches; in the former case the inch means 4 per cent., in the latter only 1 per cent. of the annual fall. Hence, to facilitate comparison the rainfall for each station is expressed not only in inches but also in ratios, the average for the month or period being indicated in each case by 100. Thus in the tables 50 represents 50 per cent. or one-half of the average fall, 75 represents three-quarters of the average fall, and so on; figures above 100 indicate falls above the average.

TABLE I.—*Six Months' Winter Rainfall, September, 1904—February, 1905.*

Stations.	Sept.		Oct.		Nov.		Dec.		Jan.		Feb.		Sept. to Feb.	
	Total rain.	Per cent. of aver.	Total rain.	Per cent. of aver.	Total rain.	Per cent. of aver.	Total rain.	Per cent. of aver.	Total rain.	Per cent. of aver.	Total rain.	Per cent. of aver.	Total rain.	Per cent. of aver.
London	1.17	51	1.56	55	1.70	69	1.79	84	1.34	71	.79	49	8.35	63
Tenterden	1.28	49	1.98	55	2.04	63	3.56	130	1.15	49	.76	41	10.77	66
Hartley Wintney	1.23	52	1.73	56	1.42	47	2.39	94	.72	30	.66	32	8.15	53
Hitchin	1.12	50	1.13	42	1.36	53	2.12	103	1.13	62	1.00	65	7.86	61
Winslow	1.41	59	.96	33	1.50	57	1.88	83	.84	41	.56	32	7.15	51
Bury St. Edmunds	1.17	47	1.14	43	1.50	60	1.80	85	1.19	70	1.37	88	8.17	63
Brundall	1.78	69	1.20	40	2.00	74	2.55	120	.93	56	1.43	96	9.89	73
Alderbury	2.00	79	1.72	51	1.07	34	3.29	117	.61	23	.72	33	9.41	56
Winterbourne Steepleton	3.13	92	2.77	64	1.80	37	4.20	102	1.42	36	.79	25	14.11	60
Torquay	1.81	59	2.05	50	1.55	42	2.74	79	1.42	45	.84	29	10.41	51
Polapit Tamar	2.52	69	2.32	47	4.52	105	3.75	85	2.44	63	1.63	57	17.18	72
Bath	1.37	47	.71	22	1.81	59	1.96	71	.61	24	.86	41	7.32	44
Stroud	2.27	83	.58	19	1.52	51	2.15	87	.68	28	.80	38	8.00	50
Woolstaston	2.12	77	.70	18	1.20	38	2.53	87	.70	25	1.35	59	8.60	48
Bromsgrove	1.96	84	.60	24	.99	44	1.75	90	.77	40	.50	31	6.57	52
Boston	3.13	136	.91	35	.57	27	1.95	109	.81	51	.54	35	7.91	66
Worksop	1.21	56	.32	12	.98	47	1.20	59	.53	30	.73	46	4.97	40
Derby	1.67	70	.55	20	1.25	55	1.39	61	.80	41	.67	40	6.33	48
Bolton	1.73	39	2.90	61	3.72	95	3.29	79	2.23	66	2.86	107	16.73	72
Wetherby .....	.81	32	.72	23	2.25	101	1.57	72	.99	52	1.40	86	7.74	57
Arncliffe	1.75	34	2.92	45	7.04	117	4.58	71	3.35	53	4.53	96	24.17	69
Hull	1.70	71	.50	15	1.51	62	1.43	61	.62	34	1.16	62	6.92	49
Newcastle	1.18	50	.81	28	3.14	118	1.94	73	.44	22	.91	58	8.42	60
Seathwaite	7.48	59	9.19	69	12.52	90	15.09	103	9.15	62	9.86	85	63.29	78
Cardiff	4.03	99	2.69	56	3.49	82	3.38	76	1.64	43	1.17	37	16.40	67
Haverfordwest	5.10	121	2.25	40	3.51	65	5.14	98	2.70	53	1.83	49	20.53	70
Gogerddan	3.96	94	3.23	58	3.18	68	4.77	106	3.05	79	2.74	90	20.93	81
Llandudno	1.15	39	1.29	32	1.84	54	3.01	102	2.20	86	1.87	95	11.36	64
Dumfries	2.78	75	2.28	52	3.10	69	3.47	74	2.33	51	2.71	75	16.67	66
Lilliesleaf .....	.96	35	.96	30	1.86	57	2.18	69	1.15	44	1.17	49	8.28	47
Colmonell	4.49	110	2.59	52	5.30	109	3.72	77	2.98	66	3.95	108	23.03	86
Glasgow	3.12	93	1.73	51	2.14	61	3.41	97	1.87	58	2.43	96	14.70	75
Tighnabruaich	7.26	131	3.45	60	5.81	94	6.16	97	5.34	91	5.74	126	33.76	99
Inveraray	6.25	103	5.69	90	5.42	85	7.92	107	7.12	107	6.88	140	39.28	104
Islay	4.30	104	4.45	85	6.13	115	4.20	75	4.53	97	4.07	109	28.28	97
Mull	4.61	84	5.30	87	4.35	68	4.58	71	4.29	73	5.03	112	28.16	81
Dundee	2.35	92	.70	26	.60	22	1.80	66	.35	17	.80	38	6.60	44
Braemar	2.14	65	1.29	32	1.39	35	1.87	59	1.61	55	2.36	87	10.66	53
Aberdeen	2.33	77	1.03	32	1.41	41	2.80	83	.73	31	2.04	84	10.34	58
Cawdor	1.73	57	1.33	47	1.67	63	2.26	89	2.05	96	2.45	132	11.49	76
Invergarry	5.72	112	3.85	70	3.77	63	6.66	100	7.55	114	7.23	148	34.78	100
Bendampy	8.19	99	7.39	74	6.70	68	8.73	97	8.51	97	11.66	172	51.18	97
Dunrobin	2.40	89	1.82	55	2.20	67	2.45	72	3.38	129	3.73	157	15.98	90
Killarney	3.42	73	2.85	47	4.34	74	5.01	75	4.52	69	2.80	51	22.94	65
Waterford	4.40	143	1.74	43	2.15	55	3.76	87	2.73	67	1.14	35	15.92	70
Broadford	2.97	101	3.15	101	2.51	79	3.36	100	2.56	86	1.84	84	16.39	92
Carlow	3.35	120	1.51	43	1.68	53	2.09	60	2.40	76	1.04	40	12.07	65
Dublin	2.34	109	.45	15	1.08	42	1.50	63	1.90	88	.75	38	8.02	56
Mullingar	2.98	94	2.50	73	1.99	58	2.23	65	2.40	78	1.71	68	13.81	72
Ballinasloe	3.11	98	2.77	80	2.70	75	3.48	96	2.26	65	1.63	66	15.95	80
Clifton	5.97	89	4.92	62	6.22	75	6.21	69	6.08	77	5.08	84	34.48	75
Crossmolina	3.81	92	2.98	59	5.55	99	4.82	83	4.70	94	3.63	91	25.49	86
Seaforde	3.71	110	.85	22	2.36	60	2.46	68	1.85	51	1.70	57	12.93	61
Londonderry	2.68	71	2.80	63	4.73	113	3.06	71	3.08	87	3.78	138	20.13	87
Omagh	3.00	85	3.51	94	3.41	97	2.85	76	3.30	99	1.98	80	18.05	88

When the figures quoted in Table I. are set down on a map, the apparent irregularity of the deficiencies disappears, and the distribution is seen to be simple and easy to grasp. The rainfall for the six months reached and even slightly exceeded the average over a narrow strip in the west of Scotland from the west end of the Caledonian Canal to the Firth of Clyde. The rainfall amounted to at least 75 per cent. or three-quarters of the average over all Scotland north of Inverness and west of the meridian of 4° W., and also in the north-western half of Ireland, in the English Lake district, and in a small area on the west coast of Wales. All the rest of the British Isles had less than three-quarters of the usual fall.

In two large areas the rainfall for the six months fell short of 50 per cent. of the average. The first of these areas with less than half the usual fall is situated in the south-east of Scotland, including practically the whole of the counties of Fife, Kinross, Haddington and Berwick, as well as most of Forfar and Midlothian, and parts of Perth, Peebles, Selkirk and Roxburgh. The gathering grounds for the water supply of Edinburgh and Dundee lie in this area of great deficiency.

The second and larger district in which less than half the average amount of rain has fallen since September 1st, 1904, occupies the Midlands, extending from Hull in the north-east to beyond Hereford and Bath in the south-west. It includes the whole valley of the Trent, the Warwickshire Avon and the upper Thames. The whole of the counties of Derby, Nottingham, Leicester, Stafford and Warwick appear to lie within the dry area, which also includes a little of the south of Yorkshire and portions of Lincoln, Rutland, Northampton, Shropshire, Hereford, Worcester, Oxford, Gloucester, Wiltshire and Somerset. It is worthy of notice that both the dry areas have normally a low rainfall, so that the total amount of rain which fell there is extremely small. Hodsock Priory, near Worksop, is the most remarkable instance, the falls and percentages at that station having been as follows :—

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Six months
Inches	1·21	·32	·98	1·20	·53	·73	4·97
Per cent. of average..	56	12	47	59	30	46	40

It is, of course, well-known to our readers that the longer the period under consideration, the smaller is the deviation from the average which is likely to occur. Thus a week with less than 1 per cent. of the average rainfall is common, but a month with only 1 per cent. of the average rainfall is excessively rare, and for the general rainfall of the British Isles the driest year on record showed 77 per cent. of the average.

Although the number of stations the records of which have been discussed is too small to allow one to treat detached portions of the United Kingdom with the same confidence as the whole, it is possible to compare at least the three kingdoms as shown in Table II.

TABLE II.—*Monthly Rainfall, Sept., 1904—Feb., 1905.*

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Six months.
England and Wales	67	40	64	89	47	57	60
Scotland	88	56	67	82	75	106	78
Ireland	99	59	73	76	78	69	75
British Isles	80	48	67	84	62	73	68

February was a wet month in the west and north of Scotland, and it was the only month in the six during which the general rainfall of any of the larger divisions touched the average, though in Ireland September came very near it. Leaving Ireland out of account, for the contrasts in rainfall in that island are as usual slight, we may divide Great Britain from north to south into a smaller western and a larger eastern division. A convenient line to take is the meridian of 4° W., which runs through the centre of the map, Caithness and the portion of Sutherland east of that line being reckoned with the western division. The result for monthly rainfall then appears :—

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Six months.
Western Division, } 12 stations	101	64	81	90	85	114	88
Eastern Division, } 31 stations	64	38	61	85	46	59	58

This shows that in the west there were only four consecutive months with any general deficiency, and that was so small as to be scarcely noticeable in such a wet region.

The much larger eastern division, containing most of Wales and the whole of England except Cornwall, only received as much as two-thirds of the average rainfall in one month out of the six, and had far less than half the average amount in October (which has normally the heaviest fall of any month in the year) and in January; the total deficiency for the six months amounting to as much as 42 per cent. of the average fall.

The necessity of economising water-supply had already made itself felt in several large towns within the dry area before the end of February. In several cases warnings had been issued to householders to economise the supply, and in some the supply had actually been shut off for a considerable part of the day. As the gathering grounds of most of the large towns supplied by gravitation lie in the area of considerably deficient rainfall, the effect of this exceptionally small autumn and winter rainfall cannot fail to be seriously felt as the year advances, even if the Spring months bring a normal fall sufficient for the needs of agriculture. The winter rainfall also is that on which deep wells depend for their supply, and water from underground sources may be deficient in summer unless the rainfall is so distributed as to keep the ground saturated. The first fortnight of March has shown a comparatively large rainfall over the whole country, and it is already apparent that the succession of continuously deficient months has been broken.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE DEFICIENCY OF RAINFALL.

THE deficiency of rainfall in this district seems so remarkable as to be worthy of note in your pages.

Since January 1st of the present year to date, the total precipitation has been but 1·46 inches, falling on 23 days, and I am given to understand that in some of the outlying country districts water is so scarce that it is being purchased in small quantities at high prices.

The weekly totals from Jan. 1st to Feb. 25th, 1905, are :—

Week ending.	Amount of Rain.	Week ending.	Amount of Rain.
Jan. 7th	·19 in.	Feb. 4th	·08 in.
„ 14th	·08 in.	„ 11th	·02 in.
„ 21st	·75 in.*	„ 18th	·08 in.
„ 28th	·03 in.	„ 25th	·22 in.
On January 29th...	·01 in.		
Total to 31st Jan...	1·06 in.	Total to Feb. 25th	·40 in.
		Total from Jan. 1st	1·46 in.

* This amount all fell on one day, viz. :—the 16th, leaving 0·31 in. as the total for the rest of the month.

If it had not been for the considerable fall on January 16th, the total precipitation for the *nine weeks* under consideration would have been only 0·71 in. !

D. W. HORNER.

Worthing, Feb. 25th, 1905.

I SHOULD be glad to hear if the following is of interest or use to you, as it is certainly curious.

Rainfall at Goring, 1905.

Jan. 2.....	·04 in.	Feb. 6.....	·04 in.
„ 4.....	·07 „	„ 7.....	·03 „
„ 5.....	·04 „	„ 18.....	·02 „
„ 6.....	·02 „	„ 25.....	·15 „
„ 8.....	·02 „	„ 26.....	·18 „
„ 17.....	·07 „	„ 28.....	·06 „
Total ...	·26 „	Total ...	·48 „

Average for 2 months, 3·48 ; fall, ·74 ; deficit, 2·74. Following a very dry autumn this is serious. The poor on our hills have been hauling water for a long while, and as an example of the dryness, the leaves of the beech lie in drifts knee-deep in our woods. Some one had set these alight, and the flames spread over a considerable area before a strong N.E. wind last week.

C. GAMBIER PARRY, MAJOR.

Elmcroft, Goring, Oxfordshire, 1st March, 1905.

I SEND you the rainfall at Walton for the four wet months, October, November, December, and January, in periods of 10 years with averages for each. These figures strikingly emphasise the present abnormal dryness: the first, 1876: 15·49, compared with the last, 1904: 2·91, shows the variations of our climate strongly.

	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
Oct.	2·28	2·54	2·07	·94	4·80	2·62	3·74	3·23	1·13	5·39
Nov.	3·44	1·84	2·07	1·11	1·54	2·10	2·60	2·09	·52	2·22
Dec.	6·03	2·24	1·38	1·32	3·28	2·44	1·65	·84	2·05	·53
Jan.	3·74	2·02	1·14	·56	·06	1·95	2·47	2·98	·93	3·79
	15·49	8·64	6·66	3·93	9·68	9·11	10·46	9·14	4·63	11·93
	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.
Oct.	4·16	2·32	·84	3·85	·61	2·83	5·42	1·54	3·86	2·95
Nov.	1·44	1·62	5·45	·77	2·65	1·86	·89	1·53	·76	2·15
Dec.	3·65	1·44	1·55	1·49	·51	3·11	·48	2·73	1·13	2·72
Jan.	2·24	·94	1·39	2·28	1·27	·91	1·21	1·41	3·80	·24
	11·49	6·32	9·23	8·39	5·04	8·71	8·00	7·21	9·55	8·06
	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	
Oct.	3·66	1·17	2·85	2·37	2·48	1·67	2·45	5·89	·30	
Nov.	1·19	1·67	1·59	·55	1·64	2·92	1·43	1·04	·98	
Dec.	1·84	1·77	2·01	2·37	2·48	3·57	1·11	·66	1·21	
Jan.	2·50	·38	2·27	2·00	1·11	·89	1·18	1·73	·42	
	9·19	4·99	8·72	7·29	7·71	9·05	6·17	9·32	2·91	
10 years, 1876-1885						Average 8·97				
10 years, 1886-1895						" 8·20				
9 years, 1896-1904						" 7·26				
29 years, 1876-1904						" 8·17				

EDWARD SIMPSON.

Walton Hall, Wakefield, 23rd Feb., 1905.

GREAT BAROMETRIC RANGE.

In the February number of the Magazine there is much about the high barometer of January, 1905, but no reference is made to the low barometer of the same month, or to the extreme range of the barometer in the British Isles.

In the *Daily Weather Report* of 17th January, 1905, it was stated that "at Blacksod Point the mercury descended in the night to 27·99 in."

In the Magazine you write, "so far as we have been able to ascertain, the highest recorded was 31·097 inches at Falmouth Observatory."

This gives the great range of 3·107 in. for the British Isles in a single month.

W. E. MILNER.

Rose Cottage, Berkhamsted, 24th Feb., 1905.

REVIEWS.

Observations de la direction des nuages faites en Danemark, aux Færøe, en Islande et au Grönland, 1896-97. [Observations of cloud direction made in Denmark, the Færøes, Iceland and Greenland.] Copenhagen, 1904.

THIS report is published by the Meteorological Institute of Denmark, the work having been carried out in accordance with the programme of the International Meteorological Committee. The figures are stated without discussion.

Bericht über die Ergebnisse der Beobachtungen für das Liv-Estländische Regenstationennetz. 15-jährige Mittelwerte . . . für den Zeitraum 1886-1900, von PROF. DR. B. SRESNEWSKY. [Report on the results of the observations of the rainfall system of Livonia-Esthonia. 15-year means for the period 1886-1900.] Yuryeff [Dorpat], 1904. Size 10 × 7. Pp. 48. Maps.

THE rainfall statistics of the western Baltic province of Russia are set out in detail and embodied in a series of neatly constructed maps.

Report of the Meteorological Council for the year ending 31st March, 1904, to the President and Council of the Royal Society. London. Printed for H.M. Stationery Office. Size 9½ × 6. Pp. 204. Price 1s. 2d.

IF Mr. Mawley included the phenomena of official meteorological publications in his phenological report, he would have indicated the appearance of this annual by means of a very large negative quantity, for it has rarely, if ever in recent years, blossomed so early before. By our delay in noticing its arrival we have done it an injustice which we are anxious to repair by placing on record our high appreciation of the steady improvement in quality and arrangement, as well as date of issue of this very important Report. Amongst other subjects touched on in the report is the advisability of adopting a uniform scale and projection for the synoptic weather charts of all countries. It is gratifying to see the increased number of references to scientific researches, some of fundamental importance which are being promoted by the Meteorological Council. The fulfilment of the daily weather forecasts, however, shows no improvement, but that, we may hope, is due rather to a higher standard being applied to results than to less accurate prevision. The Council has decided to publish no sunshine observations made by recorders the results of which are not comparable with the standard Campbell-Stokes pattern.

Hourly Readings obtained from the Self-Recording Instruments at Four Observatories under the Meteorological Council, 1901. Thirty-third year. New Series. Vol. II. London. Printed for H.M. Stationery Office, 1904. Size 12 × 10. Pp. xiv. + 198. Price 25s.

ONE of the volumes in arrear. The preparation of the others is, we are glad to learn, well advanced.

THE GLACIAL SNOW OF BEN NEVIS.

BY REV. R. P. DANSEY.

THE assertion that Great Britain can boast a glacier will probably seem to most people a bold one. The sceptical will, the writer trusts, be more inclined to believe it after perusing these notes. Ben Nevis, as every one knows, is the highest summit in Britain—4,406 feet above sea level, 110 feet above its rival, Ben Macdhui, of the Cairngorms. But it is somewhat surprising to find that the area of Ben Nevis above 4,000 feet is not quite so large as the corresponding area of Ben Macdhui, or indeed of Braeriach. If, moreover, the 3,000 feet contour line is taken, the contrast is still more startling, for it will be found that at least fifteen of the flat-topped Cairngorms have a larger surface above 3,000 feet than Ben Nevis possesses. The proximity of Ben Nevis to the western sea-board ensures it a very heavy precipitation, of which perhaps quite half, if not more, falls as snow. The precipitation on Ben Nevis is much greater than on the Cairngorms, hence we may expect a greater depth of snow than on the former mountains, but the nearness of Ben Nevis to the sea, and therefore its greater mildness, probably tend to counterbalance its greater snowfall.



CORRIE OF ALT-A-MHULLINN, BEN NEVIS, SHOWING SITE OF GLACIER
AT THE END OF APRIL.

But there is one especial feature which favours the accumulation and duration of snow on Ben Nevis; this feature is not to be found in nearly such a marked degree on any other Scottish mountain. The summit plateau, which rises steeply from the S.W.—the Glen Nevis side—terminates, after forming the summit crest, in a magnificent series of precipices, nearly two miles in length, overlooking the N.E. face. At the bottom of these precipices runs the small stream of the Allt-a-Mhuilinn, whence the corrie takes its name. On the other side of this, rise again the steep scree-covered slopes of Cairn Mor Dearg, 4,012 feet, which at the head of this great corrie joins Ben Nevis on the east by an arête which never falls below 3,478 feet. It will thus be seen that the Allt-a-Mhuilinn corrie is enclosed on all sides except the north by very high ground. Indeed; under the summit of Ben Nevis the precipices are 2,000 feet in height, and into these grim recesses the summer sun never entirely penetrates. These grand cliffs however, their two miles of length seamed by buttress, ridge and gully, not only keep off the sun but they also intercept the warm Atlantic winds which blow over the top and on to the slopes of the opposite mountain, Cairn Mor Dearg, leaving the snow-covered corrie in a cold atmosphere of its own making.

It will now be seen how favourably situated is this great corrie under the N.E. precipices of Ben Nevis for the accumulation and duration of snow.

And now as regards that accumulation. By far the greater part of the snow that falls on Ben Nevis with all winds from S. by W. to W.N.W.—which are the prevailing winds and bring the heaviest snowfalls—is swept off over the precipices, where it accumulates in the great hollows and gullies underneath, in the Allt-a-Mhuilinn Corrie. The maximum depth on the summit is generally reached about the end of April or some time in May. The snow usually disappears from the summit about the beginning of July, except drifts, but the much greater accumulation below still remains. The minimum depth of snow under the precipices is usually found at the beginning of September, but as I have never visited the mountain in summer I am indebted to the Rev. A. E. Robertson for the following information. But, first, what constitutes a glacier? Where does the distinction between a glacier and névé come in? The glaciers of Ben Nevis—there are two—are *not* glaciers, in so far as they are not fed permanently by high level snows as are real glaciers. But, says Mr. Robertson, “if you were to examine into it, I am sure you would find them practically ice, say after 12 or 24 inches below the surface, and I think also they would show glacial movement as well, so if that makes a glacier. then I think you have it on Ben Nevis.” They have never been quite melted away within living memory, so no one knows what is below, or how much is below. Mr. Robertson crossed the largest “glacier” between the “Observatory Ridge” and the “N.E. Buttress,” (climbers’ names for routes up the precipices,) in August last, and said the length of the “glacier” from top to

bottom was then 300 feet ; that it was of an average breadth of 50 yards, hard as a board, ribbed just like *nevé* in the Alps, and that it would not melt much more, if at all, that year. In many places at its side he could look over into the *bergschrund* between the rocks and the snow and could see down a great way, in many places 50 feet ; so Mr. Robertson concludes that if it was 50 feet at the sides it must have been much more in the middle. The rocks near it were heavily glaciated and rounded off. Mr. Robertson, who has a knowledge of all the mountains over 3,000 feet high in Scotland, says that it is on Ben Nevis only that you will find your semi-glacier if at all, and that the snow-beds in the Cairngorms—the next nearest thing—are much more open and therefore more liable to be practically melted away in a hot summer. The level of the Ben Nevis “glacier” would be about 3,000 feet, part of it higher, and part, perhaps, lower. The snow drifts on the Cairngorms are much more open and exposed, and therefore more liable to great variations, if the weather be very hot or very cold in summer, and the nearest approach to the snow-beds (glaciers) on Ben Nevis that Mr. Robertson has seen was a large drift on Ben Macdhui above the Feithe Buidhe, which he once saw practically gone in September some years ago.

The corrie of the Allt-a-Mhuilinn is probably the wettest spot in Great Britain ; if a rain gauge were placed, as Mr. Gethin Jones recently suggested in these pages, half-a-mile on the lee side of the summit of Ben Nevis, that is the side opposite to that on to which the prevailing rain-bearing winds blow, this corrie would be the spot. But the difficulties attending its reading would be very great, especially from October to June, when the corrie is often full of drift snow ; and on the advent of warmer weather, avalanches, due chiefly to the giving way of the cornices on the cliffs above, crash right down into the centre of the corrie, so that unless daily observations could be taken, the records would be of little value, as the gauge would soon be snowed up and lost. Even with daily observations the records could only be approximate, unless the observer was always on the spot and could take the measurements hour by hour, as was done at the Summit Observatory, now unfortunately closed through lack of funds.

Having only visited the Corrie of the Allt-a-Mhuilinn at the end of April, three years in succession, when the snow is at its maximum depth, the writer has not had an opportunity for studying the “glaciers,” as they were then indistinguishable in the vast wilderness of snow. This year he hopes to photograph them in July or August. It would be interesting if photographs could be taken of them twice monthly, from the beginning of July to the end of September, till all melting had practically ceased. A series of photographs thus obtained might be published and compared, care being taken to remember the date on which each was taken. A piece of iron, too, might be driven deeply into the ice at, say the beginning

of July, and a mark made in the rocks alongside and the rate of movement—if any—of the glacier might thus be obtained by observations at certain intervals. I may mention that the head of the Allt-a-Mhuilinn Corrie, where the “glaciers” are, is about three hours’ walk from Fort William.

A QUARTER OF A CENTURY'S RAINFALL AT THROCKING, HERTS.

By REV. C. WIGAN HARVEY.

WITH the year 1904 I completed 25 years of rainfall observations at Throcking, Herts (487 ft. above sea-level), of which I place before your readers the yearly totals, and the ratio which each year bears to the 25 years’ average.

	Total Fall. in.	Percent- age of Average. %	Max. Fall in 24 hrs. in.	Rainy Days.		Total Fall. in.	Percent- age of Average. %	Max. Fall in 24 hrs. in.	Rainy Days.
1880 ...	27·41 ...	114 ...	1·22 ...	157	1894 ...	23·26 ..	96 ...	1·09 ...	203
1881 ...	27·32 ...	113 ...	1·36 ...	186	1895 ...	24·50 ...	101 ...	1·33 ...	165
1882 ...	27·92 ...	116 ...	1·04 ...	193	1896 ...	26·60 ...	110 ...	0·93 ...	177
1883 ...	25·95 ...	107 ...	1·20 ...	169	1897 ...	23·41 ...	97 ...	1·15 ...	177
1884 ...	18·39 ...	77 ...	1·60 ...	138	1898 ...	20·71 ...	85 ...	1·08 ...	170
1885 ...	26·22 ...	109 ...	1·25 ...	169	1899 ...	24·23 ...	100 ...	0·96 ...	182
1886 ...	25·24 ...	105 ...	1·10 ...	166	1900 ...	24·49 ...	101 ...	0·98 ...	178
1887 ...	18·26 ...	76 ...	0·79 ...	150	1901 ...	19·73 ...	82 ...	0·96 ...	134
1888 ...	22·87 ...	94 ...	0·75 ...	178	1902 ...	17·97 ...	74 ...	0·69 ...	161
1889 ...	25·57 ...	106 ...	2·60 ...	165	1903 ...	36·36 ...	150 ...	2·00 ...	201
1890 ...	20·73 ...	86 ...	1·24 ...	171	1904 ...	22·38 ...	93 ...	1·09 ...	201
1891 ...	26·64 ...	110 ...	1·02 ...	212					
1892 ...	25·62 ...	106 ...	1·41 ...	171	Aver.	24·16 ...	100 ...	2·60 ...	174
1893 ...	22·34 ...	92 ...	1·12 ...	168					

It may be noted that the year of least rainfall in the period, 1902, when the fall was 26 per cent. below the average, and the year of greatest rainfall, 1903, when the fall was 50 per cent. above the average, are consecutive. The greatest monthly fall occurred in October, 1903, when 5·93 in. were registered; and the smallest monthly fall in February, 1891, when only 0·01 in. was gauged.

There were 30 occasions on which 1 in. and upwards fell in 24 hours; on two of these it reached 1½ in., and on two it reached 2 in. These 30 falls occurred—1 in April, 3 in May, 3 in June, 7 in July, 4 in August, 4 in September, 4 in October, 2 in November, and 2 in December. The heaviest fall of rain was 2·60 in. on July 12th, 1899, the result of a series of thunderstorms; and the heaviest fall of snow was on February 15th, 1900, when 0·98 in. was registered. There were 25 periods of absolute drought (14 days or more without rain), the longest being a period of 30 days from March 17th to April 15th, 1893. There was, however, a period of 34 days from February 1st to March 6th, 1891, during which only 0·01 in. was registered. Snow was registered to the amount of 17·11 in. on 194 days, representing about 3 per cent. of the 25 years’ aggregate fall (604·12 in.).

ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting was held on Wednesday evening, February 15th, at the Society's Rooms, 70, Victoria Street, Westminster, Mr. Richard Bentley, President, being in the chair.

Mr. Edward Mawley read his "Report on the Phenological Observations for 1904." He said that the weather of the phenological year ending with November, 1904, was chiefly remarkable for the persistent rains in January and February, the absence of keen frosts in May, the long continuance of hot and dry weather in July, and the small rainfall during the autumn. Throughout the year wild plants came into flower behind their usual dates, but at no period were the departures from the average exceptional. The accompanying table shows the mean dates for the thirteen selected plants in the different districts of England.

YEAR.	S.W.		S.		MIDLAND.		E.		N.W.	
	Day of year.	Diff. from aver.	Day of year.	Diff. from aver.	Day of year.	Diff. from aver.	Day of year.	Diff. from aver.	Day of year.	Diff. from aver.
1891...	144	+10	144	+ 9	150	+11	147	+10	150	+ 6
1892...	139	+ 5	138	+ 3	144	+ 5	143	+ 6	147	+ 3
1893...	118	-16	122	-13	125	-14	123	-14	128	-16
1894...	126	- 8	130	- 5	135	- 4	127	-10	137	- 7
1895...	139	+ 5	138	+ 3	141	+ 2	138	+ 1	144	0
1896	125	- 9	128	- 7	132	- 7	130	- 7	134	-10
1897...	130	- 4	132	- 3	136	- 3	132	- 5	142	- 2
1898...	133	- 1	135	0	138	- 1	136	- 1	141	- 3
1899...	136	+ 2	136	+ 1	141	+ 2	138	+ 1	145	+ 1
1900...	142	+ 8	141	+ 6	144	+ 5	143	+ 6	152	+ 8
1901...	138	+ 4	139	+ 4	141	+ 2	139	+ 2	144	0
1902...	139	+ 5	140	+ 5	145	+ 6	142	+ 5	152	+ 8
1903...	134	0	134	- 1	137	- 2	134	- 3	145	+ 1
1904...	139	+ 5	139	+ 4	142	+ 3	140	+ 3	149	+ 5
Mean ...	134	...	135	...	139	...	137	...	144	...

— signifies early and + late.

Such spring migrants as the swallow, cuckoo and nightingale made their appearance in this country at as nearly as possible their usual time. The yield of wheat per acre was the smallest since 1895, while those of barley, beans and peas were also deficient. On the other hand, there were good crops of oats, potatoes and mangels. The best farm crops of the year were, however, those of hay, swedes and turnips. Both corn and hay were harvested in excellent condition. Apples were everywhere abundant, and all the small fruits yielded well, especially strawberries, but there was only a moderate supply of pears and plums.

The President said that Dr. Gatty, who had made a study of the

question of the migration of birds, had found that they always followed practically the same course, and that they were not much influenced by the character of the season, whether it was favourable or otherwise.

Dr. W. N. Shaw said that he had been engaged recently in an attempt to summarise the meteorological data of the "Weekly Weather Report" in a form which would facilitate inquiry into the meteorological conditions of observed phenological results, the yield of crops, and other similar questions. One aspect of the inquiry, the relation between autumn rainfall and the yield of wheat, had already been noticed in *The Times* (see this Magazine for February). It had found an explanation of the deficient yield of 1904, after the favourable spring and summer of that year, in the excessive rainfall of the autumn of 1903.

Mr. H. Mellish said that in his own immediate neighbourhood in Nottinghamshire the swedes and turnips were the worst products of the year.

Mr. Baldwin Latham suggested that the deficiency in the yield of the wheat crop in 1904 was due to the excessive wet period in the year 1903, when a large amount of percolation took place, which washed out the soluble manurial elements and left the soil impoverished. It was well known that the effect of drought on the growth and yield of wheat was nothing like so detrimental as excessive wet, and the effect of the diminution of percolation during last summer and autumn could not but have a beneficial effect in producing a good wheat harvest in the present year.

Captain D. Wilson-Barker, Mr. J. E. Clark, and Mr. F. Gaster also took part in the discussion, and Mr. E. Mawley replied.

The other papers read were :—

"Observations of Meteorological Elements made during a Balloon Ascent at Berlin, September 1st, 1904," by Dr. H. Elias and Mr. J. H. Field; and

"The Winds of East London, Cape Colony," by Mr. J. R. Sutton.

The following gentlemen were elected Fellows of the Society :—
Capt. G. Caie, Mr. G. A. Fernandez, Mr. E. Holt, Mr. A. E. Mitchell, and Mr. J. M. G. Shaw.

METEOROLOGICAL OBSERVATIONS IN PEMBA DURING 1903 AND 1904.

By THEODORE BURTT.

THE following statistics of climatological observations at the Friends' Industrial Mission, Pemba, East Africa, summarise and supplement those published in this Magazine for April, 1901, and October, 1902.

It will be noticed that there is but little variation in temperature between one year and another, and apparently no relation between

the temperature and the rainfall. The highest temperature in the sun was 175°.

It is very noticeable how the rainfall has decreased in the five years, but 1904 shows a heavier rainfall than either of the two preceding years. Though I have no record of 1898, I remember it as an unusually dry year, the rainy season being almost a failure; 1897, on the other hand, was a much wetter year. From the accompanying table of 1903 it will be seen that the lack of rain was chiefly during the rainy season in April and May. May is distinctly the wettest month in the year, though in 1902 and 1904 there was a little more rain in April. During May, 1899, 56·16 in. of rain fell, 13½ inches falling in 48 hours.

Meteorological Observations in Pemba.

YEARS.	Mean Max.	Mean Min.	Absolute Max.	Absolute Min.	Rainfall. in.	Rainy Days.
1899	83·3	70·2	92·0	65·0	105·24	149
1900	83·5	71·3	95·0	66·0	90·35	160
1901	81·8	70·4	90·5	65·0	92·78	166
1902	82·8	71·4	91·0	67·0	68·72	132
1903.						
January	84·6	73·9	90·0	70·5	4·90	5
February	84·7	73·1	89·5	71·0	2·00	4
March	86·7	75·2	91·5	71·5	1·40	5
April	83·1	72·2	86·5	70·0	13·09	24
May	80·0	71·0	85·0	68·5	17·93	24
June	81·3	70·5	83·0	69·0	5·22	13
July	79·4	69·0	82·0	66·0	3·15	15
August	79·5	68·4	84·0	67·0	1·14	14
September	80·9	68·6	84·0	67·5	·52	6
October	82·8	70·0	86·0	68·0	1·91	2
November	80·9	71·7	86·0	70·0	2·65	11
December	83·2	73·3	87·0	70·0	9·33	15
Year, 1903	82·3	71·4	91·5	66·0	63·24	138
1904.						
January	83·5	72·9	90·5	71·5	2·12	10
February	84·5	72·3	86·0	71·0	·23	2
March	84·4	72·4	90·0	70·0	5·46	11
April	80·6	71·1	86·0	66·0	23·50	20
May	79·2	70·7	84·0	69·0	19·74	27
June	78·8	69·2	82·0	66·0	12·13	17
July	77·4	67·7	80·0	65·0	3·27	15
August	77·9	67·4	80·0	66·0	·97	8
September	79·6	68·2	82·0	66·0	1·11	8
October	81·2	69·2	86·0	68·0	1·71	8
November	81·7	70·9	87·0	68·0	13·34	17
December	82·5	72·9	85·0	72·0	2·65	13
Year, 1904	80·9	70·4	90·5	65·0	86·23	156

RAINFALL AND TEMPERATURE, FEBRUARY, 1905.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.]	RAINFALL.				Days on which 101 or more fell.	TEMPERATURE.						No. of Nights below 32°.	
		Total Fall.	Diff. from average, 1870-99.	Greatest in 24 hours.			Max.		Min.					
				Depth.	Date.		Deg.	Date.	Deg.	Date.	Shade	Grass		
		inches.	inches.	in.										
I.	London (Camden Square) ...	·79	--	·83	·19	26	12	54·4	5	30·6	20	2	10	
II.	Tenterden.....	·76	--	1·09	·43	26	14	56·0	5	28·5	12	6	13	
„	Hartley Wintney	·66	--	1·40	·18	25	13	59·0	19	29·0	12	4	10	
III.	Hitchin	1·00	--	·54	·49	26	13	52·0	5, 16	28·0	19, 20	..	8	
„	Winslow (Addington)	·56	--	1·17	·14	26	12	55·0	5	27·0	20	9	20	
IV.	Bury St. Edmunds (Westley) ..	1·37	--	·18	·38	26	13	53·0	5	26·0	20	10	20	
„	Brundall	1·43	--	·06	·17	20	19	53·8	5	26·8	8	6	15	
V.	Alderbury	·72	--	1·49	·26	25	12	56·0	18	...	...	...	...
„	Winterbourne Steepleton ...	·79	--	2·32	·32	25	14	55·1	14	27·2	12	8	13	
„	Torquay (Cary Green)	·84	--	2·03	·46	25	10	56·8	14	32·0	25	1	9	
„	Polapit Tamar [Launceston] ..	1·63	--	1·21	·37	25	17	53·9	14	26·8	25	9	10	
„	Bath	·86	--	1·26	·27	25	10	54·8	14	21·5	25	5	19	
VI.	Stroud (Upfield)	·80	--	1·33	·26	25	14	53·0	16	27·0	24	8	...	
„	Church Stretton (Woolstaston) ..	1·35	--	·92	·33	26	18	52·5	5	26·0	22	11	...	
„	Bromsgrove (Stoke Reformatory) ..	·50	--	1·13	·14	6	9	52·0	18	24·0	11	16	...	
VII.	Boston	·54	--	1·01	·17	17	7	53·0	16	25·0	8	12	...	
„	Worksop (Hodsock Priory) ..	·73	--	·85	·23	25	9	58·2	18	24·5	8	9	20	
„	Derby (Midland Railway) ...	·67	--	·99	·16	26	15	56·0	18	28·0	7	8	...	
VIII.	Bolton (The Park)	2·86	+	·19	·49	13	20	53·9	18, 19	29·0	12	6	13	
IX.	Wetherby (Ribston Hall) ...	1·40	--	·23	·35	28	12	...	...	...	...	...	...
„	Arncliffe Vicarage	4·53	--	·21	·81	28	19	...	...	...	...	...	...
„	Hull (Pearson Park)	1·16	--	·70	·42	28	11	55·0	18	28·0	8, 12	6	21	
X.	Newcastle (Town Moor) ...	·91	--	·67	·15	25	15	...	...	...	...	...	...
„	Borrowdale (Seathwaite) ...	9·86	--	1·78	1·41	25	21	49·1	4	21·5	22	8	...	
XI.	Cardiff (Ely)	1·17	--	1·96	·33	26	17	...	...	...	...	...	...
„	Haverfordwest (High St.) ...	1·83	--	1·87	·53	25	22	52·8	18	29·2	25	3	16	
„	Aberystwith (Gogerddan) ...	2·74	--	·29	·37	1	21	54·0	7, 14	21·0	21	8	...	
„	Llandudno	1·87	--	·10	·40	6	17	53·0	16	31·0	25	3	...	
XII.	Cargen [Dumfries]	2·71	--	·91	·78	25	14	52·0	13, 18	25·0	12	10	...	
„	Lilliesleaf (Riddell)	1·17	--	1·24	·21	18	18	50·0	13a	22·0	11, 12	16	19	
XIII.	Edinburgh (Royal Observy.) ..	1·34	...	...	·36	18	13	53·3	18	24·6	12	7	17	
XIV.	Colmonell	3·95	+	·28	·80	25	19	51·0	5, 8b	20·0	23	8	...	
XV.	Tighnabruaich	5·74	+	1·17	·65	26	23	46·0	14	24·0	11	17	17	
„	Mull (Quinish)	5·03	+	·53	·97	25	24	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis) ..	·80	--	1·30	·20	1	11	52·4	14	24·9	12	13	...	
XVII.	Braemar	2·36	--	·34	·38	2	15	50·7	5	12·3	22	...	18	
„	Aberdeen (Cranford)	2·04	--	·29	·40	27	18	56·0	5, 9	24·0	11	15	...	
„	Cawdor (Budgate)	2·45	+	·59	·37	1	18	...	...	...	...	...	...
XVIII.	Invergarry	7·23	+	2·34	1·25	18	19	...	...	...	...	...	...
„	Bendamoah	11·66	+	4·89	1·74	12	25	...	...	...	...	...	...
XIX.	Dunrobin Castle	3·73	+	1·34	·50	3	19	54·0	18	24·5	12	12	...	
„	Castletown	4·54	...	...	·63	9	24	51·0	5	23·0	11, 12	12	...	
XX.	Killarney	2·80	--	2·64	1·25	26	20	55·5	5	23·0	23	...	...
„	Waterford (Brook Lodge) ...	1·14	--	2·16	·58	25	14	56·0	18	26·0	23, 24	7	...	
„	Broadford (Hurdlestown) ...	1·84	--	·35	·68	25	21	50·0	6, 8, 9	25·0	22	7	...	
XXI.	Carlów (Browne's Hill)	1·04	--	1·57	·39	25	11	...	...	...	...	...	...
„	Dublin (Fitz William Square) ..	·75	--	1·23	·22	25	12	55·8	18	32·0	20	1	10	
XXII.	Ballinasloe	1·63	--	·85	·32	25	22	60·0	8, 13	19·0	24	11	...	
„	Clifden (Kylemore House) ..	5·08	--	1·00	·77	25	19	...	...	...	...	...	...
XXIII.	Seaforde	1·70	--	1·27	·54	25	17	51·0	16	26·0	22	11	15	
„	Londonderry (Creggan Res.) ..	3·78	+	1·05	·62	27	22	...	...	...	...	...	...
„	Omagh (Edenfel)	1·98	--	·51	·30	25	21	51·0	5, 8	26·0	22	8	14	

+ Shows that the fall was above the average; — that it was below it. a—and 14, 18 b—and 9, 16.

SUPPLEMENTARY RAINFALL, FEBRUARY, 1905.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	·85	XI.	New Radnor, Ednol	1·91
„	Ramsgate, West Cliff.....	·89	„	Rhayader, Nantgwillt	4·08
„	Hailsham	·74	„	Lake Vyrnwy	3·39
„	Crowborough	1·18	„	Ruthin, Plâs Drâw.....	1·14
„	Osborne.....	·62	„	Criccieth, Talarvor.....	1·37
„	Emsworth, Redlands.....	·71	„	Anglesey, Lligwy	1·32
„	Alton, Ashdell	1·20	„	Douglas, Woodville	1·94
„	Newbury, Welford Park ...	1·01	XII.	Stoneykirk, Ardwell House	2·05
III.	Harrow Weald	·91	„	Dalry, Old Garroch	5·61
„	Oxford, Magdalen College..	·43	„	Langholm, Drove Road.....	3·08
„	Banbury, Bloxham... ..	·72	„	Moniaive, Maxwellton House	3·41
„	Pitsford, Sedgebrook.....	·58	XIII.	N. Esk Reservoir [Penicuik]	2·65
„	Huntingdon, Brampton.....	·78	XIV.	Maybole, Knockdon Farm..	3·28
„	Wisbech, Bank House	1·09	„	Glasgow, Queen's Park	2·43
IV.	Southend	·56	„	Campbeltown, Redknowe...	3·62
„	Colchester, Lexden	·67	XV.	Inveraray, Newtown	6·88
„	Saffron Waldon, Newport...	1·36	„	Ballachulish House.....	9·15
„	Rendlesham Hall	·98	„	Islay, Eallabus	4·07
„	Swaffham	1·04	XVI.	Dollar	2·18
„	Blakeney	1·16	„	Loch Leven Sluices	1·22
V.	Bishops Cannings	·73	„	Balquhider, Stronvar	4·77
„	Ashburton, Druid House ...	1·62	„	Coupar Angus Station	·74
„	Okehampton, Oaklands.....	2·38	„	Blair Atholl.....	2·29
„	Hartland Abbey	1·49	„	Montrose, Sunnyside.....	·99
„	Lynmouth, Rock House ...	1·54	XVII.	Alford, Lynturk Manse ...	1·65
„	Probus, Lamellyn	1·38	„	Keith.....	2·42
„	Wellington, The Avenue ...	1·04	XVIII.	N. Uist, Lochmaddy.....	5·21
„	North Cadbury Rectory ..	·94	„	Aviemore, Alvey Manse ...	2·69
VI.	Clifton, Pembroke Road ...	·86	„	Loch Ness, Drumnadrochit.	3·94
„	Moreton-in-Marsh, Longboro'	·97	„	Glencarron Lodge .....	...
„	Ross, The Graig	·77	„	Fearn, Lower Pitkerrie.....	2·26
„	Shifnal, Hatton Grange.....	·69	XIX.	Invershin	4·53
„	Wem Rectory	·81	„	Altnaharra	6·22
„	Cheadle, The Heath House.	1·00	„	Bettyhill	3·89
„	Coventry, Kingswood	·96	„	Watten	3·27
VII.	Market Overton	·74	XX.	Cork, Wellesley Terrace ...	1·42
„	Market Rasen	·75	„	Darrynane Abbey	3·07
„	Bawtry, Hesley Hall.....	·63	„	Glenam [Clonmel]	2·01
VIII.	Neston, Hinderton	1·11	„	Ballingarry, Gurteen	1·75
„	Southport, Hesketh Park...	1·24	„	Miltown Malbay.....	1·71
„	Chatburn, Middlewood	2·53	XXI.	Gorey, Courtown House ...	1·01
„	Cartmell, Flookburgh	2·25	„	Moynalty, Westland	1·76
IX.	Langsett Moor, Up. Midhope	3·06	„	Athlone, Twyford	1·53
„	Scalby, Silverdale	1·46	„	Mullingar, Belvedere.....	1·71
„	Ingleby Greenhow	1·43	XXII.	Woodlawn	2·16
„	Middleton, Mickleton	1·62	„	Westport, Murrisk Abbey..	2·64
X.	Beltingham	1·22	„	Crossmolina, Enniscoe	3·63
„	Font Reservoir, Fallowlees.	1·25	„	Collooney, Markree Obsy...	3·96
„	Ilderton, Lilburn Cottage..	·98	XXIII.	Enniskillen, Portora	2·97
„	Keswick, The Bank	3·83	„	Warrenpoint	1·33
XI.	Llanfrehfa Grange.....	·82	„	Banbridge, Milltown	1·34
„	Treherbert, Tyn-y-waun ...	4·20	„	Belfast, Springfield	2·61
„	Carmarthen, Friary	1·93	„	Bushmills, Dundarave	2·92
„	Castle Malgwyn	2·19	„	Stewartstown	2·02
„	Plynlimon.....	7·45	„	Killybegs	3·77
„	Tallyllyn	1·40	„	Horn Head	3·59

METEOROLOGICAL NOTES ON FEBRUARY, 1905.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—A mild and dry month, rather showery in the latter half. Violent squalls with H on 26th. Notable absence of frost. Duration of sunshine 68·1* hours, and of R 22·4 hours. Mean temp. 42°·2, or 2°·4 above the average.

TENTERDEN.—A pleasant month on the whole, but variable. Out of 14 rainy days 11 had only ·01 or ·02 in. S on 11th and 20th. Duration of sunshine 89·5† hours.

CROWBOROUGH.—Mild with scanty R, nearly half of which fell on 26th. Several H storms during the last 10 days. Mean temp 40°·3.

OSBORNE.—R about 70 per cent. below the average of 46 years.

HARTLEY WINTNEY.—Another dry month, with remarkably mild and fine weather. Great scarcity of water in ponds and springs. The last week was stormy with light R. Ozone on 25 days, with a mean of 4·0.

PITSFORD.—Very dry. The first part was pleasant, the latter cold and wet. R 1·41 in. below the average of 1880-89. Mean temp. 40°·6.

BURY ST. EDMUNDS.—Another dry month. Rivers and ponds very low and water supply getting short. Westerly winds on 23 days.

WINTERBOURNE STEEPLETON.—A very dry month, with mean temp. about 3° above the average, and many very beautiful days.

TORQUAY.—Mean temp. 45°·0, or 1°·9 above the average. Duration of sunshine 98·3* hours, or 17·9 hours above the average. Mean amount of ozone 5·2. Max. 9·0 on 27th, with W. wind; min. 1·0 on 25th with N. wind.

WELLINGTON.—Another remarkably dry month, the R being more than 1·50 in. below the average. The temp. was generally high until 19th, when there followed a few cold days with some S.

NORTH CADBURY.—The cloud, wind and temp. were exactly normal, but the range of temp. was small, and frosts were few and slight. Extremely dry till 26th, when there was a rapid change to cyclonic conditions.

CLIFTON.—Very dry, though with frequent and light drizzle, till 25th, when a sudden change took place with the arrival of a deep cyclone in the N., and stormy weather. R one-third of the average. The R of January and February together was only 1·54 in., the least in 49 years except in 1896, when only 1·18 in. fell.

ROSS.—The dry period, which, with the exception of 10 days, Dec. 4th-13th, had continued from September 14th, or for 164 days, lasted till midnight on February 25th. In this time only 5·88 in. of R fell, or 8·92 in. less than the average.

WEM.—On the whole dry and fine, but with much cold wind during the last 10 days.

WORKSOP.—Mild and windy. The sixth dry month in succession, the fall of the six months, September to February, being less than in any of the last 29 years.

BOLTON.—The R was in excess for the first time since May, 1904. Mean temp. 40°·0, or 2°·5 above the average. Duration of sunshine 48·2* hours, or 6·3 hours above the average. Mean amount of ozone 2·3, being 1·6 above the average.

SOUTHPORT.—An anomalous month. Very stormy and somewhat mild, westerly winds again greatly predominating, but unusually dry and sunny, with high pressure. Duration of sunshine 20* hours above the average. R ·80 in. below the average, and underground water remarkably low. Ozone very abundant.

UPPER MIDHOPE.—From 1st to 24th dry and windy, with occasional slight R, sleet, H and S. From 25th it was very wintry, with heavy R, sleet, S and H.
 CARMARTHEN.—Mild and dry in the early part. Cold N. and N.E. winds later, with showers of cold R, H, sleet and S.

HAVERFORDWEST.—Fine and mild generally, with small R. Sharp frost from 21st to 28th, causing a wholesome check to vegetation. Duration of sunshine 70·2* hours. Gales on 5 days.

DOUGLAS.—R in small quantities on 21 days, but sunshine and temp. above the average except in the last week, when it was cold. Owing to the prevalence of strong gales vegetation was backward in spite of the mild weather and sunshine.

SCOTLAND.

CARGEN [DUMFRIES].—A “dropping” month without exceptionally heavy R. The temp. was high and vegetation forward.

LANGHOLM.—R 1·27 in, below the average of 29 years. The last week was very cold, with frequent sleet and H.

INVERARAY.—Stormy and unsettled throughout, but mild.

COUPAR ANGUS.—An ideal, open month, with vegetation advanced. Morning frosts were numerous, but in no case severe. Mean temp. 39°·4. R fell in small quantities on many days.

LYNTURK.—R still considerably below the average. Till 19th there were high winds, several times reaching the force of a gale, but thereafter it was fairly quiet.

DRUMNADROCHIT.—R 1·06 in. above the average of 19 years.

ALTNAHARRA.—Very severe gales were experienced in the first half. Exceptionally keen frost at times.

WATTEN.—Boisterous and very changeable, with storms of wind, and short S and R storms. Generally fresh and open and at times fine.

CASTLETOWN.—Till 20th damp, cold and cloudy. From 20th to 23rd clear, cold and dry, with remarkably high bar. The last few days were very damp.

IRELAND.

DARRYNANE.—The first three weeks were mild and fine, the rest cold with H showers, some S and strong N.W. winds. R 74·5 per cent. of the average of 25 years.

HURDLESTOWN.—The first three weeks were mild, the last cold and severe.

MILTOWN MALBAY.—Very little R. Mild to the 19th, thence to the end inclement and stormy, with S, H, T and L.

DUBLIN.—Mild and open till the 18th, when a change to cold weather took place. The last 10 days were wintry, with R, H and sleet on 25th and following days. Mean temp. 43°·6, or 1°·1 above the average.

MARKREE OBSERVATORY.—Fair generally until the last few days, when a severe storm set in with H, sleet and S.

BANBRIDGE. R ·76 in. below the average of 40 years.

BELFAST.—A most useful month for the land till 26th, when the heavy sleet and S undid the previous good. R just under the average.

OMAGH.—A very favourable winter month, with temp. above, and R below, the average. The duration of bright sunshine was above the average, but it was accompanied by much barometric oscillation.

* Campbell-Stokes.

† Jordan[†]

Climatological Table for the British Empire, September, 1904.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	74·9	5	39·1	26	65·7	48·2	51·3	87	121·2	31·1	1·17	11	4·0
Malta.....	88·5	1	62·3	30	81·8	68·1	65·0	72	138·9	57·9	2·30	6	3·9
Cape Town ...	84·7	17	40·6	4	65·0	49·6	50·3	75	...	...	2·48	11	5·3
Durban, Natal	101·1	3	50·6	11	76·5	58·6	...	...	142·9	...	·58	10	5·1
Johannesburg	79·5	30	26·5	10	67·8	45·0	37·5	55	...	24·8	·13	2	2·2
Mauritius.....	78·8	17	50·9	21	76·4	60·0	57·0	69	148·2	42·0	1·04	15	6·1
Calcutta.....	93·4	18	74·9	10	89·3	77·6	76·3	82	163·2	72·0	5·72	12	6·3
Bombay.....	88·1	27	75·4	25	85·6	77·8	71·7	80	136·7	69·4	1·81	11	5·9
Madras.....	100·5	18	72·6	2	95·7	77·2	70·7	67	161·2	70·7	3·51	10	5·2
Kodaikanal	67·0	26	48·5	25	62·8	51·3	54·0	83	136·6	38·2	6·51	16	6·3
Colombo, Ceylon.....	87·6	13	74·8	18	85·7	77·2	72·7	79	153·0	72·6	1·77	16	5·6
Hongkong.....	88·9	1	73·0	19	85·0	76·3	73·8	81	145·8	...	9·77	22	6·6
Melbourne.....	69·2	24	35·1	12	62·6	45·4	40·2	70	133·7	27·6	1·26	12	6·0
Adelaide	79·6	17	37·9	29	64·6	46·0	43·6	65	140·1	32·5	·69	10	4·2
Coolgardie	83·2	16	35·2	2	68·8	46·5	44·5	62	153·4	26·0	2·05	15	5·0
Sydney	80·9	25	42·0	30	66·1	49·0	44·3	65	119·1	32·8	1·00	16	4·3
Wellington	64·0	16a	35·7	24	56·5	42·4	47·3	75	115·0	33·0	5·22	20	7·0
Auckland	63·0	6, 30	41·0	23	59·1	48·4	47·2	78	130·0	37·0	3·91	24	5·8
Jamaica, Negril Point..	89·9	4	70·1	2	86·7	72·7	74·2	80	...	...	6·31	13	...
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada.....	88·8	5	70·4	22	84·7	74·4	72·0	76	152·0	...	9·14	23	3·7
Toronto	79·2	11	33·8	21	67·2	50·2	52·5	79	107·0	27·4	3·99	12	5·4
Fredericton ...	77·7	12	25·4	23	63·7	40·3	42·4	64	...	...	7·73	12	5·2
Winnipeg	78·0	27	26·0	20	62·1	40·8	...	...	...	...	1·88	11	6·5
Victoria, B.C.	73·4	13	43·0	19	65·6	49·3	...	...	...	...	·32	5	2·6
Dawson	60·6	11	7·8	19	46·5	27·6	...	...	...	...	1·01	6	4·4

a—and 28.

MALTA.—Mean temp. of air 74°·2, or 1°·9 below, and mean hourly velocity of wind 8·3 miles, or 0·5 above, averages. Mean temp. of sea 78°·0. TSS on 4 and L on 7 days.

MAURITIUS.—Mean temp. of air 1°·9, dew point 3°·2, and rainfall ·33 in., below averages. Mean hourly velocity of wind 10·1 miles, or 1·9 miles below average, mean computed direction E.S.E.

MADRAS.—Bright sunshine 180·2 hours. TSS on 4 days.

KODAIKANAL.—Bright sunshine 148 hours.

COLOMBO.—Mean temp. of air 81°·1, or 0°·3 above, of dew point 0°·6 below, and R 3·36 in. below, averages. Mean hourly velocity of wind 11·4 miles.

HONGKONG.—Mean temp. of air 80°·2. Bright sunshine 161·3 hours. Mean hourly velocity of wind 11·5 miles; mean direction E.

ADELAIDE.—Mean temp. of air 1°·9 below, and R 1·04 in. below, averages. Driest September with one exception (1896) in 66 years records.

SYDNEY.—Mean temp. of air 1°·3, R 1·97 in., and humidity 5·1, all below averages.

WELLINGTON.—Mean temp. of air 0°·4 below, and R 1·00 in. above, averages.

Erratum.—Vol. 39, p. 244, Johannesburg, last col., Cloud, *should be* 0·6, not 6·0 as printed.

Symons's Meteorological Magazine.

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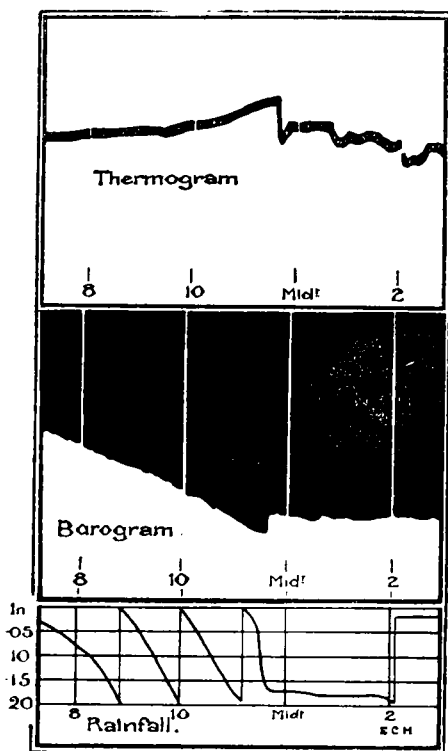
VOL. XL.

ON A FORM OF SUDDEN WEATHER CHANGE.

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

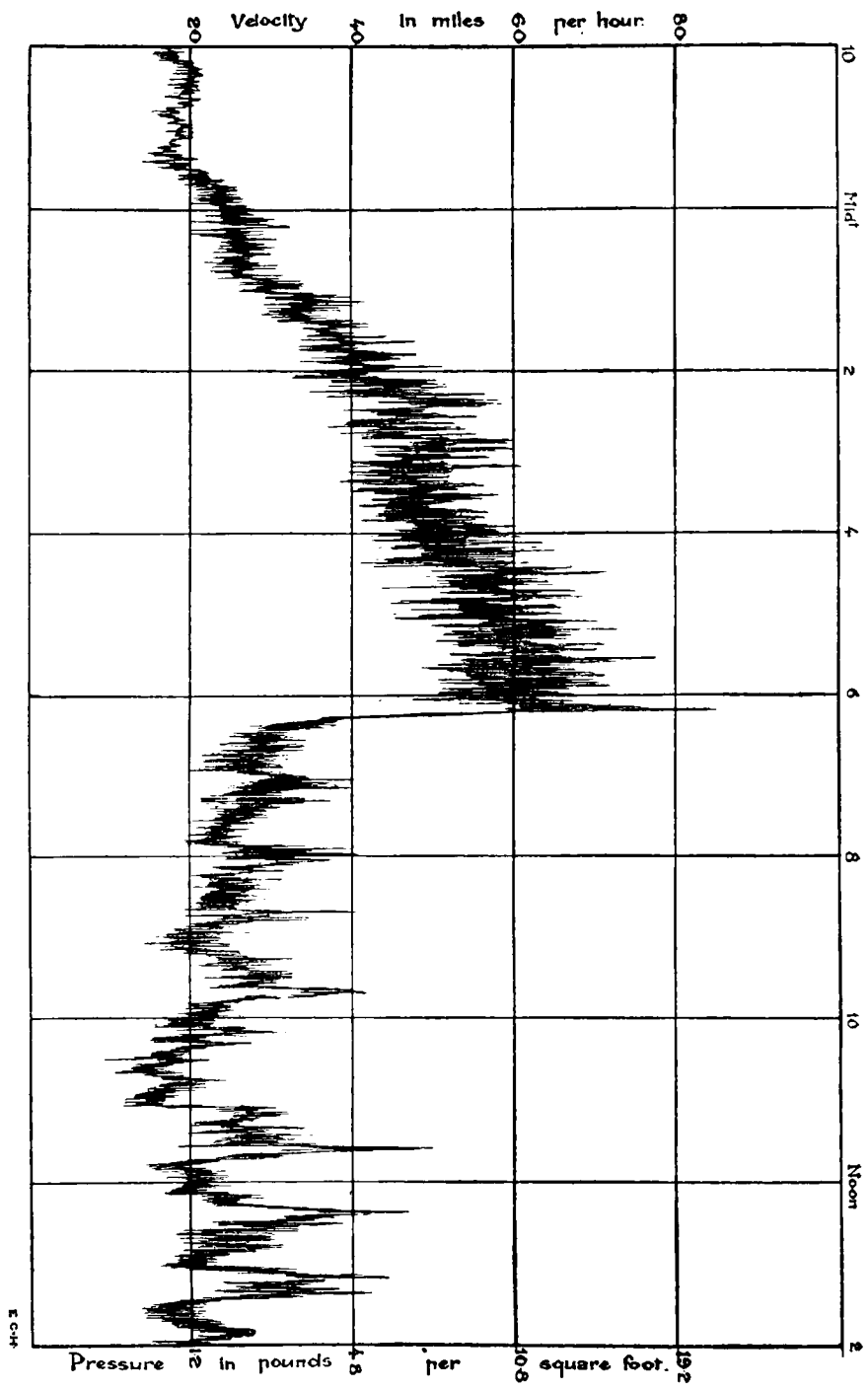
(of the Meteorological Office.)

THE changes shown on the traces of the self-recording instruments at our western Observatories on February 25th and 26th last were so striking that, at the Secretary's request, I forward the following description of them.



At Valencia, our most western station, a strong southerly wind got up during the early part of the evening of the 25th, and reached a velocity of 40 miles an hour at 11 p.m. During this time the barometer fell briskly, while the temperature curve showed a slow rise. Rain set in at 6.30 p.m. and continued steadily during the following hours. At 11.35 p.m. an abrupt change took place in all the elements. The wind veered suddenly from south to west; the barometer rose through as much as 0.08 inch in the space of a few minutes, and the temperature fell 4.5 degrees in the same interval of time. The trace of the rain-gauge was almost vertical through a distance of 0.1 inch, and then the rain ceased; the total rainfall since 6.30 p.m. was about .75 in.

Subsequently the barometer remained steady, but many small oscillations were recorded. The temperature curve, which before the change occurred had been remarkably free from minor fluctuations, became very irregular.



The wind direction was also much less steady, many temporary changes—of which the more prominent ones were accompanied by smart showers—being shown.

Turning now to Falmouth, we find the changes similar in many respects and yet different in others. The pressure tube anemogram is reproduced in the accompanying diagram. During the period of rapidly increasing velocity, the wind direction was from S.S.W., but the sudden drop from 84 to about 30 miles per hour shortly after 6 a.m. was accompanied by a shift of wind to W.S.W. The remaining part of the trace shows a series of oscillations of a period of about an hour, each of which was accompanied by a sudden veering of the wind through several points. The barogram is similar to that from Valencia in that it shows a brisk fall up to the time of change of wind and remains approximately steady afterwards, but the sudden increase of pressure, which was so very characteristic at Valencia, is only faintly indicated at Falmouth. In the thermogram a fall of temperature is indicated, but this change was also less sudden than at Valencia. The marked increase in the rate of rainfall at the time of the change of wind, and the subsequent clearing of the weather, were again very characteristic; the total rainfall between 2 a.m., the hour at which rain commenced, and 6.30 a.m. was 0.37 inch, about half the amount measured at Valencia.

The anemograms from Scilly and Holyhead show changes similar to those recorded at Falmouth, but the difference between the wind velocities in the southerly and westerly winds was not so marked. The change occurred at Scilly at 5 a.m., and at Holyhead at about 5.30 a.m.

At Kew the phenomena were less pronounced. A strong southerly wind prevailed during the morning of the 26th, but no definite hour can be assigned for its interruption. The barometer ceased falling at about 2 p.m.

The phenomena, described above, seem to suggest that we have here a case of an air current from the west cutting into a current from the south, and, in view of the heavy rainfall which accompanied the change, we may perhaps go a step further and regard the westerly current as forcing its way underneath the southerly one. The information at present available is too scanty to enable us to trace the passage of the phenomenon across the country; it would, however, be a matter of interest to see whether it was propagated along a linear front in a similar manner to hail and thunder squalls. I should be glad to hear from any of your readers whose self-recording instruments showed changes which may be brought into connexion with the effects I have described.

The isobaric distribution at 8 a.m. on February 26th was of the type generally described as a depression off the north-west of Scotland; the gradient was moderately steep, and the isobars were concave to a point situated, say, 200 miles to the north-west of

Stornoway. A line drawn slightly to the westward of Liverpool and Jersey separates the map into two portions. On its eastern side the wind was strong in force and generally southerly in direction (it was, however, S.W. at Portland Bill); on its western side it was westerly in direction and rather less strong in force. The same line separates a region of continuous rainfall from a region of detached clouds and occasional showers.

One further point is perhaps of interest. Two years ago, also in the month of February, a very similar series of changes was recorded under similar isobaric conditions at all stations in the south-west of England, and it would be interesting to know whether this type of weather is particularly frequent at this time of the year.

RECEPTION BY THE METEOROLOGICAL COUNCIL.

It is believed that the Report of the Treasury Committee is about to be acted upon, and the constitution of the Meteorological Office altered, although up to the date of going to press no definite announcement has been made, and nothing can yet be stated as to the future relationship between the national weather service and the Government.

On March 31st, the last day of its official year, the Meteorological Council was "At Home," in 63, Victoria Street, to a large party of men of science, and ladies. General Sir Richard Strachey, Chairman of the Meteorological Council, and Lady Strachey, received the guests, and most of the members of the Council were present, including Professor George Darwin, Admiral Sir William Wharton, and Dr. W. N. Shaw. The fourteen principal rooms of the Office were open for inspection, and an interesting collection of charts, diagrams, and instruments, was on view; which the members of the staff of the office were ready to exhibit and explain. A list of the exhibits formed an attractive memento of the occasion, the cover giving, in colour, reduced facsimiles of the Atlantic pilot-chart for April, and the daily weather chart for March 31st.

The exhibits were largely historical, serving to illustrate the development in the work of the Office from the time of Admiral Fitzroy to the present day. A number of notable records from recording instruments were shown, including those which revealed the air-waves round the world, started by the eruption of Krakatoa, and the twenty-four hour traces of continuous sunshine obtained on the Antarctic expedition of the *Discovery*. The instruments on view included Lord Kelvin's harmonic curve analyser, Sir Richard Strachey's harmonic curve compounder, Mr. F. Galton's pantagraph for reducing diagrams in different ratios for length and breadth, computing machines, and several of the new forms of apparatus which had been shown at the recent exhibition of the Royal Meteorological Society. Mr. Lempfert showed an ingenious application

of the "wheel of life," which represented in a vivid way the movement of a particle of air through an atmospheric depression.

In the forecast room a special weather chart was prepared at 4 p.m., and before the party broke up the later-comers had an opportunity of seeing the usual 6 p.m. chart prepared from the data as they were received. A good deal of interest was aroused by the series of special weather charts prepared in order to advise the captain of the Royal Yacht *Victoria and Albert*, as to the prospects of weather in the Channel, after the Queen had gone on board on March 14th, until the conditions were sufficiently favourable to make it prudent to go to sea on the 18th.

Dr. Shaw and all the members of the Office staff deserve to be congratulated on the happy result of their efforts in showing the work of the Meteorological Council at its best, and in making that work interesting and attractive to all.

EXHIBITION OF METEOROLOGICAL INSTRUMENTS.

A LARGE and interesting Exhibition of Meteorological Instruments, arranged by the Royal Meteorological Society, was held in the Library of the Institution of Civil Engineers, Great George Street, Westminster, from Tuesday, March 14th, to Friday, the 17th.

Since the Society's last Exhibition, in 1897, considerable improvements have been made in recording instruments, and there has also been a great development in the methods adopted for ascertaining the meteorological conditions of the upper air. The instruments used for these purposes consequently formed the characteristic portion of the Exhibition, which was admirably arranged in the spacious and convenient room. In the centre there was a railed-off enclosure arranged to represent a typical Climatological Station of the Royal Meteorological Society, with instruments in position.

The Meteorological Council showed in position the photographic barograph and the Beckley self-recording rain gauge which were in use at the Fort William Observatory from 1890 to 1904. Messrs. Negretti and Zambra exhibited their self-recording rain gauges, anemometers, and sunshine recorders, and also a number of other instruments. Messrs. J. Levi and Co. contributed a collection of most of Richard's (Paris) noted self-recording instruments. Mr. F. L. Halliwell showed his rain gauges, anemometers, and an evaporation tank fitted with his float and index for reading the water-level to '01 in.

Mr. W. H. Dines exhibited the kites and meteorographs used by him at Crinan, as well as a Russian kite sent from St. Petersburg. Mr. P. Y. Alexander sent two rubber balloons which had been used as "*ballons sondes*." Meteorographs for use with kites and balloons were exhibited by M. L. Teisserenc de Bort, Mr. W. S. Bruce, Messrs. J. and A. Bosch, and Mr. J. J. Hicks. The kite camera and cage used in the Scottish Antarctic Expedition were also shown by Mr. Bruce. The Royal Meteorological Society exhibited the instru-

ments used by Mr. J. Glaisher in his famous balloon ascents for the British Association during 1862—66, which were placed in position on the board as used in the car of the balloon.

The Meteorological Council showed a number of instruments which had been used in the National Antarctic Expedition and also in several Arctic Expeditions. Mr. W. S. Bruce sent some of the thermometers used in the Scottish Antarctic Expedition. The Cambridge Scientific Instrument Company exhibited their electrical resistance thermometers and Callendar recorder. Dr. H. R. Mill showed a number of old pattern rain gauges used in the early experiments of Mr. G. J. Symons, and also a Redier barograph. Dr. W. N. Shaw and Mr. S. Skinner both exhibited their micro-barographs for the study of minor variations of atmospheric pressure. Mr. R. W. Munro showed the Dines pressure-tube anemometer, and Messrs. Lander and Smith contributed a set of their recording meteorological instruments. Mr. J. Baxendell exhibited his anemograph and snow-melting rain gauge; and anemometers were also shown by the National Physical Laboratory, Mr. C. Dales, Mr. J. J. Hicks, and Mr. R. M. Lowne.

The Astronomer Royal sent several patterns of sunshine recorders which were formerly used at the Royal Observatory, Greenwich. The Meteorological Council exhibited two sunshine recorders used by the National Antarctic Expedition while in the *Discovery's* winter quarters in $77^{\circ} 50'$ S. lat., the instruments being so constructed as to give continuous records for 24 hours.

Dr. W. N. Shaw gave demonstrations with his "thermopsychrophorus," which is an apparatus illustrating the cooling effect by the communication of heat under certain conditions to a mass of air in the free atmosphere. Mr. G. Simpson exhibited apparatus for measuring the amount of radio-active emanation in the atmosphere, and Herr R. Fuess, of Berlin, showed Assmann's aspiration psychrometer and other instruments.

Dr. J. L. Thomas exhibited a life-size "dummy," dressed in the remains of the clothes of a man who was struck by lightning near Cardiff on July 17th, 1903. Objects struck by lightning were also shown by the Royal Meteorological Society and by Messrs. J. W. Gray and Son.

The Exhibition also included a large collection of interesting meteorological photographs, records, drawings and maps.

A brief address was given each afternoon by Mr. W. Marriott, descriptive of the instruments included in the Exhibition; and the Exhibition succeeded in its purpose of attracting a large number of visitors interested in the science of the atmosphere.

At the meeting of the Royal Meteorological Society, on Wednesday evening, March 15th, the President, Mr. Richard Bentley, delivered an address on the Growth of Instrumental Meteorology.

After briefly touching on the historic and non-instrumental era of

Meteorology, he spoke of the seven great weapons of the meteorologist—the thermometer, and of later years the heliograph, for temperature—the hygrometer and rain gauge, for moisture—the barometer, for pressure—and the anemometer and kite, for the study of the upper air; and of the foundation of instrumental meteorology laid by Galileo, Torricelli, Wren and Hooke.

The President, in dwelling upon our indebtedness to Italy in science (as well as in art) from Galileo to Marconi, pointed out that the theory of rainfall was correctly enunciated as early as the beginning of the fourteenth century by Dante. He also dwelt on the great services rendered to the community by meteorologists, largely working voluntarily and at their own expense, and referred to the close observation kept by rain gauges on the water supply of the country—by anemometers protecting the traffic over some of our lofty and more exposed railway viaducts—by the use of the barometer for storm warnings and for the safety of miners—by the heliograph with relation to the ripening of fruits and crops—and regretted how much of the immense mass of information daily accumulating had still to be analysed and put to use. It was disappointing to find in so wealthy a country as this, and where the results could not fail to be of the greatest practical utility to the nation, that the means of digestion of this vast amount of data are so meagre and the aid given by the Government is so slender as to be a constant source of reproach, when compared with the large provision made for the same purpose in other countries.

Mr. W. Marriott also exhibited a number of lantern slides illustrating meteorological phenomena.

The following gentlemen were elected Fellows of the Society:—Dr. F. A. Barton, Mr. N. Gyles, Mr. F. W. Harmer, F.G.S., Major A. D. D. Kelly, Mr. J. M. Kerr, Assoc. M.Inst.C.E., and Captain E. R. McKinsty.

METEOROLOGICAL NEWS AND NOTES.

PROFESSOR C. H. WIND having been appointed to a Professorship in the University of Utrecht, has resigned the Directorship of the Dutch Meteorological Institute, and Dr. E. van Everdingen has been appointed provisional Director.

THE BRITISH ASSOCIATION for the Advancement of Science meets this year in South Africa, but so far as we are aware no special sub-section for Cosmical Physics will meet. Papers on meteorology will probably be taken in Section A, and Dr. H. R. Mill hopes to be able to arrange for the usual Meteorological Breakfast at Cape Town on the morning when these papers are read. The keen interest taken in the study of the weather in South Africa will, it is hoped, lead to some interesting discussions.

THREE MONTHS' RAINFALL OF 1905.

Aggregate Rainfall for January—March, 1905.

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London	5·13	100	Bolton	8·90	100	Braemar	8·86	110
Tenterden	5·53	91	Wetherby	4·66	87	Aberdeen	6·33	88
Hartley Wintney	5·30	85	Arnccliffe	13·58	84	Cawdor	8·82	143
Hitchin	4·94	101	Hull	3·83	70	Invergarry	21·66	133
Winslow	4·37	81	Newcastle	2·70	48	Bendamph	30·18	138
Westley	4·82	99	Seathwaite	30·11	82	Dunrobin	11·52	154
Brundall	4·18	87	Cardiff, Ely	8·80	90	Killarney	15·56	97
Alderbury	6·63	100	Haverfordwest	10·59	89	Waterford	9·45	95
Winterbourne	8·48	90	Gogerddan	12·02	122	Broadford	9·43	128
Torquay	7·59	89	Llandudno	7·20	111	Carlow	7·36	92
Polapit Tamar	9·87	108	Cargen	9·87	88	Dublin	5·38	90
Bath	5·11	78	Lilliesleaf	5·26	71	Mullingar	9·33	116
Stroud, Upfield	5·84	91	Colmonell	11·09	98	Ballinasloe	8·15	97
Woolstaston	7·24	102	Glasgow	7·47	92	Clifden	19·74	101
Bromsgrove	4·65	95	Inveraray	21·97	133	Crossmolina	14·85	115
Boston	2·95	66	Islay, Eallabus	14·22	119	Seaforde	7·62	83
Hodsock Priory	3·23	66	Mull	17·25	118	Londonderry	10·06	108
Derby	3·98	78	Dundee	4·30	70	Omagh	10·50	126

All observers reporting for March showed rainfalls in excess of the average, except in the neighbourhood of Newcastle, and at many long-established stations the month was the wettest March on record. The percentage excesses were greatest in the south-west of England, the fall over the greater part of the country south-west of a line drawn from the Mersey to Beachy Head being more than twice and at some points approaching three times the average. Along the east coast and in the north of England the excess was smallest, not exceeding 25 per cent. The excess in Scotland averaged about 50 per cent., and more than twice the average amount of rain fell in the south and centre of Ireland. The result of such a wet month was a considerable reduction in the remarkable shortage of rainfall, on which we dwelt at length in our last issue, and for the first quarter of the current year it practically made up the deficiency of the two preceding months. The condition of things for 1905 was that in London and for a distance of 100 miles or so to the north-east and the south-west the rainfall for the three months was exactly the average. In North Wales, the north-west of Ireland, and especially in the north-west of Scotland, it was well above the average, and in the south-east of Ireland but little below. Along the east coast of Great Britain from the Wash to Montrose there was still a marked deficiency of rainfall, that part of the country having received less than three-quarters of the average amount, and in some parts of Northumberland and Durham not quite one-half.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE HOTTEST PORTIONS OF THE EMPIRE.

THE summary of the climatological records of the British Empire for the year 1903, published in "Symons's Meteorological Magazine," for 1904, and repeated in "Nature," for January 26th, 1905, conveys an erroneous idea as to the hottest places in the British Empire. It is pointed out that it is impossible to represent the average conditions of the climate of the Empire by so small a number of stations, but according to the figures given this doubtful honour appears to lie between Adelaide, in South Australia, and Coolgardie, in this State. Now as a matter of fact there are places in the Empire very much hotter than either of these, and it would perhaps give a more correct impression if one or two of such places were included. In this State, for example, Marble Bar, in the N.W. division, is very much hotter than Coolgardie. The *mean* of the daily maximum temperatures for last month was $109^{\circ}\cdot 8$, and the highest reading $120^{\circ}\cdot 5$. In the Eastern States there are, I believe, places with similar records. At Jacobabad, in India, the *average* daily maximum temperature is $111^{\circ}\cdot 6$ in May, $112^{\circ}\cdot 7$ in June, and $107^{\circ}\cdot 8$ in July. At Berber, in the Egyptian Sudan, the mean maxima for each month of 1902 were $102^{\circ}\cdot 2$, $102^{\circ}\cdot 9$, $113^{\circ}\cdot 9$, $112^{\circ}\cdot 6$, $108^{\circ}\cdot 0$, $109^{\circ}\cdot 8$, $109^{\circ}\cdot 2$, $102^{\circ}\cdot 7$, $95^{\circ}\cdot 5$, and $91^{\circ}\cdot 4$; and the absolute maxima— $109^{\circ}\cdot 4$, $114^{\circ}\cdot 8$, $116^{\circ}\cdot 6$, $116^{\circ}\cdot 6$, $113^{\circ}\cdot 0$, $116^{\circ}\cdot 6$, $111^{\circ}\cdot 2$, $109^{\circ}\cdot 4$, $104^{\circ}\cdot 9$, and $95^{\circ}\cdot 0$. At Duem, in the same district, the mean maximum for March, 1902, was $114^{\circ}\cdot 4$, and the absolute maximum was $127^{\circ}\cdot 4$.

There may be hotter places still, but compared with these the temperatures at Adelaide and Coolgardie are mild, although high temperatures are occasionally registered during the prevalence of a "heat wave."

W. E. COOKE, *Govt. Astronomer.*

*Perth Observatory, West Australia,
February 28th, 1905.*

[We are sorry that an erroneous idea has been conveyed by our summary of the Climatology of the British Empire for 1903. We so clearly realize the tendency of the human mind to seize on deductions from a limited number of observations as if they expressed all truth, that we spend a considerable amount of space in each annual summary in beseeching our readers to bear in mind the small number of places represented in our pages, and the large number from which there are no records. On the occasion referred to above, fearing that some journalist might proclaim Coolgardie "the hottest place on earth," we followed the quotation of its maximum temperature by the caution—"It must be remembered, however, that we do not publish returns from any of the intensely

hot stations in the north-west of India." In previous years we have been prodigal in similar cautions. We shall try once more, when another annual summary is due, to discover some form of comprehensive repudiation of all possible misconceptions. We always welcome contributions from readers in the British Dominions beyond the seas, and would particularly value such an account of the Australian climate as was furnished in our volume for 1903 by Professor Stupat, for the Canadian climate.—ED. *S.M.M.*]

LONG PERIOD RAINFALL AVERAGES.

I NOTICE that you consider the thirty years' average of rainfall for 1870—1899 to be nearly the same as that for a much longer period.

Here I have compared it with the 87 years, 1818—1904 inclusive, and find that they compare wonderfully nearly, as the following table shows :—

Average Rainfall, Ross and neighbourhood.

	1818—1904 (87 years).		1870—1899 (30 years).
January	2·59	.....	2·66
February	2·11	.....	2·16
March	1·86	.....	1·74
	— 6·56		— 6·56
April	2·05	.....	1·95
May	2·14	.....	2·10
June	2·28	.....	2·27
	— 6·47		— 6·32
July	2·59	.....	2·81
August	2·55	.....	2·62
September	2·66	.....	2·70
	— 7·80		— 8·13
October	3·17	.....	3·09
November	2·87	.....	2·95
December	2·65	.....	2·47
	— 8·69		— 8·51
Year	29·52	.....	29·52

Variation in Average Rainfalls.

				inches.
1818—1829	12 years.	Average	.....	29·27
1830—1844	15 "	"	.....	31·62
1845—1859	15 "	"	.....	28·85
1860—1874	15 "	"	.....	28·46
1875—1889	15 "	"	.....	32·32
1890—1904	15 "	"	.....	26·57

My own observations are from January 1, 1859 ; Captain Pendergrass, F.R.Met.Soc., observed from 1818 to 1842 ; and Judge Herbert, a very careful observer, from 1852 to 1881 ; but I have given my own from 1859. Another gentleman, a few miles to the north of this, is responsible for the years 1843 to 1851, inclusive.

The year (365 days) ending March 7, 1905, gave only 17·07 in. of rain at this station, the lowest for any similar previous period—the

nearest being 1854-5, with 17·55 in. 1903-4, on the contrary, showed the largest amount registered—namely, 41·75 in. The lowest or smallest falls in any calendar years were—

1864	.....	19·22 in.
1854	.....	19·42 „
1870	.....	20·18 „
1893	.....	20·13 „

but on three occasions of 365 days, ending at different periods of the year, these records were much lower—

1854	.....	16·48 in.
1864	.....	16·48 „
1893	.....	16·91 „

The following shows the periods when greatest deficits occurred—

	Days.	Rainfall.	Difference from Average, 1867—1897.
March 8 to July 18, 1904	..... 133	..... 5·22	..... -4·13
July 19 to Sept. 14, 1904	..... 58	..... 5·25	..... + 0·06
Sept. 15, 1904, to March 7, 1905	..... 174	..... 6·60	..... -8·86
	365	17·07	-12·93

Thus during what is normally the wettest part of the year, the difference was greatest, and consequently the effects on wells and springs proportionally greater.

In 1903 October gave 7·40 in., and in 1904 only ·55 in.—the one year yielding the absolute maximum recorded for the month, and the next year the absolute minimum.

H. SOUTHALL.

*The Graig, Ross, Herefordshire,
April 3rd, 1905.*

A PARALLEL CONTINUED.

YOU published in your February number, on page 6, some remarks from me on the resemblance between the Januaries of 1896 and 1905. I should like now to point out further that February and March of this year have continued to follow the pattern of 1896, with quite surprising closeness. February, 1st-25th, 1905, like February, 1896, had continuously high barometer, coupled with the calm and dryness that go naturally with high pressure, and also by a general mildness that does not usually accompany anti-cyclonic conditions at that time of year.

Again, February 26th—March 31st, 1905, like March, 1896, had a long series of depressions, some of them very deep, with violent gales, constant wind and rain, a most un-March-like prevalence of S.W. winds, and consequent mildness, noticeable absence of polar winds, and an unusual frequency of thunder and lightning.

Referring to back numbers of the Magazine, and examining the "Tables of Rainfall at 50 stations," which are published monthly, I notice for February, 1896, that every single station whose departure from a stated average is indicated by a + or a —, had in that

month a — sign. Also that in February, 1905, there is a very great preponderance of — signs. There is but one + for England (a small one in Yorkshire); one + for the extreme north of Ireland; and seven for the west and north of Scotland, some of which are evidently due to the break up of the anti-cyclone three or four days before the end of the calendar month. Again, the table for March, 1896, shews for England a + at all but two stations; and a considerable preponderance of + signs, both for Ireland and Scotland; and the March number in that year devotes half of page 38 to "Early Damage by Lightning in 1896," quoting instances of serious mischief done on March 4th, 16th, 24th, and 25th, in Jersey, Derbyshire, Yorkshire and Durham.

I am curious to see what comments upon this letter will be afforded by the records which you will be publishing along with it; but it would surely seem that for the first three months of 1896 and 1905, "the atmospheric conditions must have been *very similar* over a large area" (vide Mr. Bonacina's article on p. 7 of this volume); and it will be interesting to watch whether a dry April, and a still drier May, are going to keep up the parallel yet longer.

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

North Cadbury Rectory, Somerset, April 1st, 1905.

[The Table published this month fully bears out Mr. Boys's expectations, every sign but one is a +.]

THE THUNDERSTORMS OF MARCH 12th AND 15th.

ON the 12th, thunder-clouds (cumulo-nimbus) were first observed in the S.W. at 3.15 p.m., moving with considerable rapidity in a N.E. direction. Thunder was first heard at 3.30 p.m.; at 3.35 p.m. a very vivid flash of fork lightning was seen due N., torrential rain commencing, along the whole of the northern sky-line enormous mist wreaths were visible hanging from the storm pallium; several further loud thunder claps and flashes of fork lightning were noticed; at 3.45 p.m., on the cessation of the rain, the wind increased in force to a whole gale from the W.S.W., and blew furiously for about fifteen minutes; by 3.50 p.m. the sky had partially cleared, with bright sunshine. During the ten minutes that rain fell—viz., from 3.35 p.m. to 3.45 p.m.—0.11 in. was registered.

On the evening of the 15th, the sky being entirely thick and overcast, but no definite cloud forms visible, at 10.30 p.m. a thunder storm broke lasting to 11.5 p.m., the most remarkable feature being the almost continuous and very vivid display of sheet and fork lightning, with practically speaking little thunder but torrents of rain and hail. Between 4 a.m. and 4.15 a.m., on the same date, a violent hail squall had been experienced, a very rapid rise in the barometer being noted at 4.10 a.m.; 0.05 in. in 6 minutes. I believe that hail falling during the hours of darkness is somewhat rare.

SPENCER C. RUSSELL.

Ashley Road, Epsom, March 25th, 1905.

THE LEGEND OF SAHARAN DUST FALLS.

WHEN the valiant Sir Francis Drake set forth, in 1577, on the famous buccaneering expedition during which he discovered Cape Horn, he carried a chaplain, the Rev. Francis Fletcher. This worthy man must have had a sore time of it—on one occasion his erratic master set him in irons on the quarter-deck with a parchment bound round his arm bearing the inscription, “frances fletcher y^e falsest knave y^t liveth”—but he was a faithful if somewhat credulous chronicler. In the narrative of the cruise, which he wrote under the title of ‘The World Encompassed by Sir Francis Drake,’ Mr. Francis Fletcher gives the following account of a dust-storm in the Atlantic, with the explanation of the phenomenon as narrated by a Portuguese pilot, who, it would appear, was not devoid of a quaint sense of humour, and could spin as good a yarn as any land-lubber might wish to preserve in print. As no fall of Saharan dust has to be chronicled this spring, we give the old story, spelling and all:—

“After so long but a sweet pleasant travaile, before remembered, by the Providence of God we chanced and fell in the sight of Brasilia, where at the first the land seemed to make us a faire offer of opertunity to do that we had long desyred and now was most necessary for us, that is, to trim our shipp, being very fowle, for the land seemed to be verry pleasant, a fare bay, and a sandy ground, fitt for our purpose, and to encourage the rather, som of the people being in sight did show themselves very joyful to see us in drawing to stand inward towards their land: but the case was quickly altered, sweet meates would have sower sawce, and long delights was likely to have sower gaule and bitterness, for we had not longer held our way inward but the sight of land was taken from us, and that sodainly, with such a lasynes as if it had been a most deadly fogg, with the palpabel darkeness of Egypt, that never a shipp could see another. In the neck whereof did follow such extreame storms as heaven and earth had gon together, and the routes of the rocks and the bottom of the sea should have been discovered, and that which was a signe of a desperat state to utter destruction, wee were upon a lee shore, and the shoales increased upon us. So that if the Portugall pilot had not ben apointed of God to do us good, we had perished without remembrance; for he being well acquainted with the bloody government of the Portugalls, was not ignorant of this part of cuntrye; and knowing the present danger, he presently cryed a returne as we could, or els no way but imminent death, wherein, though we made all possible speed, yet one of our shippes touched with the shoales, but by God's Providence came cleere away, and being cast about to the seas, even against the streames, our fleet was so separated that in many monthes after we came not together againe. Now the pilot being in the Admiral, the question was whether he could give anny reason of so sodain an alteration, and so extreame an accident to fall out against us in this place; whose answer was, that such was the tyranny of the Portugalls towards the naturall inhabitants, that rather than they would endure their intollerable and bloody cruelty, they willingly exile themselves and banish themselves from their naturall soile and inheritances, to dwell in the far remote and

unfruitfull partes of the land, where being settled, the unmercifull and murthering Portugalls could not be contented with the fatt of their land, but they must pursue the poore and harmles people to root them out, their wives and children, from the face of the earth. Wherefore this people, which before did live by the instinct of nature, were now driven to yelde themselves into the hands of divells, and took them for their patrons and protectors against their bodily enemies the Portugalls, haveing them allwayes their familiars; who, when they see any shippes upon their coasts, the shoare being sandy, they cast the saud up in the ayre, whereof ariseth sodainly such a haziness as a most gross and thick fogg, that there followeth a palpable darkenes that the land cannot be seen, no nor the heavens; besides this, they hurle the sand into the heavens, which as they increast, so the shoales increast in the way of the shippes in the seas to ground them; and withall such horrible, fearful, and intollerable winds, raines, and stormes, that there is no certainty of life one moment of tyme, whereof we had present experience, and had perished, if God had not in His mercy and power prevented the same. By this meanes did they continually overthrow the Portugalls, when they came with their armies of men, and their *armethos*, that is, their huge shippes of warr, against them; whereof many had been cast away, and non that ever came in the dance did ever escape; and they supposing us to be Portugalls, and therefore their deadly enemies, being not acquainted with anny other people to frequent their land, they did practise against us as against them."

REVIEWS.

United States Geological Survey. The Relation of Rainfall to Run-off,
by GEORGE W. RAFTER. Washington: 1903. Size 9 x 6.
Pp. 104.

THE relation of rainfall to the flow of streams is here discussed somewhat fully, although hardly any definite conclusions seem to have been arrived at. In the words of the author:—

"No general formula is likely to be found expressing accurately the relation of rainfall to the run-off of streams, for streams vary widely in their behavior, and when they do agree the agreement is usually accidental. As a general proposition we may say that every stream is a law unto itself."

The writer is, however, greatly handicapped by the inadequate rainfall data available for the United States, and the unsatisfactory nature of many of the existing records. Streams are divided into classes with regard to the amount of rainfall, separating those in districts with exceptionally high evaporation, so that the relation may be roughly similar in each class, but it does not seem clear that this classification leads to any satisfactory result, and the author confines his remarks to detailing methods which he recommends should be avoided in any attempt to arrive at a solution of the problem.

The question of the effect of deforestation upon rainfall is likewise touched on, but abandoned for want of information. The paper, however, contains a large amount of detailed observational work for particular streams set forth in the form of diagrams.

Indian Meteorological Memoirs. Vol. XVII., Normal monthly and annual means of temperature, pressure, wind, humidity, cloud, rainfall, and number of rainy days of stations in India, by SIR JOHN ELIOT, F.R.S., K.C.I.E. Calcutta, 1904. Size $13\frac{1}{2} \times 10$. Pp. 288. Price 3 rupees.

THIS volume contains the normal data for the meteorology of India, a vast mine of statistics. The publications of the Indian meteorological department are in one way the worst in the world, not as to intrinsic merit, which is of the highest; but in the mode of forwarding the great quartos by post tightly rolled up and swathed in wrappings from which it is practically impossible to decorticate them uninjured, while to store the unrolled parts on a shelf is like trying to stow a set of compressed spiral springs into a drawer. This particular volume is not quite so springy as the rest, but it has touched the spring that lets forth our criticism like a meteorological jack-in-the-box.

Missions scientifiques pour la mesure d'un arc du méridien au Spitzberg entreprises en 1899-1902 sous les auspices des gouvernements Suédois et Russe. Mission Suédois, Tome II., Physique Terrestre. VIII. section. Météorologie. Observations régulières à la station d'hivernage, par J. WESTMAN. Stockholm, 1904. Size $12\frac{1}{2} \times 10$. Pp. 222. Plates.

THIS volume contains the meteorological observations made at Treurenberg Bay in Spitzbergen in 1899 and 1900 by the Swedish men of science engaged in the joint determination of an arc of the meridian by the Swedish and Russian governments. The station was situated in $79^{\circ} 55' N$.

On the Tension of Carbonic Acid in natural waters and especially in the sea. . . . The abnormal CO_2 percentage in the Air in Greenland and the general relations between Atmospheric and Oceanic Carbonic Acid, by AUGUST KROGH, Ph.D. Reprinted from *Meddelelser om Grönland*, vol. 26. Copenhagen, 1904. Size 9×6 . Pp. 333-434.

THE author employs a new method to attack an old problem. He found the percentage of oxygen in the air in Greenland to be practically the same as in Europe, but the carbonic acid, instead of varying from 0.02 to 0.04 with an average of 0.03 per cent., as in all other parts of the world away from towns, was found to vary in Greenland from 0.025 to 0.07. The percentage was higher with northern and western winds, lower with eastern and southern. The suggestion put forward is that this may be due to the liberation of carbonic acid from solution in sea water in that part of the world.

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## RAINFALL AND TEMPERATURE, MARCH, 1905.

| Div.   | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.] | RAINFALL.      |                                    |                          |       | Days on which<br>41 or more fell. | TEMPERATURE. |        |      |        | No. of<br>Nights<br>below<br>32°. |     |
|--------|--------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------|--------------------------|-------|-----------------------------------|--------------|--------|------|--------|-----------------------------------|-----|
|        |                                                                                                                                      | Total<br>Fall. | Diff. from<br>average,<br>1870-99. | Greatest in<br>24 hours. |       |                                   | Max.         |        | Min. |        |                                   |     |
|        |                                                                                                                                      |                |                                    | Depth.                   | Date. |                                   | Deg.         | Date.  | Deg. | Date.  |                                   |     |
|        |                                                                                                                                      |                |                                    |                          |       |                                   |              |        |      |        |                                   |     |
| I.     | London (Camden Square) ...                                                                                                           | inches<br>3·00 | inches.<br>+ 1·38                  | in.<br>·58               | 15    | 21                                | 60·9         | 22     | 27·0 | 4      | 2                                 | 12  |
| II.    | Tenterden .....                                                                                                                      | 3·62           | + 1·73                             | ·68                      | 10    | 20                                | 61·0         | 22     | 26·5 | 4      | 2                                 | 12  |
|        | Hartley Wintney .....                                                                                                                | 3·92           | + 2·15                             | ·56                      | 15    | 17                                | 64·0         | 23     | 25·0 | 4      | 4                                 | 7   |
| III.   | Hitchin .....                                                                                                                        | 2·81           | + 1·28                             | ·40                      | 15    | 24                                | 60·0         | 21     | 26·0 | 3      | 3                                 | ... |
|        | Winslow (Addington) .....                                                                                                            | 2·97           | + 1·35                             | ·41                      | 13    | 22                                | 59·0         | 24     | 25·0 | 4      | 4                                 | 15  |
| IV.    | Bury St. Edmunds (Westley) ...                                                                                                       | 2·26           | + ·62                              | ·32                      | 14    | 20                                | 61·0         | 22a    | 24·5 | 5      | 5                                 | ... |
|        | Brundall .....                                                                                                                       | 1·82           | + ·17                              | ·27                      | 10    | 21                                | 60·0         | 22     | 24·6 | 4      | 3                                 | 11  |
| V.     | Alderbury .....                                                                                                                      | 5·30           | + 3·52                             | ·91                      | 13    | 20                                | 64·0         | 22     | ...  | ...    | ...                               | ... |
|        | Winterbourne Steepleton ...                                                                                                          | 6·27           | + 3·86                             | 1·10                     | 8     | 22                                | 60·5         | 21     | 24·3 | 4      | 2                                 | 9   |
|        | Torquay (Cary Green) .....                                                                                                           | 5·33           | + 2·88                             | 1·42                     | 10    | 19                                | 58·5         | 18     | 31·5 | 15     | 1                                 | 5   |
|        | Polapit Tamar [Launceston] ...                                                                                                       | 5·80           | + 3·39                             | 1·20                     | 10    | 24                                | 60·0         | 21     | 24·0 | 3      | 4                                 | 9   |
|        | Bath .....                                                                                                                           | 3·64           | + 1·70                             | ·57                      | 10    | 21                                | 61·0         | 22     | 25·0 | 4      | 3                                 | 18  |
| VI.    | Stroud (Upfield) .....                                                                                                               | 4·36           | + 2·50                             | ·57                      | 10    | 23                                | 64·0         | 28     | 30·0 | 3      | 1                                 | ... |
|        | Church Stretton (Woolstaston) ...                                                                                                    | 5·19           | + 3·18                             | ·67                      | 15    | 22                                | 58·0         | 22     | 31·0 | 2      | 3                                 | ... |
|        | Bromsgrove (Stoke Newington) ...                                                                                                     | 3·38           | + 2·02                             | ·45                      | 23    | 19                                | 59·0         | 22     | 23·0 | 3      | 6                                 | ... |
| VII.   | Boston .....                                                                                                                         | 1·60           | + ·24                              | ·26                      | 13    | 12                                | 63·0         | 22     | 26·0 | 4      | ...                               | ... |
|        | Worksop (Hodsock Priory) ...                                                                                                         | 1·97           | + ·42                              | ·39                      | 28    | 19                                | 60·5         | 24     | 27·0 | 20     | 6                                 | 22  |
|        | Derby (Midland Railway) ...                                                                                                          | 2·51           | + 1·02                             | ·37                      | 10    | 23                                | 60·0         | 22, 23 | 28·0 | 3      | 2                                 | ... |
| VIII.  | Bolton (The Park) .....                                                                                                              | 3·81           | + ·93                              | ·52                      | 17    | 22                                | 60·5         | 22     | 30·8 | 3      | 2                                 | 13  |
| IX.    | Wetherby (Ribston Hall) ...                                                                                                          | 2·27           | + ·42                              | ·37                      | 26    | 17                                | ...          | ...    | ...  | ...    | ...                               | ... |
|        | Arncliffe Vicarage .....                                                                                                             | 5·70           | + ·67                              | ·81                      | 11    | 25                                | ...          | ...    | ...  | ...    | ...                               | ... |
|        | Hull (Pearson Park) .....                                                                                                            | 2·05           | + ·26                              | ·58                      | 28    | 19                                | 58·0         | 18, 28 | 30·0 | 19     | 3                                 | 24  |
| X.     | Newcastle (Town Moor) ...                                                                                                            | 1·35           | — ·75                              | ·42                      | 25    | 13                                | ...          | ...    | ...  | ...    | ...                               | ... |
|        | Borrowdale (Seathwaite) ...                                                                                                          | 11·10          | + ·59                              | 1·59                     | 11    | 23                                | 59·5         | 22     | 27·9 | 3      | 2                                 | ... |
| XI.    | Cardiff (Ely) .....                                                                                                                  | 5·99           | + 3·20                             | 1·27                     | 10    | 23                                | ...          | ...    | ...  | ...    | ...                               | ... |
|        | Haverfordwest (High St.) ...                                                                                                         | 6·06           | + 3·03                             | 1·02                     | 10    | 22                                | 56·5         | 22     | 26·4 | 3      | 1                                 | 17  |
|        | Aberystwyth (Gogerddan) ...                                                                                                          | 6·23           | + 3·30                             | ·70                      | 27    | 22                                | 67·0         | 22     | 19·0 | 2      | 5                                 | ... |
|        | Llandudno .....                                                                                                                      | 3·13           | + 1·16                             | ·55                      | 14    | 20                                | 61·0         | 22     | 29·5 | 3      | ...                               | ... |
| XII.   | Cargen [Dumfries] .....                                                                                                              | 4·83           | + 1·82                             | ·58                      | 11    | 19                                | 58·0         | 22     | 28·0 | 3      | 2                                 | ... |
|        | Lilliesleaf (Riddell) .....                                                                                                          | 2·94           | + ·54                              | ·60                      | 25    | 25                                | 53·0         | 23     | 24·0 | 19     | 6                                 | 15  |
| XIII.  | Edinburgh (Royal Observatory) ...                                                                                                    | 2·41           | ...                                | ·57                      | 25    | 19                                | 61·1         | 22     | 33·1 | 3      | 0                                 | 19  |
| XIV.   | Colmonell .....                                                                                                                      | 4·16           | + ·98                              | ·85                      | 23    | 22                                | 57·6         | 22     | 29·0 | 2      | 3                                 | ... |
| XV.    | Tighnabruach .....                                                                                                                   | 6·61           | + 2·25                             | ·74                      | 23    | 26                                | 50·0         | 30     | 26·0 | 2      | 7                                 | 7   |
|        | Mull (Quinish) .....                                                                                                                 | 7·93           | + 3·70                             | ·71                      | 20    | 26                                | ...          | ...    | ...  | ...    | ...                               | ... |
| XVI.   | Dundee (Eastern Necropolis) ...                                                                                                      | 3·15           | + 1·23                             | ·80                      | 25    | 21                                | 54·0         | 19, 22 | 27·2 | 3      | 3                                 | ... |
| XVII.  | Braemar .....                                                                                                                        | 4·89           | + 2·47                             | 1·27                     | 15    | 22                                | 53·0         | 22     | 16·4 | 3      | 11                                | ... |
|        | Aberdeen (Cranford) .....                                                                                                            | 3·56           | + 1·13                             | ·89                      | 25    | 20                                | 53·0         | 31     | 27·0 | 2      | 9                                 | ... |
|        | Cawdor (Budgate) .....                                                                                                               | 4·32           | + 2·16                             | 1·40                     | 11    | 19                                | ...          | ...    | ...  | ...    | ...                               | ... |
| XVIII. | Invergarry .....                                                                                                                     | 6·88           | + 2·05                             | ·90                      | 15    | 24                                | ...          | ...    | ...  | ...    | ...                               | ... |
|        | Bendamp. ....                                                                                                                        | 10·01          | + 3·63                             | 1·08                     | 11    | 27                                | ...          | ...    | ...  | ...    | ...                               | ... |
| XIX.   | Dunrobin Castle .....                                                                                                                | 4·41           | + 1·94                             | 1·58                     | 11    | 17                                | 55·5         | 31     | 30·0 | 10     | 2                                 | ... |
|        | Castletown .....                                                                                                                     | 3·77           | ...                                | ·70                      | 11    | 28                                | 54·0         | 21     | 31·0 | 17, 18 | 2                                 | ... |
| XX.    | Killarney .....                                                                                                                      | 8·24           | + 4·21                             | 1·22                     | 23    | 28                                | 59·0         | 22     | 31·0 | 24     | ...                               | ... |
|        | Waterford (Brook Lodge) ...                                                                                                          | 5·58           | + 3·03                             | ·81                      | 14    | 25                                | 57·0         | 22     | 25·0 | 3      | 8                                 | ... |
|        | Broadford (Hurdlestown) ...                                                                                                          | 5·03           | + 2·86                             | ·59                      | 10    | 26                                | 52·0         | 22, 26 | 26·0 | 2      | 6                                 | ... |
| XXI.   | Carlow (Browne's Hill) .....                                                                                                         | 3·92           | + 1·66                             | ·69                      | 14    | 25                                | ...          | ...    | ...  | ...    | ...                               | ... |
|        | Dublin (Fitz William Square) ...                                                                                                     | 2·73           | + ·88                              | ·70                      | 14    | 20                                | 61·4         | 22     | 29·7 | 3      | 1                                 | 8   |
| XXII.  | Ballinasloe .....                                                                                                                    | 4·26           | + 1·81                             | ·70                      | 14    | 29                                | 63·0         | 22     | 25·0 | 3      | 15                                | ... |
|        | Clifden (Kylemore House) ...                                                                                                         | 8·58           | + 2·91                             | ·90                      | 24    | 24                                | ...          | ...    | ...  | ...    | ...                               | ... |
| XXIII. | Seaforde .....                                                                                                                       | 4·07           | + 1·51                             | 1·04                     | 23    | 21                                | 54·0         | 26, 27 | 27·0 | 2      | 7                                 | 20  |
|        | Londonderry (Creggan Res.) ...                                                                                                       | 3·20           | + ·14                              | ·55                      | 23    | 25                                | ...          | ...    | ...  | ...    | ...                               | ... |
|        | Omagh (Edenfel) .....                                                                                                                | 5·22           | + 2·75                             | ·50                      | 14    | 29                                | 58·0         | 22     | 30·0 | 2      | 7                                 | 14  |

+ Shows that the fall was above the average; — that it was below it "—" and 23, 24.



## SUPPLEMENTARY RAINFALL, MARCH, 1905.

| Div.  | STATION.                      | Rain.<br>inches | Div.   | STATION.                     | Rain.<br>inches |
|-------|-------------------------------|-----------------|--------|------------------------------|-----------------|
| II.   | Dorking, Abinger Hall .....   | 4.20            | XI.    | New Radnor, Ednol .....      | 6.13            |
| „     | Ramsgate, West Cliff.....     | 1.98            | „      | Rhayader, Nantgwillt ...     | 8.76            |
| „     | Hailsham .....                | 5.55            | „      | Lake Vyrnwy .....            | 6.82            |
| „     | Crowborough .....             | 5.09            | „      | Ruthin, Plâs Drâw .....      | 3.30            |
| „     | Osborne.....                  | 5.24            | „      | Criccieth, Talarvor.....     | 4.17            |
| „     | Emsworth, Redlands.....       | 4.82            | „      | Anglesey, Lligwy .....       | 3.98            |
| „     | Alton, Ashdell .....          | 6.28            | „      | Douglas, Woodville .....     | 4.28            |
| „     | Newbury, Welford Park ...     | 5.77            | XII.   | Stoneykirk, Ardwell House    | 2.49            |
| III.  | Harrow Weald .....            | 3.30            | „      | Dalry, Old Garroch .....     | 6.98            |
| „     | Oxford, Magdalen College..    | 2.69            | „      | Langholm, Drove Road.....    | 5.86            |
| „     | Banbury, Bloxham.....         | 3.05            | „      | Moniaive, Maxwellton House   | 5.76            |
| „     | Pitsford, Sedgebrook.....     | 2.35            | XIII.  | N. Esk Reservoir[Penicuik]   | 4.00            |
| „     | Huntingdon, Brampton.....     | 2.08            | XIV.   | Maybole, Knockdon Farm..     | 3.77            |
| „     | Wisbech, Bank House .....     | 2.02            | „      | Glasgow, Queen's Park .....  | 3.17            |
| IV.   | Southend .....                | 2.15            | „      | Campbeltown, Redknowe...     | 3.83            |
| „     | Colchester, Lexden.....       | 1.81            | XV.    | Inveraray, Newtown.....      | 7.97            |
| „     | Saffron Waldon, Newport...    | 2.50            | „      | Ballachulish House.....      | 11.11           |
| „     | Rendlesham Hall .....         | 1.72            | „      | Islay, Eallabus .....        | 5.62            |
| „     | Swaffham .....                | 2.65            | XVI.   | Dollar .....                 | 4.43            |
| „     | Blakeney .....                | 2.06            | „      | Loch Leven Sluices .....     | 4.29            |
| V.    | Bishops Cannings .....        | 4.28            | „      | Balquhiddy, Stronvar .....   | 8.48            |
| „     | Ashburton, Druid House ...    | 9.17            | „      | Coupar Angus Station .....   | 3.07            |
| „     | Okehampton, Oaklands.....     | 7.31            | „      | Blair Atholl.....            | 4.76            |
| „     | Hartland Abbey .....          | 4.12            | „      | Montrose, Sunnyside.....     | 3.64            |
| „     | Lymouth, Rock House ...       | 5.64            | XVII.  | Alford, Lynturk Manse ...    | 3.44            |
| „     | Probus, Lamellyn .....        | 5.03            | „      | Keith.....                   | 4.13            |
| „     | Wellington, The Avenue ...    | 4.88            | XVIII. | N. Uist, Lochnaddy.....      | 6.25            |
| „     | North Cadbury Rectory ...     | 3.44            | „      | Aviemore, Alvey Manse .....  | 3.43            |
| VI.   | Clifton, Pembroke Road .....  | 4.74            | „      | Loch Ness, Drumnadrochit.    | 3.09            |
| „     | Moreton-in-Marsh, Longboro'   | 3.66            | „      | Glencarron Lodge .....       | ...             |
| „     | Ross, The Graig .....         | 3.41            | „      | Fearn, Lower Pitkerrie.....  | 3.94            |
| „     | Shifnal, Hatton Grange.....   | 3.30            | XIX.   | Invershin .....              | 4.38            |
| „     | Wem Rectory .....             | 3.17            | „      | Altnaharra .....             | 4.59            |
| „     | Cheadle, The Heath House.     | 3.92            | „      | Bettyhill .....              | 5.15            |
| „     | Coventry, Kingswood .....     | 3.10            | „      | Watten .....                 | 3.12            |
| VII.  | Market Overton .....          | 2.53            | XX.    | Cork, Wellesley Terrace ...  | 6.82            |
| „     | Market Rasen .....            | 2.32            | „      | Darrynane Abbey .....        | 8.16            |
| „     | Bawtry, Hesley Hall.....      | 1.80            | „      | Glenam [Clonmel] .....       | 6.15            |
| VIII. | Neston, Hinderton.....        | 2.62            | „      | Ballingarry, Gurteen .....   | 4.39            |
| „     | Southport, Hesketh Park...    | 3.00            | „      | Miltown Malbay.....          | 5.67            |
| „     | Chatburn, Middlewood .....    | 3.15            | XXI.   | Gorey, Courtown House .....  | 4.48            |
| „     | Cartmel, Flookburgh .....     | 3.02            | „      | Moynalty, Westland .....     | 4.68            |
| IX.   | Langsett Moor, Up. Midhope    | 5.14            | „      | Athlone, Twyford .....       | 4.42            |
| „     | Scalby, Silverdale .....      | 2.38            | „      | Mullingar, Belvedere.....    | 5.22            |
| „     | Ingleby Greenhow .....        | 2.48            | XXII.  | Woodlawn .....               | 5.13            |
| „     | Middleton, Mickleton .....    | 1.99            | „      | Westport, Murrisk Abbey..    | 6.43            |
| X.    | Beltingham .....              | 2.48            | „      | Crossmolina, Enniscoie ..... | 6.52            |
| „     | Font Reservoir, Fallowlees.   | 1.47            | „      | Collooney, Markree Obsy...   | 5.34            |
| „     | Illderton, Lilburn Cottage... | 1.81            | XXIII. | Enniskillen, Portora .....   | 4.47            |
| „     | Keswick, The Bank .....       | 5.79            | „      | Warrenpoint .....            | 5.09            |
| XI.   | Llanfrechfa Grange.....       | 5.81            | „      | Banbridge, Milltown .....    | 3.57            |
| „     | Treherbert, Tyn-y-waun ...    | 11.39           | „      | Belfast, Springfield .....   | 3.92            |
| „     | Carmarthen, Friary .....      | 6.29            | „      | Bushmills, Dundarave .....   | 2.99            |
| „     | Castle Malgwyn .....          | 6.49            | „      | Stewartstown .....           | 4.10            |
| „     | Plynlimon.....                | 11.20           | „      | Killybegs .....              | 4.55            |
| „     | Tallyllyn .....               | 5.00            | „      | Horn Head .....              | 3.80            |



## METEOROLOGICAL NOTES ON MARCH, 1905.

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.

## ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—Unsettled and rainy weather prevailed until 17th, with slight frosts in the first few days, and rough S. to W. winds during the second week. On 19th a change to more genial conditions took place and the latter part of the month was on the whole fine and dry. Duration of sunshine 86·0\* hours and of R 67·0 hours. Mean temp. 45°·2, or 3°·1 above the average. Slight TS at 11 p.m. on 14th.

ABINGER HALL.—Stormy and wet, although R was much needed. Vegetation progressed fast with sunny days and warmer nights, but the ground was still cold. Short TSS on 11th and 18th.

TENTERDEN.—A warm and pleasant month, but very wet from 8th to 17th. High winds on 11th and 12th. Duration of sunshine 137† hours.

CROWBOROUGH.—A wet month, with more R than any March since 1870. Unusually mild, especially at night. A succession of gales, with occasional T, L and H, from 7 p.m. on 10th to the evening of 15th. Except on 3rd the month was entirely free from frost. Mean temp. 43°·3.

OSBORNE.—The wettest March for at least 47 years, the R being 3·40 in. above the average for that period.

HARTLEY WINTNEY.—The first two weeks were squally and tempestuous, with much R and T, making the wettest fortnight yet recorded here and also the wettest March. The latter part was drier, with absence of frost. Ozone every day, with a mean of 4·6. S.W. gales on 10th and 11th.

COLCHESTER.—Mild, with little E. wind and frequent showers. Several bright and warm days and everything looking well. Short but sharp TS on 14th, during which some houses were damaged.

TORQUAY.—Mean temp. 46°·4, or 2°·3 above the average. Duration of sunshine 153·9\* hours, or 15·6 hours above the average. Mean amount of ozone 5·8.

ASHBURTON.—TSS on 11th and 14th, that on 14th consisting of a continuous series of flashes of L from midnight to 5 a.m. with torrents of R.

POLAPIT TAMAR.—Very wet, with a rough and stormy period from 9th to 16th. The total R was the largest for March for 36 years, except in 1903.

LYNMOUTH.—The wettest March since 1878, except 1903, when 7·30 in. of R fell. R 2·74 in. above the average. Much bright sunshine in the last 10 days. L on 11th and 20th.

WELLINGTON.—A great change from many previous months, the R during the first 17 days being exceedingly heavy, and the total for the month about double the normal. Very violent winds at times. TS on 15th, with H.

NORTH CADBURY.—Except on the first three days there were no polar winds and frosts were few and slight. The R, though much wanted, interfered with sowing. The worst gale of the winter occurred between 8 p.m. on 14th and noon on 15th. Trees were felled and a church window was blown in.

CLIFTON.—Wild weather from 10th to 17th, with a succession of gales and heavy R. The rest of the month was unsettled, with frequent showers. R exactly double the average and the greatest since 1867. TSS on 3 days and H on 4.

STROUD.—On 11th, during a furious H storm, between 6.30 and 7 a.m., an elm and a poplar were struck by L, about a mile from here. On 14th an elm was blown down in a S.W. gale. T, L and H on 7th.

ROSS.—Very warm, with fewer, and less severe, frosts than usual. The period of 365 days ending on March 7th gave 17·07 in. of R, against 41·75 in. in the year immediately preceding. The former was the smallest similar total in 87 years, whilst the latter was only exceeded two or three times.

BOLTON.—Remarkably bright, only two days being sunless. Total duration



82·3\* hours, or 2·8 hours above the average. Mean temp.  $43^{\circ}\cdot0$ , or  $3^{\circ}\cdot6$  above the average, and only once exceeded since observations commenced in 1887. The season was consequently very forward. Mean amount of ozone 2·0, being ·5 above the average. T on 4 days and L on 2.

LILBURN.—Changeable, with frequent showers, but fine on the whole. Vegetation forward.

HAVERFORDWEST.—Stormy and wet, especially on 15th, when much damage was done. Mild generally, with a good deal of sunshine. Agricultural operations were well advanced and vegetation forward. Duration of sunshine 128·9\* hours.

DOUGLAS.—Wet and generally mild, with much wind. An extremely severe W. gale on 15th did much damage. From 17th to 23rd was fine and spring-like, and vegetation was not backward at the end. H, S, L and T on 9th. Hills covered with S for some days from 24th.

### SCOTLAND.

LANGHOLM.—R 1·60 in. above the average of 29 years.

LILLIESLEAF.—Very windy, with continuous and sometimes heavy showers. "Summer all day, winter each night," the min. temp. keeping near freezing point.

COLMONELL.—Strong winds or gales on 3rd, 10th, and 13th to 15th, and very frequent but seldom heavy R. Mean temp.  $42^{\circ}\cdot9$ , or  $2^{\circ}\cdot3$  above the average.

INVERARAY.—Wet and stormy, with R chiefly in heavy showers, and a good deal of H. Too wet for sowing and the usual March work.

COUPAR ANGUS.—Mean temp. almost  $3^{\circ}$  above the average. R nearly an inch above the average, this being the first month with a surplus since August, 1904. Frost on 10 mornings.

DRUMNADROCHIT.—R 1·11 in., and rainy days 3, above the average. Remarkable absence of frost.

CASTLETOWN.—Cold and continuously wet until 18th. Latter part warmer, but still very wet. The ground was too wet for farmers to complete ploughing, and no cereal seed was in by the end.

### IRELAND.

CORK.—The wettest March for at least 27 years, the R being nearly three times the average. Great storm on 14th and 15th, in which the bar. fell to 28·14 in. L on 11th and 14th.

DARRYNANE ABBEY.—A great contrast to the two previous months, the R being 4·85 in. more than the average of 25 years, and 1·91 in. more than the next heaviest fall in that period.

MILTOWN MALBAY.—Cold, wet, stormy and squally, with T, L and H. All tillage work stopped.

† DUBLIN.—Unsettled, squally and showery, with S.W. and W. winds. Mean temp.  $45^{\circ}\cdot2$ , or  $1^{\circ}\cdot6$  above the average. Duration of sunshine 159\* hours. H on 9 days. On 15th, at 5 a.m., the bar. fell to 28·077 in., the lowest pressure since December 8th, 1886, when 27·758 in. was recorded.

MARKREE OBSERVATORY.—R, H, sleet and some S fell frequently till 17th, with high winds and gales at times. Fine and showery after, and generally mild.

OMAGH.—It would be difficult to find in the record a more unfavourable March for agricultural purposes. The ground became entirely unfit to receive seed of any kind, and no sowing seems to have been attempted in any part of the country.

\* Campbell-Stokes,

† Jordan.



## Climatological Table for the British Empire, October, 1904.

| 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.     |    |       |
|                                                                  | Temp.<br>° | Date. | Temp.<br>° | Date. |          |      |               |           |                 |                   |            |    |       |
| London, Camden Square                                            | 67·1       | 18    | 32·7       | 15    | 57·7     | 44·7 | 47·9          | 90        | 98·7            | 22·9              | 1·56       | 11 | 6·3   |
| Malta.....                                                       | 81·7       | 8     | 53·7       | 10    | 72·8     | 61·8 | 59·8          | 80        | 133·8           | 48·3              | 6·34       | 15 | 4·6   |
| Lagos.....                                                       | 86·0       | 25a   | 70·0       | 13c   | 84·0     | 73·7 | 72·8          | 77        | 148·0           | 68·5              | 6·37       | 12 | 7·2   |
| Cape Town .....                                                  | 93·0       | 30    | 41·6       | 12    | 67·2     | 52·5 | 51·9          | 74        | ...             | ...               | 2·83       | 10 | 5·4   |
| Durban, Natal .....                                              | 96·1       | 23    | 53·3       | 16    | 77·0     | 61·6 | ...           | ...       | 159·2           | ...               | 2·52       | 19 | 5·2   |
| Johannesburg .....                                               | 82·5       | 6     | 37·8       | 13    | 72·9     | 50·8 | 41·3          | 57        | ...             | 35·8              | ·79        | 7  | 3·7   |
| Mauritius.....                                                   | 87·1       | 31    | 54·6       | 10    | 80·4     | 64·0 | 61·4          | 71        | 149·6           | 46·9              | ·93        | 13 | 6·7   |
| Calcutta.....                                                    | 92·4       | 1     | 63·1       | 27    | 88·0     | 73·4 | 72·2          | 77        | 155·8           | 57·4              | ·98        | 3  | 4·6   |
| Bombay.....                                                      | 93·1       | 4     | 75·1       | 21    | 89·3     | 77·6 | 75·1          | 77        | 141·1           | 66·8              | ·56        | 4  | 3·4   |
| Madras .....                                                     | 94·5       | 4     | 67·3       | 29    | 90·2     | 74·7 | 72·7          | 78        | 146·5           | 63·9              | 2·33       | 15 | 5·2   |
| Kodaikanal .....                                                 | 67·2       | 19    | 45·3       | 31    | 62·2     | 51·1 | 51·2          | 86        | 135·8           | 41·9              | 12·29      | 20 | 6·4   |
| Colombo, Ceylon.....                                             | 87·6       | 2     | 72·0       | 5d    | 85·5     | 75·1 | 71·6          | 79        | 154·6           | 68·0              | 21·73      | 24 | 5·7   |
| Hongkong.....                                                    | 85·1       | 2     | 67·4       | 31    | 80·1     | 73·3 | 49·6          | 74        | 137·0           | ...               | 2·01       | 8  | 5·8   |
| Melbourne.....                                                   | 88·7       | 31    | 38·2       | 3     | 68·1     | 48·9 | 47·8          | 72        | 147·9           | 31·0              | 2·72       | 11 | 5·0   |
| Adelaide .....                                                   | 95·7       | 18    | 43·6       | 7     | 73·4     | 52·7 | 48·0          | 60        | 149·0           | 39·5              | 2·11       | 13 | 5·2   |
| Coolgardie .....                                                 | 94·2       | 30    | 38·4       | 9     | 71·9     | 49·5 | 44·7          | 55        | 159·1           | 35·7              | 1·87       | 10 | 4·8   |
| Sydney .....                                                     | 86·4       | 30    | 43·9       | 1     | 71·4     | 56·0 | 51·7          | 67        | 125·0           | 36·3              | 2·33       | 17 | 4·5   |
| Wellington .....                                                 | 66·2       | 31    | 39·9       | 13    | 57·4     | 46·4 | 43·7          | 74        | 127·0           | 37·0              | 12·94      | 17 | 7·4   |
| Auckland .....                                                   | 67·0       | 24b   | 44·0       | 8     | 61·0     | 50·0 | 47·5          | 75        | 137·0           | 39·0              | 3·80       | 17 | 5·8   |
| Jamaica, Negril Point..                                          | 87·9       | 8, 12 | 70·9       | 5e    | 85·1     | 73·6 | 75·5          | 86        | ...             | ...               | 5·07       | 11 | ...   |
| Grenada .....                                                    | 91·4       | 31    | 73·2       | 8     | 85·6     | 75·0 | 71·8          | 73        | 156·2           | ...               | 1·57       | 16 | 3·0   |
| Toronto .....                                                    | 71·0       | 10    | 23·0       | 31    | 54·2     | 37·8 | 39·9          | 78        | 98·2            | 16·8              | 2·48       | 11 | 6·1   |
| Fredericton ... ..                                               | 67·8       | 21    | 19·9       | 28    | 53·5     | 34·2 | 30·9          | 58        | ...             | ...               | 2·81       | 9  | 5·8   |
| Winnipeg .....                                                   | 66·0       | 16    | 20·7       | 6     | 51·8     | 35·3 | ...           | ...       | ...             | ...               | 1·51       | 12 | 6·9   |
| Victoria, B.C. ....                                              | 66·2       | 2     | 40·2       | 28    | 57·5     | 47·9 | ...           | ...       | ...             | ...               | ·88        | 8  | 7·1   |
| Dawson .....                                                     | 55·0       | 10    | 8·2        | 23    | 36·5     | 21·3 | ...           | ...       | ...             | ...               | ·36        | 3  | 4·2   |
| Lagos (July) .....                                               | 84·0       | 9     | 69·0       | 26    | 80·9     | 72·7 | 71·6          | 82        | 140·0           | 65·0              | 12·27      | 14 | 8·0   |
| „ (August) .....                                                 | 85·0       | 26    | 69·0       | 5     | 82·1     | 72·3 | 69·6          | 75        | 141·0           | 65·0              | ·08        | 2  | 7·7   |
| „ (September).....                                               | 87·5       | 4     | 70·5       | 18    | 83·3     | 73·2 | 72·6          | 80        | 148·0           | 66·0              | 7·06       | 20 | 8·2   |

a—and 26. b—and 25. c—and 28. d—and 21, 26. e—and other days.

MALTA.—Mean temp. of air 66°·3, or 3°·1 below average, mean hourly velocity of wind 8·2 miles, or 0·6 below average. Mean temp. of sea 73°·9. TSS on 3 days.

Mauritius.—Mean temp. of air 0°·5, dew point 0°·4, and rainfall ·63 in., below averages. Mean hourly velocity of wind 9·4 miles, or 1·6 miles below average.

KODAIKANAL.—Bright sunshine 149 hours.

COLOMBO.—Mean temp. of air 80°·0, or 0°·2 below, of dew point 1°·4 below, and R 7·27 in. above, averages. Mean hourly velocity of wind 6·1 miles; prevailing direction S.W.

HONGKONG.—Mean temp. of air 76°·5. Bright sunshine 191·2 hours. Mean hourly velocity of wind 14·1 miles; mean direction E. 11° N.

Adelaide.—Mean temp. of air 63°·0, or 0°·9 above, and R ·39 in. above, averages.

Sydney.—Mean temp. of air 0°·2, above, R ·65 in. below, and humidity 1·4 p.c. below averages.

Wellington.—Mean temp. of air 2°·3 below, and R 9·01 in. above, averages.



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## NEW SCHEME FOR THE ADVANCEMENT OF METEOROLOGICAL KNOWLEDGE.

THE Council of the Royal Meteorological Society has been for some time past engaged upon a scheme for the advancement of the general knowledge of Meteorology and the promotion of that larger measure of public interest in the science which its very close connection with many of the other sciences and the phenomena of everyday life undoubtedly merits.

The Council, considering that the object in view can be largely attained with the co-operation of the various scientific societies and institutions scattered over the country, is arranging for a series of lectures to be given in connection with them. These lectures will be delivered by lecturers appointed by the Council itself and will be drawn up in accordance with the Council's approved programme. They will, it is understood, be of a practical character and in many cases illustrated by lantern slides, of which the Royal Meteorological Society has a large and comprehensive collection. Various societies and institutions frequently hold scientific exhibitions and the Council is making provision for a series of exhibits for these, illustrative of the methods of taking meteorological observations and of the instruments generally used. The exhibits will be in charge of a representative of the Society, who will be prepared to explain them and their use.

It is expected that such lectures and exhibitions will lead to an increased appreciation of the importance of an accurate knowledge of weather conditions and the elements of climate, and to the establishment of new observing stations under the auspices of the Royal Meteorological Society, thus meeting a frequently expressed wish for authoritative information and guidance upon meteorological subjects, which the Society is eminently fitted to give.

The Council has always attached great importance to the intimate connection of Meteorology with Agriculture, and recognising the special and public benefit which a proper appreciation of this would confer, it has included in its scheme the arrangement of exhibits



such as are referred to above, and others bearing directly on the relations between the two sciences, in the Shows of the various agricultural societies, and it is believed that such an exhibit has been arranged for at this year's meeting of the Royal Agricultural Society at Park Royal. In pursuance also of this part of the scheme the Council has approached the authorities in charge of the Agricultural Education in Elementary Schools Bill, now before Parliament, with a view to the inclusion of Meteorology and Weather Study with the subjects proposed to be taught in such schools.

The scheme is, of course, in its initial stages at present, but it has already received a considerable measure of support, and the Council will be prepared to extend the series of lectures and exhibits, where feasible, to, *e.g.*, the great Public Schools, Private and Elementary Schools, Polytechnics and (the camera in skilled hands being a valuable aid as a means of cloud recording) Photographic Societies.

The scheme as thus far noticed provides for bringing meteorological knowledge to the societies and institutions' own doors, so to speak, but it is also intended by the Council of the Royal Meteorological Society to hold conferences in London, from time to time, to which representatives from the various societies shall be invited and papers dealing with Meteorology and its practical uses shall be read and discussed, and exhibitions illustrating the science in all its branches and open to the general public in connection with the conferences, will be held.

The present time of year, when the scientific societies and institutions are in full work, is, it is believed, being chosen for putting the scheme into operation, and it is to be hoped that in many cases advantage will be taken by the societies of its provisions for their next session, and that Fellows of the Royal Meteorological Society who are also members of local societies will assist the Council in the necessary arrangements and in thus extending the already wide sphere of the Society's operations.

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### SCOTTISH METEOROLOGICAL SOCIETY.

A MEETING of this Society was held on March 16th, in Dowell's Rooms, Edinburgh, Sir John Murray, K.C.B., F.R.S., in the chair.

The report from the Council was adopted, and Mr. Ralph Richardson, W.S., appointed to the vacancy on the Council caused by the resignation of Professor Copeland.

Mr. E. M. Wedderburn, read a paper on "The Temperature Changes of the Surface Waters of Loch Ness." He described the instruments used and the methods adopted in the Survey of the Scottish lochs, at present in progress under the direction of Sir John Murray and Mr. Laurence Pullar. During the summers of 1903 and 1904 attention had been largely concentrated on Loch Ness and some important general conclusions from the temperature observations there had already been published by Mr. E. R. Watson. (*Geographical*



*Journal*, October, 1904.) The story of the investigation of temperature on the surface and at small depths was one of doubts and difficulties. They had not yet got a satisfactory instrument for accurately recording rapid variations, and the surface temperatures had been known to change as much as 6° F. in two minutes. The observations, however, clearly showed that in calm summer weather on Loch Ness a diurnal change of temperature due to solar radiation was well marked at the surface, fairly distinct at a depth of 10 feet, and non-existent at a depth of 25 feet. A set of simple observations made in May, 1904, at a depth of 5 feet, showed that between 8 p.m. and 10 p.m. abrupt change of temperature took place at that depth, followed by numerous rapid variations: the water at 5 feet got warmer, probably owing to the upper layers having cooled down with a consequent condition of unstable equilibrium giving rise to energetic convection currents. It was very difficult to investigate the surface temperature changes on account of the numerous currents and the variations produced by sudden shifts of wind.

Professor Knott read the second paper, on "Solar Radiation," and gave an account of researches he had made on this subject in relation to earth temperatures and sea temperatures. An analysis had been made of the records given by the thermometers placed by Professor Forbes in 1837 in the rock of the Calton Hill, Edinburgh, and the average amount of heat gained or lost from month to month had been calculated. The accumulated heat had a zero value at the beginning of March and its maximum at the beginning of September, by which time about 1200 units of heat had been stored under each unit of area of the rock surface. Determining next the amount of energy supplied by solar radiation, Langley's estimates had been adopted, from which it appeared that in the latitude of Edinburgh 114,800 units of energy per unit area were supplied during the summer half-year (April to September), but only 19,080 units during the winter half-year. But the Calton observations had shown that only 1200 units of heat were stored in the rock in the summer half-year—i.e., only about 1 per cent. of the energy radiated by the sun and reaching the Earth was accumulated as heat, the remaining 99 per cent. being radiated or reflected. Of course, Langley's estimates of the solar constant had been made in a very different climate from that of Edinburgh, where a much larger proportion of the sun's rays were intercepted by clouds. It was remarkable, however, that observations made at the Radcliffe Observatory down to the depth of 9½ feet, to which the Oxford gravel extends, led to a conclusion almost the same as did the Calton records.

As regards solar radiation and sea temperature, observations made by the Austrian war-ship *Pola* showed that, at all events in the Levant in September, 1892, about two-thirds of the solar energy incident on the surface was utilized by the water near the surface and that the heating effect penetrated to a depth of about 20 metres. At lower depths conduction was probably the most powerful agent



of heat distribution. It was easy to see, however, that towards the surface convective movements would be the chief factor, since the surface layers owing to evaporation and consequent increase of salinity might rapidly become denser than the slightly cooler layers below and in sinking convey heat from the surface downwards.

An interesting discussion followed, in which Sir John Murray and Dr. Buchan took part.

## METEOROLOGICAL AVERAGES AND EXTREMES AT WELLINGTON, NEW ZEALAND.

THE Rev. D. C. Bates, of the Meteorological Office, Wellington, sends the following valuable series of average and extreme values for the principal meteorological elements as the results of 40 years' observations at the Wellington Meteorological Observatory.

### *Barometer.*

Mean 29·934 in.      Highest 30·886 in. on 30 August, 1889.  
Range 2·300 in.      Lowest 28·586 in. on 6 March, 1871.

### *Air Temperature in Shade.*

Mean 55·3° F.; absolute max. 88° F.; absolute min. 30° F.

### *Rainfall.*

Mean annual fall ..... 50·75 in.  
Max.    „    „ in 1892 ..... 67·65 in.  
Min.    „    „ in 1889 ..... 31·35 in.  
Max. fall in any single month, December, 1884 ..... 12·45 in.  
Min.    „    „    „    February, 1880 ..... 0·13 in.  
Max. fall in a single day, 11th March, 1893 ..... 5·70 in.  
Average number of days when rain (·01) fell, 170.

### *Average Monthly Rainfall, 1865-1903.*

| Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|------|------|------|--------|------|-------|-------|------|-------|------|------|------|
| 3·60 | 3·25 | 3·10 | 4·15   | 4·61 | 4·94  | 5·86  | 4·94 | 4·22  | 3·93 | 3·57 | 3·26 |

### *Mean Monthly Temperatures.*

| Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|------|------|------|--------|------|-------|-------|------|-------|------|------|------|
| 62·8 | 62·4 | 60·5 | 56·9   | 52·8 | 49·5  | 47·6  | 48·5 | 51·5  | 54·3 | 57·0 | 60·6 |

### *Mean Monthly Velocities of Wind (38 years), in miles per day.*

| Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|------|------|------|--------|------|-------|-------|------|-------|------|------|------|
| 234  | 218  | 211  | 201    | 198  | 177   | 179   | 197  | 220   | 264  | 241  | 247  |

Mean velocity 216 miles per day.

Max. daily velocity 960 miles 22nd October, 1869.

### *Mean Barometer (40 years).*

| Jan.   | Feb.   | Mar.   | April. | May.   | June.  | July.  | Aug.   | Sept.  | Oct.   | Nov.   | Dec.   |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 29·893 | 29·966 | 30·024 | 30·053 | 29·950 | 29·953 | 29·898 | 29·933 | 29·922 | 29·884 | 29·869 | 29·865 |

Mean relative humidity 75·3 per cent. of saturation.

Mean Temperature of Dew Point 47°·6 F



## ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April 19th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. Richard Bentley, President, in the chair.

Mr. W. H. Dines, F.R.S., gave "An Account of the Observations at Crinan in 1904, and Description of a new Meteorograph for use with Kites." These observations, which have been carried out under the direction of a joint Committee of the Royal Meteorological Society and of the British Association, are made with meteorographs attached to kites with the object of ascertaining the conditions prevailing in the upper atmosphere. During last summer the kites were flown from the deck of H.M.S. *Seahorse*, which was placed at the disposal of the Committee by the Admiralty. Mr. Dines designed a new and inexpensive meteorograph, which he now fully described. (See this Magazine, Vol. 39, p. 109). The weather conditions of last summer were somewhat unusual, there being a decided preponderance of east and south-east winds. Near the summit of Ben Nevis the air was often dry, and was on several occasions warmer than the air at the same level at Crinan. As a rule, however, the temperature on Ben Nevis is generally much lower than the temperature in the free air at the same level. On several occasions temperature inversions were observed at levels between 3000 and 7000 feet. A fact previously noticed was again observed—viz., the decrease of strength of easterly winds with elevation.

The President, Mr. R. Inwards, Dr. W. N. Shaw, F.R.S., Mr. J. E. Clark, Mr. R. H. Curtis, Mr. F. Gaster, and Mr. W. Marriott took part in the discussion, and all spoke favourably of the new meteorograph.

Dr. H. R. Mill read a paper on the "Rate of Fall of Rain at Seathwaite." This is a discussion of the records from a Negretti and Zambra self-recording rain gauge during a period of eighteen months, July, 1899, to December, 1900. Seathwaite, which is in Borrowdale, Cumberland, is one of the wettest spots in the British Isles, and so these continuous records, though of short duration, possess exceptional interest and value. Dr. Mill compared the readings at Seathwaite with those at Camden Square, with the following results :—

*Rate of Fall of Rain from July 10, 1899, to December 31, 1900.*

|                                                       | No. of<br>Rainy Days. | Hours of<br>Rain. | Inches of<br>Rain. | Rate<br>Per Rainy Day.<br>in. | Rate<br>Per Hour.<br>in. | Hours per<br>Rainy Day. |
|-------------------------------------------------------|-----------------------|-------------------|--------------------|-------------------------------|--------------------------|-------------------------|
| Seathwaite.....                                       | 350                   | 1695              | 182·91             | ·523                          | ·108                     | 4 $\frac{3}{4}$         |
| Camden Square...                                      | 196                   | 484               | 32·15              | ·164                          | ·066                     | 2 $\frac{1}{2}$         |
| Ratio of Seath-<br>waite if Camden<br>Square = 100... | 179                   | 350               | 569                | 319                           | 164                      | 190                     |

This shows that the total duration of rain at Seathwaite was three times as long as in London, the amount falling six times as great and the rate of fall consequently twice as rapid.



At Seathwaite there were altogether 88 showers with more than half-an-inch of rain in the 539 days under consideration, an average of rather more than one per week. Of these 45 produced less than an inch of rain, and only 13 more than 2 inches. The mean duration of such a shower was 8 hours, the greatest 30 hours, and the least  $1\frac{3}{4}$  hours. The showers yielding less than 1 inch had a mean duration of 6 hours and a mean rate of fall of .14 in. per hour, though with a great range. The showers yielding larger amounts were proportionally shorter, for although the mean duration was  $7\frac{1}{2}$  to 20 hours, the mean rate was either .20 in. or .22 in. per hour, showing that at Seathwaite the long-continued rains are on the whole the heavier. The largest amount which fell in one continuous shower was 4.03 in. and this also gave the greatest duration, for while it was falling the rain did not cease for 30 hours. Dr. Mill's results seem to show that the rainfall at Seathwaite in an average year shows a tendency to be greater during the hours of darkness than in daylight, that rather less than half the time during which rain is falling it continues without intermission for at least six hours at a time, and that rather more than half the total amount of rain is deposited in such long showers.

The President, Mr. J. Hopkinson, Mr. W. Marriott, Mr. R. H. Hooker, Mr. W. B. Tripp, Mr. F. Campbell Bayard, Mr. Baldwin Latham, and Mr. J. E. Clark took part in the discussion, and Dr. Mill replied.

The following gentlemen were elected Fellows of the Society :— Dr. E. P. Allis, Capt. C. B. Andersson, Mr. J. Aspinall, Mr. J. Burt Davy, F.L.S., Mr. H. E. Frick, Mr. A. E. Hayter, Mr. S. C. Russell, Mr. G. C. Simpson, B.Sc., Capt. H. M. Walker, Capt. G. S. Webster, and Mr. H. D. Williamson.

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### Correspondence.

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

#### WAS IT GLOBE LIGHTNING?

It would be interesting if some of your readers in Richmond could give any further information as to the circumstances described in the following paragraph from the *Surrey Advertiser*, of April 22nd.

An alarming phenomenon was witnessed at Richmond during a thunder-storm on Sunday afternoon. Following a blinding flash of lightning about three o'clock what appeared to be a ball of fire was seen descending. It seemed to explode just over St. Matthias' Church, in Church Road. A hole was torn in the roof and the place was for a second flooded with flaming light. The church is lighted with electricity, and the storm current came into contact with the electric wires. The glass doors of the various electric switchboards were simultaneously blown outwards and smashed to pieces.

These unusual occurrences had a terrifying effect upon several hundred children who were present, but nothing more serious happening, they were gradually reassured, though the service was abandoned.

J. P. MACLEAR.

*Chiddingfold, 22nd April, 1905.*



## THE COLD WINTER IN INDIA.

SIR JOSEPH HOOKER, G.C.S.I., F.R.S., has kindly forwarded the following interesting extracts from a letter:—

We are having glorious weather still, in fact it is absolutely abnormal. In all the 60 years that Mr. Chrestien can remember of India there has never been such extraordinary weather as there has been ever since Christmas. From the middle of January till the middle of February we had a succession of cold, dismal, cloudy, rainy days; regular English weather. We wore our thickest clothes, and shivered in the middle of the day, and at night, if we were somewhere where there was a fireplace, we sat before a wood-fire, if not, native fashion, we sat with pots of burning charcoal between our feet. All through we had slight frosts at night; during two nights, early in February, it was so severe that in places one could see nothing but dead, brown leaves on the trees. Riding along the valleys of the Government Reserved Forest, one passed nothing but frost-bitten trees with not a green leaf on them. Up on the slopes the trees were untouched, but in the open acres of crops were ruined, especially castor-oil, gram and Rahur (a Dahl), and one saw huge banyan and mango trees one mass of dead, brown leaves. From the middle of February we had the cold weather we ought to have had before, and we have had glorious weather ever since. Usually at this time one lives under a punkah, in the lightest of clothes. But I still shut the doors to keep warm, and at night I am none too warm under a blanket and a rug, with the doors shut.

HUGH HANNAY.

*Camp Dhab, Hazaribagh, Bengal, 3rd April, 1905.*

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## THE CLIMATOLOGICAL TABLE.

As a subscriber to your Magazine for many years, I am taking the liberty to write to you with regard to the Climatological Table for the British Empire. I have been of the opinion for a very long time that it would be more interesting and instructive if you could publish a more representative table than one restricted to the British Empire. Observations from the United States would be of interest to compare with the numerous ones from Canada; Egypt to compare with South Africa; Japan, China and Siberia should also be there. Surely observations can be obtained without difficulty from these parts, at any rate they can be had from Europe and the States. I do not like to see the term British Empire applied to any scientific observation—what must our foreign readers think of it?

Science should know no boundary, no territory, but consider all the world equal. Perhaps, if you can find room for this letter, other meteorologists would give their views on this subject.

J. A. SARGENT.

*Bancroft, Hitchin, April 20th, 1905.*



[We are entirely in sympathy with Mr. Sargent's principle that science should not be cramped by political boundaries, and were it possible to find space for a larger Table each month we would gladly appeal, and we are sure we should not appeal in vain, to the directors of representative meteorological observatories in the United States, the various countries of Europe and the colonial possessions of other nations. But we must remind our readers that the space is not available. The Magazine is already too large for its price though too small to admit of another page being diverted from letterpress to statistical matter. The remedy lies with our readers; if they care to increase the circulation of the Magazine, we will follow by increasing the size, and one of the first improvements would be to move in the direction suggested in the foregoing letter. It is always helpful to have the opinion of readers on matters that interest them, and we would gladly see what others think on the question thus raised.—ED. S.M.M.]

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### RETURN OF WINTRY WEATHER, APRIL, 1905.

SOME correspondents of the daily papers seem to be under some apprehension that this wintry weather, lately experienced, is quite uncommon and unseasonable, according to ideas of the time of year.

On looking over my diary for the last six years, I find that snow storms appeared in Edinburgh on April 16th and 17th, 1899; again in 1900, March 27th and 28th; again on March 9th and 10th, 1901. Snow was recorded on April 3rd, 1902 and 1903; April 11th, 12th, 13th, 14th and 21st, 1904; and on April 9th and 10th, 1905, on April 7th and 8th.

The east coast of Scotland, including Edinburgh, probably has to submit to a *second winter* after its own is concluded in March with the equinoctial gales. This is brought about by the cold airs and currents drifting from the Baltic Sea, on the melting of the snows and glaciers in Scandinavia.

The same state of things happens to the west coast by the icebergs from Greenland and Davis Straits, sailing down the Atlantic Ocean, and gradually melting away in low latitudes, such as the latitude of Britain; but the phenomena on the west coast are modified or interrupted by the Gulf Stream which prevents any coldness of air or water from being so permanent as on the east coast at this time of the year.

I may express the likelihood that we may get a cold week in May, as usually happens, much to the surprise of the correspondents referred to, who think that one swallow makes a summer if a fine day occurs.

W. G. BLACK, F.R.MET.SOC., F.R.C.S.E.

*Edinburgh, April 30th, 1905*



## REVIEWS.

*Cape of Good Hope.—Report of the Meteorological Commission for the year 1903.* Cape Town, 1904. Size  $12\frac{1}{2} \times 8$ . Pp. 198. Plates.

THE work of this Commission continues to show a splendid return for the money spent upon it, though the difficulties under which it is carried on are far greater than those against which the Meteorological Offices of European countries have to contend. A decrease in the number of rain observing stations is attributed, in part, to the severe drought which prevailed over two-thirds of Cape Colony, compelling many of the farmers in the Karoo to trek with the remainder of their cattle to adjoining territories, leaving their homesteads entirely unoccupied and, naturally, the rain gauges untended. The interest shown in meteorology by the people of Cape Colony is attested by the fact that numerous applications for instruments are received every year, many from persons situated in most suitable positions; but, unfortunately, these cannot be granted, except in a very few cases, on account of lack of funds. It is amazing to find that the great mass of work epitomised in this volume is carried out on a government grant of £800 per annum. In a country so dependent as Cape Colony is on a knowledge of the climatic conditions, the policy of starving so vital a department comes dangerously near to "spoiling the ship for want of a ha'porth of tar."

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*The Cyclones of the Far East.* By REV. JOSÉ ALGUÉ, S.J. Second (revised) edition. Manila, 1904. Size  $11\frac{1}{2} \times 9\frac{1}{2}$ . P. 284.

THE learned director of the Philippine Weather Bureau has written so complete and detailed a treatise on the whole subject of tropical cyclones, and especially of the terrible typhoons which are of constant occurrence in the neighbourhood of the Philippines and of the China Seas, that any attempt to make a synopsis of the work would be an impossibility in the limited space at our disposal.

After describing at length the origin, structure, movements and laws of typhoons and discussing their frequency and classification, the author gives an account of the attendant phenomena, meteorological and otherwise, and various direct and indirect precursory signs of their occurrence.

In the latter part of the volume typical typhoons are minutely described as confirmatory evidence of the information given in the earlier part. There are also a number of notes of practical interest to sailors and a list of harbours which afford refuge in case of an encounter with a typhoon. The volume is profusely illustrated with maps, diagrams and photographs of instruments.

Taken altogether, this is an able compendium of the life-work of an acknowledged master of the subject, and takes its place as a standard work on Tropical Meteorology.



*The Climate of the Philippines.* By REV. JOSÉ ALGUÉ, S.J. Bulletin 2 of the Census of the Philippine Islands. [No place of publication.] 1904. Size 9 x 6. Pp. 104.

THE subject is divided into sections, dealing respectively with temperature, water vapour (including rainfall) and the movements of the atmosphere, and each section is profusely illustrated by diagrams representing the distribution and frequency of the various phenomena. There are also coloured maps of the mean annual temperature and rainfall of the Islands.

Temperature and rainfall observations are quoted from a considerable number of stations, but generally for a very limited period, and by far the greater part of the results are deduced from the splendid records maintained at the Manila Observatory.

In the sub-section dealing with rainfall appears a list of instances of tropical falls of rain in periods of an hour or less, as measured by the Casella recording rain gauge at the Observatory, from which we select the following extreme cases:—

May 21st, 1892, 60 m.m. (2·36 in.) in 30 minutes.

June 15th, 1891, 50 „ (1·97 in.) in 8 „

August 6th, 1889, 50 „ (1·97 in.) in 7 „

The last mentioned fall was at the rate of 16·88 in. per hour. On six occasions in the period from 1865 to 1902 inclusive, daily falls exceeding 200 m.m. (nearly 8·00 in.) took place, of which the most notable were 336·0 m.m. (13·23 in.) on September 24th, 1867, and 290·1 m.m. (11·42 in.) on July 30th, 1880.

## METEOROLOGICAL NEWS AND NOTES.

THE INTERNATIONAL METEOROLOGICAL COMMITTEE will meet at Innsbruck, in Tyrol, on September 9th, and representative meteorologists from all countries have been invited to take part in the proceedings. A provisional programme has been drawn up and circulated by Professor Hildebrandsson. Amongst the questions put forward for discussion are suggestions for improving observations which may be used for the comparison of phenomena over wide areas, especially with regard to noting the exact time of observing each instrument, reducing observations to standard conditions, and the like. Attention is to be called to the very important question of the causes and the prognostics of widespread heavy rains, the importance of which as affecting floods is naturally felt much more on the continent than in our country of mild extremes. Professor Pernter is to suggest a more precise classification of meteorological stations according to the equipment and the nature of the observations carried on. The question of the possibility of extending the use of wireless telegraphy for obtaining reports from the eastern Atlantic, and many others on which an international understanding is desirable, will be taken up.



MR. R. C. MOSSMAN has returned to this country in excellent health, after a sojourn of two years in charge of the meteorological observatory established in a sub-Antarctic island of the South Orkneys by Mr. Bruce's expedition in the *Scotia* and subsequently taken over by the Argentine Government. Mr. Mossman's description of his unique experiences is profoundly interesting, and the work of so accomplished a meteorologist in a part of the world whence no previous records have been obtained is invaluable.

MR. JOHN AITKEN, of the Union Bank, Braemar, whose rainfall record has appeared monthly in this Magazine since 1873, and in *British Rainfall* since 1865, dates the commencement of his services to meteorology still further back, and we are happy to see by the following cutting from the *Aberdeen Journal* of April 21st that they have been recognised in an unusual and gratifying manner:—

It was in 1856 that the late Prince Consort founded the Braemar Observatory, which stands at an altitude of 1114 feet above sea level. On its inception Mr. Aitken was appointed observer by its founder, and ever since observations have been taken by him twice daily and reports despatched weekly and monthly to head quarters. To mark the appreciation of the services rendered by Mr. Aitken, the King has sent him a letter, and made him the recipient of a jewelled scarf-pin. The letter which accompanied the gift expresses His Majesty's satisfaction with the attendance paid and the interest taken in the work of the observatory by Mr. Aitken, and expresses the hope that he may be long spared to wear the gift.

Mr. Aitken informs us that he has always had great pleasure in the work, and that he is gratified by the appreciation of his services by those whose desire it is to advance the science of meteorology, a science which he truly observes is deserving of more attention, support and encouragement than it has hitherto received.

BEN NEVIS, although deserted by meteorologists, is occasionally visited, even in the winter months, by mountaineers, who find its cliffs and snow-slopes no mean test of their Alpine craft. In the article on a Ben Nevis glacier, by the Rev. R. P. Dansey, recently published in these pages, the important work of the Rev. A. E. Robertson was dwelt upon, and our readers will regret to hear that a serious accident has befallen that intrepid climber. On April 6th, according to the report of a Fort William correspondent:—

The day was a most unsuitable one for climbing, there being an almost continuous fall of snow, accompanied by thunder and lightning, but, nevertheless, Mr. Robertson set out alone to make the ascent of the mountain. He succeeded in reaching the summit in safety, and started on the return journey. All went well until he was near the edge of a precipice, and, holding on with his ice axe, had commenced to negotiate a dangerous snow slope. Then came a vivid flash of lightning, which Mr. Robertson thinks must have struck the axe, and he was almost immediately precipitated over the slope. Mr. Robertson calculates that he must have rolled nearly 1000 ft. before his progress was stopped, and how long he lay unconscious afterwards he cannot say. He must have dragged himself to his hotel in Fort William in a semi-unconscious condition, for he recollects nothing from the moment when he began to fall.



## RAINFALL AND TEMPERATURE, APRIL, 1905.

| Div.   | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.] | RAINFALL.   |                              |                       |       | Days on which 40 or more fell. | TEMPERATURE. |       |        |       | No. of Nights below 32°. |       |     |
|--------|--------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------|-----------------------|-------|--------------------------------|--------------|-------|--------|-------|--------------------------|-------|-----|
|        |                                                                                                                                      | Total Fall. | Diff. from average, 1870-99. | Greatest in 24 hours. |       |                                | Max.         |       | Min.   |       | Shade                    | Grass |     |
|        |                                                                                                                                      |             |                              | Depth.                | Date. |                                | Deg.         | Date. | Deg.   | Date. |                          |       |     |
|        |                                                                                                                                      | inches.     | inches.                      | m.                    |       |                                |              |       |        |       |                          |       |     |
| I.     | London (Camden Square) ...                                                                                                           | 1.75        | +                            | .06                   | .49   | 9                              | 19           | 64.7  | 13     | 31.6  | 8                        | 1     | 111 |
| II.    | Tenterden.....                                                                                                                       | 2.33        | +                            | .56                   | .92   | 10                             | 15           | 63.5  | 13     | 29.7  | 8                        | 3     | 12  |
|        | Hartley Wintney .....                                                                                                                | 1.68        | —                            | .01                   | .52   | 30                             | 13           | 65.0  | 12     | 29.0  | 9, 10                    | 4     | 8   |
| III.   | Hitchin .....                                                                                                                        | 1.84        | +                            | .22                   | .32   | 10                             | 20           | 62.0  | 13     | 27.0  | 2                        | 7     | ... |
|        | Winslow (Addington) .....                                                                                                            | 1.92        | +                            | .09                   | .30   | 9                              | 19           | 62.0  | 16     | 30.0  | 3, 8                     | 6     | 10  |
| IV.    | Bury St. Edmunds (Westley) .....                                                                                                     | 1.82        | +                            | .28                   | .39   | 10                             | 20           | 61.5  | 13     | 28.5  | 9                        | 4     | ... |
|        | Brundall .....                                                                                                                       | 2.06        | +                            | .38                   | .36   | 10                             | 24           | 64.0  | 14     | 27.0  | 8                        | 3     | 9   |
| V.     | Alderbury .....                                                                                                                      | 1.78        | —                            | .10                   | .36   | 14                             | 15           | 62.0  | 13, 14 | 29.0  | 8, 22                    | 7     | ... |
|        | Winterbourne Steepleton ...                                                                                                          | 2.59        | —                            | .01                   | .61   | 13                             | 20           | 58.3  | 13     | 29.5  | 22                       | 2     | 12  |
|        | Torquay (Cary Green) .....                                                                                                           | 2.65        | +                            | .20                   | .67   | 10                             | 15           | 59.3  | 11     | 36.9  | 23                       | 0     | 1   |
|        | Polapit Tamar [Launceston] .....                                                                                                     | 3.21        | +                            | .98                   | .63   | 10                             | 20           | 56.4  | 11     | 30.8  | 7                        | 3     | 4   |
|        | Bath .....                                                                                                                           | 2.47        | +                            | .42                   | .44   | 10                             | 17           | 61.0  | 13     | 29.2  | 22                       | 1     | 14  |
| VI.    | Stroud (Upfield) .....                                                                                                               | 2.70        | +                            | .65                   | .36   | 11                             | 21           | 60.0  | 16     | 33.0  | 21                       | 0     | ... |
|        | Church Stretton (Woolstaston) .....                                                                                                  | 2.25        | +                            | .11                   | .66   | 30                             | 21           | 61.0  | 1      | 27.5  | 8                        | 7     | ... |
|        | Bromsgrove (Stoke Reformatory) .....                                                                                                 | 1.88        | +                            | .22                   | .26   | 30                             | 17           | 56.0  | 13     | 25.0  | 21                       | 7     | ... |
| VII.   | Boston .....                                                                                                                         | 3.17        | +                            | 1.58                  | .47   | 6                              | 18           | 68.0  | 29     | 27.0  | 8                        | 6     | ... |
|        | Workshop (Hodsock Priory) .....                                                                                                      | 1.74        | +                            | .05                   | .29   | 6                              | 21           | 62.2  | 13     | 25.0  | 3                        | 4     | 15  |
|        | Derby (Midland Railway) .....                                                                                                        | 1.37        | —                            | .35                   | .25   | 6, 30                          | 21           | 61.0  | 13     | 29.0  | 7                        | 4     | ... |
| VIII.  | Bolton (The Park) .....                                                                                                              | 4.24        | +                            | 2.09                  | .73   | 28                             | 21           | 57.7  | 15     | 28.7  | 8                        | 3     | 11  |
| IX.    | Wetherby (Ribston Hall) ...                                                                                                          | 2.55        | +                            | .57                   | .41   | 6                              | 20           | ...   | ...    | ...   | ...                      | ...   | ... |
|        | Arncliffe Vicarage .....                                                                                                             | 6.47        | +                            | 3.15                  | 1.11  | 30                             | 23           | ...   | ...    | ...   | ...                      | ...   | ... |
|        | Hull (Pearson Park) .....                                                                                                            | 2.44        | +                            | .72                   | .41   | 23                             | 20           | 60.0  | 28     | 27.0  | 8                        | 3     | 13  |
| X.     | Newcastle (Town Moor) ...                                                                                                            | 2.88        | +                            | 1.09                  | .38   | 14                             | 24           | ...   | ...    | ...   | ...                      | ...   | ... |
|        | Borrowdale (Seathwaite) .....                                                                                                        | 12.71       | +                            | 6.44                  | 2.83  | 1                              | 23           | 58.2  | 15     | 24.5  | 8                        | 6     | ... |
| XI.    | Cardiff (Ely) .....                                                                                                                  | 2.72        | +                            | .38                   | .43   | 10                             | 22           | ...   | ...    | ...   | ...                      | ...   | ... |
|        | Haverfordwest (High St.) ..                                                                                                          | 4.36        | +                            | 1.69                  | .80   | 30                             | 20           | 58.2  | 13     | 32.9  | 22                       | 0     | 8   |
|        | Aberystwith (Gogerddan) ..                                                                                                           | 3.41        | +                            | 1.02                  | .49   | 8                              | 18           | 66.0  | 13     | 32.0  | 17                       | 1     | ... |
|        | Llandudno .....                                                                                                                      | 1.80        | —                            | .02                   | .45   | 6                              | 18           | 60.8  | 13     | 30.5  | 8                        | 1     | ... |
| XII.   | Cargen [Dumfries] .....                                                                                                              | 3.99        | +                            | 1.69                  | .76   | 30                             | 13           | 58.0  | 15     | 25.0  | 8                        | 8     | ... |
|        | Lilliesleaf (Riddell) .....                                                                                                          | 2.84        | +                            | .88                   | .35   | 30                             | 24           | 55.0  | 14     | 21.0  | 7                        | 12    | 17  |
| XIII.  | Edinburgh (Royal Observy.)                                                                                                           | 1.48        | ...                          | ...                   | .23   | 26                             | 17           | 59.7  | 14     | 25.5  | 8                        | 5     | 17  |
| XIV.   | Colmonell .....                                                                                                                      | 2.63        | +                            | .38                   | .55   | 1                              | 12           | 58.0  | 15, 27 | 20.0  | 7                        | 8     | ... |
| XV.    | Tighnabruach .....                                                                                                                   | 3.22        | +                            | .33                   | .73   | 1                              | 16           | 54.0  | 30     | 23.0  | 7                        | 13    | 13  |
|        | Mull (Quinish) .....                                                                                                                 | 3.14        | +                            | .34                   | .70   | 1                              | 19           | ...   | ...    | ...   | ...                      | ...   | ... |
| XVI.   | Dundee (Eastern Necropolis)                                                                                                          | 2.20        | +                            | .26                   | .50   | 14                             | 17           | 58.3  | 4      | 25.6  | 8                        | 9     | ... |
| XVII.  | Braemar .....                                                                                                                        | 2.59        | +                            | .41                   | .44   | 14                             | 22           | 54.2  | 4      | 20.6  | 8                        | 12    | ... |
|        | Aberdeen (Cranford) .....                                                                                                            | 3.43        | +                            | 1.21                  | .62   | 30                             | 22           | 53.0  | 26, 27 | 23.0  | 6                        | 8     | ... |
|        | Cawdor (Budgate) .....                                                                                                               | 2.09        | +                            | .60                   | .43   | 22                             | 16           | ...   | ...    | ...   | ...                      | ...   | ... |
| XVIII. | Invergarry .....                                                                                                                     | 3.12        | +                            | .44                   | 1.21  | 1                              | 8            | ...   | ...    | ...   | ...                      | ...   | ... |
|        | Bendamp. ....                                                                                                                        | 2.95        | —                            | 1.39                  | .48   | 3                              | 19           | ...   | ...    | ...   | ...                      | ...   | ... |
| XIX.   | Dunrobin Castle .....                                                                                                                | 1.73        | —                            | .08                   | .31   | 5                              | 14           | 57.0  | 29     | 26.0  | 7, 9                     | 8     | ... |
|        | Castletown .....                                                                                                                     | 3.39        | ...                          | ...                   | .58   | 5                              | 26           | 55.0  | 26     | 25.0  | 6, 7                     | 10    | ... |
| XX.    | Killarney .....                                                                                                                      | 4.02        | +                            | .31                   | 1.07  | 25                             | 25           | 62.5  | 6      | 32.0  | 19                       | ...   | ... |
|        | Waterford (Brook Lodge) ..                                                                                                           | 4.01        | +                            | 1.45                  | .45   | 8                              | 19           | 56.5  | 4a     | 28.0  | 8                        | 2     | ... |
|        | Broadford (Hurdlestown) ...                                                                                                          | 2.48        | +                            | .31                   | .49   | 30                             | 23           | 58.0  | 3      | 28.0  | 7                        | 3     | ... |
| XXI.   | Carlow (Browne's Hill) .....                                                                                                         | 3.05        | +                            | .71                   | .64   | 30                             | 20           | ...   | ...    | ...   | ...                      | ...   | ... |
|        | Dublin (Fitz William Square)                                                                                                         | 2.47        | +                            | .47                   | .68   | 30                             | 25           | 59.1  | 14, 27 | 30.0  | 8                        | 1     | 5   |
| XXII.  | Ballinasloe .....                                                                                                                    | 1.33        | —                            | .99                   | .17   | 26                             | 24           | 67.0  | 13     | 22.0  | 8                        | 10    | ... |
|        | Clifden (Kylemore House) ..                                                                                                          | 4.91        | +                            | .17                   | .82   | 26                             | 18           | ...   | ...    | ...   | ...                      | ...   | ... |
| XXIII. | Seaford .....                                                                                                                        | 2.46        | —                            | .13                   | .41   | 6                              | 19           | 58.0  | 29     | 23.0  | 7                        | 6     | 11  |
|        | Londonderry (Creggan Res.)                                                                                                           | 3.09        | +                            | .77                   | .51   | 28                             | 21           | ...   | ...    | ...   | ...                      | ...   | ... |
|        | Omagh (Edenfel) .....                                                                                                                | 2.53        | +                            | .28                   | .50   | 6                              | 22           | 62.0  | 13     | 26.0  | 7                        | 4     | 14  |

+ Shows that the fall was above the average; — that it was below it. a—and 7, 27



## SUPPLEMENTARY RAINFALL, APRIL, 1905.

| Div.  | STATION.                     | Rain.<br>inches | Div.   | STATION.                    | Rain.<br>inches |
|-------|------------------------------|-----------------|--------|-----------------------------|-----------------|
| II.   | Dorking, Abinger Hall .....  | 1.56            | XI.    | New Radnor, Ednol .....     | 4.98            |
| „     | Ramsgate, West Cliff.....    | 2.63            | „      | Rhayader, Nantgwillt ....   | 6.67            |
| „     | Hailsham .....               | 1.64            | „      | Lake Vyrnwy .....           | 3.59            |
| „     | Crowborough .....            | 2.87            | „      | Ruthin, Plâs Drâw.....      | 2.58            |
| „     | Osborne.....                 | 1.83            | „      | Criccieth, Talarvor.....    | 2.45            |
| „     | Emsworth, Redlands.....      | 1.63            | „      | Anglesey, Lligwy .....      | 2.60            |
| „     | Alton, Ashdell .....         | 1.55            | „      | Douglas, Woodville .....    | 2.87            |
| „     | Newbury, Welford Park ...    | 2.49            | XII.   | Stoneykirk, Ardwell House   | 2.30            |
| III.  | Harrow Weald .....           | 1.95            | „      | Dalry, Old Garroch .....    | 4.57            |
| „     | Oxford, Magdalen College..   | 1.90            | „      | Langholm, Drove Road.....   | 4.46            |
| „     | Banbury, Bloxham.....        | 2.24            | „      | Moniaive, Maxwellton House  | 3.50            |
| „     | Pitsford, Sedgebrook.....    | 1.64            | XIII.  | N. Esk Reservoir [Penicuik] | 3.10            |
| „     | Huntingdon, Bampton.....     | 1.55            | XIV.   | Maybole, Knockdon Farm..    | 2.55            |
| „     | Wisbech, Bank House .....    | 1.52            | „      | Glasgow, Queen's Park ..... | 1.92            |
| IV.   | Southend .....               | 2.48            | „      | Campbeltown, Redknowe...    | 2.35            |
| „     | Colchester, Lexden.....      | 1.86            | XV.    | Inveraray, Newtown.....     | 3.82            |
| „     | Saffron Waldon, Newport...   | 1.79            | „      | Lochalish House.....        | 4.31            |
| „     | Rendlesham Hall .....        | 2.24            | „      | Islay, Eallabus .....       | 3.03            |
| „     | Swaffham .....               | 1.91            | XVI.   | Dollar .....                | 2.56            |
| „     | Blakeney .....               | 1.44            | „      | Loch Leven Sluices .....    | 1.93            |
| V.    | Bishops Cannings .....       | 3.02            | „      | Balquhidder, Stronvar ..... | 3.83            |
| „     | Ashburton, Druid House ...   | 3.89            | „      | Coupar Angus Station .....  | 1.31            |
| „     | Okehampton, Oaklands.....    | 3.54            | „      | Blair Atholl.....           | 2.17            |
| „     | Hartland Abbey .....         | 2.92            | „      | Montrose, Sunnyside.....    | 3.09            |
| „     | Lynmouth, Rock House .....   | 1.92            | XVII.  | Alford, Lynturk Manse ...   | 2.86            |
| „     | Probus, Lamellyn .....       | 3.05            | „      | Keith .....                 | 2.43            |
| „     | Wellington, The Avenue ...   | 2.43            | XVIII. | N. Uist, Lochmaddy.....     | 1.77            |
| „     | North Cadbury Rectory ..     | 2.10            | „      | Aviemore, Alvey Manse ...   | 2.19            |
| VI.   | Clifton, Pembroke Road ..... | 3.16            | „      | Loch Ness, Drumnadrochit.   | 1.21            |
| „     | Moreton-in-Marsh, Longboro'  | 2.67            | „      | Glencarron Lodge .....      | ...             |
| „     | Ross, The Graig .....        | 2.59            | „      | Fearn, Lower Pitkerrie..... | 1.82            |
| „     | Shifnal, Hatton Grange.....  | 1.87            | XIX.   | Invershin .....             | 2.40            |
| „     | Wem Rectory .....            | 1.47            | „      | Altnaharra .....            | 3.54            |
| „     | Cheadle, The Heath House.    | 2.45            | „      | Bettyhill .....             | 3.21            |
| „     | Coventry, Kingswood .....    | 1.64            | „      | Watten .....                | 2.54            |
| VII.  | Market Overton .....         | 1.74            | XX.    | Cork, Wellesley Terrace ... | 3.27            |
| „     | Market Rasen .....           | 1.69            | „      | Darrynane Abbey .....       | 5.57            |
| „     | Bawtry, Hesley Hall.....     | 1.93            | „      | Glenam [Clonmel] .....      | 5.30            |
| VIII. | Neston, Hinderton.....       | 2.16            | „      | Ballingarry, Gurteen .....  | 1.86            |
| „     | Southport, Hesketh Park...   | 2.60            | „      | Miltown Malbay.....         | 3.04            |
| „     | Chatburn, Middlewood .....   | 3.44            | XXI.   | Gorey, Courtown House ...   | 3.18            |
| „     | Cartmel, Flookburgh .....    | 3.89            | „      | Moynalty, Westland .....    | 2.23            |
| IX.   | Langsett Moor, Up. Midhope   | 3.05            | „      | Athlone, Twyford .....      | 1.38            |
| „     | Scalby, Silverdale .....     | 2.96            | „      | Mullingar, Belvedere.....   | 2.08            |
| „     | Ingleby Greenhow .....       | 3.04            | XXII.  | Woodlawn .....              | 1.71            |
| „     | Middleton, Mickleton .....   | 2.78            | „      | Westport, Murrisk Abbey..   | 2.47            |
| X.    | Beltingham .....             | 4.15            | „      | Crossmolina, Enniscoe ..... | 2.44            |
| „     | Font Reservoir, Fallowlees.  | 1.71            | „      | Collooney, Markree Obsey... | 1.96            |
| „     | Ilderton, Lilburn Cottage... | 2.62            | XXIII. | Enniskillen, Portora .....  | 1.93            |
| „     | Keswick, The Bank .....      | 4.81            | „      | Warrenpoint .....           | 2.21            |
| XI.   | Llanfrehfa Grange.....       | 3.69            | „      | Banbridge, Milltown .....   | 2.30            |
| „     | Treherbert, Tyn-y-waun ...   | 7.88            | „      | Belfast, Springfield .....  | 2.93            |
| „     | Carmarthen, Friary .....     | 5.50            | „      | Bushmills, Dundarave .....  | 2.15            |
| „     | Castle Malgwyn .....         | 5.10            | „      | Stewartstown .....          | 2.01            |
| „     | Plynlimon.....               | 8.20            | „      | Killybegs .....             | 2.03            |
| „     | Tallyllyn .....              | 4.10            | „      | Horn Head .....             | 2.06            |



## METEOROLOGICAL NOTES ON APRIL, 1905.

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.

## ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—Typical April weather with frequent changes and no period of settled conditions. There was a spell of cold N. and E. winds from 16th, lasting more or less till 25th, with low temp. and only slight R. A little S fell on 7th and a quantity of sleety H on 18th and 19th. T and L on 16th. Duration of sunshine 91·3\* hours and of R 53·7. Mean temp. 47°·6.

TENTERDEN.—Cold, with polar winds on 15 days, but strong S.W. winds at the close. Dry at Easter, but with deficient sunshine, the total for the month being only 117½ hours.

CROWBOROUGH.—A typical April, showery and cool, with R ·66 in. above the average of 34 years, reducing the deficiency for the year to ·86 in. From the 17th there was a week of cold wintry weather, with strong N.E. winds and occasional light S, sleet and H. Mean temp. 45°·9, or 1°·7 below the average.

HARTLEY WINTNEY.—Not a good word can be said on the phenomena of the month's weather. Very mild in the first week, then cool, harsh, acrid and sunless days, with rough, biting N. and N.E. winds until the last two days, which were mild and stormy. Ozone daily, with a mean of 3·8.

BRUNDALL.—S fell heavily on 5th and 6th, lying five inches deep on the level. S, sleet and H also fell on 18th and 19th. T and L on 23rd and 30th.

TORQUAY.—Mean temp. 48°·7, or 0°·5 above the average. Duration of sunshine 107·8\* hours, being 72·4 hours below the average. Mean amount of ozone 6·0; max. amount 9·0 on 13th, 14th and 30th; min. 3·5 on 12th.

LYNMOUTH.—From 1st to 13th was mild, with sunshine and showers. Cold from 14th to 24th, afterwards mild and warm, with sunshine and R.

NORTH CADBURY.—A very disagreeable April. R was frequent, but the total was only 88 per cent. of the average of 9 years. The max. temp. was much below, and the min. temp. well above, the normal.

CLIFTON.—A rainy month, with R nearly an inch above the normal. The driest period was from 17th to 22nd, under the influence of cold N.E. winds. There were about 45 hours of continuous R from 9th to 11th, and R fell nearly the whole of 25th and 26th. S.S.E. gale and heavy R on 30th.

ROSS.—One of the most cheerless Aprils remembered. The amount of cloud was 8 or more on no less than 25 mornings. R very persistent but not heavy, being about one-third more than the average. Mean max. temp. very low and mean min. much above the average.

WORKSOP.—Cloudy and showery, with mild nights but no warm days. Two inches of S lying at 8 a.m. on 7th. Earthquake shock at 1.36 a.m. on 23rd.

BOLTON.—Temp. generally slightly below the average; mean 42°·7. Duration of sunshine 76·7\* hours, 34 hours below the average. Prevailing winds E. and N. till the end, then S. All growing factors were in excess of 1904.

SOUTHPORT.—Exceptionally sunless and rather wet. Mean temp. 1°·3 below the average. Duration of sunshine 46 hours below the average. R ·86 in. above the average. Underground water level still exceptionally low.

LILBURN.—Very cold, with frequent showers of S, H and R and little sunshine. Milder at the end. R above the average.

HAVERFORDWEST.—Fine generally but cold, with no R from 16th to 23rd, after which it was very wet. Vegetation and agricultural operations were generally backward. Duration of sunshine 84·9\* hours.

RUTHIN.—The early part was mild and rainy, followed by dull days with cold N.E. and N.W. winds. The last week was mild and rainy.

LLANDUDNO.—A variable month. Very cold from 16th to 20th. H on 5th and S on 7th. Duration of sunshine 106·6\* hours. Vegetation very advanced, and lilac and laburnum in bloom at the end. Summer migrants all late.

\* Campbell-Stokes.

† Jordan



DOUGLAS.—A deplorable month. Except perhaps 1880 and 1891, almost unprecedentedly cold and wintry, with bitter, strong N.E. winds, S, H and frosts. The 21st and 29th were mild.

## SCOTLAND.

LILLIESLEAF.—Unusually windy and wet. Very bad seed time, with continual heavy showers and only two consecutive fine days.

COLMONELL.—Mean temp.  $43^{\circ}9$ , or  $1^{\circ}3$  below the average of 29 years. About two inches of S on the ground on 7th, the heaviest in April in 29 years.

INVERARAY.—There was a spell of fine dry weather in the middle, but it was too cold for anything to grow, and the season was very backward.

COUPAR ANGUS.—The month opened with a few bright and warm days, but a protracted period of cold and barren weather lasted till 26th, then milder.

DRUMNADROCHIT.—R  $\cdot 68$  in. less than the average of 19 years, but rainy days 8 above the average. Unusually cold, with drizzling R or S almost daily.

CASTLETOWN.—Cold, wet and sunless. S storm from 5th to 10th. The ground was so soaked with water that in many cases turnip crops could not be carted, and at the end only about half the seed was sown and ploughing unfinished.

## IRELAND.

DARRYNANE ABBEY.—Again very wet, with R 156 per cent. of the average of 25 years, and only exceeded three times in that period. Cold easterly wind from 8th to 22nd; the rest fairly mild with some hot days.

MILTOWN MALBAY.—Ung genial, cold and dripping, ending a bad spring.

DUBLIN.—Cold, dull and very showery. Mean temp.  $46^{\circ}8$ , or  $0^{\circ}8$  below the average. Duration of sunshine 107·8 hours, or 51·2 hours below the average. A very cold Easter.

BELFAST.—Cold and dull until the last week, when a vast change came and spring really commenced. R just over the average.

OMAGH.—With a considerable preponderance of polar and easterly winds and rather above the average R, the weather was mostly ungenial and unfavourable for vegetation.

## FOUR MONTHS' RAINFALL OF 1905.

*Aggregate Rainfall for January—April, 1905.*

| Stations.             | Diff.<br>from<br>Aver. | Per<br>cent.<br>of<br>Aver. | Stations.             | Diff.<br>from<br>Aver. | Per<br>cent.<br>of<br>Aver. | Stations.         | Diff.<br>from<br>Aver. | Per<br>cent.<br>of<br>Aver. |
|-----------------------|------------------------|-----------------------------|-----------------------|------------------------|-----------------------------|-------------------|------------------------|-----------------------------|
|                       | in.                    |                             |                       | in.                    |                             |                   | in.                    |                             |
| London .....          | 6·88                   | 101                         | Bolton .....          | 13·14                  | 119                         | Braemar .....     | 11·45                  | 112                         |
| Tenterden .....       | 7·86                   | 100                         | Wetherby .....        | 7·21                   | 98                          | Aberdeen .....    | 9·76                   | 104                         |
| Hartley Wintney ..... | 6·98                   | 88                          | Arnccliffe .....      | 20·05                  | 103                         | Cawdor .....      | 10·91                  | 143                         |
| Hitchin .....         | 6·78                   | 104                         | Hull .....            | 6·27                   | 87                          | Invergarry .....  | 24·78                  | 130                         |
| Winslow .....         | 6·29                   | 87                          | Newcastle .....       | 5·58                   | 75                          | Bendamph .....    | 33·13                  | 126                         |
| Westley .....         | 6·64                   | 103                         | Seathwaite .....      | 42·82                  | 99                          | Dunrobin .....    | 13·25                  | 143                         |
| Brundall .....        | 6·24                   | 96                          | Cardiff, Ely .....    | 11·52                  | 95                          | Killarney .....   | 19·58                  | 99                          |
| Alderbury .....       | 8·41                   | 98                          | Haverfordwest .....   | 14·95                  | 103                         | Waterford .....   | 13·46                  | 108                         |
| Winterbourne .....    | 11·07                  | 92                          | Gogerdan .....        | 15·43                  | 126                         | Broadford .....   | 11·91                  | 125                         |
| Torquay .....         | 10·24                  | 93                          | Llandudno .....       | 9·00                   | 108                         | Carlow .....      | 10·41                  | 100                         |
| Polapit Tamar .....   | 13·08                  | 115                         | Cargen .....          | 13·86                  | 103                         | Dublin .....      | 7·85                   | 98                          |
| Bath .....            | 7·58                   | 88                          | Lilliesleaf .....     | 8·10                   | 86                          | Mullingar .....   | 11·41                  | 110                         |
| Stroud, Upfield ..... | 8·54                   | 100                         | Colmonell .....       | 13·72                  | 101                         | Ballinasloe ..... | 9·48                   | 88                          |
| Woolstaston .....     | 9·49                   | 103                         | Glasgow .....         | 9·39                   | 95                          | Clifden .....     | 24·65                  | 101                         |
| Bromsgrove .....      | 6·53                   | 100                         | Inveraray .....       | 25·79                  | 130                         | Crossmolina ..... | 17·29                  | 109                         |
| Boston .....          | 6·12                   | 100                         | Islay, Eallabus ..... | 17·25                  | 121                         | Seaforde .....    | 10·08                  | 86                          |
| Hodsock Priory .....  | 4·97                   | 76                          | Mull .....            | 20·39                  | 117                         | Londonderry ..... | 13·15                  | 113                         |
| Derby .....           | 5·35                   | 78                          | Dundee .....          | 6·50                   | 81                          | Omagh .....       | 13·03                  | 123                         |



## Climatological Table for the British Empire, November, 1904.

| 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. |          |      |               |           |                 |                   |             |       |        |
|                                                                  |           |       |          |       |          |      |               |           |                 |                   |             |       |        |
| °                                                                |           | °     |          | °     | °        | °    | 0-100         | °         | °               | inches            |             |       |        |
| London, Camden Square                                            | 58·8      | 9     | 24·1     | 26    | 47·8     | 36·7 | 39·5          | 91        | 87·6            | 16·5              | 1·70        | 11    | 7·2    |
| Malta                                                            | 71·6      | 6     | 46·7     | 18    | 61·5     | 53·6 | 49·9          | 75        | 121·6           | 44·0              | 2·82        | 20    | 4·4    |
| Lagos                                                            | 90·0      | 29    | 70·5     | 13    | 87·5     | 74·9 | 75·2          | 77        | 143·0           | 69·5              | ·63         | 2     | 5·6    |
| Cape Town                                                        | 83·8      | 25    | 44·6     | 13    | 69·9     | 54·3 | 52·7          | 71        | ...             | ...               | 1·21        | 6     | 4·7    |
| Durban, Natal                                                    | 90·7      | 26    | 57·8     | 5     | 80·4     | 65·0 | ...           | ...       | 148·6           | ...               | 3·61        | 18    | 6·4    |
| Johannesburg                                                     | 88·3      | 8     | 47·2     | 4     | 75·5     | 55·4 | 51·0          | 62        | ...             | 44·5              | 4·32        | 9     | 2·2    |
| Mauritius                                                        | 87·0      | 28    | 61·9     | 17    | 83·5     | 67·0 | 62·7          | 66        | 155·2           | 53·0              | 1·38        | 10    | 5·8    |
| Calcutta                                                         | 88·2      | 13    | 55·4     | 29    | 82·3     | 64·7 | 63·2          | 72        | 144·4           | 50·0              | ·15         | 1     | 3·2    |
| Bombay                                                           | 92·1      | 16    | 69·8     | 24    | 87·4     | 72·7 | 67·4          | 68        | 139·4           | 58·9              | ·00         | 0     | 1·1    |
| Madras                                                           | 93·4      | 5     | 64·1     | 24a   | 89·4     | 69·3 | 65·6          | 66        | 146·8           | 60·7              | ·20         | 3     | 3·2    |
| Kodaikanal                                                       | 69·0      | 27    | 40·5     | 28    | 62·5     | 45·9 | 49·9          | 74        | 132·2           | 25·2              | ·09         | 1     | 4·0    |
| Colombo, Ceylon                                                  | 90·7      | 29    | 71·8     | 23    | 87·7     | 74·5 | 71·4          | 76        | 150·5           | 67·8              | 3·39        | 9     | 6·4    |
| Hongkong                                                         | 83·7      | 14    | 52·2     | 30    | 74·0     | 64·6 | 56·3          | 62        | 132·9           | ...               | ·22         | 5     | 5·5    |
| Melbourne                                                        | 92·2      | 16    | 41·6     | 20    | 71·0     | 50·8 | 47·7          | 65        | 146·7           | 33·0              | 1·29        | 8     | 5·4    |
| Adelaide                                                         | 99·5      | 16    | 44·9     | 7     | 76·9     | 53·5 | 47·7          | 50        | 154·5           | 40·2              | ·65         | 7     | 3·3    |
| Coolgardie                                                       | 100·6     | 19    | 39·0     | 2     | 87·9     | 56·3 | 46·1          | 40        | 168·9           | 35·2              | ·70         | 2     | 2·4    |
| Sydney                                                           | 93·2      | 2     | 54·2     | 5     | 78·4     | 61·8 | 56·4          | 58        | 132·7           | 42·8              | ·46         | 10    | 4·2    |
| Wellington                                                       | 73·8      | 28    | 42·0     | 22    | 63·8     | 48·9 | 45·3          | 67        | 140·0           | 36·0              | 1·06        | 7     | 5·2    |
| Auckland                                                         | 71·0      | 25    | 47·0     | 17    | 62·5     | 52·5 | 49·8          | 76        | 135·0           | 41·0              | 4·35        | 16    | 5·5    |
| Jamaica, Negril Point.                                           | 89·5      | 10    | 66·8     | 26    | 86·4     | 72·1 | 72·5          | 78        | ...             | ...               | ·35         | 2     | ...    |
| Grenada                                                          | 86·4      | 17    | 72·0     | 28    | 84·1     | 74·4 | 72·0          | 77        | 152·0           | ...               | 5·69        | 24    | 3·5    |
| Toronto                                                          | 58·0      | 3     | 9·9      | 28    | 43·2     | 28·6 | 29·6          | 78        | 82·0            | 3·5               | ·11         | 9     | 5·9    |
| Fredericton                                                      | 49·8      | 4     | -0·5     | 29    | 37·6     | 20·3 | 19·0          | 64        | ...             | ...               | 2·41        | 8     | 6·3    |
| Winnipeg                                                         | 64·8      | 2     | -7·0     | 30    | 41·3     | 22·6 | ...           | ...       | ...             | ...               | ·32         | 2     | 5·0    |
| Victoria, B.C.                                                   | 60·0      | 9     | 34·0     | 18    | 52·7     | 45·4 | 45·5          | 86        | ...             | ...               | 5·23        | 22    | 8·1    |
| Dawson                                                           | 22·0      | 2     | -27·5    | 18    | 5·0      | -4·3 | ...           | ...       | ...             | ...               | ·80         | 5     | 5·6    |

a—and 29.

MALTA.—Mean temp. of air 58°·3, or 3°·8 below average, mean hourly velocity of wind 10·5 miles, or 1·1 above average. Mean temp. of sea 66°·0. TSS on 3 days.

MAURITIUS.—Mean temp. of air 0°·4, dew point 1°·6, and R ·38 in., below averages. Mean hourly velocity of wind 10·0 miles, or 0·7 mile below average. Computed direction of wind E. by S.

MADRAS.—R the lowest recorded since 1813. Bright sunshine 238 hours.

KODAIKANAL.—Bright sunshine 214 hours.

COLOMBO.—Mean temp. of air 81°·1, or 1°·3 above, of dew point 0°·9 below, and R 9·25 in. below, averages. Mean hourly velocity of wind 7·5 miles; prevailing direction N. and N.W. TSS on 5 days.

HONGKONG.—Mean temp. of air 68°·8. Bright sunshine 187·3 hours. Mean hourly velocity of wind 13·1 miles; mean direction E. 27° N.

ADELAIDE.—Mean temp. of air 2°·0 below, and bright sunshine 35 hours above the averages, and R ·36 in. below average.

SYDNEY.—Mean temp. of air 3°·2, above, R 2·64 in. below, and humidity 10·7 p.c. below averages.

WELLINGTON.—Mean temp. of air 0°·9 below, and R 2·51 in. below, averages.

AUCKLAND.—Mean temp. of air 3·5 degrees below, and R 2·20 in. above average.



# Symons's Meteorological Magazine.

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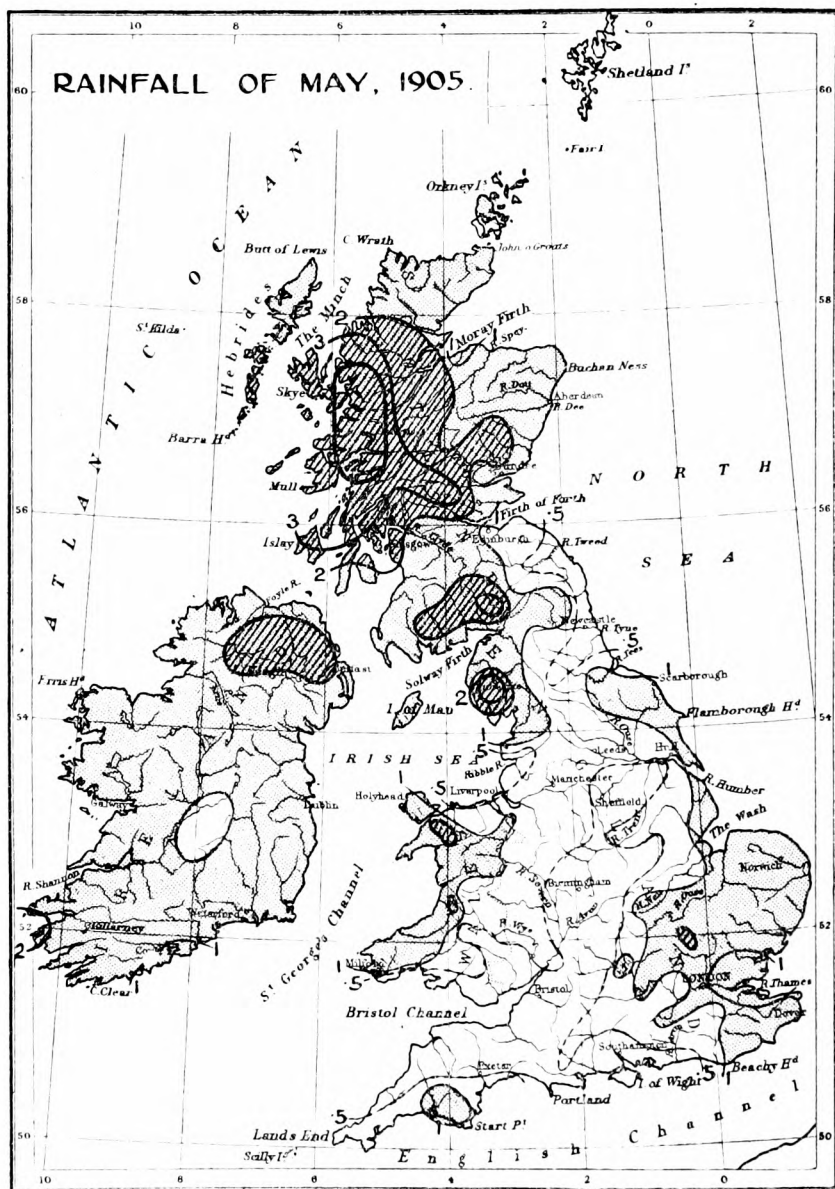
## THE RAINFALL AND WEATHER OF MAY, 1905.

THE month proved very dry in all parts of the country except in the western Highlands, where the deficiency was less marked. The usual tables give the actual amounts which were recorded at about 150 well-distributed stations, but about 200 additional stations have been utilized in compiling the accompanying map. We should like to be able to print all the figures which were made use of, but that is impossible, and we have to content ourselves with thanking all those who send in observations monthly, every one of whom has been helpful in drawing the map.

On the map the parts of the country where the rainfall of May exceeded one inch, are shaded with a light tint, a darker shading shows places where the falls exceeded two inches, and the lines upon that dark shading denote falls exceeding three and four inches respectively. Except in the extreme south-east and south-west, Scotland had everywhere more than an inch, and in most parts more than two inches of rainfall. The rainfall in Scotland, taking it altogether, was probably about 25 per cent. below the average. Ireland had only a small area with more than two inches, and a still smaller with less than one. It was dry, relatively, in all parts, the general deficiency from the average being something like 36 per cent.

The chief interest of the rainfall lay in England. Here the fall was everywhere far below the average, the deficiency being 57 per cent., not half the normal amount having fallen. But for a thunderstorm which arrived just too early to belong to June, the map would have been more remarkable still. As it is we see that more than an inch of rain only occurred in three districts in the west, viz.: Dartmoor, western Wales, and the Lake District, and also along a more or less irregular belt bordering the east coast, from Beachy Head to the Tees. Round Snowdon and round Seathwaite several inches of rain fell, but that took place on very small patches of country. In the relatively wet belt of the east coast, only one station reported as much as 2·00 in. The thin line running through the unshaded portion of the map includes the driest part of the country upon which less than half an inch of rain, or roughly one-quarter of the







usual amount fell. It includes the north of Cornwall, North Devon, the whole of Somerset, most of Dorset, Wiltshire, Hampshire, Gloucester, Monmouth, Glamorgan and Breconshire, the whole of Worcestershire, most of Warwickshire and Leicestershire, and considerable parts of Staffordshire, Derbyshire, Nottinghamshire and the south of Yorkshire. The dearth of rain culminated in the districts bordering on the Bristol Channel, where less than a quarter of an inch of rain fell during the month, and in some cases less than one-tenth of an inch. Several observers report that no May, and some that no month, had proved so dry in a long period over which observations extended. We quote a number of the most remarkable figures which we have received.

*Stations reporting .15 in. or less of Rain in May, 1905.*

|                      |                                     | Total<br>Rain.<br>in. | No. of<br>Days. | Max.<br>Fall.<br>in. | Date.    |
|----------------------|-------------------------------------|-----------------------|-----------------|----------------------|----------|
| <i>Deron</i> ...     | Braunton, Light House .....         | ·03                   | 2               | ·02                  | 11       |
| " .....              | " " Saunton .....                   | ·06                   | 2               | ·05                  | 11       |
| <i>Somerset</i> ...  | Bath, Henrietta Park .....          | ·07                   | 6               | ·02                  | 18       |
| <i>Devon</i> .....   | Westward Ho!, Ferndale .....        | ·10                   | 3               | ·03                  | 1, 2, 31 |
| " .....              | Instow .....                        | ·10                   | 2               | ·06                  | 2        |
| <i>Somerset</i> ...  | East Harptree, Harptree Court... .. | ·11                   | 5               | ·04                  | 1        |
| <i>Gloucester</i> .. | Clifton, Pembroke Road .. ..        | ·11                   | 7               | ·03                  | 31       |
| <i>Glamorgan</i> ..  | Penarth .....                       | ·11                   | 3               | ·06                  | 1        |
| <i>Devon</i> .....   | Hartland Abbey .....                | ·12                   | 4               | ·04                  | 11       |
| " .....              | Woolacombe .....                    | ·13                   | 4               | ·04                  | 11       |
| <i>Glamorgan</i> ..  | Cardiff, Ely .....                  | ·13                   | 3               | ·08                  | 1        |
| <i>Devon</i> .....   | South Molton, Castle Hill School .. | ·15                   | 4               | ·06                  | 1        |
| " .....              | Bideford, Horwood .....             | ·15                   | 4               | ·07                  | 2        |
| " .....              | Northam .....                       | ·15                   | 4               | ·06                  | 2        |
| " .....              | Ilfracombe Hotel .....              | ·15                   | 3               | ·03                  | 1        |
| " .....              | Martinhoe .....                     | ·15                   | 4               | ·06                  | 2        |
| " .....              | Lynmouth, Rock House .....          | ·15                   | 4               | ·07                  | 1        |

Taken as a whole England has been drier in the month of May than it was this year, and we need go no farther back than 1896 for a striking example. In that month only one station, quoted in this Magazine, from England or Wales recorded so much as one inch (and that was Seathwaite), while at most stations almost the whole of the trifling fall occurred on one day. May, 1905, can bear no comparison with so exceptional a month, but it has points of individual interest notwithstanding. In the Observers' Notes it will be seen that north-easterly and easterly winds prevailed in England to an extent unusual even in that month of east winds, and the low rainfall of the south-west of England with the steady increase of rain from Cornwall to Norfolk, may be looked upon as a direct result of the inversion of the prevailing wind, while farther north the Welsh mountains, on account of their height and the increased cooling and condensation, appear to have masked this result to some extent.

The Table of Aggregate Rainfall shows that the result of the dry month has been to throw practically the whole of England, the south-



east of Scotland, and the east of Ireland, considerably below the average for the five months to the end of May. Parts of the south-east of England, however, have come very near the average, and a remarkable deficiency is confined to the north Midlands.

The month was very free from cloud, remarkable for the large number of hours of sunshine, for high maximum temperatures, and, as is natural enough, for low minimum temperatures also. Severe night frosts did a great deal of damage in many parts of the country, and though we may hope that the first reports in the newspapers were exaggerated, there can be no doubt that the fruit crop was seriously affected.

Several letters from correspondents, on another page, deal with the nature of the month of May in different parts of the country, and we may conclude this article with a condensed quotation from the *Evesham Journal* of May 27th.

"We are sorry to have to record that the market gardeners of the town and district have sustained a most serious reverse owing to the frosts of Monday and Tuesday mornings. At the end of last week the gardens were looking exceedingly well, and there was every prospect of a successful season, and the outlook pointed to a heavy crop of plums. Now, however, the condition of things has totally changed. Monday morning's frost did a certain amount of damage, but that of the following morning was disastrous.

"The thermometer in the screen at Lansdowne registered only two degrees each night; this would be equal to about five degrees on the grass. At Beckford nearly five degrees of frost were registered in the screen, and eight degrees on the grass. In other parts the frost seems to have been more severe, particularly at Toddington. Speaking broadly, the frost has played havoc on the low lying grounds, leaving the higher land either unhurt or only slightly damaged.

"Perhaps the frost was most severely felt in the low strip of ground which runs from Hampton across the Cheltenham Road to the Mint, and along by the Red Barn between Bench Hill and Longdon Hill. Here it made a clean sweep of everything, as it has done on previous occasions. Plums, strawberries, beans and so on were destroyed in very large quantities, and strawberry beds which were a picture on Sunday presented a very dismal sight on Tuesday.

"These terrible visitations of frost lead one to wonder whether some steps cannot be taken to counteract or forestall them. It sounds somewhat far-fetched, but we do not think it at all beyond the bounds of possibility to find means for fighting the frost. It is not so very many years ago since some people objected to the investigations of the Evesham Fruit Pests Committee—on the ground of impiety for one thing! 'You can syringe 'em,' it was said, 'and you can grease-band 'em; but it's no use; you can't fight against the Almighty.' Perhaps even now some people would object to fighting the frost on the same grounds."



## FIVE MONTHS' RAINFALL OF 1905.

*Aggregate Rainfall for January—May, 1905.*

| Stations.             | Total Rain. | Per cent. of Aver. | Stations.             | Total Rain. | Per cent. of Aver. | Stations.         | Total Rain. | Per cent. of Aver. |
|-----------------------|-------------|--------------------|-----------------------|-------------|--------------------|-------------------|-------------|--------------------|
|                       | in.         |                    |                       | in.         |                    |                   | in.         |                    |
| London .....          | 8·06        | 94                 | Bolton .....          | 13·95       | 103                | Braemar .....     | 13·10       | 105                |
| Tenterden .....       | 9·10        | 95                 | Wetherby .....        | 7·82        | 85                 | Aberdeen .....    | 10·98       | 95                 |
| Hartley Wintney ..... | 7·73        | 80                 | Arncliffe .....       | 21·03       | 92                 | Cawdor .....      | 12·99       | 134                |
| Hitchin .....         | 8·78        | 105                | Hull .....            | 6·78        | 74                 | Invergarry .....  | 27·51       | 126                |
| Winslow .....         | 7·05        | 76                 | Newcastle .....       | 6·09        | 65                 | Bendamph .....    | 37·13       | 119                |
| Westley .....         | 7·90        | 95                 | Seathwaite .....      | 51·00       | 101                | Dunrobin .....    | 14·39       | 127                |
| Brundall .....        | 7·65        | 93                 | Cardiff, Ely .....    | 11·65       | 79                 | Killarney .....   | 21·05       | 93                 |
| Alderbury .....       | ...         | ...                | Haverfordwest .....   | 16·26       | 95                 | Waterford .....   | 15·05       | 103                |
| Winterbourne .....    | 11·60       | 83                 | Gogerddan .....       | 17·05       | 116                | Broadford .....   | 13·23       | 114                |
| Torquay .....         | 10·80       | 84                 | Llandudno .....       | 9·43        | 93                 | Carlow .....      | 12·06       | 95                 |
| Polapit Tamar .....   | 13·56       | 102                | Cargen .....          | 16·03       | 100                | Dublin .....      | 9·03        | 91                 |
| Bath .....            | 7·65        | 71                 | Lilliesleaf .....     | 8·97        | 78                 | Mullingar .....   | 12·60       | 99                 |
| Stroud, Upfield ..... | 9·28        | 88                 | Colmonell .....       | 14·61       | 91                 | Ballinasloe ..... | 10·67       | 81                 |
| Woolstaston .....     | 10·16       | 86                 | Glasgow .....         | 10·94       | 89                 | Clifden .....     | ...         | ...                |
| Bromsgrove .....      | 6·93        | 81                 | Inveraray .....       | 29·49       | 129                | Crossmolina ..... | 18·85       | 100                |
| Boston .....          | 7·47        | 96                 | Islay, Eallabus ..... | 20·27       | 122                | Seaforde .....    | 11·06       | 78                 |
| Hodsock Priory .....  | 5·39        | 63                 | Mull .....            | 23·79       | 117                | Londonderry ..... | 15·14       | 107                |
| Derby .....           | 5·74        | 65                 | Dundee .....          | 7·90        | 79                 | Omagh .....       | 15·12       | 117                |

## Correspondence.

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

## PARTIAL DROUGHT IN MAY.

I SEND herewith a few notes of the recent dry weather.

A partial drought of 37 days with 0·35 in. of rain lasted from May 3rd to June 7th inclusive, the rain falling on 9 days, the heaviest being ·11 in. on May 14th. The only other dry period comparable with this in my register (commencing December, 1880) was in 1889, when the 35 days from June 3rd to July 8th (inclusive) had only ·19 in., of which 25 consecutive days were rainless—*i.e.*, June 11th to July 5th.

I have also a record of 25 days entirely without rain in 1887, from June 9th to July 3rd, and by going 5 days further back, 30 days with only ·01 in. of rain.

In 1899 also there were 24 consecutive days without rain; May 25th to June 17th.

In this climate both absolute and partial droughts according to your definitions are rare. I have altogether 10 absolute and 4 partial in 24½ years, their duration being—



*Absolute Droughts.*

3 of 15 days  
 3 „ 16 „  
 1 „ 17 „  
 1 „ 24 „  
 2 „ 25 „

*Partial Droughts*

1 of 29 days  
 1 „ 33 „  
 1 „ 35 „  
 1 „ 37 „ (to date)

CHARLES L. BROOK.

*Harewood Lodge, Meltham, June 9th, 1905.*

## RANGE OF TEMPERATURE DURING MAY, & HEAVY RAINFALL DURING THUNDERSTORM ON MAY 30th, 1905.

THE extreme range of temperature experienced here during the month of May may seem worthy of notice in your pages. On May 23rd the thermometer in the screen fell to  $28^{\circ}$ , considerable damage being caused by the sharp frost, especially to laurels and potatoes. On the 29th the shade maximum rose to  $84^{\circ}\cdot 2$ , thus giving the extreme range of  $56^{\circ}\cdot 2$  for the month. I may add that the thermometers are Kew certified instruments.

On May 30th a sharp thunderstorm broke at 3.27 p.m., being accompanied by a perfect deluge of rain, lasting for a period of 23 minutes (to 3.50 p.m.); during this space of time the amount registered was  $\cdot 66$  in., or a fall at the rate of nearly  $\cdot 03$  per minute. The amount recorded previously for the month only totalled  $\cdot 61$  in., 24 days having been absolutely rainless.

SPENCER C. RUSSELL, F. R. MET. SOC.

*Ashley Road, Epsom, June 1st, 1905.*

[The fall of  $\cdot 66$  in. in 23 minutes, though interesting, is not unusual, as great an amount has frequently been recorded in half the time.—  
ED. S.M.M.]

## MAY FROSTS.

YOUR readers may be interested to know that two sharp frosts—for the time of year—were registered in this district during the early mornings of May 23rd and 24th :—

23rd ..... Grass min.  $28^{\circ}\cdot 2$  ; screen min.  $30^{\circ}\cdot 9$ .

24th ..... „ „  $29^{\circ}\cdot 8$  ; „ „  $31^{\circ}\cdot 7$ .

The instruments were verified at Kew.

W. J. CARTER.

*Edenfield, New Malden, Surrey, 25th May, 1905.*

THE shade temperatures registered yesterday morning were maximum  $53^{\circ}$  and minimum  $32^{\circ}$ , while this morning they were maximum  $53^{\circ}$  and minimum  $31^{\circ}$ . In May, 1898, 1900, 1901, 1903 and 1904,



there was no frost, the minimum temperature being  $33^{\circ}$ . In May, 1894,  $31^{\circ}$  was registered on 21st; in 1896,  $32^{\circ}$  on 3rd; in 1897,  $30^{\circ}$  on 13th; in 1899,  $31^{\circ}$  on 5th; and in 1902,  $29^{\circ}$  on 14th. This year furnishes a record for the end of the month at this station.

WILLIAM HALL.

*Swerford, Oxfordshire, May 23rd, 1905.*

### PARTIAL DROUGHT, MAY, 1905.

FROM 3 p.m. on 3rd May, 1905, to 4 a.m. on 1st June, 1905, or 28 days 13 hours, the only measurable rain that fell was .05 in. on four days, three with .01 in., and one with .02 in., showing an average rainfall of only about one-fifth of the maximum named in the definition of a partial drought. Within this period was included an all but absolute drought, viz. : from 4 p.m. on May 11th to 4 a.m. on the 24th—12½ days—with no rainfall.

Either *partial* or *absolute* droughts are so rare in mid-East Cheshire—where Wilmslow lies—that I thought it worth while to report the above at once.

EDWARD PEARSON.

*Parkside, Wilmslow, 2nd June, 1905.*

### FROST IN URUGUAY.

NOT long ago I received a copy of the *International Geography*, and in reading over the article on the Republic of Uruguay my attention was drawn to a part where the writer clearly states that frosts never occur.

I consider it is a pity that such an error should occur in what, otherwise, is a most excellent description of the country in which I have been a resident for the last fifteen years. A neighbour of mine, who has taken meteorological observations for many years back, tells me that as many as  $13^{\circ}$  F. have been registered, and there is never a winter without a succession of heavy frosts falling.

HERBERT J. WALKER, M.B. EDIN.

*Estacion Molles, Uruguay, February 25th, 1905.*

[It is not clear whether the statement as to  $13^{\circ}$  means a temperature of  $13^{\circ}$  F., or  $13^{\circ}$  of frost ( $19^{\circ}$  F.); but the fact is plain that severe frosts do occur.—ED. S.M.M.]

### GLACIAL SNOW ON BEN NEVIS.

THE Rev. R. P. Dansey referred in his interesting article in the March number on the Glacial Snow on Ben Nevis, to the difficulty of recording the rainfall in the corrie—called Allt-a-Mhuilinn—situated on the N.E. side of Ben Nevis, during the winter months.



Considering the height, geographical position of Ben Nevis, and the favourable features of this corrie to produce high rainfall, I am inclined to believe with Mr. Dansey that the wettest spot in Great Britain will be found in this corrie.

As the amount of the rainfall has been so thoroughly investigated at both the summit and the foot of Ben Nevis for so many years, and as the rainfall of probably the wettest spot in such an interesting district is still unknown, I beg to ask—could not some local people, or others, undertake to ascertain the rainfall in the corrie for only *a few months* of the coming summer.

If gauges were fixed in the corrie and on the summit, and measured, say once or twice during June, July, August and September, and *all* measured at the *same date* as those of Fort William, this would give a good idea of the amount at the supposed wettest spot for a long period, and its relation to that at the summit and at Fort William. Also by selecting these months it would enable us to record the actual precipitation, and afford a more true comparison because of the large proportion of the precipitation falling as snow during the other months, which by being blown and mixed with drift from all directions above the gauges, makes it very difficult to measure the real amount of moisture at the summit of the corrie.

I find from the one-inch Ordnance map that the corrie runs almost in a straight line towards N.W., and that the Ordnance contour lines intersect the Allt-a-Mhuilinn stream at fairly uniform distances, and in order that the records should be taken in a systematic manner, and at spots where others could see and study the different results from the map, I beg to suggest that gauges should be fixed at the points where the following contour lines crosses the stream, say 1000, 1500, 2000, 2500, and 3000 feet, and also at the summit; the distances of such spots from the main road, near the Ben Nevis Distillery, are only  $1\frac{1}{2}$ ,  $2\frac{1}{2}$ , 3,  $3\frac{1}{2}$ , and 4 miles, respectively, all along the same path to the end of the corrie. For a temporary purpose like this, I should think that galvanized iron, simply made into a cylindrical form, say 24 inches deep, and 5 inches diameter (for measuring a possible two weeks maximum rainfall), with a cap on the top, and the lower part of the cone turned upwards, to prevent evaporation, also a small cylinder of, say 4 inches diameter, and 4 inches deep,—which would of course hold and lift a known quantity of rain—would be suitable to do the work, and could be made by any local tinman at a small cost.

It will be seen that in order to have a good idea of the rainfall at this interesting corrie for a long period, it is *absolutely* necessary to record that of the summit and at Fort William for the *same period*, and the gauges should be fixed 10 to 20 yards from the stream, if possible on a flat piece of ground, or a slight slope, the top being 12 inches above ground, and clear of rocks, boulders and precipices.

J. R. GETHIN JONES.

*Bodgethin, Deganwy, May 9th, 1905.*



[We trust that Mr. Gethin Jones's suggestions will lead to some action being taken ; but the Ben Nevis Observatories have been closed, and we are not aware of a single rainfall record left in Fort William. This is the more deplorable because, unless we are mistaken, 1905 is the first year since 1875 without rainfall observations at that extremely interesting locality. Here is a definite and simple problem, one of the few in which an active observer, even without special scientific training, may furnish the data for an important piece of scientific work.—ED. *S.M.M.*].

### THE PARALLEL BETWEEN 1896 and 1905.

IF I may write a third time on this subject I would begin by saying that the weather of 1905 seems to have great difficulty in getting out of the groove of 1896.

It is true that last April made an attempt to do so. Cloudy, cold and showery, it bore little resemblance to the dry and sunny April of 1896. But in one important respect the two months were not very dissimilar. The Observers' Notes in the Magazine for 1896 show that dry though that April was, there was a marked absence of easterly winds ; and it does not appear that this year the winds from between N. and E. were at all more than one expects in April. Where you have printed precise figures they seem to have ranged from 10 to 15 days.

But whatever success April may have had in departing from the 1896 pattern, May certainly fell back into the old groove. The Observers' Notes in the 1896 Magazine might be describing the May just ended. The extremely low rainfall, the decided preponderance of N. and N.E. winds, the bright sunny days with keen dry air, the cold clear nights, the injurious frosts during the first week and again just after the 20th, are features which, limited though my information is, I suspect are by no means confined to Somersetshire.

Let us hope that if England is to have repeated the hot dry July of 1896, it may also have during the next few days the welcome refreshing rains of the first ten days of that June. They are sorely needed. —Yours faithfully,

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

*North Cadbury Rectory, Somerset, June 2nd, 1905.*

[So far as the refreshing rains of early June are concerned, Mr. Boys has proved himself once more to be a true prophet ; but it is extremely difficult to carry out such a comparison as he attempts in any but the most general terms. The heavy rains of the last days of May in the neighbourhood of London changed the character of the month at the last moment, and left the west of England, which escaped the thunderstorm, very much drier than the east, while in the north the early part of June has proved to be extremely dry, in marked contrast to the south.—ED. *S.M.M.*].



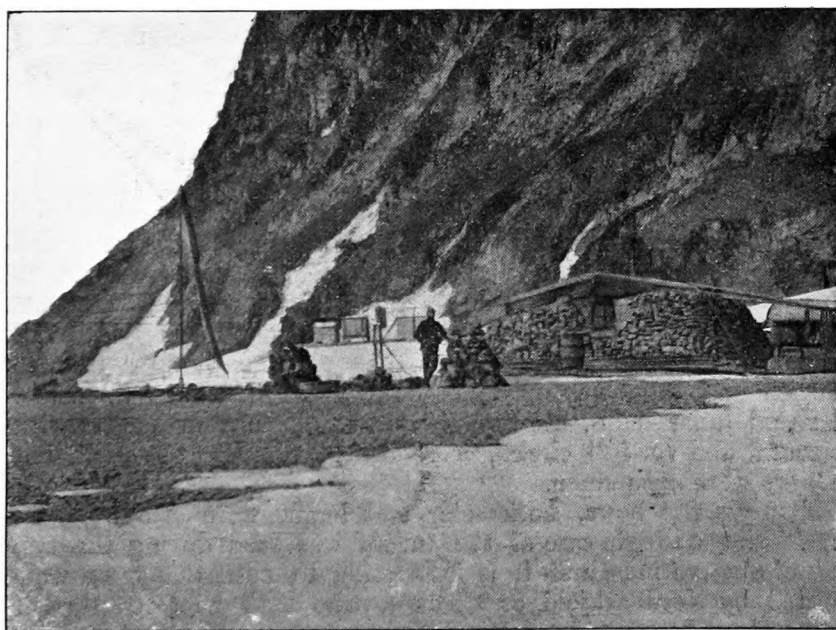
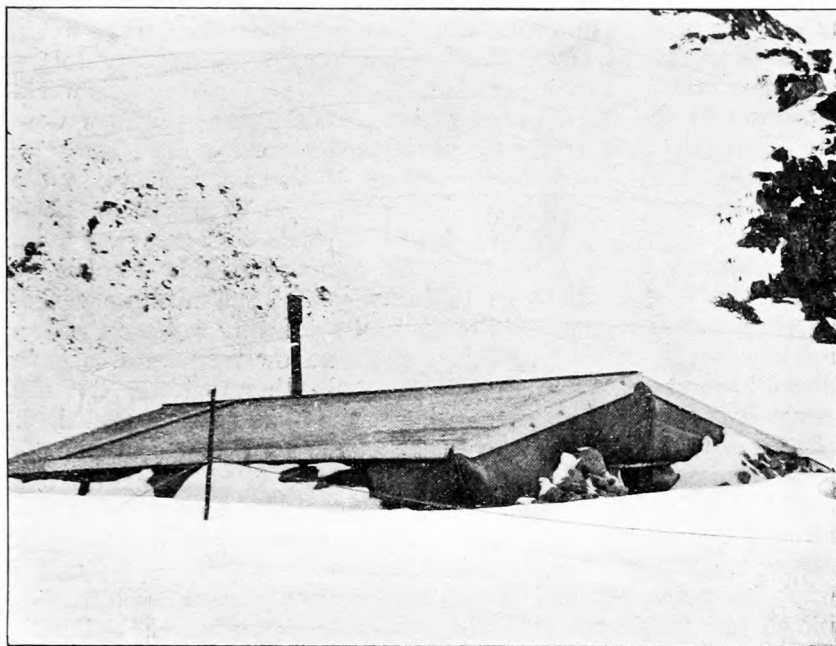
## THE ANTARCTIC METEOROLOGICAL STATION IN THE SOUTH ORKNEYS.

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

THE work at this station commenced at the end of March, 1903, on the arrival of the "Scotia" in winter quarters, and terminated, so far as my connection with the station was concerned, on January 1st of the present year. In this short notice it is not intended to go with any detail into the climatic problems of the region in question; but merely to give some of the more salient features associated with our meteorological work there. From March 25th till the end of October, 1903, the observations were taken on the "Scotia," which was frozen in, in the centre of a large bay on the south side of Laurie Island. For wind observations the position occupied was remarkably good, although westerly winds were deflected somewhat owing to high land a short distance off in that direction. During the winter of 1903 the staff, officers and crew were occupied in building a house on a narrow spit that here divides the north from the south side of the island, and close to this an auxiliary meteorological station was established soon after the "Scotia" went into winter quarters. For wind directions this place was not so good as at the position where the ship wintered, as the cliffs to the west were nearer and the disturbing effect consequently greater. In this connection special attention was given to the movement of the lower clouds. On November 1st the hourly observations were transferred from the ship to the shore, where a land party had been installed to carry on the work while the "Scotia" was absent at Buenos Aires.

The instruments employed at this station were those that experience had shown to give satisfactory results under the prevailing climatic conditions. The instruments in use during 1904, when the station was under Argentine auspices, were much the same as formerly. The barometer, of the Fortin pattern, was hung in the living room of the house as far from the stove as possible. There were also two large Richard barographs, one recording in millimeters and the other in inches. The thermometer screens, five in number, were fixed on to two thick spars resting on cairns and securely anchored to the ground by stout cables. This precaution was necessary owing to the extreme violence of the squalls that occurred from time to time. In these screens were two thermographs, two hygrographs, two pairs of dry and wet bulb thermometers, and a maximum and minimum registering thermometer. Screwed to the outside of one of the screens was a stand containing a black bulb solar radiation maximum in vacuo. Close to the screens was a snow gauge, while a little further off was the Robinson anemometer, mounted on a post with the cups about seven and a half feet above the ground. There were also two sunshine recorders, one a Jordan and the other a Campbell-Stokes instrument. A terrestrial minimum thermometer was occasionally in use. Hourly observations were





METEOROLOGICAL STATION, SCOTIA BAY, LAURIE ISLAND.—WINTER AND SUMMER VIEWS.



taken, and, as there were four observers, the day was divided into four watches of six hours each and the watches changed every week. By this arrangement each observer had ample opportunity to get plenty of exercise, or to engage in natural history or magnetic work. In addition to the station observations, simultaneous readings were made during the first winter by all the sledge parties.

With regard to the general working of the instruments, in the main satisfactory results were obtained. As is usual on polar expeditions, there was a good deal of trouble with the wet bulb, which required much attention. At temperatures below  $10^{\circ}$  F. I found the best method was to do away with the muslin covering altogether, and merely use a film of ice by painting water on with a camel hair brush. The hair hygrographs at low temperatures gave better all-round results than the wet bulb thermometer, but the traces were frequently imperfect owing to the blizzards that prevailed. So fine was the snow that the inside of the recording instruments was full of it, and even the anemometer got filled once or twice although protected by a glass cover. Most of the snow that fell was hard and granular, and large flakes—so common at home—were rarely seen. Silver thaw, or rain falling with a temperature under the freezing point, was of frequent occurrence and gave much trouble owing to the frequency with which the screens became choked with icy incrustations. The deposition of snow crystals from fog was occasionally observed, but the crystals seldom exceeded five inches in length. On three occasions a curious phenomenon was seen at the mouth of crevasses from which smoke appeared to be issuing. The air temperature when this occurred was from  $10^{\circ}$  to  $30^{\circ}$  below zero, and the intense frost had evidently cracked the ice and liberated a quantity of relatively warm air from the interior, the water vapour of which condensed on contact with the cold external atmosphere. A smoke-like haze, known as the "Barber," was often observed issuing from open lanes or pools of water amidst the ice, the result of the great difference (often  $50^{\circ}$  to  $60^{\circ}$ ) in the temperature of the water and the air in contact with it. Remarkable mirage effects were common, icebergs being observed in the air in an inverted position, at one moment lying flat like a pancake the next shooting up into tall spiral columns, while from time to time portions would appear to break off and sail away only to reunite again in a few moments. Solar and lunar halos, accompanied by mock suns or moons with horizontal and vertical circles, were also occasionally observed, but rainbows were uncommon.

Colourless fog bows, both solar and lunar, were also noted at times. Not a single case of the aurora was seen during the two years of observations, and it is interesting to note that none were reported by Nordenskjöld or Charcot, who both wintered further south and to the west of the South Orkneys, so that auroral displays must be of infrequent occurrence in this region. With regard to the clouds, the most typical form both summer and winter was stratus,



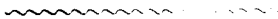
which in the former season covered the sky for days together without a break. The clouds seemed to form at a very low elevation, and even cirri were seen quite close—say, from 6,000 to 8,000 feet above the ground—but as no observations were made no definite heights can be assigned for the various cloud levels. Föhn winds were noted on several days, usually in winter, the highest temperatures recorded being  $46^{\circ}\cdot8$  on May 31st, 1903, and  $47^{\circ}\cdot0$  on February 11th, 1904. A peculiarity of these winds was the instability of temperature during their occurrence, which was clearly shown by the curve of a quickly moving thermograph. When these abnormally warm winds occurred they invariably blew from the W.N.W., in which direction are located some high mountains. The curious rise of temperature during blizzards, reported at the winter quarters of the "Discovery" and by Nordenskjöld, was not observed. The lowest temperature of the period occurred on August 3rd and 4th, 1904. On both these days a minimum of  $-40^{\circ}$  F. was recorded, with a mean for the latter day of  $-33^{\circ}$  F., and as late as October 11th, 1904, the temperature fell to  $-25^{\circ}$  F., all remarkably low temperatures when one considers the low latitude ( $60^{\circ} 47'$  S.) of the observatory, and the fact that it is located on an oceanic island. The mean annual temperature is, approximately,  $23^{\circ}\cdot0$  F., and the mean barometric pressure  $29\cdot260$  inches,\* but both these values are liable to slight alterations. The highest pressure observed was  $30\cdot113$  inches on October 3rd, 1903, and the lowest  $27\cdot992$  inches on June 8th, 1904. There is much cloud, the mean annual amount (overcast sky or fog, 100) being 82. Summer is the cloudiest time, and winter has the least cloud. As regards the discussion of results, the values for 1904 have been worked out and prepared for publication under the direction of Mr. Walter G. Davis, the able chief of the Argentine Meteorological Office, and will appear shortly. Meanwhile good progress is being made with the reduction of the "Scotia's" observations on land and sea, but some little time must necessarily elapse before the data are published.

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Mr. Mossman has kindly supplied photographs of the station as it appeared in winter and summer conditions, and these are reproduced in illustration of his description.

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\* The barometric readings are corrected to  $32^{\circ}$  and sea level, but not to standard gravity at  $45^{\circ}$ .





## ROYAL METEOROLOGICAL SOCIETY.

THE first of the Afternoon Meetings for the present session was held on Wednesday, May 17th, in the Society's Rooms, 70, Victoria Street, Westminster, Captain D. Wilson-Barker, Vice-President, in the chair.

Mr. Richard Strachan, F.R.Met.Soc., read a paper on the "Measurement of Evaporation." He pointed out that the rainfall, evaporation and percolation are related to each other; and that rainfall is commonly considered to form the sum of evaporation and percolation. If two of these quantities are found by experiment or observation, the other is assumed to be known. This, however, does not always hold good. A month may be very dry, and still evaporation will go on at the expense of previous percolation—and otherwise. A month may be excessively wet; then there may be a fourth item in the account—viz., overflow. If evaporation, and also percolation, could be observed as readily and closely as is rainfall, then overflow could be detected and measured.

As it is unfortunately not possible to make evaporation and percolation the subject of experiment except at a very few observatories, the author thinks that it is desirable to be able to estimate, even empirically, the probable amounts of each. By using the meteorological data published for the Royal Observatory, Greenwich, he has calculated the probable evaporation for the year 1898, which agrees very closely with the observed evaporation at Camden Square and also at Croydon.

The Chairman thought it was unfortunate that a standard evaporimeter was not obtainable.

Dr. H. R. Mill said that the subject of evaporation was one of great importance and no less difficulty. He had continued Mr. Symons's observations and was not without hope of arriving at some definite conclusion from the readings.

Mr. Baldwin Latham said that all calculations of evaporation were liable to considerable errors. He did not think the taking of the temperature of the ground at Greenwich at one inch in depth at noon at all represented the true mean temperature of the water evaporated at Camden Square or Croydon. It was not possible to arrive at the true amount of evaporation by deducting the depth of water passing through a percolating gauge from the depth of rainfall, for the simple reason that during some months in a year no percolation takes place, the gauges are comparatively dry, and there is no water to evaporate.

A paper by Dr. John Ball, of Cairo, on a "Logarithmic Slide-Rule for Reducing Readings of the Barometer to Sea Level," was read by the Secretary. This slide-rule has been devised for the purpose of saving the time and labour usually occupied in calculation.

The Chairman and Mr. W. Marriott took part in the discussion.

Capt. J. J. Alsop, Mr. W. P. Gibbons, J.P., Mr. S. W. S. Morris, Mr. C. G. Trevett, and Rev. H. W. Williams, M.A., were elected Fellows of the Society.



## METEOROLOGICAL NEWS AND NOTES.

THE METEOROLOGICAL OFFICE has now been placed under the charge of Dr. W. N. Shaw, F.R.S., as Director of Meteorology, instead of under the Meteorological Council with Dr. Shaw as Secretary. We have not yet been able to ascertain authoritatively what the new constitution of the Office is, or how far the Report of the Treasury Committee (see this Magazine, vol. 39, p. 101) has been acted upon, and we can only hope that the Director has a free hand and increased resources.

METEOROLOGY AT THE PUBLIC SCHOOLS is, we are glad to see, receiving increased attention. It is pleasant to quote the following paragraph from the *Standard* of June 8th :—

Harrow hitherto has been alone among the Public Schools in the non-registration and in the non-publication of an annual series of weather observations. The principal cause of this—the lack of the necessary apparatus—no longer exists, as Mr. F. Druce has now presented the school with a full equipment for the registration of temperature, moisture, and rainfall. The donor has completed his gift by a collection of books on meteorology, which have been placed in the Vaughan Library. The means thus provided of recording and describing the atmospheric variations as to climate and weather will be much appreciated by the Harrovian residents, who have experienced, in 1879, in 1897, and on May 30th last, three local storms of exceptional severity.

THE ARGENTINE GOVERNMENT have purchased the Antarctic research ship, *Le Français*, which recently arrived at Buenos Aires with Dr. Charcot's Expedition on board. Mr. Davis, director of the Oficina Meteorologica Argentina, hopes next summer to be able to establish meteorological and magnetical stations on one of the South Sandwich group, and possibly on Wandel Island, where Dr. Charcot's expedition wintered. Records from the sub-Antarctic station of South Georgia are being maintained during the present year, while the First Order station on Laurie Island, South Orkneys, established by the Scottish Antarctic Expedition, is being continued for a second year under Argentine auspices.

DR. J. HANN'S "LEHRBUCH DER METEOROLOGIE," recently reviewed in these pages, is, we are happy to see, already coming out in a new edition, which, like the first, is appearing in periodical parts. There is no other storehouse of the facts and theories of meteorology so well stocked as this, and it is simply indispensable to all students with whom the language is no bar. The translation of this work would confer an immense boon on the not-inconsiderable number of English-speaking meteorologists who do not read German.

AMAZING VALUES FOR THE RAINFALL appeared in a return recently received, and the figures could not be explained until they were referred to the observer, who solved the problem by explaining that an assistant in copying out the figures had strayed, now and again, into the adjoining column of wet bulb temperature readings !



## RAINFALL AND TEMPERATURE, MAY, 1905.

| Div.   | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.] | RAINFALL.   |                              |                       |       |                                | Days on which 40 or more fell. | TEMPERATURE. |        |      |       |         |     | No. of Nights below 32°. |  |
|--------|--------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------|-----------------------|-------|--------------------------------|--------------------------------|--------------|--------|------|-------|---------|-----|--------------------------|--|
|        |                                                                                                                                      | Total Fall. | Diff. from average, 1870-99. | Greatest in 24 hours. |       | Days on which 40 or more fell. |                                | Max.         |        | Min. |       |         |     |                          |  |
|        |                                                                                                                                      |             |                              | Depth.                | Date. |                                |                                | Deg.         | Date.  | Deg. | Date. |         |     |                          |  |
|        |                                                                                                                                      |             |                              |                       |       |                                |                                |              |        |      |       | inches. | in. |                          |  |
| I.     | London (Camden Square) ...                                                                                                           | 1·18        | —                            | ·54                   | ·41   | 30                             | 9                              | 83·2         | 29     | 35·1 | 23    | 0       | 2   |                          |  |
| II.    | Tenterden .....                                                                                                                      | 1·24        | —                            | ·48                   | ·51   | 1                              | 8                              | 79·2         | 29     | 32·5 | 23    | 0       | 6   |                          |  |
|        | Hartley Wintney .....                                                                                                                | ·75         | —                            | 1·04                  | ·48   | 31                             | 3                              | 76·0         | 29, 30 | 33·0 | 22    | 0       | 3   |                          |  |
| III.   | Hitchin .....                                                                                                                        | 2·00        | +                            | ·13                   | 1·57  | 30                             | 9                              | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
|        | Winslow (Addington) .....                                                                                                            | ·76         | —                            | 1·30                  | ·43   | 30                             | 8                              | 79·0         | 29     | 28·0 | 23    | 3       | 11  |                          |  |
| IV.    | Bury St. Edmunds (Westley) ..                                                                                                        | 1·26        | —                            | ·59                   | ·63   | 30                             | 7                              | 81·5         | 29     | 29·0 | 23    | ...     | ... |                          |  |
|        | Brundall .....                                                                                                                       | 1·41        | —                            | ·33                   | ·69   | 1                              | 12                             | 80·2         | 29     | 33·6 | 23    | 0       | 4   |                          |  |
| V.     | Alderbury .....                                                                                                                      | ...         | ...                          | ...                   | ...   | ...                            | ...                            | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
|        | Winterbourne Steepleton ...                                                                                                          | ·53         | —                            | 1·49                  | ·26   | 1                              | 8                              | 69·7         | 17     | 29·6 | 23    | 1       | 11  |                          |  |
|        | Torquay (Cary Green) .....                                                                                                           | ·56         | —                            | 1·40                  | ·43   | 1                              | 5                              | 68·8         | 17     | 37·9 | 4     | 0       | 0   |                          |  |
|        | Polapit Tamar [Launceston] ..                                                                                                        | ·48         | —                            | 1·50                  | ·26   | 1                              | 5                              | 69·4         | 20     | 28·1 | 23    | 4       | 6   |                          |  |
|        | Bath .....                                                                                                                           | ·07         | —                            | 2·02                  | ·02   | 18                             | 6                              | 71·5         | 28     | 32·0 | 23    | 1       | 17  |                          |  |
| VI.    | Stroud (Upfield) .....                                                                                                               | ·74         | —                            | 1·36                  | ·27   | 3                              | 6                              | 73·0         | 31     | 36·0 | 3     | 0       | ... |                          |  |
|        | Church Stretton (Woolstaston) ..                                                                                                     | ·67         | —                            | 1·95                  | ·20   | 1                              | 7                              | 68·5         | 28     | 32·0 | 22    | 1       | ... |                          |  |
|        | Bromsgrove (Stoke Reformatory) ..                                                                                                    | ·40         | —                            | 1·54                  | ·14   | 1                              | 6                              | 72·0         | 28     | 26·0 | 22    | 6       | ... |                          |  |
| VII.   | Boston .....                                                                                                                         | 1·35        | —                            | ·38                   | ·62   | 30                             | 6                              | 83·0         | 28     | 30·0 | 23    | 1       | ... |                          |  |
|        | Worksop (Hodsock Priory) ..                                                                                                          | ·42         | —                            | 1·59                  | ·32   | 1                              | 4                              | 75·6         | 28     | 27·6 | 23    | 3       | 16  |                          |  |
|        | Derby (Midland Railway) ..                                                                                                           | ·39         | —                            | 1·57                  | ·27   | 1                              | 5                              | 76·0         | 28     | 30·0 | 5     | 2       | ... |                          |  |
| VIII.  | Bolton (The Park) .....                                                                                                              | ·81         | —                            | 1·65                  | ·34   | 1                              | 8                              | 71·0         | 28     | 33·9 | 22    | 0       | 6   |                          |  |
| IX.    | Wetherby (Ribston Hall) ...                                                                                                          | ·61         | —                            | 1·29                  | ·29   | 1                              | 8                              | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
|        | Arncliffe Vicarage .....                                                                                                             | ·98         | —                            | 2·38                  | ·41   | 1                              | 11                             | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
|        | Hull (Pearson Park) .....                                                                                                            | ·51         | —                            | 1·44                  | ·36   | 1                              | 9                              | 79·0         | 28     | 31·0 | 23    | 2       | 10  |                          |  |
| X.     | Newcastle (Town Moor) ..                                                                                                             | ·51         | —                            | 1·38                  | ·11   | 3                              | 14                             | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
|        | Borrowdale (Seathwaite) ...                                                                                                          | 8·18        | +                            | ·92                   | 2·21  | 28                             | 13                             | 72·2         | 18     | 32·6 | 22    | 0       | ... |                          |  |
| XI.    | Cardiff (Ely) .....                                                                                                                  | ·13         | —                            | 2·42                  | ·08   | 1                              | 3                              | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
|        | Haverfordwest (High St.) ...                                                                                                         | 1·31        | —                            | 1·22                  | ·43   | 1                              | 7                              | 71·0         | 18     | 33·2 | 23    | 0       | 11  |                          |  |
|        | Aberystwyth (Gogerddan) ...                                                                                                          | 1·62        | —                            | ·82                   | ·46   | 10                             | 5                              | 76·0         | 17     | 27·0 | 8     | 6       | ... |                          |  |
|        | Llandudno .....                                                                                                                      | ·43         | —                            | 1·42                  | ·16   | 31                             | 7                              | 68·0         | 28     | 39·5 | 23    | 0       | ... |                          |  |
| XII.   | Cargen [Dumfries] .....                                                                                                              | 2·17        | —                            | ·43                   | 1·44  | 28                             | 8                              | 73·0         | 17, 18 | 31·0 | 23    | 1       | ... |                          |  |
|        | Lilliesleaf (Riddell) .....                                                                                                          | ·87         | —                            | 1·20                  | ·23   | 1                              | 14                             | 69·0         | 31     | 30·0 | 4     | 2       | 11  |                          |  |
| XIII.  | Edinburgh (Royal Observatory) ..                                                                                                     | ·55         | ...                          | ...                   | ·22   | 28                             | 9                              | 64·8         | 28     | 34·8 | 22    | 0       | 1   |                          |  |
| XIV.   | Colmonell .....                                                                                                                      | ·89         | —                            | 1·61                  | ·20   | 26                             | 7                              | 75·0         | 18     | 28·0 | 25    | 2       | ... |                          |  |
| XV.    | Tighnabruaich .....                                                                                                                  | 2·95        | —                            | ·26                   | ·66   | 28                             | 13                             | 65·0         | 18     | 32·0 | 3     | 1       | 4   |                          |  |
|        | Mull (Quinish) .....                                                                                                                 | 3·40        | +                            | ·49                   | ·61   | 24                             | 19                             | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
| XVI.   | Dundee (Eastern Necropolis) ..                                                                                                       | 1·40        | —                            | ·48                   | ·40   | 26                             | 12                             | 67·7         | 31     | 33·0 | 23    | 0       | ... |                          |  |
| XVII.  | Braemar .....                                                                                                                        | 1·65        | —                            | ·64                   | ·54   | 25                             | 15                             | 70·0         | 17     | 30·0 | 4     | 2       | ... |                          |  |
|        | Aberdeen (Cranford) .....                                                                                                            | 1·22        | —                            | ·98                   | ·24   | 26                             | 14                             | 68·0         | 30     | 30·0 | 22    | 2       | ... |                          |  |
|        | Cawdor (Budgate) .....                                                                                                               | 2·08        | +                            | ·05                   | ·28   | 28                             | 18                             | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
| XVIII. | Invergarry .....                                                                                                                     | 2·73        | —                            | ·11                   | ·60   | 10                             | 10                             | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
|        | Bendamph .....                                                                                                                       | 4·00        | —                            | 1·05                  | ·90   | 9                              | 18                             | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
| XIX.   | Dunrobin Castle .....                                                                                                                | 1·14        | —                            | ·88                   | ·20   | 23                             | 15                             | 63·5         | 29     | 35·0 | 24    | 0       | ... |                          |  |
|        | Castletown .....                                                                                                                     | ...         | ...                          | ...                   | ...   | ...                            | ...                            | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
| XX.    | Killarney .....                                                                                                                      | 1·47        | —                            | 1·48                  | ·35   | 26                             | 13                             | 75·0         | 16     | 34·0 | 4     | 0       | ... |                          |  |
|        | Waterford (Brook Lodge) ...                                                                                                          | 1·59        | —                            | ·52                   | ·36   | 28                             | 10                             | 69·5         | 18     | 30·0 | 23    | 1       | ... |                          |  |
|        | Broadford (Hurdlestown) ...                                                                                                          | 1·32        | —                            | ·77                   | ·21   | 25                             | 14                             | 70·0         | 18     | 34·0 | 3     | 0       | ... |                          |  |
| XXI.   | Carlow (Browne's Hill) .....                                                                                                         | 1·65        | —                            | ·70                   | ·79   | 1                              | 10                             | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
|        | Dublin (Fitz William Square) ..                                                                                                      | 1·18        | —                            | ·76                   | ·71   | 1                              | 10                             | 70·9         | 28     | 36·9 | 4     | 0       | 2   |                          |  |
| XXII.  | Ballinasloe .....                                                                                                                    | 1·19        | —                            | 1·30                  | ·27   | 28                             | 14                             | 76·5         | 18     | 28·0 | 4     | 2       | ... |                          |  |
|        | Clifden (Kylemore House) ..                                                                                                          | ...         | ...                          | ...                   | ...   | ...                            | ...                            | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
| XXIII. | Seaforde .....                                                                                                                       | ·98         | —                            | 1·47                  | ·33   | 31                             | 8                              | 73·0         | 29     | 35·0 | 4     | 0       | 5   |                          |  |
|        | Londonderry (Creggan Res.) ..                                                                                                        | 1·99        | —                            | ·49                   | ·44   | 27                             | 16                             | ...          | ...    | ...  | ...   | ...     | ... |                          |  |
|        | Omagh (Edenfel) .....                                                                                                                | 2·09        | —                            | ·34                   | ·60   | 28                             | 13                             | 76·0         | 18     | 30·0 | 22    | 3       | 3   |                          |  |

+ Shows that the fall was above the average; — that it was below it.



## SUPPLEMENTARY RAINFALL, MAY, 1905.

| Div.  | STATION.                          | Rain.<br>inches | Div.   | STATION.                          | Rain.<br>inches |
|-------|-----------------------------------|-----------------|--------|-----------------------------------|-----------------|
| II.   | Dorking, Abinger Hall .....       | ·67             | XI.    | New Radnor, Ednol .....           | ·58             |
| „     | Ramsgate, West Cliff .....        | 1·15            | „      | Rhayader, Nantgwillt .....        | ·69             |
| „     | Hailsham .....                    | 1·63            | „      | Lake Vyrnwy .....                 | 1·19            |
| „     | Crowborough .....                 | 1·23            | „      | Ruthin, Plás Draw .....           | ·73             |
| „     | Osborne .....                     | ·37             | „      | Criccieth, Talarvor .....         | 1·12            |
| „     | Emsworth, Redlands .....          | ·39             | „      | Anglesey, Lligwy .....            | ·92             |
| „     | Alton, Ashdell .....              | ·86             | „      | Douglas, Woodville .....          | 1·89            |
| „     | Newbury, Welford Park .....       | ·66             | XII.   | Stoneykirk, Ardwell House .....   | ·84             |
| III.  | Harrow Weald .....                | 1·00            | „      | Dalry, Old Garroch .....          | 2·36            |
| „     | Oxford, Magdalen College .....    | ·88             | „      | Langholm, Drove Road .....        | 3·37            |
| „     | Banbury, Bloxham Grove .....      | ·41             | „      | Moniaive, Maxwellton House .....  | 2·23            |
| „     | Pitsford, Sedgebrook .....        | 1·63            | XIII.  | N. Esk Reservoir [Penicuik] ..... | 1·50            |
| „     | Huntingdon, Brampton .....        | 1·26            | XIV.   | Maybole, Knockdon Farm .....      | 1·44            |
| „     | Wisbech, Bank House .....         | 1·02            | „      | Glasgow, Queen's Park .....       | 1·55            |
| IV.   | Southend .....                    | ·80             | „      | Campbeltown, Redknowe .....       | 1·51            |
| „     | Colchester, Lexden .....          | 1·20            | XV.    | Inveraray, Newtown .....          | 3·70            |
| „     | Saffron Walden, Newport .....     | 1·09            | „      | Ballachulish House .....          | 4·25            |
| „     | Rendlesham Hall .....             | 1·41            | „      | Islay, Eallabus .....             | 3·02            |
| „     | Swaffham .....                    | 1·42            | XVI.   | Dollar .....                      | 2·57            |
| „     | Blakeney .....                    | 1·02            | „      | Loch Leven Sluices .....          | 1·88            |
| V.    | Bishops Cannings .....            | ·33             | „      | Balquhiddy, Stronvar .....        | 3·12            |
| „     | Ashburton, Druid House .....      | ·86             | „      | Coupar Angus Station .....        | 1·83            |
| „     | Okehampton, Oaklands .....        | ·43             | „      | Blair Atholl .....                | 1·55            |
| „     | Hartland Abbey .....              | ·12             | „      | Montrose, Sunnyside .....         | 1·37            |
| „     | Lymouth, Rock House .....         | ·15             | XVII.  | Alford, Lynturk Manse .....       | 1·69            |
| „     | Probus, Lamellyn .....            | ·71             | „      | Keith .....                       | 1·30            |
| „     | Wellington, The Avenue .....      | ·33             | XVIII. | N. Uist, Lochmaddy .....          | 1·25            |
| „     | North Cadbury Rectory .....       | ·32             | „      | Aviemore, Alvey Manse .....       | 2·01            |
| VI.   | Clifton, Pembroke Road .....      | ·11             | „      | Loch Ness, Drumnadrochit .....    | 1·99            |
| „     | Moreton-in-Marsh, Longboro' ..... | ·42             | „      | Glencarron Lodge .....            | 4·85            |
| „     | Ross, The Graig .....             | ·36             | „      | Fearn, Lower Pitkerrie .....      | 1·82            |
| „     | Shifnal, Hatton Grange .....      | ·48             | XIX.   | Invershin .....                   | 1·32            |
| „     | Wem Rectory .....                 | ·83             | „      | Altnaharra .....                  | 1·32            |
| „     | Cheadle, The Heath House .....    | ·51             | „      | Bettyhill .....                   | ·98             |
| „     | Coventry, Kingswood .....         | ·28             | „      | Watten .....                      | 1·13            |
| VII.  | Market Overton .....              | ·48             | XX.    | Cork, Wellesley Terrace .....     | ·90             |
| „     | Market Rasen .....                | ·92             | „      | Darrynane Abbey .....             | 1·46            |
| „     | Bawtry, Hesley Hall .....         | ·43             | „      | Glenam [Clonmel] .....            | 1·19            |
| VIII. | Neston, Hinderton .....           | ·72             | „      | Ballingarry, Gurteen .....        | ·84             |
| „     | Southport, Hesketh Park .....     | ·31             | „      | Miltown Malbay .....              | 1·29            |
| „     | Chatburn, Middlewood .....        | ·55             | XXI.   | Gorey, Courtown House .....       | 1·09            |
| „     | Cartmel, Flookburgh .....         | 1·47            | „      | Moynalty, Westland .....          | 1·11            |
| IX.   | Langsett Moor, Up. Midhope .....  | ·51             | „      | Athlone, Twyford .....            | 1·53            |
| „     | Scalby, Silverdale .....          | 1·42            | „      | Mullingar, Belvedere .....        | 1·19            |
| „     | Ingleby Greenhow .....            | 1·00            | XXII.  | Woodlawn .....                    | 1·38            |
| „     | Middleton, Mickleton .....        | ·28             | „      | Westport, Murrisk Abbey .....     | 1·15            |
| X.    | Beltingham .....                  | ·75             | „      | Crossmolina, Enniscoie .....      | 1·56            |
| „     | Font Reservoir, Fallowlees .....  | 1·25            | „      | Collooney, Markree Obsy .....     | 1·53            |
| „     | Ilderton, Lilburn Cottage .....   | ·64             | XXIII. | Enniskillen, Portora .....        | 1·72            |
| „     | Keswick, The Bank .....           | 2·14            | „      | Warrenpoint .....                 | ·99             |
| XI.   | Llanfrechfa Grange .....          | ·28             | „      | Banbridge, Milltown .....         | 1·31            |
| „     | Treherbert, Tyn-y-waun .....      | ·66             | „      | Belfast, Springfield .....        | 2·44            |
| „     | Carmarthen, Friary .....          | 1·06            | „      | Bushmills, Dundarave .....        | 1·79            |
| „     | Castle Malgwyn .....              | 1·32            | „      | Stewartstown .....                | 1·96            |
| „     | Plynlimon .....                   | 2·10            | „      | Killybegs .....                   | 1·22            |
| „     | Tallylyn .....                    | ·20             | „      | Horn Head .....                   | 1·08            |



## METEOROLOGICAL NOTES ON MAY, 1905.

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.

## ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—A particularly fine and pleasant month. R fell on the first three and last two days, leaving the remainder of the month practically rainless. TS of moderate severity on the afternoon of 30th. Duration of sunshine 222·2\* hours and of R 10·0 hours. Mean temp. 51°·1, or 1°·1 above the average.

ABINGER HALL.—A very dry month, with N.E. winds practically the whole time and much damage by frost, particularly on 25th. Rain was greatly needed and grass crops were very light.

TENTERDEN.—Wet at first, then three very dry weeks. Cold, with N. wind on 22 days. Damage by frost on 23rd, serious on low ground. Mean temp. 52°·5. Duration of sunshine 259·5† hours.

CROWBOROUGH.—Very cold nights with persistent N. and N.E. winds up to 23rd, then exceedingly warm. R 95 in. below the average of 34 years, raising the deficiency since January 1st to 1·84 in. The dry weather, cold nights and E. winds retarded all vegetation, and hay prospects were not good. Mean temp. 52°·5.

HARTLEY WINTNEY.—Stormy and rough on 1st, but afterwards exceedingly harsh and dry. TS on 31st. Ozone on 23 days; mean 3·0.

ADDINGTON MANOR.—Much damage was done by frost on 23rd, when the grass thermometer fell to 22°.

PITSFORD.—From 5th to 25th there was a continuance of cold N. wind. R was very much needed. R 42 in. below the average. Mean temp. 51°·6.

COLCHESTER.—Almost continuous N. to E. wind from 4th to 23rd, yielding cold, bright and very dry weather. Hot and close from 28th to 30th.

RENDLESHAM HALL.—Heavy R and gale on the first two days, then dry with N. to N.E. winds, ending on 22nd with S, H and R storms and frost. The last days were mild and showery.

BURY ST. EDMUNDS.—Very dry and cold, with northerly wind on 23 days. Between 3rd and 29th only 0·8 in. of R fell. Gardens and fruit were much injured by frost on 23rd.

BRUNDALL.—Mean temp. about the average, the warm days in the last week compensating for the extremely cold ones immediately preceding. The 29th was the warmest day in May since 1895.

TORQUAY.—Duration of sunshine 288·3\* hours. Mean temp. 53°·0, or 0°·1 below the average. Mean amount of ozone 5·6: max. 9·0 on 1st and 2nd; min. 4·0 on several days.

POLARIT TAMAR.—Exceptionally dry, with very low temp. at night.

LYNMOUTH.—Except the first two days and the last four, it was dry and very sunny, with cool winds keeping the temp. low. R 2·86 in. below the average of 9 years.

WELLINGTON.—Abnormally dry and fine, but the nights were generally cold. R only about one-fifth of the average.

NORTH CADBURY.—The driest month since the record commenced in September, 1896. Humidity and cloud much below the normal, and a pleasant sunny month, though bad for gardens and grass. Disastrous frost on 23rd.

CLIFTON.—Practically rainless and the driest May in 50 years, the nearest approach being in 1876, with 23 in. Cold from 21st to 23rd, with N.E. wind and frost. Last week warm.

ROSS.—The driest May since 1896. Generally very fine, but the severe frost of 22nd did considerable injury to fruit and vegetables. Temp. about the average, and R about one-sixth of average.



BOSTON.—Frost on 23rd did an immense amount of harm to early potatoes, vegetables and strawberries. Very high temp. from 28th to 30th.

WORKSOP.—The driest May for at least 30 years, practically nothing falling after the 3rd. Frost on 23rd did much damage, especially to ash plantations. Min. on grass 16°·5.

BOLTON.—Very dry, warm and sunny, and vegetation in exposed places suffering from want of R. Mean temp. 50°·8, or 1°·1 above the average. Duration of sunshine 162·1\* hours, or 6·3 hours above the average.

SOUTHPORT.—The driest May in 34 years. Mean temp. 0°·3 above the average. Duration of sunshine 6 hours above the average. R 1·81 in. below the average.

UPPER MIDHOPE.—R 1·77 in. below the average of 10 years and the lowest in any month in that period.

LILBURN.—Remarkably dry. Cold in the early part and hot in the latter.

LLANFRECHEA GRANGE.—Very dry and R much wanted. Frost on 21st and 22nd did much harm to fruit blossom. Very warm on the last three days.

HAVERFORDWEST.—Fine but cold. Considerable damage was done by frost and vegetation was backward. Duration of sunshine 254·5\* hours. One sunless day.

GOGERDDAN.—Very dry and cold, with keen E. and N.E. winds.

DOUGLAS.—Very fine with excessive sunshine, but strong, cold polar winds, the only genial period being from 14th to 18th. Absolute drought from 7th to 24th, with hot sun, parching wind and cold nights.

## SCOTLAND.

LANGHOLM.—R ·38 in. above the average of 28 years.

LILLIESLEAF.—Cold E. winds. Quite fine for the first three weeks, then R. Cold nights. Beautiful weather for garden and farm and no damage from frost.

COLMONELL.—R the least in May with three exceptions since observations commenced. Frost on 25th did little damage near the shore.

COUPAR ANGUS.—Dry with bright sun to 23rd, then after three days with night frosts mild weather with daily R and high night temp. R ·09 in. below the average.

DRUMNADROCHIT.—R ·07 in., and rainy days 3, below the average of 19 years. Bitterly cold N. and E. winds.

DUNROBIN CASTLE.—Cold easterly winds in the early part. After 22nd milder, with occasional genial R to the end.

## IRELAND.

CORK.—R only about one-third of the average. Mean temp. slightly above the average. Prevailing wind N.E. and N.W.

DARRYNANE ABBEY.—A dry month, the R being 59 per cent. of the average of 25 years. The first part was very dry and hot.

DUBLIN.—After opening with a downpour, the month proved to be one of drought. Polar winds largely predominated.

BELFAST.—A glorious month and the finest spell since May, 1901. Heavy falls in the latter days almost brought the R up to the average.

OMAGH.—All the R fell in the first and last weeks, the intermediate period being dry, mostly cloudless and warm, sometimes hot. Severe frost on 22nd, occasioning injury to all tender vegetation and fruit blossom, which the R of the last week did much to restore.

\* Campbell-Stokes.

† Jordan



## Climatological Table for the British Empire, December, 1904.

| 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. |          |      |               |           |                 |                   |             |       |        |
|                                                                  |           |       |          |       |          |      |               |           |                 |                   |             |       |        |
| °                                                                |           | °     |          | °     | °        | °    | 0-100         | °         | °               | inches.           |             |       |        |
| London, Camden Square                                            | 56·3      | 29    | 27·6     | 9     | 45·2     | 36·6 | 38·9          | 92        | 68·3            | 19·9              | 1·79        | 18    | 7·7    |
| Malta                                                            | 67·2      | 3     | 41·2     | 31    | 60·4     | 49·2 | 46·5          | 76        | 107·8           | 35·8              | 2·30        | 12    | 5·1    |
| Lagos                                                            | 91·5      | 30    | 70·0     | 25    | 87·4     | 74·1 | 74·1          | 76        | 138·0           | 65·0              | ·75         | 1     | 3·7    |
| Cape Town                                                        | 92·9      | 30    | 49·1     | 26    | 75·0     | 57·4 | 54·6          | 67        | ...             | ...               | 1·51        | 5     | 3·6    |
| Durban, Natal                                                    | 85·5      | 8, 18 | 56·0     | 14    | 78·9     | 63·9 | ...           | ...       | 149·0           | ...               | 6·44        | 19    | 6·0    |
| Johannesburg                                                     | 81·8      | 29    | 40·0     | 15    | 72·0     | 52·6 | 49·9          | 68        | 145·5           | 39·5              | 3·27        | 5     | 4·6    |
| Mauritius                                                        | 88·2      | 26    | 65·4     | 6     | 85·5     | 70·8 | 67·2          | 71        | 153·2           | 57·7              | 4·66        | 16    | 6·3    |
| Calcutta                                                         | 81·4      | 11    | 50·9     | 27c   | 78·0     | 57·8 | 57·6          | 71        | 136·9           | 44·9              | ·00         | 0     | 2·0    |
| Bombay                                                           | 87·7      | 23    | 65·9     | 30    | 84·6     | 69·9 | 64·6          | 67        | 137·9           | 56·5              | ·00         | 0     | 2·0    |
| Madras                                                           | 87·7      | 1     | 62·7     | 27    | 83·7     | 69·6 | 65·4          | 72        | 141·2           | 59·7              | ·85         | 9     | 5·5    |
| Kodaikanal                                                       | 71·4      | 1     | 43·1     | 15    | 61·2     | 47·4 | 49·6          | 74        | 124·6           | 30·7              | 2·90        | 9     | 4·2    |
| Colombo, Ceylon                                                  | 90·2      | 8     | 70·0     | 24    | 86·1     | 72·8 | 73·6          | 78        | 153·2           | 66·0              | 2·12        | 9     | 5·0    |
| Hongkong                                                         | 75·7      | 8     | 44·8     | 24    | 66·1     | 55·7 | 48·1          | 62        | 125·5           | ...               | ·23         | 4     | 4·5    |
| Melbourne                                                        | 102·0     | 24    | 44·7     | 22    | 78·1     | 53·4 | 48·7          | 55        | 160·2           | 33·2              | ·11         | 3     | 4·7    |
| Adelaide                                                         | 114·0     | 31    | 47·1     | 19    | 85·6     | 59·0 | 49·7          | 46        | 161·0           | 42·4              | ·00         | 0     | 3·4    |
| Coolgardie                                                       | 108·6     | 27    | 53·2     | 24    | 93·0     | 62·2 | 51·8          | 42        | 174·6           | 49·4              | ·81         | 5     | 3·2    |
| Sydney                                                           | 107·5     | 31    | 57·5     | 2     | 79·9     | 64·5 | 59·8          | 63        | 138·1           | 47·0              | ·88         | 9     | 5·5    |
| Wellington                                                       | 69·8      | 2     | 43·0     | 16    | 61·5     | 50·2 | 47·4          | 72        | 128·0           | 38·0              | 5·38        | 17    | 7·3    |
| Auckland                                                         | 73·0      | 20a   | 48·0     | 14d   | 64·8     | 52·9 | 50·4          | 74        | 141·0           | 41·0              | 3·56        | 12    | 5·0    |
| Jamaica, Negril Point.                                           | 87·6      | 2     | 65·9     | 31    | 85·1     | 70·3 | 70·6          | 79        | ...             | ...               | 4·64        | 4     | ...    |
| Grenada                                                          | 83·8      | 9b    | 71·0     | 11    | 82·2     | 73·2 | 69·8          | 71        | 150·0           | ...               | 7·59        | 21    | 3·6    |
| Toronto                                                          | 48·5      | 23    | 1·3      | 14    | 29·4     | 15·1 | 18·8          | 80        | 65·8            | -5·2              | 1·45        | 13    | 8·0    |
| Fredericton                                                      | 38·9      | 20    | -20·8    | 25    | 20·6     | 0·2  | -2·0          | 56        | ...             | ...               | 1·80        | ...   | 4·6    |
| Winnipeg                                                         | 40·2      | 30    | -29·6    | 24    | 16·5     | -4·2 | ...           | ...       | ...             | ...               | 1·65        | ...   | 6·8    |
| Victoria, B.C.                                                   | 55·6      | 29    | 28·2     | 25    | 47·2     | 40·5 | 40·0          | 86        | ...             | ...               | 4·71        | 24    | 8·5    |
| Dawson                                                           | 21·5      | 3     | -36·4    | 26    | 5·1      | -4·5 | ...           | ...       | ...             | ...               | 1·45        | 5     | 5·1    |

a—and 21. b—and 10, 31. c—and 28. d—and 15.

MALTA.—Mean temp. of air 54°·4, or 1°·8 below average, mean hourly velocity of wind 10·4 miles, or 0·7 below average. Mean temp. of sea 59°·4. TSS on 5th.

MAURITIUS.—Mean temp. of air 0°·5, dew point 0°·4, and R ·73 in., below averages. Mean hourly velocity of wind 8·9 miles, or 1·9 below averages; mean computed direction of wind E. by N.

MADRAS.—Bright sunshine 173·2 hours.

KODAIKANAL.—Bright sunshine 173 hours.

HONGKONG.—Mean temp. of air 60°·7. Bright sunshine 201·7 hours. Mean hourly velocity of wind 10·6 miles; mean direction E. 20° N.

ADELAIDE.—Mean temp. 0·9 above average. No rain; the driest December on record.

SYDNEY.—Mean temp. of air 2°·2 above, R 1·62 in. below, and humidity 6·0 below, averages.

WELLINGTON.—Mean temp. of air 4°·1 below, R 2·12 in. above, averages.

AUCKLAND.—Mean temp. of air 6°·0 below the average of the previous 36 years, and R 1·00 in. above average.



# Symons's Meteorological Magazine.

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## THE NEW CONSTITUTION OF THE METEOROLOGICAL OFFICE.

WE are now able to give on official authority the new arrangements made by the Government for carrying on the meteorological service of the United Kingdom. The information was contained in a Treasury Minute dated May 20th, 1905, which, after a question on the subject was asked in the House of Commons by Sir J. Batty Tuke, M.P. for the Universities of Edinburgh and St. Andrews, was issued on June 21st as a Parliamentary Paper under the reference number [Cd. 2559.]

The Minute runs as follows :—

My lords resume consideration of the report of the committee presided over by Sir Herbert Maxwell on the administration of the Meteorological Office.

Since the issue of the report my lords have been in communication with the Royal Society, the Board of Admiralty, the Board of Trade, and the Board of Agriculture and Fisheries, and they are now in a position to place on record the conclusions at which they have arrived.

1. The Meteorological Office will, as from the 1st April, 1905, be placed under the management of a committee constituted as follows :—

The director of the Meteorological Office.

Two members nominated by the Royal Society.

The hydrographer of the Navy.

One member nominated by the Board of Trade.

One member nominated by the Board of Agriculture and Fisheries.

One member nominated by the Treasury.

The members of the committee will be appointed by the Treasury and, subject to the discretion of the authorities by which they are respectively nominated, will hold office for a period not exceeding five years, but will be eligible for re-appointment.

2. The director will be appointed by the Treasury, and will receive out of the grant-in-aid a salary of £800, rising after five years to £1,000 per annum, without a title to pension. He will hold office for a period of five years, but, like the other members of the committee, will be eligible for reappoint-



ment until he attains the age of 65. The present director will receive the *maximum* of the scale, namely, £1,000 per annum, from the 1st April, 1905.

3. Subject to the general control of the committee and to such regulations as may be laid down by the Treasury, the director will be responsible for the administration of the office.

4. The director will act as chairman of the committee, and will summon it at such times as he considers it desirable; but four meetings at least shall be held during the year.

5. The members of the committee will not receive remuneration for their services, but travelling and subsistence expenses will be allowed in the case of members not residing in the metropolis.

6. My lords will ask Parliament annually to vote a grant-in-aid of the expenses of the office. For the present this grant is fixed at £15,300.

7. The grant will be administered by the committee, who may, with the consent of the Treasury, delegate to the director such powers of expenditure as they consider proper. All cheques will be signed by the director and countersigned by a member of the committee.

8. The committee will make an annual report for presentation to Parliament, and will at the same time transmit to the Treasury a statement of their accounts in such form as may be prescribed. In December of each year the committee will submit a statement showing the manner in which it is proposed to apply the grant for the ensuing financial year.

9. The staff will be appointed and their salaries fixed by the committee on the recommendation of the director.

10. In the absence of the director the committee may appoint one of its members to act as interim director.

11. My lords are pleased to appoint the following gentlemen to be members of the committee:—

Mr. W. N. Shaw, Sc.D., F.R.S., Director.

Capt. Arthur M. Field, R.N., Hydrographer to the Navy.

Capt. A. J. G. Chalmers, Professional Officer of the Marine Department, Board of Trade.

Mr. W. Somerville, Sc.D., Assistant Secretary of the Board of Agriculture and Fisheries.

Professor G. H. Darwin, F.R.S., University of Cambridge.

Professor Arthur Schuster, F.R.S., University of Manchester.

Mr. G. L. Barstow, nominated by the Treasury.

The result is to abolish the exclusive control exercised by the Royal Society through the Meteorological Council, to do away with the anomalous and undignified constitution of the Council as a limited company with dummy shareholders, and greatly to simplify the working of the Meteorological Office. So far the recommendations of Sir Herbert Maxwell's Committee\* have been carried out; but they have not been carried out fully. The Meteorological Office is not placed under the Board of Agriculture and Fisheries as was recommended, and the staff of the Office are denied the status and privileges of civil servants, though accorded the civil service liability to compulsory retirement at an age-limit (without the pension that

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\* See this Magazine, vol. 39, p. 101.



reconciles the privileged official to conclude his active service). The Office is now under the control, though we gather that this control is advisory and not executive, of a composite Committee representing one learned society and four different government departments. So far as the composition of the new Committee is concerned it is simply the old Meteorological Council with the place of the unofficial meteorologists, who were formerly upon it, taken by government officials, and with the former Secretary as Chairman. We consider that it is a blot on the re-organization that the Royal Meteorological Society is not recognized so far as to be invited to nominate one member of the Committee. Apart from this we have no criticisms to offer. The gentlemen who form the Committee are of the highest standing and of tried administrative ability. The Director, the Hydrographer, and Professors Darwin and Schuster can be trusted to preserve all that was best in the old Council of which they were members. Professor Schuster said in evidence to the Treasury Committee that he became a member of the Meteorological Council reluctantly "and should not in future remain one if the constitution of the office were not reorganised," indicating that the Committee should be advisory and the Director of the Office given more freedom. As he is a member of the new body we take it that these reforms have been made. The Marine Department of the Board of Trade is rightly represented since so very large a share of the meteorological observations at sea are made by captains of the mercantile marine. The Board of Agriculture and Fisheries contains no official better fitted for a place on the Committee than Dr. Somerville, whose distinguished career as Lecturer on Forestry and Professor of Agriculture successively in the Universities of Edinburgh, Durham and Cambridge, has given him exceptional opportunities for appreciating the bearings of meteorology on agriculture. Mr. Barstow acquired a thorough knowledge of the working of the old Council and of the views of those who wished for reform when he acted as Secretary of Sir Herbert Maxwell's Committee.

The most satisfactory feature in the Committee is the Director, who as chairman, and no longer as secretary, will be more favourably placed for applying his experience and knowledge to the improvement of the weather service in all its branches, including, we have reason to hope, a great development of meteorological research.

Although the opportunity has not been fully utilized and further changes will be necessary in the future, we gladly recognize that the action of the Government has started a movement in the right direction.

Though looking forward to the achievements of the new body we must not forget a backward glance at the old Meteorological Council, the members of which, and especially the Chairman, General Sir Richard Strachey, did good service in their generation, and we miss any expression of thanks to them in the Treasury Minute which we have re-printed.



## Correspondence.

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

## A LOW FREEZING POINT.

I HAVE occasionally exposed vessels of clear rain water upon the grass during cold winter nights when the atmospheric conditions were quiet enough. The lowest temperature I have ever observed in these without freezing is as nearly as possible  $27^{\circ}$ . There is some uncertainty in the exact temperature because a very small movement of the thermometer causes the water to change at once into ice at or near  $32^{\circ}$ . I have also exposed water in bottles which has remained liquid at temperatures below  $30^{\circ}$ , but which has changed to ice during the act of pouring it out. From these, and previous experiments described by others, I had a notion that under ordinary atmospheric conditions a water temperature below  $26^{\circ}$  was probably not to be expected. On Friday night, June 9th, at 11.45 p.m., however, the sky being clear and the air quite still, a radiation thermometer lying on the grass and reading  $23^{\circ}5$  was covered with what was undoubtedly dew. A quarter of an hour later the reading had fallen to  $22^{\circ}8$ , and the dew had changed to thick hoar frost. The thermometer was quite accurate and in good order. Do you know of any observations similar to this?

J. R. SUTTON.

*Kenilworth, Kimberley, June 12th, 1905.*

[In this Magazine for February, 1897 (Vol. 32, p. 1), a description is given of experiments made in order to account for the water in a wet-bulb glass remaining unfrozen at  $28^{\circ}$  even when stirred; and having probably been cooled to  $25^{\circ}$ , or nearly so, without freezing. The laboratory experiments showed that ordinary distilled water could be cooled to  $12^{\circ}3$  F. without freezing, "then the whole froze with a sort of flash, and temp. rose to  $31^{\circ}8$ ." The cooling of water far below the freezing point without solidifying is referred to in most books on chemical physics,  $10^{\circ}$  F. being the extreme we have noted.—ED. S.M.M.]

## PARTIAL DROUGHT.

A PARTIAL drought lasted here from May 3rd to June 17th inclusive, the amount registered being .34 in. in 46 days, measurable quantities falling on 12 days. On the 40 days May 8th to June 16th inclusive .16 in. only fell; and on the 14 days from June 2nd to 15th inclusive there was no measurable rain. The record for May 2nd was .29 in., and for June 18th, .57 in. On this latter date there were two thunderstorms (without lightning), which is the first record of either thunder or lightning at this station since August 30th, 1904. Total fall September, 1904, to May, 1905, inclusive, 11.02 ins. being 7.84 in. less than the average. T. W. BACKHOUSE.

*West Hendon House, Sunderland, June 19th, 1905.*



ON the 1st inst. I reported to you a partial drought of 28 days—very rare in these parts.

Since then it has become a partial drought of 44 days reaching from 3 p.m. on the 3rd May to 8.30 a.m. on 17th June—or 44 days—17½ hours.

Our rainfall in that period has been :—

|                                | in.  |
|--------------------------------|------|
| May 7 .....                    | ·011 |
| „ 10 .....                     | ·018 |
| „ 23 .....                     | ·010 |
| „ 25 .....                     | ·011 |
| „ 31 (falling on June 1) ..... | ·120 |
| June 1 .....                   | ·153 |
| „ 2 .....                      | ·036 |
| „ 6 .....                      | ·006 |
| „ 7 .....                      | ·007 |
| „ 10 .....                     | ·004 |
| „ 12 .....                     | ·063 |

Total ... ·439

We are thankful to-day at last to welcome rain though it may spoil the hay harvest.

EDWARD PEARSON.

*Parkside, Wilmslow, June 17th, 1905.*

### HEAVY RAIN IN JUNE AT HASLEMERE.

THE rain during June, 1905, has been unusually heavy, and may be worth a record in the *Meteorological Magazine*. On the 5th rain began to fall at 7 a.m., and when the observations were taken at 8 a.m., there was ·07 in. in the gauge; the rain continued all day and night; at 8 a.m. on the 6th 1·75 in. was recorded; rain and drizzle continued during the 6th, but it was at no time heavy. It was a wet week, as the following will show :—

|                | in.                |                          |
|----------------|--------------------|--------------------------|
| June 4th ..... | ·07                | } practically continuous |
| „ 5th .....    | 1·75               |                          |
| „ 6th .....    | ·43                |                          |
| „ 7th .....    | ·24                |                          |
| „ 8th .....    | ·03                |                          |
| „ 9th .....    | ·20                |                          |
| „ 10th .....   | ·51                |                          |
| „ 11th .....   | ·14                |                          |
| „ 12th .....   | 1·57 (Whit Monday) |                          |

Total of nine days... 4·94 in.

Whit Monday morning was misty and rainy, clearing to bright, hot sunshine about 2 o'clock; numbers of people were tempted out in summer clothes to local festivities. About 4 p.m. heavy rain began, accompanied, half an hour later, by thunder and lightning. At 5.30 p.m. there was 1·30 in. in the gauge. Mr. Penfold writes of



this storm, at Courts Hill, one mile S.E. from Hazellhurst, "The heavy rain was from 4.0 to 5.5 p.m.; 1.50 in. must have fallen in that time along this side of the valley." His record for the 24 hours is 2.48 in. The Hazellhurst fall was 1.57 in.; a difference of nearly an inch within a distance of one mile. The road was flooded in one place 4 feet deep, and much injury has been done to roads in the district where the rain was heaviest. Mr. Penfold reports 5.80 in. for the nine days.

On turning back for wet periods of eight days, I find that 4.94 in. in nine days has only once been exceeded at Hazellhurst, viz., in 1899, when from November 2nd to 9th (eight days) 6.63 in. fell.

The average rainfall of June (1891-1900) is 2.26 in.: the total of June, 1905, was 6.47 in., exceeding the average by 4.21 in.

Falls of 2 inches or above have occurred as under:—

|                            | in.                |
|----------------------------|--------------------|
| July 29th, 1894 .....      | 2.00 (Hazellhurst) |
| September 1st, 1896 .....  | 2.06 ( " )         |
| September 29th, 1898 ..... | 2.17 ( " )         |
| November 23rd, 1898 .....  | 2.35 ( " )         |
| November 3rd, 1899 .....   | 2.11 ( " )         |
| June 12th, 1905 .....      | 2.48 (Courts Hill) |

T. P. NEWMAN.

*Hazellhurst, Haslemere, Surrey.*

### RAINFALL OF JULY 9th.

I THINK the rainfall on Sunday, July 9th, during a severe thunderstorm, may interest you. The fall for the 24 hours amounted to 1.67 in., and I add particulars:—

Storm began 3.8 p.m.

|                                  |          |
|----------------------------------|----------|
| 3.8 to 4.8 .....                 | 1.14 in. |
| 4.8 to 5.28 .....                | .10 "    |
| 5.30 to 6.30 .....               | .39 "    |
| 6.30 to 7.20 (rain ceased) ..... | .03 "    |
| During night .....               | .01 "    |
| Total                            | 1.67 "   |

G. C. LAWSON.

*Mayfield House, nr. Ashbourne, Derbyshire, July 10th 1905.*

RAINFALL at Hill House, Harrow Weald, was yesterday 2.21 in., which fell between 11.50 a.m. and 4.30 p.m., 1.18 in. fell between 11.50 and 1.30 p.m., and 1.03 in. between 3.30 and 4.30. It was the heaviest fall during the last 15 years.

ALEX. CROSSMAN.

*10th July, 1905.*



THE rain to-day commenced at 1 p.m. here, and in 50 minutes we had a fall of 2.44 in. It resumed at 3.30 p.m. and added .11 in.; total 2.55 in. We seem to have been near the centre as two neighbours, 500 yards away in different directions, had under 2 inches.

JOHN McEWAN.

*Carisbrooke, Enfield, 9th July, 1905.*

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A FEW particulars of the exceptional storm in this district yesterday (Sunday) may be of interest. :—

The morning was a very sultry one, the shade temp. reading being as high as 82° by 11 a.m. At this time large massive cumuli were rapidly forming, and about 11.20 a.m., thunder was first heard in the S.W., and from this time until 6 p.m. thunder and lightning were more or less incessant at greater or less distances. At 12.40 p.m. the first rain fell, the sky being almost completely overcast, the exception being to the N.E., where the sky was clear, the surface wind at the time being easterly, strong and gusty in force. Rain continued in moderate showers until 1 p.m., the measurement then being .11 in. At 1 p.m. the wind suddenly calmed, the sky being very black at the time and the storm burst right overhead, the first flash of lightning being of exceptional intensity, the thunder, following immediately, being very loud and "crackly." From this time (1 p.m.) until 1.30 p.m. the storm was practically overhead, rain falling to the amount of .64 in. At 1.30 p.m., for a brief moment the wind shifted to S.W. and lulled to a calm. This, however, was but very temporary, as the storm immediately afterwards burst with terrific fury, the wind shifting to the S.E. and blowing with hurricane force, while rain and hail fell with almost indescribable fury, the latter coming down in an apparently solid sheet, the stones being large, but not exceptionally so. At 1.49 p.m. the storm suddenly ceased, the wind calmed and the clouds passed away to the N.E. On examining the gauge it was found that between 1.30 and 1.49 p.m., or a period of 19 minutes, 1.05 in. had been collected therein, but so violent was the hail, and so terrific the force of the rain and wind that it is highly probable that the gauge did not collect anything like the amount that actually fell in this time, not because of the gauge *overflowing*, but by reason of the hail and rain (the drops were abnormally large) striking the gauge with such force as to bounce out again, this of course applying especially to the hail, which even when it falls in slight showers is very difficult to measure. As a check to the measurement of the rain gauge, a tank, which before the storm was quite empty, was measured and found to contain 32 ins. of rainfall when measured in usual glass for 5 in. rain gauge. This tank is elliptical in shape, has an outside circumference of 70 ins, and stands on wheels, slightly raised from the ground, while the distance from the *top* of the tank to the ground is 32 ins., the tank itself being 22½ ins. deep and perfectly level.



Perhaps, from the foregoing details you will be able to make out what the actual rainfall was, as registered by the tank. I would ask you to note carefully that the 32 ins. of rain collected by the tank fell between 12.40 p.m. and 6 p.m., while the amount collected by the ordinary gauge during that time was 1.96 in., made up as follow:—

| Time.                | Inches. |
|----------------------|---------|
| 12.40 to 1 p.m. .... | .11     |
| 1 „ 1.30 p.m. ....   | .64     |
| 1.30 „ 1.49 „ ....   | 1.05    |
|                      | <hr/>   |
|                      | 1.80    |
| 3.40 „ 4 „ ....      | .03     |
| 4.57 „ 5.10 „ ....   | .12     |
| 5.30 „ 6.10 „ ....   | .01     |
|                      | <hr/>   |
| Total...             | 1.96    |

As before stated, at 1.49 p.m. the storm passed away to the N.E., but for the rest of the day until 6 p.m., thunder and lightning were never very far from us, and as will be seen from the table above, several showers fell during the afternoon.

During the storm temp. fell from 82° to 56° but afterwards rose considerably. There was much flooding in this district; the cellars of this house were flooded. Great damage was also done by the hail.

HAROLD E. FREIR.

*Bylock Hall, Ponders End, July 10th, 1905.*

AT Camden Square the lightning was extremely vivid, and the thunder remarkably loud and continuous, but the rainfall was comparatively small. The total for the day was .31 in. with a total duration of 1 hour, the fall occurring in three well defined showers, the first at 0.50 p.m., being short and sharp, the second from 1.10 to 1.20 p.m. giving a greater fall with rather less intensity, and the third at 5.15 p.m. being comparatively slight.

The rain varied greatly, and little or none was recorded in the western suburbs. The storm raged with great fury on Hampstead Heath and in the suburbs, where a considerable amount of damage was done by lightning and two lives were lost. Thunderstorms appear to have occurred on this day in all parts of Great Britain.—  
H. R. M.

### A SMALL WHIRLWIND.

A SOMEWHAT unusual phenomenon occurred here yesterday at 11.45 a.m. I was seated on a piece of sloping ground, 250 yards west of Newton Racecourse, when there was a sudden noise as of an explosion, and on looking to the direction of the Grand Stand (east)



I heard all the doors banging, and windows rattling, and people coming helter skelter towards me. The wind had suddenly gathered in a sort of huge whirlwind all the dust, paper, and light materials, and was whirling it round and round at a terrific rate within a 50 yards circle. I was not more than ten yards from the edge of the wind's operations, and some pieces of paper were carried a quarter of a mile, at an altitude of fully 100 feet. The air was soft and the breeze quiet before the incident occurred. Immediately afterwards, there came over a shivering coldness in the atmosphere, but during the next hour the original conditions were gradually restored. I enquired of men whom I saw coming from the direction the disturbance pursued, and they all testified that they had not before seen anything like it.

T. E. CLOUGH.

*Town Hall, Earlestown, June 5th, 1905.*

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### ROYAL METEOROLOGICAL SOCIETY.

THE final Meeting of the session was held on Wednesday afternoon, June 21st, at the Society's rooms, 70, Victoria Street, Westminster, Mr. Richard Bentley, President, in the chair.

Mr. George C. Simpson read a paper on the "Normal Electrical Phenomena of the Atmosphere." In no branch of physics has the discovery of ions, electrons, and radio-activity produced a greater revolution than in that devoted to atmospheric electricity. Mr. Simpson in this paper stated with striking clearness the chief lines along which investigations have been made during the last few years and the conclusions arrived at, and also pointed out some of the problems awaiting solution. The amount of radio-active emanation in the lower regions of the atmosphere is increased by all those meteorological conditions which tend to keep the air stagnant over the Earth's surface. The meteorological conditions which either cause or often accompany stagnant air are calm, low temperature and high relative humidity ; while, on the contrary, high winds, high temperature and low humidity generally accompany the mixing of large masses of air. This all agrees with the observed facts that the atmospheric radio-activity increases with falling temperature, rising humidity, and increasing wind strength. Mr. Simpson is of the opinion that a solution of the problems of atmospheric electricity can only be expected from the results of extended measurements in the atmosphere itself, and from laboratory experiments directed towards the problems.

The President, Dr. W. N. Shaw, Mr. W. B. Tripp, Captain A. Carpenter, Mr. R. Strachan, and Mr. C. Beadle, took part in the discussion, and Mr. Simpson was heartily thanked for his paper.

A paper by Mr. S. P. Fergusson on "Two New Meteorological Instruments," was, in the absence of the author, read by the Secretary. The instruments described were : An Automatic Polar Star Light



Recorder, for measuring the amount of cloudiness at night by the obscuration of the pole-star; and an Ombroscope for determining with great exactness the time of commencement and the duration of rain. Both of these instruments are in use at the Blue Hill Observatory, Mass., U.S.A.

Dr. S. M. W. Bodie, Mr. L. A. Crosse, Mr. R. M. Kerr, Captain H. G. Lyons and Mr. F. Sadler were elected Fellows of the Society.

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## METEOROLOGY AND AGRICULTURE.

IN the May number of this Magazine reference was made to a scheme which the Council of the Royal Meteorological Society had under consideration for the extension of the knowledge of Meteorology amongst Local Scientific and other Societies. A practical demonstration of the utility of such a scheme was given at the Royal Agricultural Society's Show, at Park Royal, from June 27th to 30th.

An Agricultural Education and Forestry Exhibition has been held in connection with the last few annual Shows. This year it was decided to include a section of Meteorology, and the Royal Meteorological Society was invited to undertake the arrangements for this new departure.

A typical climatological station was set out in the grounds adjoining the Exhibition, an enclosure twenty feet square being railed off and the following instruments placed in position: viz.—1. Stevenson Thermometer Screen, fitted with dry bulb, wet bulb, maximum and minimum thermometers; 2. Snowdon Rain gauge; 3. Black and bright bulb solar radiation thermometers; 4. Grass minimum thermometer; 5. Campbell-Stokes' Sunshine recorder; and 6. Earth thermometers (1 and 4 feet). The visitors were greatly interested in watching the sunshine recorder at work, and in learning that the temperature of the soil at a depth of 4 feet was  $10^{\circ}$  lower than at 1 foot.

In the Exhibition there was arranged an interesting collection of diagrams, maps, charts and photographs lent by the Royal Meteorological Society, Dr. W. N. Shaw, Dr. H. R. Mill, and Mr. W. Marriott. A number of self-recording and other instruments used for meteorological purposes were lent by Messrs. Negretti and Zambra, Mr. J. J. Hicks, and Mr. F. L. Halliwell. A specially drawn Weather Map, together with the Forecasts, was posted up about noon each day.

Mr. W. Marriott gave an address each afternoon on "Meteorology in relation to Agriculture."

On Tuesday the Prince of Wales spent some time in looking over the exhibits, and on Wednesday the King and the Princess Victoria visited the Show and were much interested in the meteorological part of it.



## SIX MONTHS' RAINFALL OF 1905.

*Aggregate Rainfall for January—June, 1905.*

| Stations.             | Total Rain. | Per cent. of Aver. | Stations.             | Total Rain. | Per cent. of Aver. | Stations.         | Total Rain. | Per cent. of Aver. |
|-----------------------|-------------|--------------------|-----------------------|-------------|--------------------|-------------------|-------------|--------------------|
|                       | in.         |                    |                       | in.         |                    |                   | in.         |                    |
| London .....          | 12·45       | 117                | Bolton .....          | 16·88       | 101                | Braemar .....     | 14·51       | 97                 |
| Tenterden .....       | 14·36       | 124                | Wetherby .....        | 8·87        | 76                 | Aberdeen .....    | 11·74       | 86                 |
| Hartley Wintney ..... | 12·42       | 107                | Arncliffe .....       | 23·45       | 89                 | Cawdor .....      | 14·30       | 120                |
| Hitchin .....         | 12·07       | 118                | Hull .....            | 9·06        | 81                 | Invergarry .....  | 29·72       | 120                |
| Winslow .....         | 10·23       | 91                 | Newcastle .....       | 7·28        | 64                 | Bendampf .....    | 39·37       | 109                |
| Westley .....         | 12·14       | 118                | Seathwaite .....      | 56·94       | 99                 | Dunrobin .....    | 15·25       | 113                |
| Brundall .....        | 10·78       | 107                | Cardiff, Ely .....    | 15·77       | 92                 | Killarney .....   | 23·15       | 89                 |
| Alderbury .....       | 15·03       | 121                | Haverfordwest .....   | 18·54       | 94                 | Waterford .....   | 16·93       | 98                 |
| Winterbourne .....    | 13·53       | 83                 | Gogerddan .....       | 19·40       | 110                | Broadford .....   | 15·32       | 108                |
| Torquay .....         | 13·57       | 90                 | Llandudno .....       | 11·37       | 93                 | Carlow .....      | 13·41       | 89                 |
| Polapit Tamar .....   | 15·28       | 99                 | Cargen .....          | 18·03       | 92                 | Dublin .....      | 10·21       | 86                 |
| Bath .....            | 11·13       | 85                 | Lilliesleaf .....     | ...         | ..                 | Mullingar .....   | 14·39       | 93                 |
| Stroud, Upfield ..... | 13·43       | 105                | Colmonell .....       | 16·37       | 87                 | Ballinasloe ..... | 13·16       | 83                 |
| Woolstaston .....     | 13·34       | 93                 | Glasgow .....         | 11·73       | 79                 | Clifden .....     | 30·31       | 88                 |
| Bromsgrove .....      | 9·28        | 88                 | Inveraray .....       | 31·54       | 119                | Crossmolina ..... | 21·00       | 97                 |
| Boston .....          | 10·13       | 104                | Islay, Eallabus ..... | 21·69       | 111                | Seaforde .....    | 14·14       | 84                 |
| Hodsock Priory .....  | 7·80        | 72                 | Mull .....            | 25·03       | 105                | Londonderry ..... | 16·80       | 98                 |
| Derby .....           | 8·13        | 71                 | Dundee .....          | 8·75        | 72                 | Omagh .....       | 17·17       | 108                |

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REVIEW.

Twenty Years on Ben Nevis. By WM. T. KILGOUR. Paisley : Alexander Gardner. Size 7 × 5. Pp. 154. Price 1s. 6d. net.

A PLEASANTLY written popular account of life and work at the high level Observatory. The illustrations are numerous and well chosen. We quote with some sympathy the author's closing words of preface :—

“Doubly repaid would the Author deem himself if, as a result of the publication of this small work, an indulgent public would agitate for the re-opening of Ben Nevis Observatory, the abandonment of which in this enlightened age when other countries are devoting so much of their wealth towards the propagation of meteorological research, is, to Britons, alike discreditable and unpatriotic.”

We do not, however, consider that public agitation will do any good. The public ceased to care enough about the subject to find the money for continuing the work, otherwise it would never have stopped.

RAINFALL AND TEMPERATURE, JUNE, 1905.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.]	RAINFALL.				Days on which 101 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Diff. from average, 1870-99.	Greatest in 24 hours.			Max.		Min.			
				Depth.	Date.		Deg.	Date.	Deg.	Date.		
inches.	inches.	in.								Shade	Grass	
I.	London (Camden Square) ...	4.39	+ 2.30	.87	5	17	81.9	22	46.2	7	0	0
II.	Tenterden.....	5.26	+ 3.30	1.47	29	17	75.0	22a	48.0	7	0	0
	Hartley Wintney	4.69	+ 2.80	.96	5	15	79.0	22, 25	45.0	7	0	0
III.	Hitchin	3.29	+ 1.40	.94	6	12	...	...	...	...	...	...
	Winslow (Addington)	3.18	+ 1.19	.81	6	14	81.0	27	45.0	7, 9c	0	0
IV.	Bury St. Edmunds (Westley) ...	4.24	+ 2.20	1.20	17	14	78.0	27	45.0	15	0	0
	Brundall	3.13	+ 1.24	1.00	5	16	77.3	16	42.6	1	0	0
V.	Alderbury	4.23	+ 2.14	1.23	6	14	86.0	22	35.0	14	0	0
	Winterbourne Steepleton ...	1.93	— .39	.79	5	14	76.5	25	42.0	14	0	0
	Torquay (Cary Green)	2.77	+ .64	.61	16	17	75.9	25	46.9	9	0	0
	Polapit Tamar [Launceston] ...	1.72	— .40	.34	29	20	75.0	22b	36.0	14	0	0
	Bath	3.48	+ 1.17	.72	12	16	78.0	22	44.0	9	0	0
VI.	Stroud (Upfield)	4.15	+ 1.92	1.08	30	19	78.0	25	45.0	8	0	0
	Church Stretton (Woolstaston) ...	3.18	+ .72	.90	30	16	77.0	23	36.0	9	0	0
	Bromsgrove (Stoke Reformatory) ...	2.35	+ .28	1.04	30	11	79.0	22	40.0	4, 9	0	0
VII.	Boston	2.66	+ .72	1.57	17	15	80.0	27	45.0	10	0	0
	Workshop (Hodsock Priory) ...	2.41	+ .17	1.13	17	11	77.4	25	35.6	5	0	5
	Derby (Midland Railway) ...	2.39	— .31	.76	17	14	84.0	25	43.0	4, 9	0	0
VIII.	Bolton (The Park)	2.93	— .28	1.18	17	12	78.5	25	42.6	9	0	1
IX.	Wetherby (Ribston Hall) ...	1.05	— 1.33	.50	17	6	...	...	...	...	...	...
	Arnccliffe Vicarage	2.42	— 1.27	.90	17	7	...	...	...	...	...	...
	Hull (Pearson Park)	2.28	+ .16	.94	30	10	78.0	22	41.0	10	0	0
X.	Newcastle (Town Moor) ...	1.19	— .84	.72	18	8	...	...	...	...	...	...
	Borrowdale (Seathwaite) ...	5.94	— 1.03	3.10	20	8	80.8	23	38.5	9, 11	0	0
XI.	Cardiff (Ely)	4.12	+ 1.59	.75	29, 30	19	...	...	...	...	...	...
	Haverfordwest (High St.) ...	2.28	— .33	.59	19	12	79.8	25	41.1	14	0	3
	Aberystwyth (Gogerddan) ...	2.35	— .58	.65	20	12	85.0	23	35.0	3	0	0
	Llandudno	1.94	— .06	.77	17	11	77.0	23	44.0	11	0	0
XII.	Cargen [Dumfries]	2.00	— .68	.92	20	5	82.6	23	38.0	9	0	0
	Lilliesleaf (Riddell) .....	...	...	...	...	...	...	...	...	...	...	...
XIII.	Edinburgh (Royal Observatory) ...	.91	...	.39	27	9	76.8	27	42.5	12	0	2
XIV.	Colmonell	1.76	— .95	.47	18	6	83.6	23	35.0	10	0	0
XV.	Tighnabruaich	1.09	— 2.67	.28	20	7	73.0	23	40.0	5, 6c	0	0
	Mull (Quinish)	1.24	— 2.31	.69	19	7	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis) ...	.85	— 1.30	.30	27	8	77.5	27	39.7	7	0	0
XVII.	Braemar	1.41	— 1.03	.40	20	9	79.3	25	33.7	11	0	0
	Aberdeen (Cranford) .....	.76	— 1.33	.19	27	7	70.0	19, 27	32.0	10	1	0
	Cawdor (Budgate)	1.31	— .93	.31	4	12	...	...	...	...	...	...
XVIII.	Invergarry	2.21	— .64	1.16	5	5	...	...	...	...	...	...
	Bendamp.	2.24	— 2.54	.74	20	9	...	...	...	...	...	...
XIX.	Dunrobin Castle .....	.86	— 1.28	.34	18	8	69.5	24	40.0	1	0	0
	Castletown .....	.79	...	.28	15	8	74.0	24, 27	40.0	9, 10d	0	0
XX.	Killarney	2.10	— 1.19	.46	21	13	80.0	25	41.0	7	0	0
	Waterford (Brook Lodge) ...	1.88	— .73	.46	19	10	77.0	26	38.0	4	0	0
	Broadford (Hurdlestown) ...	2.09	— .43	.54	18	13	83.0	25	42.0	6	0	0
XXI.	Carlow (Browne's Hill)	1.35	— .97	.31	20	10	...	...	...	...	...	...
	Dublin (Fitz William Square) ...	1.18	— .77	.36	18	11	77.0	26	46.2	5, 11	0	0
XXII.	Ballinasloe	2.49	— .20	.66	18	13	83.7	25	35.0	4	0	0
	Clifden (Kylmore House) ..	3.07	— 2.26	1.00	21	9	...	...	...	...	...	...
XXIII.	Seaforde	3.08	+ .36	1.49	18	10	85.0	23, 24	37.0	10	0	0
	Londonderry (Creggan Res.) ...	1.66	— 1.26	.87	18	13	...	...	...	...	...	...
	Omagh (Edenfel)	2.05	— .83	.70	19	10	80.0	23, 26	40.0	5	0	0

+ Shows that the fall was above the average; — that it was below it. a and 27. b and 23, 25. c and 10. d and 15.

SUPPLEMENTARY RAINFALL, JUNE, 1905.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	5·61	XI.	New Radnor, Ednol	3·10
„	Ramsgate, West Cliff	4·14	„	Rhayader, Nantgwillt .....	...
„	Hailsham	3·52	„	Lake Vyrnwy	5·13
„	Crowborough	4·39	„	Ruthin, Plâs Drâw	1·92
„	Osborne	4·29	„	Criccieth, Talarvor	1·69
„	Emsworth, Redlands	3·65	„	Anglesey, Lligwy	2·10
„	Alton, Ashdell	5·11	„	Douglas, Woodville	3·22
„	Newbury, Welford Park ...	4·74	XII.	Stoneykirk, Ardwell House	1·51
III.	Harrow Weald	3·26	„	Dalry, Old Garroch	3·32
„	Oxford, Magdalen College..	3·51	„	Langholm, Drove Road	2·35
„	Banbury, Bloxham Grove...	2·96	„	Moniaive, Maxwellton House	3·10
„	Pitsford, Sedgebrook	3·34	XIII.	N. Esk Reservoir [Penicuik]	1·45
„	Huntingdon, Brampton	3·18	XIV.	Maybole, Knockdon Farm..	1·59
„	Wisbech, Bank House	3·59	„	Glasgow, Queen's Park	·79
IV.	Southend	3·57	„	Campbeltown, Redknowe	2·44
„	Colchester, Lexden	3·23	XV.	Inveraray, Newtown	2·05
„	Saffron Waldon, Newport...	3·13	„	Ballachulish House	3·78
„	Rendlesham Hall	3·83	„	Islay, Eallabus	1·42
„	Swaffham	2·81	XVI.	Dollar	·65
„	Blakeney	3·08	„	Loch Leven Sluices	·38
V.	Bishops Cannings	3·86	„	Balquhidder, Stronvar .....	...
„	Ashburton, Druid House ...	3·79	„	Coupar Angus Station	·91
„	Okehampton, Oaklands	2·61	„	Blair Atholl	2·71
„	Hartland Abbey	1·47	„	Montrose, Sunnyside	·56
„	Lynmouth, Rock House ...	3·21	XVII.	Alford, Lynturk Manse ...	·51
„	Probus, Lamellyn	2·41	„	Keith	·47
„	Wellington, The Avenue ...	3·21	XVIII.	N. Uist, Lochmaddy	1·36
„	North Cadbury Rectory ...	3·69	„	Aviemore, Alvey Manse ...	·95
VI.	Clifton, Pembroke Road ...	4·28	„	Loch Ness, Drumnadrochit	·68
„	Moreton-in-Marsh, Longboro'	4·54	„	Glencarron Lodge	2·33
„	Ross, The Graig	3·69	„	Fearn, Lower Pitkerrie	·61
„	Shifnal, Hatton Grange	1·78	XIX.	Invershin	·74
„	Wem Rectory	2·59	„	Altnaharra	2·44
„	Cheadle, The Heath House	1·94	„	Bettyhill	·76
„	Coventry, Kingswood	3·66	„	Watten	·72
VII.	Market Overton	4·21	XX.	Cork, Wellesley Terrace ...	2·42
„	Market Rasen	1·28	„	Darrynane Abbey	3·86
„	Bawtry, Hesley Hall	2·22	„	Glenam [Clonmel]	2·22
VIII.	Neston, Hinderton	2·56	„	Ballingarry, Gurteen	1·35
„	Southport, Hesketh Park ...	1·87	„	Miltown Malbay	1·95
„	Chatburn, Middlewood	3·47	XXI.	Gorey, Courtown House ...	1·46
„	Cartmel, Flookburgh	2·63	„	Moynalty, Westland	2·41
IX.	Langsett Moor, Up. Midhope	2·58	„	Athlone, Twyford	1·45
„	Scalby, Silverdale	·64	„	Mullingar, Belvedere	1·79
„	Ingleby Greenhow	1·49	XXII.	Woodlawn	1·55
„	Middleton, Mickleton	·60	„	Westport, Murrisk Abbey..	1·85
X.	Beltingham	1·34	„	Crossmolina, Enniscooe	2·15
„	Font Reservoir, Fallowlees ..	1·70	„	Collooney, Markree Obsy ...	1·83
„	Ilderton, Lilburn Cottage..	·50	XXIII.	Eniskillen, Portora	2·20
„	Keswick, The Bank	2·98	„	Warrenpoint .....	...
XI.	Llanfrechfa Grange	3·61	„	Banbridge, Milltown	2·76
„	Treherbert, Tyn-y-waun ...	8·59	„	Belfast, Springfield	3·82
„	Carmarthen, Friary	2·86	„	Bushmills, Dundarave	1·47
„	Castle Malgwyn	3·29	„	Stewartstown	2·85
„	Plynlimon	4·30	„	Killybegs	1·54
„	Tallyllyn	1·70	„	Horn Head	2·12

METEOROLOGICAL NOTES ON JUNE, 1905.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—In spite of the persistent heavy R of the first half and the last two days of the month, there was a considerable amount of pleasant weather and brilliant sunshine. It was, however, seldom hot, the shade temp. reaching 80° on two days only. TS on 10th and T on 15th. Duration of sunshine $157\cdot6$ hours,* and of R $77\cdot9$ hours, the latter being $49\cdot8$ hours in excess of the average. Mean temp. $61^{\circ}\cdot4$, or $1^{\circ}\cdot0$ above the average.

TENTERDEN.—By far the largest fall in June since 1860, the most before being $3\cdot87$ in. in 1896, whilst only five other Junes had over 3 inches. Duration of sunshine $179\frac{1}{2}$ hours; 8 sunless days. Wind N. or E. on 20 days. Max. temp. below 60° on 5 days. TS on 27th, with $\cdot24$ in. of R in 8 minutes.

CROWBOROUGH.—A dripping June, changing the deficiency for the year into an excess of $\cdot11$ in. compared with the average of 34 years. The day and night temp. was high notwithstanding the R and N. and N.E. winds on 18 days, and there were many days of brilliant sunshine. TSS on 27th and 30th. Mean temp. $57^{\circ}\cdot9$.

OSBORNE.—The R exceeded that of any June since 1860, when $5\cdot38$ in. fell.

HARTLEY WINTNEY.—A repetition of June, 1903. Cold and cheerless with R and wind storms till 18th, but afterwards a delightful spell of summer weather. Ozone on 19 days with a mean of $3\cdot1$. Hay crops very scanty.

ADDINGTON MANOR.—In a TS on 15th a large elm was struck by L.

RENDLESHAM HALL.—Heavy R to 10th, then nice showers to the end with hot sunny periods. Heavy TSS on 27th and 30th.

BURY ST. EDMUNDS.—The wettest June since 1860, when $4\cdot40$ in. of R fell. A very growing month. The old saying, "A dripping June brings everything in tune," came true this month, and the country was lovely.

BRUNDALL.—Heavy R at times and an unusual amount of T, some of the storms being severe and destructive. Mean temp. $59^{\circ}\cdot8$, or $1^{\circ}\cdot4$ above the average, and higher than in any June since 1897.

WINTERBOURNE STEEPLETON.—A dry month, following the previous shortage, made the deficiency for the year considerable. T on 14th and 16th.

TORQUAY.—Duration of sunshine $167\cdot2^*$ hours, or $64\cdot0$ hours below the average. Mean temp. $58^{\circ}\cdot4$, or $0^{\circ}\cdot3$ below the average. Mean amount of ozone $5\cdot2$; max. $8\cdot0$ on 5th with N.W. wind; min. $2\cdot0$ on 4th with E.S.E. wind.

HARTLAND ABBEY.—The district suffered much from the drought of May and the heat of June.

NORTH CADBURY.—A pleasant and beneficial June. The bountiful R from 5th to 12th saved the hay crop. There was a remarkable continuous cold R from 5th to 8th, like that of June, 1903.

CLIFTON.—Unsettled and rainy except from 22nd to 28th. Close and thunder with heavy R from 14th to 20th and on the last two days. R nearly 2 inches above the average, and the greatest in June since 1879, when $5\cdot29$ in. fell.

BOSTON.—The dry period and continuous N.E. winds ended on 17th with a heavy TS and $1\cdot57$ in. of R. Afterwards there were several partial TSS.

BOLTON.—Fine and bright. Mean temp. $57^{\circ}\cdot2$, or $1^{\circ}\cdot2$ above the average. Duration of sunshine $166\cdot2^*$ hours, or $5\cdot4$ hours above the average.

SOUTHPORT.—Chiefly characterized by prevalence of N.E. and E. winds, occasioning an abnormally dry atmosphere. Little cloud, much sunshine, and the largest mean daily range of temp. yet recorded. Mean temp. $1^{\circ}\cdot3$ above the average. Duration of sunshine 33^* hours above the average. R $\cdot33$ in. below the average. T and L on 18th and T on 19th. Several buildings struck by L on 18th.

LILBURN.—Again remarkable for small R and extreme heat. The total R for the first six months of the year was only 7·05 in., and the country suffered severely from drought.

LLANFRECHFA GRANGE.—R wanted early in the month, the ground being very dry and hard. Cereal and root crops backward. Meadow grass short.

HAVERFORDWEST.—A fine month; cool at first, but hot from 11th to the end. Crops generally good but late. Duration of sunshine 184·0* hours. No TSS.

GOGERDDAN.—Very hot and trying. Good R in the third week came just in time to save the crops from failure.

SCOTLAND.

LANGHOLM.—R 1·01 in. below the average of 28 years.

TIGHNABRUACH.—A delightful summer month, with very little R but heavy dews. Mean temp. 55°·3.

INVERARAY.—Remarkably dry, and the last ten days unusually warm.

MULL.—The driest June since 1895, when only ·77 in. of R fell. High temp. and heavy dews. Springs drying up and R much needed. No T.

COUPAR ANGUS.—The month may be divided into a cold and a warm period, the mean temp. before the 20th being 11° lower than that of the last eleven days. Mean temp. 56°·2. R about half the average.

ABERDEEN.—Fine, dry and warm, being the driest June since 1891, when the R was ·35 in.

LYNTURK.—Fine but exceedingly dry, the R being the lowest in any month in five years. There were TSS in the neighbourhood but none here.

DRUMNADROCHIT.—R 1·44 in., and rainy days 5, below the average of 19 years, the fall being the least in June in that period, except in 1889, when it was only ·33 in. There was much damage from extraordinary cloud-bursts in the vicinity. One of these took place on the higher course of this river, which rose so suddenly that several children were only saved with difficulty.

DUNROBIN CASTLE.—Dry easterly winds most of the month, crops on light soils suffering from drought.

ALTNAHARRA.—Intensely warm throughout, with exceptional continuance of sunshine and drought. Heavy local showers about the end.

IRELAND.

DARRYNANE ABBEY.—Fine and warm on the whole. R ·05 in. below the average of 25 years.

MILTOWN MALBAY.—Little R, cold dry winds and sunny days in the first half; the second half opened with three days of copious R, followed by a heat wave to the end.

DUBLIN.—A beautiful month, dry and bright, with a large preponderance of N.E. and E. winds. The only heavy R was on 16th, with T, and on 18th. Warm from 21st to 27th, the max. being above 70° each day. Duration of sunshine 237·5 hours. R since January 1st 1·86 in., and rainy days 3, below the average of 30 years.

BELFAST.—The R was almost an inch above the average, but of great benefit to the land. Excessive heat on 5 days.

OMAGH.—A remarkably fine and favourable month. A damp spell at the beginning was followed on 5th by 11 days without rain, fine and cloudless. Then 5 days of most welcome R, which gave place on 21st to 10 days of magnificent summer weather, the shade temp. reaching 80° on 23rd and 26th.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, January, 1905.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
London, Camden Square	54·3	6	21·2	16	43·5	32·7	53·9	88	69·9	18·1	1·34	8	5·6
Malta.....	60·4	17	38·7	4, 5	55·4	46·3	41·4	74	108·7	33·0	3·03	16	5·6
Lagos.....	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	98·1	16	53·3	2	77·7	61·1	60·5	73	...	...	·60	5	3·1
Durban, Natal	89·8	8	62·1	1	83·7	69·0	...	...	150·1	...	4·44	17	6·2
Johannesburg	81·2	13	51·5	19	75·3	55·8	54·6	75	146·0	49·2	3·28	17	5·0
Mauritius.....	88·5	21	71·0	12	84·6	74·1	73·7	85	156·4	67·4	21·09	31	8·4
Calcutta.....	83·7	29	47·8	27	75·8	55·4	55·7	71	136·4	42·2	·94	2	3·1
Bombay.....	86·9	8	56·1	31	80·9	66·6	62·0	69	137·8	48·3	·00	0	1·7
Madras	87·2	24	57·4	29	83·2	65·2	64·6	75	140·8	52·8	1·92	3	2·3
Kodaikanal	67·4	30a	39·8	29	61·3	44·9	43·3	75	121·4	23·2	·56	5	3·9
Colombo, Ceylon.....	91·2	27	67·2	14	86·8	72·2	70·4	78	150·7	61·5	4·05	7	3·3
Hongkong.....	79·3	23	46·8	31	69·0	60·7	58·4	79	131·1	...	1·80	4	6·9
Melbourne.....	108·5	11b	45·6	24	81·2	57·3	52·7	60	165·4	36·0	1·47	9	5·8
Adelaide	109·7	12	51·3	31	87·4	62·3	52·0	44	164·0	43·1	1·51	6	4·0
Coolgardie	108·5	20	47·2	2	94·0	61·8	54·5	45	175·0	41·2	·46	3	1·8
Sydney	87·5	2	55·6	24	79·1	66·0	62·2	68	128·9	45·4	1·74	10	5·0
Wellington	75·6	17	41·9	2	64·8	52·6	50·2	74	139·0	37·0	2·12	11	7·3
Auckland	78·5	19	48·0	3	67·6	55·4	51·9	71	140·0	38·0	2·79	12	4·8
Jamaica, Negril Point..	88·0	31	62·9	27	83·0	69·4	68·3	78	...	...	·81	4	...
Grenada.....	86·4	27	69·0	28c	81·9	71·9	68·5	71	149·2	...	2·92	15	3·3
Toronto.....	42·2	1	-7·1	26	25·3	10·4	15·8	84	49·8	-10·0	3·28	18	7·4
Fredericton ...	43·9	1	-33·5	15	22·9	-3·4	-6·0	60	...	...	6·62	12	4·4
Winnipeg	29·5	18	-39·1	10	5·7	-16·0	...	...	...	...	·20	3	3·8
Victoria, B.C.	55·0	24	27·4	13	44·6	37·4	...	...	...	...	3·34	18	7·0
Dawson .....	..	...	...	...	...	...	...	...	...	...	...	...	...

a—and 31. b—and 13. c—and 29.

MALTA.—Mean temp. of air 50°·6, or 2°·7 below average, mean hourly velocity of wind 12·4 miles, or 1·2 above average. Mean temp. of sea 56°·0. L on 8th. H on 3rd, 4th, and 28th.

MAURITIUS.—Mean temp. of air 0°·2 below, dew point 3°·6, and R 11·78 in., above averages. Mean hourly velocity of wind 8·0 miles, or 3·1 miles below average.

MADRAS.—On the 29th the min. temp. was 57°·4, the lowest ever recorded, except 57°·3 in 1895. Bright sunshine 228·9 hours.

KODAIKANAL.—Bright sunshine 205 hours.

COLOMBO.—Mean temp. of air 79°·2, or 0°·1 above, of dew point 0°·4 above, and R ·49 in. above, averages. Mean hourly velocity of wind 7·8 miles; prevailing direction N.W. and N.

HONGKONG.—Mean temp. of air 64°·3. Bright sunshine 142·9 hours. Mean hourly velocity of wind 11·5 miles; mean direction E. 11° S.

ADELAIDE.—Mean temp. of air 0°·8 above, and R ·60 in. above 45 years' average.

SYDNEY.—Mean temp. of air 1°·1 above, R 1·79 in. below, and humidity 2·6 below, averages.

WELLINGTON.—Mean temp. of air 4°·1 below, and R 1·42 in. below, averages.

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VOL. XL.

ON THE AMOUNT OF HEAT REQUIRED FOR THE GROWTH AND RIPENING OF WHEAT.

By R. H. CURTIS.

THE relation of Meteorology to Agriculture is a large subject which may be studied from several points of view. In some of its aspects the relation is sufficiently obvious, but in others it requires to be sought for, and, as has happened in other fields of enquiry, it may perhaps be found in unlooked-for directions and as the result of indirect research. The connection between the rainfall of autumn and the yield of wheat in the ensuing harvest, to which Dr. Shaw has recently called attention, would appear to be an example of such an unexpected discovery, and doubtless there are others equally interesting awaiting the patient investigator in this promising branch of enquiry.

Many facts have been observed in connection with the growth of plants which lead to the probable conclusion that the amount of heat required to enable them to perform the several functions involved must be the same for the same plant when grown under fairly similar conditions; and if these thermal constants could be determined they would probably be of considerable value. As to the precise part which heat plays in connection with growth, very little is known with certainty. Whether it is used, and if so to what extent, in the transformation of the materials of which a plant is built up; or in keeping alive and in action certain of its organs; or whether the plant itself develops heat, some of which it may possibly use again, are questions upon which we have little definite knowledge, and they lie perhaps beyond the province of meteorology. But it is within its province to ascertain information relating to the meteorological conditions which influence plant life, and these certainly embrace the amounts of heat required to bring about the accomplishment of certain stages of growth, such as the ripening of cereal crops, a knowledge of which would be of no small theoretical and practical value.

This is a subject which has already received a considerable amount of attention, and, amongst others, Boussingault, Hervé-Mangon, and De Candolle on the Continent, and Dr. Gilbert, F.R.S., in this

country, have endeavoured to determine the thermal constants for various plants, but especially for the ripening of wheat.

The method usually followed on the Continent was to find the mean temperature of the air for the entire period covered by the growth of the plant, and then to multiply the excess of that figure above zero centigrade by the number of days in the period, and to regard the product as the accumulated amount of temperature required. Gilbert somewhat modified this by starting his period from arbitrarily chosen dates, as the 1st of January, the 1st of February, &c., and also from the time at which the temperature had so far advanced in its annual march that it continuously showed some excess over the point selected as his zero. This point was 42° Fahr., which was regarded as the critical temperature at which the processes involved in the growth of the plant became active, whilst they remained dormant when the thermometer fell below it. Of course it is quite possible that each species may have, to a certain extent, its own zero at which growth begins, but probably the value chosen by Dr. Gilbert is very nearly correct for most, or at any rate for the cereals generally grown in this country.

The temperature observations employed by Gilbert were the monthly means for Greenwich for the years 1852-78, and the daily means for the six years 1871-76. He also used the mean values for accumulated temperature published by the Meteorological Office for the Eastern and Midland Counties of England for the years 1878-85; the termination of his period was in every case the time at which the harvest was reaped at the experimental agricultural station at Rothamsted.

It may be well to explain here that the values of accumulated temperature which have been published by the Meteorological Office since the year 1878, and which are the values referred to above as having been to some extent used by Dr. Gilbert, are calculated by a method devised by Gen. Strachey, F.R.S., for finding from ordinary temperature observations the amounts of the daily temperature above and below a fixed base such as Dr. Gilbert used. The results are expressed in what are termed *day-degrees*, following the analogy of the *foot-pound*, the term signifying a degree of temperature continued throughout the whole day. Thus, if the temperature throughout the day was continuously 44° , the base temperature being 42° , the accumulated temperature for the day would be 2 day-degrees. If, again, the thermometer should read 40° from midnight to noon, and then suddenly rising should remain at 44° till the following midnight, it would be equivalent to 1 day-degree *below* the base and 1 day-degree *above*, the two degrees for the half-day being obviously the equivalent of one degree for the whole day. General Strachey has given a formula for calculating these values from the readings of the maximum and minimum thermometers, and also for obtaining the mean temperature more accurately than by simply taking the mean of the readings of the two instruments as is usually done.

To turn now to Dr. Gilbert's results. As might have been expected, he got a somewhat smaller sum of accumulated temperature according as he moved the starting point of his calculations further into the year, and the results were also different, as they were derived from the Greenwich monthly means, the Greenwich daily means, or from the accumulated mean temperature values for the Eastern and Midland Counties published by the Meteorological Office. Starting in each case from the 1st of January, the average amount of accumulated temperature to the time of wheat harvest from the three sets of data was 2023° F., 2189° F., and 1904° F., respectively. Boussingault's values are much larger than these, even when reduced to the same base temperature, but this may have been due to his having used an average term for the growth of the wheat, instead of the more precise Rothamsted data employed by Gilbert. Hervé-Mangon found the value for wheat to be 1854° F. when corrected to 42° as the base value, and this amount approximates very closely to that Gilbert obtained from the Meteorological Office data.

The result of some calculations of the amount of accumulated temperature required for the blossoming of a plum tree, which I made some time ago, led me to the conclusion that it was not right to select an arbitrary date for commencing such calculations, but that they ought to cover the whole interval between sowing and reaping. Nor, for that matter, is it absolutely certain that the base temperature selected is the most suitable, or that it should be maintained throughout the whole of the year, for it is quite possible that growth may go on with lower temperatures than 42° F., or that, at any rate, with such lower temperatures certain changes and modifications proceed in the plant which prepare it for more active development later on.

It was with a view to testing some of these conclusions that I obtained, through the kindness of Mr. A. D. Hall, M.A., the Director of the Lawes Agricultural Trust, the dates of sowing and reaping wheat and barley crops at Rothamsted over a long series of years, the whole of which I have, unfortunately, not been able to use owing to the absence of the corresponding temperature observations.

For the purpose of my calculations, I employed the temperature observations actually made at Rothamsted, instead of using a mean value for a large district which might possibly embrace at once very dissimilar conditions of weather; and I also got out the number of day-degrees below, as well as above, 42° F. from the time of sowing till harvest.

The mean amount of accumulated temperature, above 42° , required for the growth and ripening of autumn sown wheat is shown by my calculations to be 1961 degrees Fahrenheit; the maximum amount is 7 per cent. in excess of this figure, and the minimum, which comes from the data for last year, 1903-4, is 8 per cent. below it. But whilst the time interval between sowing and ripening varies in different years by as much as seven weeks, which is 17 per cent. of the average period, the differences in the amounts of accumulated tempera-

ture are within 2 per cent. of the average in 16 out of the 28 years dealt with. In eight of the remaining years it amounts to or exceeds 5 per cent. ; so that, speaking broadly, one may say that the divergencies from the average, when not trifling, are rather large. This, I believe to be due to the modifying effect of other important elements, such as rainfall or sunshine, which have to be considered in conjunction with temperature, and whose incidence separately or combined was more or less abnormal in those years. The year, 1903-4, in which the largest difference from the mean temperature occurs, the 8 per cent. just mentioned, affords an illustration of this. That year was abnormal in respect of the short interval which elapsed between sowing and harvest, and also in the *distribution* of rainfall over the period. I find that for the 38 weeks it covers (strictly, 262 days), the total rainfall was nearly normal in amount, but that during no fewer than 28 weeks of the period it was less than normal, to an aggregate amount of nearly $8\frac{1}{2}$ inches. This deficit was made up to the extent of 8 inches in 10 weeks of excess, six of which fell within the winter limits when the temperature was low and growth almost stationary. Mr. Hall, the Director at Rothamsted, referring to the effect of moisture on growth in a letter to me, says : "Great dryness shuts up the growth of the plant and leads to premature ripening, the farmer is well acquainted with the character of such grain," and he gave me details of experiments he has made on the subject, in one of which three pots of wheat were grown under similar conditions of heat, whilst the supply of water was throughout maintained in one pot below, in another at, and in the third above the optimum, with the result that the low water ripened a week or ten days before either of the other two. A similar deficiency of water must, I think, have been the cause to which the abnormally short period between sowing and harvest and the consequently small amount of accumulated temperature in this year was due, and probably, also, the other fact that the yield of wheat for the year was exceptionally small.

The space at my disposal in this Magazine will not allow me to go at greater length into the influence of rainfall, or even to touch upon that of sunshine, both of which elements are, of course, intimately connected with the effect of temperature upon growth ; nor can I refer at this time to the temperature results I have similarly obtained for the growth of barley.

~~~~~ "BRITISH RAINFALL, 1904."

THE volume of *British Rainfall* for 1904* was published on August 11th. It is exactly the same size as last year ; the reduction in the number of pages in Part II., due to the less remarkable rainfall

* On the Distribution of Rain over the British Isles during the year 1904, as observed at about 4000 stations in Great Britain and Ireland. With articles upon various branches of Rainfall Work. Compiled by Hugh Robert Mill. London : Edward Stanford, 1905.

of 1904, being equalised by the increase in Part I. on account of the greater space devoted to original articles on rainfall work, and to the introduction of a new feature, the publication of complete daily records for ten selected stations.

The increase in the number of stations is less than in 1903, but amounts to the very substantial number of 153, the total number of records dealt with being 3982. All the new features introduced last year have been continued, and special attention has been devoted to the mapping of heavy rains. Nine of the wettest days have been selected for complete cartographical treatment, the distribution of rainfall being brought out by lines drawn for .25 in., .50 in. and for each whole inch of fall. The tracks of the atmospheric depressions associated with the day's rain are added.

The special articles in Part I. include a brief analysis of the rainfall records at Ben Nevis and Fort William, illustrated by a striking photograph of the high-level Observatory. There is also a discussion of Dry Octobers in which the four driest Octobers since *British Rainfall* was instituted are compared, and October, 1904, shown to have been the driest with one exception in that period. The most important article is devoted to the Mean Monthly Duration and Rate of Rainfall at Camden Square, based on the measurement of the traces of an automatic recording rain gauge for twenty-four years. Although this paper is only preliminary to a complete discussion, it yields some interesting results of a definite nature. One of these is that although the curve of mean monthly rainfall and the curve of mean monthly duration show double maxima and minima in the year, the curve of mean monthly intensity of rainfall which results from them shows a single maximum in July and a single minimum in January with a remarkably uniform rise and fall. It is shown that the rate of fall of rain per hour is twice as great in July as in January, and the annual curve of intensity bears a considerable resemblance to the annual curve of mean temperature of the air.

The Editor points out that the distinctive feature of *British Rainfall* is the joint responsibility of the Observer and the Editor for the accuracy of every entry, and he mentions that one return in every eight has been the object of special editorial enquiry before its value was accepted as correct.

SCOTTISH METEOROLOGICAL SOCIETY.

At the half-yearly meeting of this Society held in Edinburgh on July 18th, the following Report was presented by the Council:—

There has been no change in the Society's stations since the meeting in March.

The Registrar-General for Scotland has been regularly supplied with the monthly and quarterly reports from this office; and also direct from the observers in the eight large towns of Scotland, with

the daily observations of temperature and rainfall required for his weekly reports.

The Meteorological Council at London has been supplied direct from the observers at Glencarron, Fort Augustus, Braemar, Clathick, Marchmont, and Cally, with daily observations of temperature and rainfall, and in some cases sunshine, for their weekly weather reports.

As stated in the Report to the meeting in March last, the Ben Nevis and Fort William Observatories were closed in October, 1904. The buildings on Ben Nevis, and the bridle-path which extends from the foot of the hill to the summit, have now been handed over to the proprietor of the ground, in accordance with the stipulation in the Feu-charter, by which, when the building ceased to be used as an Observatory, the ground and all buildings on it revert to the Superior. The Observatory in Fort William has been advertised for sale, but has not yet found a purchaser. As soon as the Fort William Observatory is sold, the Observatories' Fund will be wound up and the board of directors dissolved.

The closing of the Ben Nevis Observatories and the dissolution of the board of directors can only be regarded as a great blow to meteorological investigation in Scotland. The important work of discussing and utilising the Ben Nevis records will now devolve on this Society. The Society has no funds available for this purpose, but certain charges in connection with the examination and discussion of the Ben Nevis observations, which were formerly paid by the Ben Nevis Observatories' Fund, have, since 31st December last, been borne by the Society. During these six months the Society has received special donations from gentlemen interested in the continuance of the discussion of the Ben Nevis records, which have enabled it to meet this additional outlay. Intimation has also been received that for the ensuing academic year 1905-6 a sum of £100 will be granted for this object to Dr. Buchan by the Carnegie Trust for the Endowment of Post-graduate Research. But more will be needed if the Ben Nevis record is to be fully utilised.

The third volume of the Ben Nevis observations, containing the records for the years 1893 to 1897 inclusive, is approaching completion.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE STUDY OF THUNDERSTORMS.

THUNDERSTORMS in England derive a special interest both on account of their comparative rarity and their uncertainty as to time and place of occurrence. It has often occurred to me, therefore, that this much neglected branch of British climatology might be cultivated more assiduously than it is with the object of ascertaining

the periods and areas of maximum and minimum frequency of storms, and then, with the aid of the known laws of physics, of theorizing upon and establishing, as far as possible, a science of British thunderstorms.

If readers of this Magazine in all parts of the British Islands would care to co-operate with us for the purpose, and send us in notices of all thunderstorms that occur in their respective localities, we would record and tabulate these notices, and after the accumulation of a sufficient number of facts, discuss them, with the hope of investigating into the real nature and causes of thunderstorms. In the notices received information would be useful as to (1) the type of thunderstorm experienced ; (2) the intensity and duration of the storm, amount of rainfall, occurrence of hail, &c. ; (3) the conditions of temperature and humidity before, during and after the storm ; (4) damage caused by the storm ; (5) the geographical features of the locality reporting the storm, while the distribution of atmospheric pressure over Great Britain during the stormy periods would also be studied. Obviously the reports would have to be received from fixed stations and not from observers away from home ; also, since no two observers would agree as to what constitutes a thunderstorm, let us fix an arbitrary standard and define a thundery day as one upon which thunder is heard at the place of observation, just as a "rainy day" is one with .01 in. of rain.

I have a very strong suspicion that one of the areas of maximum frequency and intensity of summer thunderstorms in England will be found to lie among the Pennine moorlands, for my own experience of thunderstorms in East Lancashire and the West Riding of Yorkshire has led me to believe that they are more persistent and severe in those districts than in the neighbourhood of London even, where storms are undoubtedly relatively frequent ; and I believe it is a fact that the Stonyhurst Observatory on the border of north-east Lancashire records on an average more thunderstorms a year than the Greenwich Observatory. It would be interesting to compare the observations of storms in the Pennine district and in the Lake country with those of storms in upland tracts in the south of England like Dartmoor, Exmoor, or Hindhead.

Most people have an instinctive idea that thunderstorms are less frequent at the seaside than inland, but the reason for the fact that they are is not altogether so obvious as it is sometimes imagined. So far as I know, little exact knowledge exists relating to the distribution of British thunderstorms, and on that account I have considered it not inappropriate to make the above proposal to readers of the Magazine.

Perhaps when we know more about our own displays of thunder and lightning, we shall feel more disposed to compare them with the grander and more terrible electrical phenomena of central Europe, notably those of France and northern Italy.

L. C. W. BONACINA.

4, York Terrace, Sidmouth, Devon, July 26th, 1905.

[We should be pleased to assist in any well-devised scheme for the study of thunderstorms. Perhaps Mr. Bonacina might be disposed before launching a new scheme to prepare a summary of the results obtained through Mr. Symons's investigations commenced in 1858, and those of the Thunderstorm Committee of the Royal Meteorological Society which reported in 1888 and 1889. This would greatly facilitate fresh efforts.—ED. S.M.M.]

THE PARALLEL BETWEEN 1896 AND 1905.

I CORDIALLY endorse your criticisms in the June number (page 85) upon the comparison which I have been attempting. It is entirely true that one heavy rain, whether at the beginning or end of a month, may entirely change its character, and make that which truly was a parallel appear from the tables to be no parallel. But the converse does not hold; the month cannot appear to have been dry throughout without having been so in reality.

To compare the Junes of 1896 and 1905 by the light of the tables already published, it is clear that the parallel can be claimed for no more than the southern half of England and Wales, though in some parts of that area it was very close.

It remains to be seen how far the July now ended will have been, as in 1896, very warm and dry over England south of the Humber and in South Wales, and, on the contrary, wet and cool in Scotland and excessively wet in Ireland.

The tables for 1896 show that August had its first three weeks dry, but conspicuously deficient in warmth, and turned wet at the close; and that September was excessively wet over all our islands, every station but one having a +, and these excesses in almost every case very large ones indeed.

Few of your readers can have stronger reasons than myself for hoping that the period August 20th to September 30th may depart as *widely as possible* from the 1896 pattern. I do not at all desire to be "a true prophet once more."

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

North Cadbury Rectory, Somerset, August 1st, 1905.

RAINFALL AT SUNDERLAND.

MY record is so extraordinary for the seven months that I enclose my monthly values up to date:—

1905.	Total. in.		Max. Fall. in.		Date.		Days.
January	·27	.....	·10	.....	17	.....	7
February	·56	.....	·19	.....	13	.....	12
March	1·60	.....	·45	.....	26	.....	14
April	2·53	.....	·37	.....	23	.....	21
May	·78	.....	·31	.....	3	.....	9
June	·79	.....	·32	.....	18	.....	6
July	·98	.....	·33	.....	23	.....	8
	<hr/> 7·51						<hr/> 77

Perhaps the most striking thing is the fact that the total for the three months, May, June and July, only gives 2.55 in. The month of July has been very hot, causing the summer drought to be most trying.

Reviewing the twelve months from the date of this letter, I may remark that only 16.61 in. has fallen, during which period there have been seven months giving each less than one inch.

W. F. VINT.

The Cedars, Sunderland, August 1st, 1905.

LIGHTNING CONDUCTORS.

A FEW years ago a theory was brought forward that there is no necessity to place a lightning conductor on an *old* church; because if the church has never been struck by lightning, the probability is that it never will be struck.*

This proposition seems at first sight very plausible. For if a church tower or spire, erected in the fourteenth or fifteenth century, has remained until the twentieth century without a lightning conductor, and without having attracted the lightning, it is probable that there is some especial reason for its immunity. The causes which conduce to this freedom from injury are not always easy to trace. It may be that there is some conformation of the land which draws the thunderstorms away from the church; or there may be some hills or high trees in the immediate neighbourhood; or possibly a bed of ironstone, which absorbs the lightning. In any case, by the laws of chance, if a high building has existed for five hundred years without damage by lightning, it is probable that it will stand for all time without being struck.

This protection, whatever it may be, is however liable at any time to fail, and a violent and erratic flash may in an instant destroy a beautiful piece of architecture which has stood for centuries.

A remarkable example of this occurred in Egypt on the 31st March last, when, during a very violent thunderstorm, "the minor pyramid of Ghizeh was struck by lightning slightly below the apex of the monument. Several of the immense stone boulders of which the pyramid is built were dislodged, and rolled down with a terrific crash on to the sands below. The place that received the shock looks like a gaping wound. No such accident has occurred within living memory."†

This pyramid was erected by King Menkaorea about the year 3633 B.C.; and, as far as we know, it has stood since that time without being struck by lightning. We cannot, therefore, avoid the conclusion that a building without a lightning conductor is never safe from the lightning flash; no, not after a period of five thousand years.

CHRISTOPHER A. MARKHAM.

The Garth, Dallington Avenue, Northampton, 8th July, 1905.

* *Symons's Monthly Meteorological Magazine*, June, 1898, p. 65.

† *The Times*, 10th April, 1905.

REVIEWS.

Transvaal Meteorological Department. Observations for the period 1st July, 1903—30th June, 1904. With Appendix. First Report. Pretoria, 1905. Size 13 × 8½. Pp. 68.

WE welcome Mr. Innes's first Report of the Transvaal Meteorological Service, though at first sight it seems a trifle confusing to include parts of two calendar years. It is explained, however, that it is in harmony with usage in the northern hemisphere to break the year in winter. This strikes us as a bad reason, because it is not on account of the seasons but of the calendar that it was ever adopted. Further, it is pointed out that the summer is the rainy season, and therefore it is an advantage to keep the summer unbroken. This seems to us a good and sufficient reason for the method adopted. We note with pleasure that the time-reckoning is from 0 to 24, thus obviating the stupid and bewildering use of *a.m.* and *p.m.* to which we have grown accustomed.

So far as a hasty glance at the list of stations allows us to estimate, the number at work in the colony is 210. Most of these are rainfall stations, now using a 5 in. Snowdon gauge with the rim set at a height of 4 feet above the ground, though many are still equipped with a shallower funnel, which leads to much loss by out-splashing in hail or heavy rain. In the tables of rainfall we note that cyphers are inserted for falls less than an inch. Experience will, we believe, show that the practice always followed in this Magazine and in *British Rainfall* of omitting the cypher before the decimal point saves much trouble and many errors.

We write this note hurriedly, not because the Report is of small interest, but because it is our last bit of editorial work before we start to see for ourselves something of the equipment of the South African meteorological services.

London Fogs. Report of the Meteorological Council upon an Inquiry during the Winters of 1901-2 and 1902-3. London, 1904. Size 12 × 10. Pp. 48. Plates. Price 2s. 6d.

It can hardly be denied that all that could be done with the time and materials at disposal, was done in the investigation of London fogs, recently undertaken by the Meteorological Council. Unfortunately, however, the means available were of so scanty a nature that the chief aim of the inquiry, the satisfactory forecasting of fogs and of their probable density and duration, must still be largely a problem of the future.

When the winter of 1901-2 was already so far advanced as to render a study of the season as a whole impossible, a grant of £250 by the London County Council, enabled the Meteorological Council to appoint Captain A. Carpenter to conduct the inquiry. With the co-operation of the Metropolitan Fire Brigade, the Metropolitan

Police, the Superintendents of the London Parks and various official and private observers, Captain Carpenter collected all the available information, and his ultimate conclusions may be briefly stated as follows :—

(a). There is no evidence of special connection between fog and geological conditions.

(b). Elevated stations are freer from fog than others.

(c). Fogs are produced in London by local conditions, and are not identified with any particular locality in London. The local atmospheric conditions need further investigation.

(d). The meteorological conditions for the formation of fog are carefully set forth and illustrated. They include barometric pressure, air temperature and river temperature. In 22 cases out of 25 during the night preceding fog the temperature of radiation fell much below the river temperature.

(e). There is a marked tendency for fogs to commence in the early morning after a clear night.

The question of the possibility of foretelling fogs, apart from the more definite conclusions arrived at as to favourable conditions, was not materially advanced, but a more extensive observational investigation was urged, and notes upon the outstanding part of the inquiry were set forth. To this end, in spite of the inability to obtain further support from the London County Council, the Meteorological Council carried on the collection and discussion of the observations during the winter of 1902-3, and Mr. R. G. K. Lempfert made a report upon the work. The comparative absence of fog in that season somewhat hampered the inquiry, but the observations were commenced on September 1st, and all cases of autumnal fogs were included. An improved classification of fogs with regard to density, based on their relative interference with traffic, was introduced with very fair success, and Dr. Shaw's distinction between "steaming-water fogs," "cold-surface fogs" and "cloud fogs" rendered the discussion more complete.

It is considered possible that a special organization, capable of putting the requisite meteorological observations in the hands of an expert at 5 a.m., would make it possible to forecast local fogs with some degree of success, but it is again urged that a further examination of the meteorological conditions is previously required.

Included in the report are many plates and maps showing the distribution of typical fogs, and the observations of temperature, etc., taken at the time.

SEVEN MONTHS' RAINFALL OF 1905.

Aggregate of Rainfall for January—July, 1905.

Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.
	in.			in.			in.	
London	13·41	102	Bolton	19·34	93	Braemar	16·70	94
Tenterden	14·95	108	Wetherby	10·53	74	Aberdeen	13·61	81
Hartley Wintney ..	13·36	96	Arnccliffe	25·11	80	Cawdor	16·22	106
Hitchin	13·32	104	Hull	10·66	78	Invergarry	32·18	113
Winslow	11·45	81	Newcastle	8·94	63	Bendamph	44·44	105
Westley	13·29	100	Seathwaite	61·96	93	Dunrobin	17·00	104
Brundall	11·43	89	Cardiff, Ely ...	17·46	84	Killarney	24·63	82
Alderbury	15·33	103	Haverfordwest ..	20·83	89	Waterford	19·12	94
Winterbourne ...	14·03	73	Gogerddan	22·52	103	Broadford	17·29	101
Torquay	14·16	80	Llandudno	13·58	92	Carlow	14·78	82
Polapit Tamar ...	15·91	87	Cargen	19·41	88	Dublin	11·03	76
Bath	11·69	74	Lilliesleaf	12·99	76	Mullingar	16·08	85
Stroud, Upfield ...	14·26	91	Colmonell	18·16	82	Ballinasloe	14·20	74
Woolstaston	14·70	87	Glasgow	14·60	80	Clifden	33·08	82
Bromsgrove	10·20	79	Inveraray	36·00	116	Crossmolina	23·10	91
Boston	11·38	93	Islay, Eallabus ..	25·23	111	Seaforde	15·31	75
Hodsock Priory..	9·11	68	Mull	28·78	102	Londonderry..	19·16	93
Derby	8·97	64	Dundee	10·10	67	Omagh	19·44	101

The column of the rainfall table for July devoted to difference from the average exhibits an unbroken succession of minus signs, denoting that the fall for this month fell short of the average over the whole of the British Isles. It is probable, however, that in localities where the thunderstorm of the 9th reached its greatest intensity, instances of excesses occurred. The result of the general deficiency was to reduce the average of the percentages in the aggregate table from 97 for January to June to 89 for January to July. Only a comparatively small portion of the British Isles has an aggregate fall still in excess of the average; this portion comprises the whole of that part of Scotland lying to the N.W. of a line drawn from Kintyre, through the Trossach district and roughly along the course of the river Spey. Inveraray was comparatively the wettest spot, with 116 per cent. An area in the S.E. of England, just including London and extending N. to Bury St. Edmunds and W. to Salisbury, also had a fall exceeding the average to a slight extent, and almost negligible isolated excesses occurred at Aberystwyth and Broadford. A considerable area over which less than three-quarters of the average fall has taken place lies in the S.E. of Scotland and N.E. of England, extending from Forfarshire along the E. coast and into the English Midlands. We print elsewhere a letter calling attention to the abnormally deficient rainfall at Sunderland, to which the nearest station included in the table is Newcastle, with only 63 per cent. of the average. In the extreme N. and S. of this area Dundee had only 67 per cent. and Derby 63 per cent. There was also a small area in Dorset with a deficiency exceeding a quarter of the average. Ireland showed a fairly uniform deficiency, reaching 26 per cent. at Ballinasloe.

METEOROLOGICAL NEWS AND NOTES.

THE BRITISH ASSOCIATION meets this year in South Africa, and our report of the proceedings as regards meteorology must consequently appear a little later than usual. The scientific meetings of the Association were planned to commence at Cape Town on August 15th, and after a few days they will be adjourned to Johannesburg, where the official party arrives on the 28th. On the conclusion of the scientific meetings a long excursion will be made by special train, extending as far as the Victoria Falls on the Zambesi, and a large party will return to England from Beira in Portuguese East Africa, calling at various points on the east coast on the way homeward through the Red Sea and Suez Canal. We understand that although the papers dealing with meteorology are, this year, to be scattered through several sections, the usual opportunity of a reunion of meteorologists and rainfall observers will be afforded by a Meteorological Breakfast in Cape Town.

THERE ARE DEGREES OF MANY KINDS adapted for measuring different phenomena, but while some degrees are convertible into distances, others are not. The observer, from whose report of a double rainbow in a provincial paper (the editor's blushes we sympathetically spare by suppressing name and date) we quote the following trifle, came near to finding the pot of gold that tradition says lies buried under the rainbow's foot:—"To give an idea of the width of the band from the inner violet to the outer violet is exceedingly difficult; but where the horizon was near to the observer, the band of the double bow would be about eighty yards wide." We wonder how wide the moon appears on the same scale.

THE TRUE DIRECTION AND VELOCITY OF THE WIND AT SEA may be determined by means of an instrument devised by Mr. A. Lawrence Rotch and manufactured by Mr. Casella of Holborn. This instrument, which consists of two brass discs marked with the points of the compass, and pivotted with three graduated rules, performs the operation of combining the direction taken by the smoke, or pennant, of a ship with the course and speed of the vessel, in such a manner that the resultant direction and velocity of the wind can be read off without further calculation. Mr. Rotch has found the instrument specially useful for determining wind when flying kites from vessels, and it has been satisfactorily tested during four transatlantic voyages.

AN EXTREMELY HEAVY FALL OF RAIN in one day is reported in the *Cincinnati Price Current* (Ohio) of June 29th, 1905:—"Two weeks before, at Birmingham, in S.E. Iowa, $10\frac{3}{4}$ in. of rain fell in twelve hours according to 'Government measurement'; and at Milton, a little further south, a correspondent reported 12 in. of rain as having fallen in eight hours."

RAINFALL IN THE TALLA VALLEY.*

At the beginning of 1896 the Edinburgh Water Trust undertook to ascertain the mean rainfall of the Talla Drainage Area, in the south-east of Peeblesshire, with a view to adjusting the compensation due on impounding the stream for the water-supply of Edinburgh City. For this purpose seven rain gauges were erected at spots within the area in question, varying in altitude from 966 feet to 2627 feet, and so placed that their readings should give a proper representation of the rainfall. The observations were subsequently tabulated and discussed by Mr. Hall Blyth and Mr. W. A. Tait, and the results laid before the Royal Society of Edinburgh.

It was found necessary to augment the arithmetical averages of the total falls for the seven years over which observations extended by 4 per cent, in order to arrive at an approximately correct value for a long period. This process showed means varying from 47·66 in. at Quarter Hill in the extreme north of the area, 1196 feet above sea level, to 73·92 in. at Gameshope Farm at 1538 feet. The mean of the seven gauges was 62·51 in., or for a long period 65 inches. The increase of rainfall with altitude was somewhat irregular, since three stations gave values exceeding that of the most elevated station, and two had considerably less rainfall than the least elevated.

From a table giving the average results for the seven gauges for each month it appears that December was by far the wettest month, having a mean fall of 8·76 in., whilst November, the next wettest, had only 6·44 in. May was the driest with 3·37 in. It is obvious that the period is far too short for the monthly means to have much significance, but it is noticeable that the total for the six months July to December exceeded that for January to June by 11·63 in. The wettest month recorded was December, 1900, with 17·11 in. at Gameshope Farm, and the driest, March, 1900, with ·30 in. at Gameshope Loch.

Daily records were maintained at three duplicate gauges, and these showed that the longest period of practically continuous rainfall was from September 11th to October 11th, 1896, during which period 13·89 in. of rain fell at Gameshope Farm; and the heaviest continuous fall was from December 26th to 30th, 1897, when 9·99 in. fell at the same station. Three falls exceeding 3·00 in. in 24 hours took place at Gameshope Farm, none at any other station.

It is gratifying to know that, upon the recommendation of the Arbiters, the Edinburgh Water Trust have agreed to continue the gaugings, recognising that the ultimate value of so unique a series of observations cannot fail to be very great.

* Note on the Rainfall on the Drainage Area of the Talla Reservoir, by B. Hall Blyth and W. A. Tait. *Proc. Roy. Soc. Edin.*, XXV. (1905), 616-629.

OPTICAL CONVENTION, 1905.

THE Optical Convention was held at the Northampton Institute, Clerkenwell, E.C., from May 31st to June 3rd. The object of the convention was to bring into close sympathy and co-operation men who are interested in optical matters from all sides of the question, technical and scientific.

Dr. R. T. Glazebrook, F.R.S., Director of the National Physical Laboratory, was the President, and he delivered the opening address at a *Conversazione* on Tuesday evening, May 30th. The mornings of the subsequent days of the week were devoted to papers and discussions on optical subjects. On Thursday evening, Prof. Silvanus P. Thompson, F.R.S., delivered a lecture on "The Polarization of Light by Nicol Prisms and their modern equivalents;" and on Saturday afternoon the members of the convention went on an excursion to Teddington to inspect the National Physical Laboratory.

In connection with the Convention an exhibition of Optical and Scientific Instruments was held in the great hall of the Northampton Institute, the stands being arranged on the ground floor and in the gallery. Optical glass was shown in its crude state, and the various processes could be traced through which it has to pass until it becomes a lens for the spectacle or an object glass for the most powerful telescope.

The catalogue, which was a special feature of the exhibition, was compiled in order to be a work of permanent value. It contained a classified description not only of the objects exhibited, but of the other work of many representative firms, arranged in such a way that anyone consulting it can easily find by whom the goods he is in search of are made, and where he is to go to see specimens or to obtain information.

Class VII. was devoted to "Meteorological Instruments and Temperature Measurers." The instruments were grouped in the catalogue under the following sections, although the various instruments were placed on the individual makers' stands—viz: 1. Barometers; 2. Self-Recording Barometers; 3. Thermometers; 4. Self-Recording Thermometers; 5. Hygrometers; 6. Anemometers; 7. Sunshine Recorders; 8. Rain Gauges; 9. Evaporimeters; 10. Miscellaneous; and 11. Atmospheric Electricity.

The exhibitors in this class were: Anglo-American Optical Co., Messrs. R. and J. Beck, Cambridge Scientific Instrument Co., Messrs. J. Casartelli and Son, Messrs. F. Darton and Co., Messrs. J. Davis and Son, Messrs. Dring and Fage, Mr. F. L. Halliwell, Mr. J. J. Hicks, Mr. G. Kent, Messrs. Lander and Smith, Messrs. Negretti and Zambra, and Messrs. Short and Mason.

As the exhibits were confined to the work of English makers, the well-known instruments of MM. Richard Frères and other foreign firms were not included in the exhibition.

RAINFALL AND TEMPERATURE, JULY, 1905.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.]	RAINFALL.				Days on which ·01 or more fell.	TEMPERATURE.				No. of Nights below 32°.		
		Total Fall.	Diff. from average, 1870-99.	Greatest in 24 hours.			Max.		Min.				
				Depth.	Date.		Deg.	Date.	Deg.	Date.	Shade	Grass	
		inches	inches.	in.									
I.	London (Camden Square) ...	·96	— 1·53	·31	9	8	85·3	26	49·8	7	0	0	0
II.	Tenterden.....	·59	— 1·67	·36	4	6	83·0	14	49·0	20	0	0	0
„	Hartley Wintney	·94	— 1·44	·48	5	5	83·0	9, 26	48·0	19	0	0	0
III.	Hitchin ..	1·25	— 1·30	·66	9	8	80·0	8, 9a	46·0	6, 18	0	0	0
„	Winslow (Addington)	1·22	— 1·55	·54	1, 9	6	82·0	14, 26	44·0	7, 19	0	0	0
IV	Bury St. Edmunds (Westley)	1·15	— 1·76	·49	27	8	85·3	14	46·0	7	0	0	0
„	Brundall	·65	— 2·05	·19	15	6	82·6	14	48·8	7	0	0	0
V.	Alderbury	·30	— 2·16	·10	22	7	88·0	21	32·0	6	1	...	...
„	Winterbourne Steepleton ...	·50	— 2·28	·38	10	4	78·9	25	39·8	7	0	0	0
„	Torquay (Cary Green)	·59	— 2·14	·20	27	5	78·7	26	50·7	7	0	0	0
„	Polapit Tamar [Launceston]	·63	— 2·30	·14	9	15	77·6	9	38·7	7	0	0	0
„	Bath	·56	— 2·27	·21	22	6	79·8	8	43·5	7	0	0	0
VI.	Stroud (Upfield)	·83	— 2·07	·38	9	10	81·0	26	50·0	6	0	...	...
„	Church Stretton (Woolstaston)	1·36	— 1·30	·61	26	11	77·0	21	45·5	4, 28	0	...	...
„	Bromsgrove (Stoke Reformatory)	·92	— 1·46	·44	1	6	80·0	21	38·0	6	0	...	...
VII.	Boston	1·25	— 1·19	·50	26	8	85·0	25	47·0	7	0	...	...
„	Workshop (Hodsock Priory).	1·31	— 1·20	·37	26	9	83·5	14	42·5	4	0	2	...
„	Derby (Midland Railway)...	·84	— 1·79	·46	26	8	85·0	8, 21	44·0	31	0	...	...
VIII.	Bolton (The Park)	2·46	— 1·66	·77	26	16	80·4	9	45·6	4	0	0	...
IX.	Wetherby (Ribston Hall) ...	1·66	— ·95	·65	22	8	...	...	...	...	...	...	...
„	Arncliffe Vicarage	1·66	— 3·31	·45	22	16	...	...	...	...	...	...	...
„	Hull (Pearson Park)	1·60	— ·90	·82	22	6	85·0	14	47·0	4, 19	0	0	...
X.	Newcastle (Town Moor) ...	1·66	— 1·25	·56	2	11	...	...	...	...	...	...	...
„	Borrowdale (Seathwaite) ...	5·02	— 4·35	1·75	17	18	80·3	9	44·6	29	0	...	...
XI.	Cardiff (Ely)	1·69	— 1·83	1·12	1	11	...	...	...	...	...	...	...
„	Haverfordwest (High St.)..	2·29	— 1·41	·84	1	15	77·6	9	45·1	7	0	0	...
„	Aberystwyth (Gogerddan)..	3·12	— 1·15	·65	1	11	84·0	8	39·0	3, 27	0	...	...
„	Llandudno	2·21	— ·40	·77	26	14	76·0	9	47·8	28	0	...	...
XII.	Cargen [Dumfries]	1·38	— 1·92	·38	29	8	83·0	9	41·0	28, 29	0	...	...
„	Lilliesleaf (Riddell)	2·03	— 1·23	·47	2	12	81·0	9	40·0	28	0	0	...
XIII.	Edinburgh (Royal Observy.)	1·45	...	·25	2	15	75·9	21	41·4	30	0	0	...
XIV.	Colmonell	1·79	— 1·51	·37	21	15	82·6	9	40·0	26	0	...	...
XV.	Tighnabruaich	4·03	— ·30	·64	29	21	70·0	1	42·0	5	0	0	...
„	Mull (Quinish)	3·75	— ·63	·58	28	25	...	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis)	1·35	— 1·68	·25	29	15	82·9	21	44·0	28	0	...	...
XVII.	Braemar	2·19	— ·70	·60	12	18	75·1	11	38·0	...	0	...	...
„	Aberdeen (Cranford)	1·87	— 1·15	·40	2	15	78·0	14, 21	42·0	6	0	...	...
„	Cawdor (Budgate)	1·92	— 1·42	·41	22	18	...	...	...	...	...	...	...
XVIII.	Invergarry	2·46	— 1·32	·41	9	10	...	...	...	...	...	...	...
„	Bendampf.	5·07	— 1·39	·50	16	24	...	...	...	...	...	...	...
XIX.	Dunrobin Castle	1·75	— 1·07	·44	9	16	72·0	7, 21	44·0	19	0	...	...
„	Castletown	2·75	...	·70	27	26	71·0	14	41·0	23, 24	0	...	...
XX.	Killarney	1·48	— 2·51	·46	26	15	78·0	2, 9, 10	44·0	27	0	...	...
„	Waterford (Brook Lodge)...	2·19	— ·91	·58	26	13	76·0	9	42·0	4	0	...	...
„	Broadford (Hurdlestown) ...	1·97	— ·97	·37	28	18	77·0	9	44·0	27	0	...	...
XXI.	Carlow (Browne's Hill)	1·37	— 1·65	·37	9	10	...	...	...	...	...	...	...
„	Dublin (Fitz William Square)	·82	— 1·81	·11	9	17	81·8	14	49·3	6	0	0	...
XXII.	Ballinasloe	1·04	— 2·27	·25	28	15	80·6	1	41·0	27	0	...	...
„	Clifden (Kylemore House)...	2·77	— 3·38	·50	16, 22	13	...	...	...	...	...	...	...
XXIII.	Seaforde	1·17	— 2·23	·32	28	13	84·0	12	45·0	27	0	0	...
„	Londonderry (Creggan Res.)	2·36	— 1·11	·26	28	21	...	...	...	...	...	...	...
„	Omagh (Edenfel)	2·27	— 1·12	·45	22	18	81·0	1	39·0	27	0	0	...

June.—Lilliesleaf (Riddell) 1·99 — ·45 ·90 28 | 7 || 79·0 | 24 | 39·0 | 4 | 0 | 3

+ Shows that the fall was above the average; — that it was below it. a and 25, 26.

SUPPLEMENTARY RAINFALL, JULY, 1905.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	·68	XI.	New Radnor, Ednol	2·17
„	Ramsgate, West Cliff.....	·98	„	Rhayader, Nantgwilt ...	1·93
„	Hailsham	·90	„	Lake Vyrnwy	1·65
„	Crowborough	·50	„	Ruthin, Plás Drâw.....	2·35
„	Osborne.....	·24	„	Criccieth, Talarvor.....	2·51
„	Emsworth, Redlands.....	·41	„	Anglesey, Lligwy	1·54
„	Alton, Ashdell	·24	„	Douglas, Woodville	1·41
„	Newbury, Welford Park ...	·97	XII.	Stoneykirk, Ardwell House	1·46
III.	Harrow Weald	2·61	„	Dalry, Old Garroch	2·46
„	Oxford, Magdalen College..	·14	„	Langholm, Drove Road....	4·05
„	Banbury, Bloxham Grove...	1·58	„	Moniaive, Maxwellton House	1·45
„	Pitsford, Sedgebrook	·47	XIII.	N. Esk Reservoir[Penicuik]	2·70
„	Huntingdon, Brampton.....	·68	XIV.	Maybole, Knockdon Farm..	2·68
„	Wisbech, Bank House	·91	„	Glasgow, Queen's Park	2·87
IV.	Southend	·29	„	Campbeltown, Redknowe...	2·56
„	Colchester, Lexden.....	·32	XV.	Inveraray, Newtown.....	4·46
„	Saffron Waldon, Newport...	1·64	„	Ballachulish House.....	6·77
„	Rendlesham Hall	·26	„	Islay, Eallabus	3·54
„	Swaffham	·66	XVI.	Dollar	3·00
„	Blakeney	1·61	„	Loch Leven Sluices	2·09
V.	Bishops Cannings	1·45	„	Balquhidder, Stronvar .....	...
„	Ashburton, Druid House ...	·50	„	Coupar Angus Station	1·48
„	Okehampton, Oaklands.....	·50	„	Blair Atholl.....	1·48
„	Hartland Abbey	2·07	„	Montrose, Sunnyside.....	1·30
„	Lynmouth, Rock House	1·24	XVII.	Alford, Lynturk Manse ...	3·91
„	Probus, Lamellyn	·50	„	Keith	1·74
„	Wellington, The Avenue	·27	XVIII.	N. Uist, Lochmaddy	3·09
„	North Cadbury Rectory ..	·72	„	Aviemore, Alvey Manse ...	1·35
VI.	Clifton, Pembroke Road ...	·91	„	Loch Ness, Drumnadrochit.	2·45
„	Moreton-in-Marsh, Longboro'	·38	„	Glencarron Lodge	5·96
„	Ross, The Graig	·67	„	Fearn, Lower Pitkerrie.....	1·65
„	Shifnal, Hatton Grange.....	1·82	XIX.	Invershin	1·6
„	Wem Rectory	1·48	„	Altnaharra	1·74
„	Cheadle, The Heath House.	2·13	„	Bettyhill	1·20
„	Coventry, Kingswood	1·30	„	Watten	2·11
VII.	Market Overton	3·13	XX.	Cork, Wellesley Terrace ...	1·70
„	Market Rasen	1·32	„	Darrynane Abbey	3·06
„	Bawtry, Hesley Hall.....	1·18	„	Glenam [Clonmel]	1·27
VIII.	Neston, Hinderton	3·07	„	Ballingarry, Gurteen	1·54
„	Southport, Hesketh Park...	1·75	„	Miltown Malbay.....	2·64
„	Chatburn, Middlewood	2·38	XXI.	Gorey, Courtown House ...	2·02
„	Cartmel, Flookburgh	2·01	„	Moynalty, Westland	1·39
IX.	Langsett Moor, Up. Midhope	1·47	„	Athlone, Twyford	1·12
„	Scalby, Silverdale	1·30	„	Mullingar, Belvedere.....	1·69
„	Ingleby Greenhow	1·01	XXII.	Woodlawn	2·17
„	Middleton, Mickleton	·53	„	Westport, Murrisk Abbey..	2·90
X.	Beltingham	1·19	„	Crossmolina, Enniscoe	2·10
„	Font Reservoir, Fallowlees.	1·12	„	Collooney, Markree Obsy...	1·59
„	Ilderton, Lilburn Cottage..	·65	XXIII.	Enniskillen, Portora .....	...
„	Keswick, The Bank	1·57	„	Warrenpoint	1·79
XI.	Llanfrecfha Grange.....	·69	„	Banbridge, Milltown	1·93
„	Treherbert, Tyn-y-waun ...	3·12	„	Belfast, Springfield	1·93
„	Carmarthen, Friary	2·23	„	Bushmills, Dundarave	2·51
„	Castle Malgwyn	1·81	„	Stewartstown	2·22
„	Plynlimon.....	6·80	„	Killybegs	2·63
„	Tallyllyn	·30	„	Horn Head	2·52

METEOROLOGICAL NOTES ON JULY, 1905.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—Although the temp. at no time reached an abnormally high point, the most characteristic feature of the month was the persistent heat. On every day the mean temp. was well above the average, and the mean for the month was as high as $67^{\circ}4$, exceeding the average by $4^{\circ}1$. This has only been exceeded in four previous Julys and in no other month; the mean min., $57^{\circ}7$, was only once exceeded, reaching $58^{\circ}4$ in July, 1859. Owing to the comparative absence of TSS the R was considerably in defect. TSS of moderate intensity occurred on 9th and 27th, T continuing almost all day on 9th. Duration of sunshine $214\cdot8^*$ hours, and of R only $10\cdot2$ hours.

TENTERDEN.—Very similar to July, 1904, as regards temp. and weather, but less sunshine and much less R. Duration of sunshine $258\frac{1}{2}$ hours. TS on 5th.

CROWBOROUGH.—A brilliant month without any extreme or oppressive heat. R very deficient, amounting to less than one-sixth of the average. Mean temp. $63\cdot8$. T on 5th, 6th and 14th.

OSBORNE.—Dry and warm. R only 12 per cent. of the average of 48 years.

HARTLEY WINTNEY.—Glorious summer weather prevailed throughout. Very dry, without excessive heat. The nights were as beautiful as the days. Ozone on 6 days with a mean of $2\cdot2$. Absence of TSS.

ADDINGTON MANOR.—A fine month, nearly all the R falling on two days. Very heavy TS on 9th, causing many accidents in the neighbourhood.

COLCHESTER.—The driest July since observations began in 1889, and continuously hot except for a few nights about 17th, but no exceptionally high max. All vegetation seriously dried up.

BRUNDALL.—Mean temp. $65^{\circ}5$, being $4^{\circ}1$ above the average and $0^{\circ}4$ higher than in July, 1900, which previously held the record back to 1876. T and L on 1st, 12th, 26th and 27th; T on 9th.

TORQUAY.—Duration of sunshine $238\cdot9^*$ hours or $3\cdot0$ hours above the average, Mean temp. $64^{\circ}1$, being $2^{\circ}7$ above the average. Mean amount of ozone $3\cdot4$.

WELLINGTON.—A brilliant summer month with many warm days and nights, but not excessively high shade temp. R only about one-eighth of the average.

NORTH CADBURY.—A glorious July, with high mean temp. especially at night, but small range and no extremes. A large hay crop was got in well. Entire absence of T and L.

CLIFTON.—Fine and warm, with occasional slight R caused by disturbances from the Atlantic. Weather of the westerly type continued nearly throughout. The last week was very sultry. R less than one-third of the average.

ROSS.—The month began with heavy R, but it was fine and frequently hot afterwards. Much T on 9th.

MARKET OVERTON.—On 9th $2\cdot07$ in. of R fell in little more than an hour during a TS.

BOLTON.—The temp., although at no time reaching the highest records, was decidedly above the average, the mean exceeding 60° on 13 days. Mean temp. $59^{\circ}8$. Duration of sunshine $166\cdot0^*$ hours, or $15\cdot2$ hours above the average. TS on 9th.

SOUTHPORT.—Unusually warm and sunny and decidedly dry, with an almost continuous prevalence of sea winds of normal strength. Mean temp. $2^{\circ}3$ above the average; rather hot from 8th to 14th. Duration of sunshine 28 hours above the average. R $1\cdot37$ in. below the average. Evaporation exceptionally large. TS on 9th and T on 2nd.

LILBURN.—Again remarkable for small R, only $1\cdot79$ in. having fallen in three months. Corn and pastures were burnt up and water supplies running short everywhere.

LLANFRECHEA GRANGE.—Hot and close with shortage of R. Very calm, the wind force never exceeding 2. Wheat was in good order and ripening fast, but oats and barley straw short. R was much wanted and water supply deficient.

HAVERFORDWEST.—Moderately fine with temp. generally high. No TSS; a good deal of fog. Crops were good, though some hay was spoilt. Duration of sunshine 193·1* hours.

ABERYSTWYTH.—Good R was rendered useless by the hot dry winds which followed, and crops suffered much.

DOUGLAS.—Fine and dry with temp. slightly above, and R considerably below, the average.

SCOTLAND.

LANGHOLM.—R 29 in. below the average of 29 years.

TIGHNABRUACH.—A summer temp. was maintained throughout, the mean max. being 63°·9 and the mean min. 50°·0. The R fell chiefly after sundown.

MULL.—Showery and unsettled, with wind between S. and W. throughout. Very warm. T and L on 9th and 21st.

COUPAR ANGUS.—Mean temp. 58°·7; the effect of the sunny warm days being reduced by several cold nights. The R was again short, as in every month of the year except March.

LYNTURK MANSE.—Heavy local storms, and weather of a thundery nature. A TS began at 4.45 p.m. on 2nd, was very heavy for an hour and lasted with intervals till 10 p.m. T and L on 9th, T on 10th and 11th. The temp. was high, not falling after T.

DRUMNADROCHIT.—R 43 in. less than, and rainy days equal to, the average of 19 years.

DUNROBIN.—The drought of June lasted till the middle of July, when the weather changed and showers fell on most days.

BETTYHILL.—Beautifully fine, with a few slight showers. Crops were light in consequence of want of R.

IRELAND.

CORK.—Drought, particularly up to the 25th, caused a deficiency of water supply in the city. Although no day was remarkably warm, the high min. temp. caused the mean to be high.

DARRYNANE ABBEY.—R 81 per cent. of the average of 25 years. The first 10 days were very fine and hot; afterwards close and misty till the last week, which was sunny and moderately warm.

BROADFORD.—Favourable on the whole. Root crops were good, but oats poor and hay light. Water was very low.

MILTOWN MALBAY.—Very sultry, with sea-fogs and mist. R slight until 31st, and upland pastures burnt up. Hay crop short. Potatoes promising, but blight commencing to show.

DUBLIN.—Very warm; the mean temp. being 63°·8, or 0°·1 higher than in 1887, the previous warmest. Entire absence of electrical disturbances.

ATHLONE.—The smallest R in any July during 30 years.

BALLINASLOE.—The driest July in 34 years.

BANBRIDGE.—During a TS on 9th the L struck a tent in which a Gospel service was being held. Two lives were lost and several persons injured.

BELFAST.—The finest July for several years, and most beneficial for the farmer, especially for hay.

OMAGH.—A magnificent summer month, insuring the safety of a good average hay crop in perfect order, and with sufficient R, especially during the latter half, to supply the moisture necessary for green crops of unusual luxuriance.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, February, 1905.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	54·4	5	30·6	20	47·5	37·9	38·2	87	89·6	26·9	·79	12	6·0
Malta	63·1	22	38·2	15	56·8	46·1	41·3	74	116·9	33·8	1·53	9	3·4
Lagos	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	85·8	1	55·5	3	76·8	61·4	58·1	69	...	...	·59	3	3·5
Durban, Natal	88·5	4	61·4	27	82·0	67·8	...	...	152·1	...	5·48	16	6·1
Johannesburg	80·7	2	46·8	27	73·1	55·7	56·0	82	151·0	48·5	3·30	19	5·5
Mauritius	87·5	12	69·5	26	85·3	73·7	72·1	80	152·4	64·6	3·36	17	5·9
Calcutta	86·9	25	45·9	10	75·8	54·6	51·0	60	148·4	39·9	1·62	3	3·4
Bombay	87·9	20	56·7	1	80·0	63·5	56·7	61	137·2	47·3	·08	1	1·2
Madras	91·3	27	62·0	1	87·2	70·0	68·2	73	149·7	58·4	·31	2	2·8
Kodaikanal	69·4	17	43·8	4	66·2	48·0	46·2	67	134·6	28·6	1·66	5	4·0
Colombo, Ceylon	92·4	13	68·5	12	87·4	73·0	71·0	78	156·2	64·0	2·74	6	4·5
Hongkong	73·5	24	42·8	10	58·9	51·6	51·1	84	109·9	...	1·10	11	9·2
Melbourne	101·6	10	46·6	14	76·6	55·6	51·1	62	156·4	35·0	1·83	5	4·9
Adelaide	105·4	10	46·4	13	81·0	57·2	49·3	50	168·4	41·8	·25	3	3·7
Coolgardie	105·0	17	46·4	11	85·8	59·3	49·1	45	178·8	43·2	·60	3	3·6
Sydney	95·6	23	59·8	13	77·4	64·9	59·8	68	130·8	53·1	1·86	15	5·9
Wellington	77·0	5	45·0	27	68·9	54·7	52·1	70	129·5	40·0	1·45	6	5·5
Auckland	78·0	12a	55·0	2, 28	73·0	58·7	55·5	70	143·0	42·0	·56	5	3·5
Jamaica, Negril Point.	87·9	10	64·7	25	84·5	67·7	69·1	78	...	...	1·67	4	...
Grenada	83·4	25	68·0	1	81·2	70·2	66·4	69	147·0	...	2·11	18	2·9
Toronto	37·8	20	-8·2	4	25·3	7·7	9·6	85	59·0	-14·0	1·40	13	5·6
Fredericton	42·4	26	-21·0	20	25·8	-0·9	-3·0	58	...	...	2·75	10	4·9
Winnipeg	39·8	23	-39·0	2	13·3	-10·1	...	...	...	...	·27	3	3·4
Victoria, B.C.	56·4	26	22·7	12	46·2	37·3	...	...	...	...	2·27	10	5·2
Dawson	24·6	27	-42·4	4	1·1	-12·1	...	...	...	...	1·30	5	4·4

a—and 17.

MALTA.—Adopted mean temp. of air 51°·0 or 3°·2 below, and mean hourly velocity of wind 11·6 or 0·2 below, averages. Mean temp. of sea 56°·3. TS on 12th.

MAURITIUS.—Mean temp. of air 0°·4, of dew point 1°·2 above, and R 3·96 in. below, averages. Mean hourly velocity of wind 7·9 miles, or 3·1 below average. L on 12 days and T on 9 days.

MADRAS.—Bright sunshine 238·4 hours.

KODAIKANAL.—Bright sunshine 216 hours.

COLOMBO.—Mean temp. of air 80°·1, or 0°·1 below, of dew point 0°·5 above, and R ·64 in. above, averages. Mean hourly velocity of wind 6·7 miles; prevailing direction N.W. TSS on 6 days.

HONGKONG.—Mean temp. of air 55°·3. Mean hourly velocity of wind 11·3 miles; mean direction E. by N.

ADELAIDE.—Mean temp. of air 69°·1 or 4°·9 below the average and the lowest on record, being equalled in 1886. R ·36 in. below average.

SYDNEY.—Mean temp. of air 0°·1 above, R 2·95 in. below, and humidity 5·3 per cent. below, averages.

WELLINGTON.—Mean temp. of air 0°·6 below, and R 1·77 in. below, averages.

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VOL. XL.

METEOROLOGY AT THE BRITISH ASSOCIATION.

IN the Report of the Council of the British Association, presented to the General Committee at Cape Town on August 15th, the following important statement occurs :—

The following Resolution, from the Committee of Section A, having been referred to a Committee consisting of Dr. A. Buchan, Dr. H. R. Mill, Dr. Shaw, and the General Officers, to consider and report thereon to the Council :—

The Committee of Section A desire to draw the attention of the Committee of Recommendations to the concluding portion of Sir John Eliot's Introductory Address to the Sub-Section for Astronomy and Cosmical Physics, and to express the opinion that the organisation of a Central Meteorological Department for the British Empire would be of the highest benefit to the progress of Meteorological Science and its application to the economic problems of the various Colonies and Dependencies. The object of each department would be to collect and prepare digests of the Meteorological observations taken in different parts of the Empire, to provide a scientific staff for dealing with the more general Meteorological problems, including their relations to Solar Physics and Terrestrial Magnetism, which involve the co-ordination of data from wide areas, and to promote experimental investigations of the scientific questions which arise in connection with such discoveries. The Committee desire also to express the opinion that the reorganisation of the Meteorological Office, which is at present before the Government, affords an exceptionally favourable opportunity for the establishment of such a Central Meteorological Department for the Empire.

The Memorandum that follows was drawn up by the Committee and has been approved by the Council :—

Memorandum on a Proposal for dealing with Meteorological Questions affecting the British Dominions beyond the Seas.

There is at present no provision for the systematic treatment of the meteorology of the British Dominions.

Observations of various kinds are made in nearly all the British Colonies and Dependencies, and summaries of these observations are generally included in the respective official publications. India, Ceylon, Canada, the several States of Australia, New Zealand, Mauritius, the Cape of Good Hope, and

the Transvaal have organised meteorological establishments and issue regular meteorological publications. Information with regard to the meteorology of the Crown Colonies and Protectorates is to be found in the Blue-books of the several dominions.

There is no provision for the co-ordination of the methods of observing, the instruments employed, or the presentation of results.

In 1890 the Meteorological Council published a volume of summaries of Colonial observations of the Army Medical Department and of the Royal Engineers, and recently they have published a volume of tables for tropical Africa, compiled by Mr. E. G. Ravenstein from observations practically initiated by a Committee of the British Association.

Colonial observations are sent to the Meteorological Office in accordance with a circular despatch of Mr. Chamberlain.

At the request of the Crown Agents, the Meteorological Council have recently undertaken the supervision of the supply of instruments for the Governments of the Crown Colonies. In their annual reports they have from time to time referred to the desirability of the compilation and regular issue of the results, but they have been unable to make provision for this service.

The want of a satisfactory system of co-ordinating the observations from the several dominions is to be deplored from two points of view—the economic and the scientific.

From the economic point of view, it is eminently desirable that facilities should be given for the comparison of the climatic features of the regions available for settlement and the conditions which affect various industries. At present it is possible to obtain a certain amount of information for an individual Colony by reference to Colonial Blue-books, but the data are of very different orders of completeness; and to ascertain in which Colonies specified climatic conditions are to be found would be a labour of such difficulty as to be practically prohibitive. The Board of Trade publish a certain number of tables of meteorological results among their Colonial statistics, but something of a more comprehensive character is required.

From the scientific point of view the regular issue of the meteorological data for the British Colonies in a published and easily accessible form is urgently desired by meteorologists of all countries. This is sufficiently shown by the following extract from a notice of the recent publication of the results for tropical Africa in the *Meteorologische Zeitschrift*, the leading meteorological journal :—

‘To the Meteorological Council the warmest thanks of all meteorologists are due for their resolution to publish from time to time the reports of observations at colonial or foreign stations, which are collected in the Meteorological Office partly in printed form and partly in manuscript. In this journal we have repeatedly pointed out that it is in the highest degree desirable that the rich store of observations which have accumulated in the Meteorological Office, and which might be of great importance for the physics of the atmosphere as a whole, should be made generally known and available. . . . It is very desirable that this valuable publication may soon be continued.’

But there is another aspect from which the scientific treatment of meteorological data must be regarded as having an important bearing upon the economic interests of remote parts of the Empire.

Sir John Eliot, in his address to the British Association meeting at Cambridge, pointed out how the study of the meteorological conditions of the Indian Ocean and the bordering countries had been already applied to problems affecting the economic conditions of India as depending upon the variation of the monsoon rainfall, and he gave reasons for believing that the further prosecution of the inquiry promises valuable results for India, Australia, South and East Africa, and other countries bordering on the Indian Ocean if provision were made for dealing with the meteorological problem in a comprehensive manner with reference to the Indian Ocean as a whole.

Similar reasoning may be held to apply also to other oceanic areas, in or on the border of which British Colonies are situated. In this connection it should, perhaps, be mentioned that the control of the meteorological organisation of the British West Indies is already passing into the hands of the United States.

As a result of Sir John Eliot's representation, the attention of the Council of the British Association has been called to the advantages likely to accrue from the organised study of the meteorological problems affecting various groups of British dominions.

It has been further pointed out that such organised study can be most effectively secured by the establishment of a central institution devoted to these objects. Such an institution ought to be in close connection with the Meteorological Office, which is itself in regular correspondence with the meteorological organisations of foreign countries as well as those of the self-governing Colonies. The meteorology of the ocean has been an essential part of the work of the office from its establishment in 1854, and oceanic data must necessarily be appealed to for the effective study of the meteorology of the neighbouring land areas.

The President and Council of the British Association are informed that the Meteorological Office, as at present constituted, has not the means of dealing effectively with the various problems of colonial meteorology, and the suggested institution would have to be a distinct department with separate provision, whether it was in organic connection with the Office or not.

The President and Council believe that the Government of India, from their interest in meteorological investigations, would be willing to contribute their fair share towards the maintenance of such an institution, and they desire to bring the matter to the notice of the Secretary of State for the Colonies with the view of ascertaining the opinion of the various Colonies which are interested in the subject. They desire to learn whether they would be supported in an effort to obtain the establishment of such an institution as had been described.

By way of summary, the objects of the suggested institution may be briefly stated to be :—

1. To give any information that may be required to the Governments or other authorities of the British dominions as to instruments and methods to be adopted for an effective system of meteorological observations.

2. To compile and publish periodical reports upon the climatic conditions of the various parts of the Empire upon a comparable plan. To form an accessible depository of information upon matters concerning the climates of the whole Empire, and to afford information upon those subjects to inquirers.

3. To provide a scientific staff for the study of the general meteorological conditions which affect the weather in the various British dominions, and in particular to promote the formulation of meteorological laws, and to apply them to explain and ultimately to anticipate the occurrences of abnormal seasons.

A copy of this Memorandum having been forwarded to the Colonial Office, with a covering letter suggesting that the question might be moved by a deputation to the Secretary of State, Mr. Lyttelton replied that, whilst sympathising with the object which the Council had in view, he did not think that there would be any advantage in receiving a deputation until he was in possession of further information on the subject. In satisfaction of this request, the Committee drafted the following additional information :—

Draft Memorandum in further explanation of the proposal for dealing with the Meteorology of the Colonies and Dependencies, for the information of the Secretary of State.

This memorandum deals mainly with the object numbered 3 in the concluding summary of the memorandum approved by the President and Council on March 3, 1905, because the services indicated under numbers 1 and 2 would be included incidentally in the development of number 3.

The statement of the object numbered 3 is as follows :—

To provide a scientific staff for the study of the general meteorological conditions which affect the weather in the several British dominions, and in particular to promote the formulation of meteorological laws, and to apply them to explain and ultimately to anticipate the occurrence of abnormal seasons.

The idea underlying the proposal is to deal with the general meteorological conditions of wider areas than those with which the various meteorological offices of the world have hitherto been regarded as being primarily concerned. The British Meteorological Office does indeed concern itself with the meteorology of the oceans from the point of view of shipping. In effect, the proposal is to utilise further the information already obtained at sea in conjunction with land observations for the investigation of the meteorology of large ocean areas in relation to that of the adjacent land areas, and from the point of view of the land population.

It is known, for example, that the meteorological conditions of India, Australia, South Africa, East Africa, and Egypt stand in close relation to those of the Indian Ocean, and the study of these relations promises very important results in connection with the prediction of the seasons. This investigation requires that the information shall be treated in a manner different from that now followed for the more immediate purpose of its application to the interests of shipping.

The meteorological phenomena which are regarded as demanding careful study, in the first instance, are the following :—

The conditions of favourable and unfavourable seasons in India.

The droughts of Australia and South Africa.

The conditions of favourable and unfavourable Nile floods.

With those would be associated the relation of the weather of the Mediter-

aneous to the Indian cold weather anomalies, and the relation of the South Indian anticyclone to the Antarctic ice.

The larger part of the necessary land data for the investigation of these particular questions can probably be found in the publications of the meteorological organisations of India, Australia, South and East Africa, Egypt, Mauritius, Hong Kong, Singapore, or can be furnished directly by those organisations. They should be supplemented by observations contributed by certain foreign Governments. The marine data would have to be compiled from the documents collected from ships by the meteorological departments of this country and India. The further development of the collection of observations—more especially of marine data—might be necessary, in order to complete the investigation.

The use of the data would be, in the first instance, to obtain a survey of the sequence of the more general weather changes over the whole region under consideration. The first step in the operations, therefore, would be to consider the nature and extent of the data available for the purposes in view, and the form in which they should be compiled for study or for publication.

A corresponding enquiry for the Atlantic Ocean and the countries bordering upon it is equally desirable, and should be conducted concurrently in the interests of the British Isles, and the American and West Indian Colonies.

In order to carry out the proposal, something more than what would be generally understood by “a moderate addition to the staff of the Meteorological Office” is required. The proposal involves a scientific investigation of a very important character, which could not be regarded as merely an incidental addition to the usual operations of the Office. A man of suitable scientific attainments should be responsible for conducting it in consultation with, and under the general supervision of, the Director of the Meteorological Office. It is desirable to mark the nature of the qualifications expected in the person to whom the work is entrusted by giving him the title of Assistant Director, and providing a salary of from £400 to £600 a year. It should be remembered also that the Meteorological Office could not find accommodation for the proposed additional staff without some addition to the space at present available.

It is estimated that the annual cost of the work would be £2,000, rising in five years to £2,500, made up as follows:—

SALARIES: Assistant Director	... ..	£450 to £550
Scientific assistant, computers and clerical staff	... ..	£1,050 to £1,300
PUBLICATIONS, printing and stationery	... ..	£300 to £500
INCIDENTAL EXPENSES, office rent, &c.	... ..	£200 to £150

The estimate is based on the supposition that the Meteorological Committee would be willing to undertake the general control of the department as a branch of the Meteorological Office.

It may be mentioned that the Government grant to the Meteorological Office at present stands at £15,300. The cost of the marine department, as shown in the Report of the Meteorological Council for 1903-4, is £1,366, exclusive of office expenses, publications, &c.

The Council, in approving this Memorandum, has caused it to be conveyed under a covering letter to the Secretary of State for the Colonies.

ON THE USE OF BEAUFORT'S SCALE.

By R. H. CURTIS.

METEOROLOGISTS who have not had much to do with wind observations, would probably be surprised to find how many and how varied are the scales employed for the estimation of wind-force in various countries, and even in different parts of the same country, and their surprise would scarcely be lessened to learn upon what an arbitrary and unsatisfactory basis many of these scales have been constructed.

A very slight consideration of the matter would suffice to show that it must always be difficult, and in many cases perhaps impossible, to satisfactorily correlate observations based upon scales which differ so greatly from each other as many of these do. For example, the scale given by Kaemtz in his "*Meteorology*," and which is, I believe, still in use, consists of only five numbers, which however are supposed to embrace the same range of wind-force as the much better known scale of Admiral Beaufort, who employed thirteen numbers for the purpose, or the scale proposed by Wild* for use in Russia, which consists of no less than nineteen points.

The descriptions of the several wind forces, which are attached to the scales for the purpose of giving to each degree a definite and recognizable value, are not always helpful to those who attempt to reduce to a common standard observations based on more than one of them. This is probably due, to some extent at any rate, to the different conceptions which the authors of the several scales had of the extreme range of force for which provision should be made. I have elsewhere pointed out that in estimating wind-force, the experience and environment of the observer counts for a great deal,† and they, no doubt, explain why one man defines a "gale" as "a wind which is dangerous for sailing vessels," whilst another is content with "single-reefed topsails," and a third considers the term justified when applied to a wind capable of "breaking exposed shrubs." To take another example, it can only be the same variety of experience which leads the author of one scale to call a wind blowing at the rate of 45 miles per hour a "storm," justifying the use of the figure 11 upon a scale of 12 points, whilst another requires a wind velocity of 99 miles per hour to warrant the use of the same figure on a similar scale. The latter had, doubtless, had experience of winds in regions over which the air moves with a freer and more unimpeded motion, and attains higher velocities than had ever fallen within the experience of the former, and in consequence the mental estimate each had formed of what constituted a "storm" was essentially different, the one requiring for it a wind moving at more than double the speed imagined by the other.

The advantage of using everywhere the same scale for observations of wind-force, and of selecting for the purpose a scale which can be

* Report of the Proceedings of the Meteorological Congress at Vienna.

† *Quart. Jour. Roy. Met. Soc.*, Vol. xxiii. p. 24.

standardized by reference to reliable anemometrical data, has been frequently urged, and is so obvious that one wonders steps have not been taken by one or other of the international meteorological Conferences to secure its adoption. Much can be said in favour of the choice of the "Beaufort" scale for this purpose. It is already very generally employed, and especially so by seamen; it rests upon a rational basis—the speed or spread of sail of a ship under given conditions; and already there exist for the scale carefully determined velocity equivalents based upon satisfactory and sufficiently numerous anemometer values. Its general use among seamen is very important, for there is no other class to whom wind observations are more useful, or by whom they are so systematically and universally made.

As regards the use of this scale on land, it has been objected that it consists of too many numbers, and that, however desirable it may be for a seaman to discriminate between, say, a "light air" and a "light breeze" (forces 1 and 2), or between a "fresh gale" and a "strong gale" (forces 8 and 9), such fine distinctions are not required, and are indeed scarcely possible for observations made on land.

To remove this supposed disadvantage what has been called the "Land Scale" has been proposed, which is merely the Beaufort scale divided by 2.* The descriptions given to the numbers of this scale are usually the same as are attached to double the same number on the Beaufort scale; but in some cases, at least, it is clear that what is meant is not that the number on the land scale and its equivalent on the Beaufort indicate the same absolute strength of wind, but only the same *relative* strength. Thus 6 on the one scale and 12 on the other alike stand for a "hurricane"; but whilst the Beaufort hurricane should indicate a wind of, perhaps, 100 miles per hour, or even more—a wind such as might be felt at sea upon our Atlantic coasts, but fortunately never inland—the land-scale hurricane would be the same wind after it had been reduced in force by its passage over hills and dales, and its contact with trees and houses and all the other friction-producing obstructions it would meet in its path, and would in reality be a very different wind indeed. In a very early publication of the Meteorological Office reference is made to the smaller wind velocities always recorded at inland stations, and to the possibility of educing for each place a factor which should enable one to eliminate this effect of friction, and get the equivalent velocity as it would be felt on the coast, thus suggesting the idea that

* I am aware it has been stated that the numbers of the "land" scale were not obtained in this summary way, but that they were really chosen as being the square roots of the pressures per square foot exerted by the winds they are taken to represent. I have, however, never been able to find anything to support this statement, and I think it more probable that it was first suggested as the origin of the scale when it was subsequently noticed that the squares of the numbers comprising the scale roughly approximate to some of the earlier suggested scales of wind pressures, all of which are empirical and very unreliable.

it is not so much the velocity actually recorded in those districts which is required, as the velocity which might have been recorded had the physical features of the district been removed or made to correspond with those on the seaboard.

The point I wish to emphasize is that the same number on the scale employed should always indicate the same force—a wind of the velocity proper to that number whether the scale be used inland or at sea. From the Annual Reports of the Meteorological Office it appears that a wind of the velocity of 44 miles per hour, which is that due to a force of 9 on Beaufort's scale, or a "strong gale," has not once been recorded by the anemometer at the Kew Observatory for some years past, although during the same interval higher estimated forces have several times been reported in the daily weather reports as having been experienced in London. This fact shows that in London the higher numbers of the scale are often attached to winds which observers at more exposed stations would place lower down. As a matter of fact, I think the higher numbers of the Beaufort scale are rarely justified at inland stations, and the highest numbers never. What is needed, then, in the absence of an anemometer, is some means by which observers can be taught to recognise, by its visible effect upon their surroundings, the velocity of the wind, and so be able to assign to it its proper position on the scale.

For this purpose, I suggest that it should be made possible, by the publication of reliable anemometrical results day by day, for observers to ascertain what was the general velocity of the wind in their district, using that word in a somewhat comprehensive way, during strong winds and gales, the observable effects of which they had been careful to note; then by associating these effects with the known velocity, they would presently form for themselves conceptions of wind velocity which would enable them, by means of the recognised equivalents, to assign to a given wind its place upon the scale more accurately and consistently than is now generally possible.

As a matter of fact, I believe some such method as this is actually used by the best observers of wind-force. From long and careful observations they have come to regard certain effects of the wind, the character of which will of course vary in different localities, as being due to certain forces, and the number on the scale by which it is to be represented is determined accordingly. For example, when I have been comparing my estimate of wind-force with that of an experienced observer, as I always do when an opportunity offers, and I have, perhaps, thought his estimate low, he has probably justified it by some such remark as this: "The boat you see out there wouldn't be carrying the sail she does with the force you suggest"; or, "With the wind from this quarter we should have a much heavier sea," thus showing that his estimate was something better than a simple guess.

(To be continued.)

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE STUDY OF THUNDERSTORMS.

ALLOW me to welcome the proposals contained in Mr. Bonacina's letter, published in the August number of your magazine, containing suggestions for a co-operative study of thunderstorms.

Little or no progress appears to have been made in this branch of climatology since the admirable report of the "Thunderstorm Committee of the Royal Meteorological Society in 1888 and 1889." A considerable number of observers in these islands must have in their possession more or less full details of thunderstorms at their stations, which have occurred since the above report.

No doubt a discussion of these, on some definite basis to be agreed upon, would be a great help to us in further elucidating the distribution &c., of thunderstorms. Probably this suggestion may not be workable, as, no doubt, considerable monetary assistance would be necessary to help in any adequate discussion of the results. Nevertheless, I have made the proposal for what it may be worth.

At the same time, there would not appear to be any insuperable difficulty in arriving at some co-operative scheme for the observation of thunderstorms occurring in the future. I, for one, should be only too pleased to lend whatever help I can to any scheme that may hereafter be formulated.

The reasons for the neglect of this fascinating branch of atmospheric phenomena one fails to see.

SPENCER C. RUSSELL, F.R.Met.Soc.

Ashley Road, Epsom, August 26th, 1905.

"LINE SQUALL" AT SIDMOUTH.

THE HON. RALPH ABERCROMBY in "Weather," 2nd edition, pp. 252 and 253, gives a description and illustration of a "line-squall." Conditions were so similar at Sidmouth, Devon, on August 22nd at 5.45 p.m., that they may be worth putting on record.

The squall passed very quickly from W. to E., and the wreath of dark heavy clouds followed by the sheet of rain was very pronounced. The rain lasted about 45 minutes and, just as it was ceasing, a most brilliant rainbow was produced.

It is to be noted that the Weekly Weather Report for 6 p.m. on the day in question, shows a secondary depression over the Irish Sea and moving eastwards.

F. DRUCE.

65, Cadogan Square, S.W., 5th September, 1905.

HAIL STORM IN SUFFOLK.

I HAVE just measured the amount of water in my rain-gauge after a heavy hailstorm, accompanied by thunder, and it amounted to $\cdot 73$ in. As by far the larger amount of the fall was hail, there being a few drops of rain at the commencement and at the finish, I should say that a great deal was lost by the large hailstones jumping out of the funnel.

Some of the biggest hailstones were the size of a common hazel nut, the majority the size of a marrowfat pea and in shape like a peg-top, streaked alternately with opaque and clear ice, having a very pretty appearance. Some of the biggest were, however, quite clear ice, and of a tabloid shape.

The fall lasted from 12.40 to 1.5 p.m. (25 minutes, not more), the hail was practically confined to 15 minutes (12.45—1 p.m.). Curiously, this is our first thunderstorm this summer, though we have had many quite close to us, notably one on 30th May with 1.30 in., consequently our record for May was 2.04, in contrast to 1.26 at Westley, Bury St. Edmunds, which is due N. about 7 miles in a bee-line. I regret that I did not send you that month's record at once, for I think you would have altered your map of rainfall for May, 1905.

B. P. OAKES.

Hawkedon Rectory, Bury St. Edmunds, August 28th, 1905.

THUNDERSTORMS AND HEAVY RAINS DURING AUGUST.

A THUNDERSTORM of exceptional violence occurred over Devon and Somerset on the evening of August 15th, accompanied in many places by torrents of rain. Many instances of structural damage by the lightning are reported, buildings in some cases being set on fire and destroyed; a number of cattle are said to have been killed, but, happily, we have yet seen no report of serious injury to human life, though many narrow escapes are stated to have been experienced. The storm is described as having been of exceptionally long duration, with deafening thunder and extremely vivid lightning. According to an account given in the *Bristol Mercury*, the neighbourhood of Bath suffered severely, and the reports of damage sustained in that district are numerous. At Bridgwater the thunder was stated to have been "simply deafening" and the lightning very vivid. In the town, however, much more damage was done by the rain than the lightning, many streets being flooded and houses damaged by the inrush of water. In the surrounding country, the injury to crops from the same cause is said to have been extensive. From the reports we have received, the rainfall accompanying the storm appears to have been somewhat irregularly distributed, but no doubt the heaviest precipitation was experienced in a small area around the estuary of the Exe; and we print below letters from some of our observers who have kindly forwarded notes of their experiences:—

"I registered 3.98 in. of rain, which fell between 9 p.m. on August 15th and 9 a.m. on the 16th. I hear that 3 ins. was recorded at Dawlish, but I do not know the exact amount; over two inches fell at Kenton and Mamhead. I should like to have a photo. of the road outside my gate to show the mischief done."—C. F. BENTHALL, *Cofton Vicarage, Starcross, August 18th, 1905.*

"I send you the amount of rain registered here on Wednesday morning, 16th—2.89 in. It fell in 6 hours during a thunderstorm, and is the largest quantity of rain I have measured here in 24 hours."—D. C. STEWART, *Nidderdale, Exmouth, August 17th, 1905.*

"We had such an exceptional thunderstorm last night that I think you may be glad to hear a few particulars of it. At 8.40 p.m. on Tuesday, 15th August, a flash of lightning, thunder, and a torrent of rain came with a rush after a hot and sultry day. From that hour till about 4 a.m. on Wednesday there was no stop. This morning 3.38 inches of rain was measured, and to-day has been dry. The lightning and thunder were often simultaneous. At other times I counted 4, 5, and up to 20 between. The water-courses are scoured out and a little island has formed in the river, opposite one of the town surface-water drains, from the rubble washed down the hills. I do not hear of any death from lightning. Fire-struck objects must have been extinguished instantly by the rain. The streams were so low that there is no great flood, even with the downpour. I have never seen or heard anything so extreme in Devonshire, and all to whom I have spoken say the same."—L. J. B. G., *Charlton House, Dawlish, August 16th, 1905.*

Another remarkable fall of rain occurring during the month was that of August 24th and 25th, which affected almost the whole of Ireland, especially the eastern and central portions of the country. Dublin and district appear to have been particularly severely visited, and falls ranging from three to five inches for the two days are reported from stations in the neighbourhood. By far the larger part of this quantity fell on the 25th. The downpour, which is stated to have lasted without intermission for some 40 hours, culminated in the flooding of several small rivers on the eastern coast, occasioning much damage in many places. The most disastrous flood occurred at Bray, a fashionable health resort, 13 miles south-east of Dublin, well known for the picturesque scenery to be found in its neighbourhood. Here widespread destruction was wrought in a part of the town known as Little Bray by a sudden rise in the Dargle river, which inundated the streets making them impassable. The inmates of the houses had to be rescued by boats, and hundreds were rendered homeless. One man lost his life, and many other persons were rescued only by the greatest exertions. It is unnecessary for us to say more concerning the exciting scenes which were witnessed, as they have already been vividly described by the newspaper press all over the country. A

glance at the Daily Weather Report for the 26th of August shows very distinctly the track of the depression, which must be held responsible for the deluge. At 6 p.m. on the 25th the centre of the disturbance lay outside the Bristol Channel, and moving northward up the St. George's Channel, was immediately over Dublin at 8 a.m. on the 26th; here it changed its course to eastward across the Irish Sea, and ultimately crossed England in a north-easterly direction. Below is given a Table which, though by no means complete, will give some idea of the intensity of the rainfall over the district most severely affected. The Table includes all instances where a fall of 2 inches or more was measured in the two days.

COUNTY.	STATION.	24TH. in.	25TH. in.	TOTAL. in.
<i>Cork</i>	Cork, Wellesley Terrace	1·75	·36	2·11
<i>Waterford</i> ...	Waterford, Brook Lodge.....	·89	1·55	2·44
„	Glenam [Clonmel]	1·24	·80	2·04
<i>Tipperary</i> ...	Ballingarry, Gurteen	1·07	1·74	2·81
<i>Wexford</i>	Templeudigan, Ballindoney.....	·62	1·57	2·19
„	Gorey, Courtown	·56	2·46	3·02
<i>Wicklow</i>	Greystones, Knockdolian	·82	3·35	4·17
„	Sugar Loaf, Rocky Valley	·50	5·50	6·00
„	Bray, Fassaroe	·64	4·45	5·09
<i>Carlow</i>	Carlow, Brownes Hill	·56	2·12	2·68
<i>Queen's County</i>	Mountrath, Ballyfin.....	1·07	1·48	2·55
<i>Dublin</i>	Ballybrack, Streamville	·55	3·20	3·75
„	Killiney	·58	3·06	3·64
„	Stillorgan.....	·68	3·22	3·90
„	Kingstown, People's Park	·52	3·15	3·67
„	„ Board of Works ..	·52	3·17	3·69
„	Rathmines, Leinster Road	·50	3·46	3·96
„	Dublin, Fitzwilliam Square	·51	3·44	3·95
„	„ Trinity College.....	·49	3·30	3·79
„	„ Leeson Park.....	·59	3·74	4·33
„	„ Phoenix Park .....	...	3·35	...
„	„ Glasnevin .....	...	3·58	...
„	Malahide.....	...	3·11	...
<i>Meath</i>	Oldcastle, Killeagh	·68	2·65	3·33
„	Moynalty, Westland.....	·55	2·88	3·43
<i>Westmeath</i> ...	Athlone, T'wyford	·80	1·65	2·45
„	Moate, Coolatore	·81	2·05	2·86
„	Mullingar, Belvedere.. ..	·65	2·65	3·30
<i>Louth</i>	Drogheda, St. James'.....	·64	4·01	4·65
<i>Longford</i>	Ballymahon, New Castle	·65	1·81	2·46
<i>Galway</i>	Ballinasloe	·84	1·45	2·29
„	Woodlawn	·73	1·68	2·41
<i>Down</i>	Warrenpoint, Summer Hill ..	·73	1·40	2·13
„	Seaforde	·00	2·29	2·29
„	Banbridge, Milltown	·22	2·25	2·47
<i>Antrim</i>	Belfast, Springfield	·13	2·22	2·35
<i>Tyrone</i>	Stewartstown, The Square	·35	2·18	2·53

The Table shows that the greatest intensity occurred over an area embracing the southern part of the county of Dublin, and the northern part of Wicklow; and the record of 6·00 ins. at Rocky Valley, between Great Sugar Loaf and Carrigoona, suggests that possibly an even heavier fall took place farther in the mountains.

REVIEW.

Meteorology : or, Weather Explained. By J. G. MCPHERSON, Ph.D., F.R.S.E. London: T. C. & E. C. Jack, 1905. Size 7 x 4½, pp. 126.

THE title is misleading, for the little book which bears it does not explain the weather, nor does it show any extensive knowledge of the literature of meteorology. It is a chatty, garrulous book, with many pleasant reminiscences of personal experiences by a careful and watchful observer, but it makes no attempt to deal systematically with meteorology or with weather. The essential part is a very useful summary of Dr. John Aitken's excellent work on the phenomena of dew and on the functions of atmospheric dust. Dr. Aitken's discussion of cyclonic and anti-cyclonic movements, based on experiments, is referred to, but too briefly to be of use to the reader, and the contributions of the myriad of meteorological workers in all countries are passed over unnoticed, or barely mentioned. The necessary limits of space in a shilling book, of course, excuses many omissions.

We dissent *in toto* from the first paragraph of the chapter headed "Rain Phenomena," which runs:—

"The soft rain on a genial evening, or the heavy thunder-showers on a broiling day, are too well-known to be written about. Sometimes rain is earnestly wished for, and at other times it is dreaded, according to the season, seed-time or harvest. Some years, like 1826, are very deficient in rainfall, when the corn is stunted and everything is being burnt up; other years, like 1903, there is an over-supply, causing great damage to agriculture. The year 1903 will long be remembered for its continuous rainfall; it is the record year; no year comes near it for the total rainfall all over the kingdom."

Our annual labour is indeed in vain if the phenomena of rainfall are too well-known to be written about. The best example of a year of deficient rainfall, to the best of our knowledge, is 1887. Although 1903 was a very wet year, we found, as the result of six strenuous months spent in collating the records of 4,000 stations and comparing these with the records of other wet years, that 1872 was wetter, and 1852 only a little less wet. The details are fully set forth in "*British Rainfall, 1903.*"

METEOROLOGICAL OBSERVATIONS DURING THE SOLAR ECLIPSE.

Mr. W. L. Fox has kindly forwarded particulars of the records of the self-registering instruments at the Falmouth Observatory on August 30th. The thermograph showed a slight depression at 12.30 p.m., and the temperature continued to fall very slightly till 1.15 p.m., well after the maximum phase. The barometer rose gradually and steadily throughout the day, the rise being slightly

more pronounced between 1 and 2 p.m., but there were no irregularities in the trace. The magnetic curves were somewhat unsteady, but show no special characteristics during the time of the eclipse.

Mr. C. P. Chambers, of Broughton-in-Furness, has favoured us with a diagram, showing the movements of the barometer and thermometer during the eclipse. No apparent effect is evident in the barometer record, but a decline of temperature is distinctly shown, the thermometer falling from nearly 60° at noon to 56° at 1.15 p.m. A recovery then took place, and at 3 p.m. the thermometer touched 60° , which was the maximum for the day.

A STRANGE SPECTACLE.

THE NEW ZEALAND PRESS furnishes particulars of a remarkable sight recently witnessed at various places on those islands, and we take the liberty of reprinting a portion of the monthly report, issued from the Meteorological Office at Wellington, which contains a description of the spectacle, with the impressions of several eye-witnesses :—

"On the 9th June, about three-quarters of an hour after sunset, a most remarkable phenomenon was witnessed for about twenty minutes in the western sky at places so far apart as Auckland, New Plymouth, Halcombe, Otaki, Nelson, and Hokitika. It must have been over five hundred miles away on the Tasman Sea. It may be described as a "meteoric cloud," and its appearance that of clear silver-coloured lightning. It was possibly caused by a meteor entering our atmosphere in an eastward and almost horizontal direction, and becoming luminous through combustion and disintegration into meteoric dust caused by the friction of its rapid passage through the atmosphere. At places it appeared like a long streak of luminous cloud, which gradually assumed a "Z" shape. At New Plymouth our observer, Mr. W. G. Palmer, first observed a luminous head, and afterwards another ball of light also appeared lower down. This latter shape it kept for about ten minutes, and then finally dissolved. Its azimuth is given near Auckland as about 358° ; at New Plymouth, 310° , with an altitude of 35° ; at Otaki, W.N.W., with an altitude of about 12° ; at Nelson, the azimuth 292° , and altitude 30° . Mr. A. D. MacFarlane, Meteorological Observer at Hokitika, writes: "The peculiar body of meteor which was noticed at Nelson and elsewhere was also observed here. It was noticed in the north-western heavens by a number of people, and for a time appeared to approach rapidly, then gradually faded away. It had the appearance of a large luminous body, with a long wavy ribbon-like tail." Mr. L. A. MacDonald, of Halcombe, reported: "A most extraordinary aerolite was seen in the western sky on the evening of the 9th. It traversed a zigzag course, and left a brilliant trail against the sky about 30° long; in shape it was not unlike a streak of forked lightning. It preserved its position and luminosity for more than twenty minutes, then it became more diffused and fainter, but it retained a glow equal to that of the zodiacal light for ten minutes longer. While the trail was at its greatest brightness it far outshone the moon, which was at the time entering into her first quarter.

D. C. BATES, F.R.Met. Soc.

Meteorological Office, Wellington, 17th July, 1905."

EIGHT MONTHS' RAINFALL OF 1905.

Aggregate of Rainfall for January—August, 1905.

Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.
	in.			in.			in.	
London	15·65	101	Bolton	24·98	99	Braemar	20·72	96
Tenterden	17·42	108	Wetherby	14·41	86	Aberdeen	17·25	87
Hartley Wintney	15·70	98	Arnccliffe	30·47	83	Cawdor	19·27	105
Hitchin	16·57	110	Hull	13·39	81	Invergarry	35·16	108
Winslow	14·48	87	Newcastle	11·51	66	Bendampth	50·45	102
Westley	15·50	99	Seathwaite	71·73	92	Dunrobin	20·15	107
Brundall	13·70	91	Cardiff, Ely	21·79	86	Killarney	29·72	85
Alderbury	18·39	107	Haverfordwest	26·30	96	Waterford	24·66	103
Winterbourne	18·18	81	Gogerddan	29·51	112	Broadford	21·56	103
Torquay	17·32	84	Llandudno	16·39	93	Carlow	20·83	97
Polapit Tamar	21·23	98	Cargen	23·25	89	Dublin	18·05	103
Bath	15·67	83	Lilliesleaf	17·61	86	Mullingar	22·82	99
Stroud, Upfield	18·69	101	Colmonell	23·16	89	Ballinasloe	19·92	86
Woolstaston	18·95	94	Glasgow	18·20	82	Clifden	40·23	83
Bromsgrove	15·33	99	Inveraray	42·22	115	Crossmolina	27·51	92
Boston	14·16	98	Islay, Eallabus	30·88	115	Seaforde	23·13	97
Hodsock Priory	11·54	74	Mull	32·98	100	Londonderry	23·62	96
Derby	11·90	72	Dundee	13·55	74	Omagh	24·30	104

Although the rainfall of August has had the effect of increasing the percentages all over the kingdom, and raising the average percentage from 87 at the end of July to 94 in the present table, the rainfall for Great Britain, at least, was of so general a character that the relative distribution is little changed.

Practically all the country south of the Grampians has a rainfall well below the average of the eight months, the only exceptions being the relatively wet area in the neighbourhood of London extending into the home counties, and an isolated instance in Wales. The only well defined area with a rainfall in excess of the average is that part of Scotland cut off by the Caledonian Canal. All stations in this region had more than the normal fall. Inveraray was still, save Seathwaite, both absolutely and, jointly with Eallabus, relatively the wettest station in the table, Newcastle with two thirds of its normal fall being the driest. The valley of the Trent is also shown to be remarkably dry. Ireland, which at the end of July was represented as having a deficiency of about 15 per cent. for the country, has now advanced to within 3 per cent. of the average fall, due to the abnormal rains attending the passage of a depression on August 24th and 25th. The eastern coast was in this instance most affected by the disturbance, and certain stations show a remarkable increase, notably Dublin, which with a deficit of 24 per cent. at the end of July, has now moved forward to an excess of 3 per cent. The south-west of the country, usually in the track of such disturbances, was on this occasion well to the west, and the fall was slight compared with the deluge visiting the Dublin district.

RAINFALL AND TEMPERATURE, AUGUST, 1905.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.]	RAINFALL.				Days on which 101 or more fell.	TEMPERATURE.				No. of Nights below 32°.			
		Total Fall.	Diff. from average, 1870-99.	Greatest in 24 hours.			Max.		Min.					
				Depth.	Date.		Deg.	Date.	Deg.	Date.		Shade	Glass	
		inches	inches.	in.										
I.	London (Camden Square) ...	2·24	—	·09	·83	28	16	78·1	15	45·4	24	0	0	0
II.	Tenterden.....	2·47	+	·10	·68	28	15	75·3	13	44·0	24	0	0	0
„	Hartley Wintney	2·34	+	·25	·57	27	17	75·0	4, 11a	45·0	15b	0	0	0
III.	Hitchin	3·25	+	·99	·96	28	18	74·0	14	43·0	16	0	0	0
„	Winslow (Addington)	3·03	+	·50	·85	28	18	75·0	14, 15	43·0	17, 24	0	0	0
IV.	Bury St. Edmunds (Westley)	2·21	—	·19	·35	26	16	78·5	13	45·0	17	0	0	0
„	Brundall	2·27	+	·08	·64	29	18	77·2	21	46·0	21	0	0	0
V.	Alderbury	3·06	+	·71	·68	3	20	84·0	15	30·0	23	1	0	0
„	Winterbourne Steepleton ...	4·15	+	·97	1·17	2	18	74·2	15	40·7	24	0	0	0
„	Torquay (Cary Green)	3·16	+	·25	·77	15	20	69·8	14	50·2	14	0	0	0
„	Polapit Tamar [Launceston]	5·32	+	2·13	·66	27	21	73·2	15	41·0	24	0	0	0
„	Bath	3·98	+	1·02	·70	25	20	74·5	15	42·2	24	0	0	0
VI.	Stroud (Upfield)	4·43	+	1·60	·80	28	19	76·0	15, 21	48·0	23	0	0	0
„	Church Stretton (Woolstaston)	4·25	+	1·01	·87	28	19	70·0	15	43·0	31	0	0	0
„	Bromsgrove (Stoke Reformatory)	5·13	+	2·67	·80	7	19	71·0	...	39·0	...	0	0	0
VII.	Boston	2·78	+	·53	·72	28	12	75·0	8	46·0	2	0	0	0
„	Worksop (Hodsock Priory)	2·43	+	·12	·63	25	16	74·5	15	38·7	17	0	1	0
„	Derby (Midland Railway) ...	2·93	+	·51	·38	17	20	76·0	14	45·0	16, 23	0	0	0
VIII.	Bolton (The Park)	5·64	+	1·28	1·14	25	22	73·6	15	44·5	31	0	0	0
IX.	Wetherby (Ribston Hall) ...	3·88	+	1·29	·72	26	17	...	...	...	...	...	...	...
„	Arncliffe Vicarage	5·36	—	·07	·90	19	19	...	...	...	...	...	...	...
„	Hull (Pearson Park)	2·73	—	·08	·43	25	21	74·0	14, 21	45·0	25	0	0	0
X.	Newcastle (Town Moor) ...	2·57	—	·57	·57	26	24	...	...	...	...	...	...	...
„	Borrowdale (Seathwaite) ...	9·77	—	1·46	1·77	17	20	72·9	15	40·4	31	0	0	0
XI.	Cardiff (Ely)	4·33	—	·19	·50	2	21	...	...	...	...	...	...	...
„	Haverfordwest (High St.) ...	5·47	+	1·43	·85	27	21	72·8	15	41·6	14	0	0	0
„	Aberystwyth (Gogerddan) ..	6·99	+	2·39	2·15	22	14	79·0	17	40·0	12c	0	0	0
„	Llandudno	2·81	+	·05	·80	22	16	72·0	15	46·8	14	0	0	0
XII.	Cargen [Dumfries]	3·84	—	·26	·58	17	14	74·0	15	40·0	31	0	0	0
„	Lilliesleaf (Riddell)	4·62	+	1·20	·80	25	20	69·0	31	30·0	4	1	12	0
XIII.	Edinburgh (Royal Observatory) ..	2·46	...	...	·43	28	18	67·8	4	42·4	31	0	0	0
XIV.	Colmonell	5·00	+	1·02	·90	26	20	77·0	15	39·0	30	0	0	0
XV.	Tighnabruaich	6·59	+	1·46	1·38	4	20	63·0	14	42·0	23, 30	0	0	0
„	Mull (Quinish)	4·20	—	·64	·96	17	19	...	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis) ..	3·45	+	·37	·75	3	17	70·6	8, 13	38·2	31	0	0	0
XVII.	Braemar	4·02	+	·19	·70	3	22	64·9	13	38·8	9	0	0	0
„	Aberdeen (Cranford)	3·64	+	·42	1·00	3	22	68·0	7, 12	43·0	15, 20	0	0	0
„	Cawdor (Budgate)	3·05	—	·02	·62	4	24	...	...	...	...	...	...	...
XVIII.	Invergarry	2·98	—	1·21	·45	9	13	...	...	...	...	...	...	...
„	Bendampy	6·01	—	·90	1·02	17	24	...	...	...	...	...	...	...
XIX.	Dunrobin Castle	3·15	+	·50	·90	3	19	64·5	8	45·5	31	0	0	0
„	Castletown	4·24	...	...	·58	17	27	67·0	22	40·0	3d	0	0	0
XX.	Killarney	5·09	+	·17	·61	23	22	71·5	15	43·5	8	0	0	0
„	Waterford (Brook Lodge) ...	5·54	+	1·83	1·55	25	18	70·0	7, 16	40·0	22	0	0	0
„	Broadford (Hurdlestown) ...	4·27	+	·48	·87	27	22	72·0	14	44·0	21	0	0	0
XXI.	Carlow (Browne's Hill)	6·05	+	2·54	2·12	25	19	...	...	...	...	...	...	...
„	Dublin (Fitz William Square) ..	7·02	+	4·00	3·44	25	22	70·6	16	46·0	31	0	0	0
XXII.	Ballinasloe	5·72	+	1·76	1·45	25	20	74·2	16	40·0	2	0	0	0
„	Clifden (Kylemore House) ..	7·15	—	·75	1·00	31	22	...	...	...	...	...	...	...
XXIII.	Seaforde	7·82	+	4·30	2·29	25	21	72·0	9, 15	44·0	23	0	0	0
„	Londonderry (Creggan Res.) ..	4·46	+	·52	·77	25	24	...	...	...	...	...	...	...
„	Omagh (Edenfel)	4·86	+	·83	1·05	25	23	72·0	16	41·0	7	0	0	0

+ Shows that the fall was above the average; — that it was below it.

a and 12. b and 16, 17. c and 13, 23. d and 16, 23.

SUPPLEMENTARY RAINFALL, AUGUST, 1905.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	3.45	XI.	New Radnor, Ednol	6.84
„	Ramsgate, West Cliff	1.53	„	Rhayader, Nantgwillt ...	7.86
„	Hailsham	3.37	„	Lake Vyrnwy	6.65
„	Crowborough	3.30	„	Ruthin, Plâs Drâw	4.86
„	Osborne	2.25	„	Criccieth, Talarvor	4.88
„	Emsworth, Redlands	2.87	„	Anglesey, Lligwy	3.26
„	Alton, Ashdell	3.49	„	Douglas, Woodville	5.50
„	Newbury, Welford Park ...	3.55	XII.	Stoneykirk, Ardwell House	4.99
III.	Harrow Weald	2.54	„	Dalry, Old Garroch	5.27
„	Oxford, Magdalen College..	2.91	„	Langholm, Drove Road....	5.79
„	Banbury, Bloxham Grove...	4.84	„	Moniaive, Maxwellton House	4.53
„	Pitsford, Sedgebrook	3.02	XIII.	N. Esk Reservoir [Penicuik]	3.60
„	Huntingdon, Brampton	3.15	XIV.	Maybole, Knockdon Farm..	4.43
„	Wisbech, Bank House	1.76	„	Glasgow, Queen's Park	3.60
IV.	Southend	1.73	„	Campbeltown, Redknowe...	4.86
„	Colchester, Lexden	1.50	XV.	Inveraray, Newtown	6.22
„	Saffron Waldon, Newport...	2.21	„	Ballachulish House	7.53
„	Rendlesham Hall	1.58	„	Islay, Eallabus	5.65
„	Swaffham	2.84	XVI.	Dollar	3.33
„	Blakeney	2.12	„	Loch Leven Sluices	4.03
V.	Bishops Cannings	6.05	„	Balquhider, Stronvar	7.34
„	Ashburton, Druid House ...	4.73	„	Coupar Angus Station	3.33
„	Okehampton, Oaklands	6.05	„	Blair Atholl	3.43
„	Hartland Abbey	3.64	„	Montrose, Sunnyside	3.32
„	Lynmouth, Rock House ...	4.99	XVII.	Alford, Lynturk Manse ...	4.98
„	Probus, Lamellyn	4.66	„	Keith	3.76
„	Wellington, The Avenue ...	4.57	XVIII.	N. Uist, Lochmaddy	3.67
„	North Cadbury Rectory ..	4.00	„	Aviemore, Alvey Manse ...	3.37
VI.	Clifton, Pembroke Road ...	3.89	„	Loch Ness, Drumnadrochit.	2.58
„	Moreton-in-Marsh, Longboro'	5.26	„	Glencarron Lodge	8.01
„	Ross, The Graig	3.65	„	Fearn, Lower Pitkerrie	2.99
„	Shifnal, Hatton Grange	4.80	XIX.	Invershin	3.30
„	Wem Rectory	4.20	„	Altnaharra	3.22
„	Cheadle, The Heath House.	5.04	„	Bettyhill	3.95
„	Coventry, Kingswood	4.23	„	Watten	2.78
VII.	Market Overton	2.95	XX.	Cork, Wellesley Terrace ...	6.77
„	Market Rasen	3.32	„	Darrynane Abbey	5.18
„	Bawtry, Hesley Hall	2.50	„	Glenam [Clonmel]	5.61
VIII.	Neston, Hinderton	3.88	„	Ballingarry, Gurteen	5.73
„	Southport, Hesketh Park...	3.40	„	Milton Malbay	4.19
„	Chatburn, Middlewood	4.88	XXI.	Gorey, Courtown House ...	5.57
„	Cartmel, Flookburgh	5.77	„	Moynalty, Westland	7.66
IX.	Langsett Moor, Up. Midhope	4.24	„	Athlone, Twyford	5.48
„	Scalby, Silverdale	3.20	„	Mullingar, Belvedere	6.74
„	Ingleby Greenhow	3.41	XXII.	Woodlawn	7.20
„	Middleton, Mickleton	3.58	„	Westport, Murrisk Abbey..	4.73
X.	Beltingham .....	...	„	Crossmolina, Enniscoe	4.41
„	Font Reservoir, Fallowlees.	4.87	„	Collooney, Markree Obsy...	5.34
„	Hlderton, Lilburn Cottage...	3.44	XXIII.	Enniskillen, Portora .....	...
„	Keswick, The Bank	4.65	„	Warrenpoint	7.63
XI.	Llanfrehfa Grange	5.15	„	Banbridge, Milltown	5.99
„	Treherbert, Tyn-y-waun ...	10.42	„	Belfast, Springfield	6.64
„	Carmarthen, Friary	5.58	„	Bushmills, Dundarave	4.90
„	Castle Malgwyu	6.06	„	Stewartstown	7.44
„	Plynlimon	11.10	„	Killybegs	5.02
„	Tallyllyn	1.80	„	Horn Head	4.88

METEOROLOGICAL NOTES ON AUGUST, 1905.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—Rather cool and cloudy. On no day did the max. temp. reach 80° , but the mean was $61^{\circ}\cdot9$, or only $0^{\circ}\cdot2$ below the average. Sunshine was deficient, the total duration being only 148·4* hours. A feature of the month was the number of beautiful evenings, often following stormy days. Strong winds about the middle. A short TS occurred on 5th and thundery conditions prevailed from 27th to 29th. Duration of R 40·1 hours.

ABINGER HALL.—The first and last portions were stormy, but a wonderful spell of fine weather in the middle enabled farmers to get in the harvest in good condition. Corn crops were fairly good. Sharp TSS on 22nd and 28th. Frost on 23rd.

TENTERDEN.—Rather a cold month, with showers in the first week and a good deal of R in the last. Duration of sunshine 193·3† hours.

CROWBOROUGH.—Cool and pleasant, with a considerable amount of sunshine. The R, which fell mainly in the first and last weeks, was above the average, but there was still a deficiency of 1·52 in. from January 1st. Mean temp. $58^{\circ}\cdot7$.

HARTLEY WINTNEY.—The first week was wild and stormy, with TSS and sunless days. The weather improved from 7th to 18th, becoming hotter and drier. The last week was wet and stormy, with distant TSS. Ozone on 23 days; mean 2·7. Harvest and crops good.

WISBECH.—Although it was cloudy the eclipse was seen at about 0.40 p.m., the sun being then a crescent. As the darkness soon after came on, birds became greatly excited, swallows, swifts and other small birds flying wildly about till 1.15 p.m., when they seemed to settle.

BURY ST. EDMUNDS.—Warm and dry with high max. temp. Very favourable for harvest till 26th; then good R, which was much wanted for roots.

BISHOPS CANNINGS.—Harvest began early but was greatly hindered; the greater part was, however, carried by the end of the month. On 15th 1·52 in. of R fell, nearly all between 8 and 10 p.m. with T.

TORQUAY.—Duration of sunshine 188·9* hours, or 18·4 hours below the average. Mean temp. $60^{\circ}\cdot3$, or $1^{\circ}\cdot3$ below the average. Mean amount of ozone 4·7.

OKEHAMPTON.—Very wet, with an exceptional fall of 1·72 in. on 15th, all coming down in about 2 hours during a TS.

WELLINGTON.—A great contrast to July, being unsettled, wet and cool almost throughout. R about 1·75 in. above the normal. The TS on 15th and 16th was very severe. The temp. reached 70° on 6 days only.

NORTH CADBURY.—Ranking, as regards temp., with the miserable Augusts of 1902 and 1903, the max. temp. being very low, but nights not cold. A very bad gale, lasting 24 hours, ended at 7 p.m. on 4th. T on 5th and T and L on 1st, 15th, 27th and 29th, that on 29th being preceded by terrific inky blackness in the N. although the storm was not severe. The eclipse was well seen.

ROSS.—Unsettled and showery month, but very fine from 11th to 16th. Harvest was somewhat hindered. Two slight TSS.

WORKSOP.—Showery, with no hot weather. The R for the last 12 months was only 15·25 in., or 39 per cent. below the average.

BOLTON.—Mean temp. $56^{\circ}\cdot1$, being $1^{\circ}\cdot2$ below the average; 60° was reached on only two days. Duration of sunshine 115·2* hours, or 3·1 hours below the average. TS on 17th, which was responsible for the death of a man in the neighbourhood; some trees were also damaged. T and L on 28th and T on 9th.

SOUTHPORT.—Dull, with low and unsteady bar., but in nearly all other respects fairly normal. Mean temp. $0^{\circ}\cdot7$ below the average. Duration of sunshine 26* hours below the average, and R ·39 in. under the average. Duration of R 44·4 hours. Underground water level unprecedentedly low.

LILBURN.—The R was abundant and most beneficial to growing crops and pastures, but it retarded harvest operations. TSS almost absent. Temp. normal.

LLANFRECHFA GRANGE.—The R on the first 6 days was very acceptable as scarcity of water was anticipated. Very warm in the early part. Harvest was early and well housed.

HAVERFORDWEST.—A wet and stormy month; fine and warm from 10th to 16th, broken weather afterwards. Crops were good, but much damaged by the wet. Duration of sunshine 154·0* hours.

GOGGERDDAN.—Rather wet and very cold, with frequent gales from E., N.W. and W. R was badly needed and did good to root crops but afterwards damaged harvest crops.

DOUGLAS.—Following the dry and often warm weather from May to July, this month came in with strong winds and distinctly cool conditions. On 17th the weather completely broke up, with violent gales and heavy R to 26th, during which period 3·85 in. fell. Then gloomy, wet and cold to 30th.

SCOTLAND.

CARGEN.—Warm and genial, harvest operations being very general during the latter half. T on 3rd and 9th, L on 18th. The eclipse was seen very well.

LILLIESLEAF.—There were many very heavy and continuous showers; hay and corn suffered much and could not be got in. Silent TS on 25th.

INVERARAY.—Unsettled and showery throughout, with hardly any warm days.

COUPAR ANGUS.—The R was practically normal and the mean temp. 56°·9 or 1°·2 above the average, this being due to warm nights.

ABERDEEN.—Wet, with little sunshine and light winds. Good crops and harvesting going on, but trying weather.

DRUMNADROCHIT.—R 36 in. below, and rainy days 5 above, the average of 19 years. On the whole cold and unseasonable. Thick fog all day on 27th.

CASTLETOWN.—Sunless, cold and damp throughout. Farmers were just beginning to cut barley at the end.

IRELAND.

CORK.—The R was the greatest since 1892, when it reached 8·50 in. Remarkably low temp., the mean being 55°·5. During the eclipse the temp. fell 4° during the period when it generally rises 2°.

DARRYNANE ABBEY.—A bad month with a few very fine days. R 13 per cent. over the average.

WATERFORD.—From 24th to 27th 3·05 in. of R fell with some H. T on 3rd and 4th. Fog on 14th and 17th. Mean temp. 57°·0. The eclipse was seen well.

BALLINGARRY.—Continuous R for 36 hours from 8 p.m. on 24th, yielding 2·81 in.

DUBLIN.—Changeable and cool and notable for the excessive R. Nearly half the total fell on 25th, when 3·44 in. was measured. The mean temp. was 58°·5, and the prevailing winds were N.W. and W.S.W.

BANBRIDGE.—R 2·79 in. above the average of 40 years. On 25th 2·25 in. fell, the greatest fall since October 12th, 1865.

BELFAST.—The wettest month since October, 1903, owing to the R on 25th and 26th, when 3·00 in. fell, making the wettest spell since August, 1883. Fortunately there was comparatively little damage by flooding.

OMAGH.—Except for a fine spell in the second week the month was rainy and unsettled and unfavourable for harvest operations. The most noteworthy circumstance was the heavy general R on 26th, but the moisture coming from the S. and E. the clouds had deposited their extraordinary burden before reaching here and only 1·05 in. fell.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, March, 1905.

STATIONS. (Those in italics are South of the Equator.)	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.										
	°		°		°	°	°	0-100	°	°	inches			
London, Camden Square	60·9	22	27·0	4	52·8	38·5	40·9	87	102·8	21·1	3·00	21	7·1	
Malta.....	...	...	...	...	...	...	...	...	...	...	...	...	...
Lagos.....	93·0	9a	72·0	2	90·0	77·7	75·3	72	146·0	66·5	1·48	9	5·5	
Cape Town	95·4	18	52·6	5	79·0	60·6	58·2	70	...	...	1·00	5	3·8
Durban, Natal	88·7	12	58·7	18b	80·1	64·3	...	...	144·4	...	4·07	15	4·7
Johannesburg	80·4	13	42·0	18	69·8	52·6	53·7	86	142·2	42·2	3·42	14	5·1	
Mauritius.....	86·7	1, 6	64·7	27	83·4	72·4	72·2	85	153·2	58·9	14·98	27	8·2	
Calcutta.....	94·7	30	61·4	21	86·2	67·4	67·0	74	150·9	57·5	3·48	9	5·3	
Bombay.....	86·7	15	62·0	2	82·8	70·4	65·6	71	134·4	54·1	·00	0	2·3	
Madras.....	96·9	31	68·8	6	90·4	75·2	71·5	73	150·0	65·8	·85	3	3·3	
Kodaikanal.....	73·3	13	45·9	6	67·6	51·1	47·4	67	138·4	32·1	2·34	11	3·9	
Colombo, Ceylon.....	98·7	6	72·0	5	89·3	76·6	76·9	75	154·0	67·0	1·27	4	3·6	
Hongkong.....	77·0	14	47·2	5	61·8	56·3	55·9	88	125·1	...	11·49	20	9·6	
Melbourne.....	96·1	19	44·0	13	73·6	52·4	49·0	63	143·0	33·7	·96	5	4·6	
Adelaide	101·6	18	46·7	11	79·3	56·0	49·0	54	156·0	43·2	·15	4	3·2	
Coolgardie.....	99·6	7	44·0	20	85·1	58·3	49·2	45	159·0	39·9	·17	2	2·4	
Sydney	89·9	10	59·4	14	75·2	63·8	61·3	75	126·0	50·1	8·98	19	5·6	
Wellington	73·2	13	45·8	19	65·9	54·8	52·7	76	123·0	42·0	5·39	14	6·3	
Auckland.....	78·0	3	53·0	9	71·1	57·9	54·0	69	142·0	43·0	2·54	6	3·8	
Jamaica, Negril Point.....	85·0	14	64·9	4	83·6	68·2	68·3	76	...	...	3·73	10	...
Trinidad	90·0	1	63·0	1c	86·4	66·8	73·7	87	163·0	60·0	3·74	12	...	
Grenada.....	85·6	31	68·4	26	82·2	71·8	70·1	78	150·0	...	4·70	17	3·9	
Toronto.....	64·0	29	5·7	5	38·7	22·5	23·2	79	72·3	1·0	·51	7	5·5	
Fredericton.....	57·7	30	-18·5	15	37·9	12·6	13·5	54	...	...	1·15	6	4·4
Winnipeg	57·7	26	-19·5	12	32·9	14·8	...	...	...	...	1·78	11	6·2
Victoria, B.C.	68·0	9	31·3	29	53·1	42·6	...	...	...	...	1·39	18	7·0
Dawson	41·6	28	-17·6	16	21·3	2·2	...	...	...	...	·40	2	...

Trinidad	January ...	88·0	17	61·0	31	85·0	66·3	68·5	79	158·0	57·0	2·41	10	...
	February ...	90·0	25, 26	62·0	4	85·6	65·3	67·2	74	165·0	58·0	·59	8	...

a and 13, 14. b and 19. c and 19, 20.

Mauritius.—Mean temp. 0°·1 below, dew point 1°·7 above, and R 5·82 in. above, averages. Mean hourly velocity of wind 8·8 miles, or 1·6 below average; extremes, 30·1 on 30th and 0·0 on 25th; mean direction E.S.E. L and T 1st to 4th, 6th to 8th, 13th, 14th, 19th and 22nd; L on 5th, 15th and 31st; T on 10th and 12th.

MADRAS.—Temperature was higher than usual. TSS on 3 days; distant TSS on 2 other days, and distant L on 4 other days. Bright sunshine on 227·6 hours.

KODAIKANAL.—Bright sunshine on 222 hours.

HONGKONG.—Mean temp. of air 58°·9. R 8·85 in. above 20 years' average. Mean direction of wind E.; mean hourly velocity 17·9 miles. Bright sunshine 31·1 hours.

Adelaide.—Mean temp. of air 67°·6 or 2°·6 below, R ·91 in. below, averages.

Sydney.—Mean temp. of air 0°·2 above, humidity 0·5 below, and R 3·81 in. above, averages.

Wellington.—Mean temp. of air 0°·2 below, and R 2·23 in. above, averages.

Auckland.—Mean temp. of air above average, and R 1·00 in. below average.

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VOL. XL.

THE BRITISH ASSOCIATION IN SOUTH AFRICA, 1905.

THE meeting of the British Association in South Africa has been a remarkable departure from the traditions of three-quarters of a century, not because it took place beyond the seas, for the Association met at Montreal in 1884, and at Toronto in 1897, but because never before has a meeting been held at a number of separate centres several days' journey apart. New rules were introduced to deal with the new conditions. It was arranged that only members of the Association who had attended earlier meetings, or who had been specially elected by the Council, should be eligible for the special privileges offered by the Union Castle Shipping Company and the Colonial and Municipal authorities in South Africa. A smaller number received the greater privilege of being included in the "Official Party," all of them being present or past officers of the Association, or of the Sections, and this party was favoured with priority in the abounding hospitality lavished on the Association by the people of South Africa, a hospitality so great that it created an uneasy feeling in some minds that it could never be adequately repaid. We believe, however, that the visit of the Association will be productive of real and lasting good to South Africa.

Most of the members of the official party left Southampton on board the Royal Mail Steamer *Saxon*, on July 29th, and the voyage was one of remarkable comfort and interest. The huge vessel of more than 12,000 tons was favoured by calm weather to within a few hundred miles of the Cape, and only on the last day of the voyage was the motion sufficient to make it necessary to have "fiddles" on the tables to control the dishes at meals. The weather was, however, nearly always dull, and surprisingly cool. Only on one day, when passing Cape Verde, was the temperature as high as it had been for a week before our departure from London. The warmth increased slightly, on the whole, from the Channel until the noonday sun became vertical on August 4th, in 20° N.; thereafter, when the North-East Trades gave place to the South-West monsoon of West Africa, and that in turn changed gradually into the South-East Trades, it grew steadily cooler. On the equator, blankets, which had been discarded at Madeira as an encumbrance, came into

favour once more, and long before the south temperate zone was entered upon it became uncomfortably cool for sitting on deck at night without an overcoat.

The President of the Association, Professor G. H. Darwin, of Cambridge, and the Presidents of most of the Sections, were on board, and on the initiation of Mr. Maylard, of Glasgow, a series of short impromptu lectures was arranged, which proved both pleasant and profitable. Amongst these lectures two had some bearing on meteorology, one by Professor W. M. Davis, of Harvard University, given in 1° N., on August 7th, on the Weather of the Atlantic; the other by Dr. H. R. Mill, in 15° S., on August 10th, on the Bed of the Sea and the circulation of its waters. For a week there were two well-attended lectures each day, but that did not interfere with the ordinary ship's sports, which went on with the usual enthusiasm.

The *Saxon* reached Capetown early in the morning of Tuesday, August 15th, and the routine of a British Association meeting commenced immediately. The sectional meetings were not well attended as a rule by the over-sea members, and occasionally very small numbers were present when important papers were being read. Indeed it was generally felt that the primary objects of the Association were better pursued by excursions in the neighbourhood than by presence in the buildings where the sections met.

At the meeting of the General Committee on the afternoon of the 15th, the Report of the Council of the Association was received, and this contained a remarkable resolution regarding the co-ordination of the meteorological services of the British Empire, which we published *in extenso* last month. The meteorological papers were, unfortunately, scattered through several sections, as owing to some unexplained decision of the Council, the Sub-Section of Cosmical Physics, which has been so successful in recent years, was not continued. There were papers enough both in the Astronomical and the Meteorological departments to have made a very successful sub-section, but they suffered from being taken simultaneously in some cases, so that no discussion was possible, while in other cases limitations of time made brevity the first essential. We hope to publish abstracts of the more important papers falling within our scope, and at present give the titles only.

AUGUST 16th, Wednesday.

Prof. Beattie, Mr. Lyle, and Mr. Logeman.—*Observations on Atmospheric Electricity in South Africa.* (Section A).

Mr. A. R. Dwerryhouse.—*Report of the Committee on the underground waters of North-West Yorkshire.* (Section C).

Discussion on the effect of Climate upon Health. Speakers—Sir T. Lauder Brunton, Prof. McKendrick, Dr. Gregory, Dr. Jasper Anderson, Prof. Bohr, Dr. J. A. Mitchell, Dr. C. F. K. Murray, Dr. Jane Waterston, Dr. J. Hewat, Dr. Cassalis, Dr. Fuller, Mr. J. Barcroft. (Section I).

AUGUST 17th, Thursday.

Prof. J. C. Beattie and Prof. J. T. Morrison.—*The Magnetic Survey of South Africa.* (Section A).

Mr. A. W. Rogers.—*Glacial Periods in South Africa.* (Section C).

Prof. A. Penck.—*Changes of Climate as Movements of the Snow Line and Upper Tree Limit since Tertiary Times.* (Section C).

AUGUST 18th, Friday.

Dr. H. R. Mill.—*Comparison of the long-period rainfall records at Capetown and Greenwich.* (Section A).

Mr. C. Stewart.—*The Climatology of South Africa.* (Section E.)

The Meteorological Breakfast was arranged by Mr. Charles Stewart, Secretary of the Cape of Good Hope Meteorological Commission, but on account of the distance from the centre at which many of the visitors lived, and the difficulty of communicating with them, the attendance was much smaller than usual, and many of the over-sea members who were warmly interested in the subject were unable to be present. The following were at the breakfast, which took place on Friday, August 18th, at the Grand Parade Restaurant :—

H. L. Attridge	...	...	Sea Point, nr. Capetown.
L. C. Bernacchi	...	...	London.
Henry Bohns	...	...	Kenilworth, nr. Capetown.
J. Edmund Clark	...	...	Croydon.
Richard H. Heward	...	...	Sea Point, nr. Capetown.
W. A. Legg	...	...	Capetown.
R. H. Meunard	...	...	Woodstock, nr. Capetown.
Hugh Robert Mill	...	...	London.
R. C. Wynne Roberts	...	...	Capetown.
Charles M. Stewart	...	...	Capetown.
Thomas Stewart	...	...	Capetown.
W. H. Taylor	...	...	Capetown.

Dr. H. R. Mill briefly explained the origin and nature of the annual meteorological breakfast of the British Association, and expressed his admiration of the work being done with very inadequate resources by the Cape of Good Hope Meteorological Commission. He hoped that the time might come when the meteorological services of South Africa would be consolidated into one system, and assimilated with that of the rest of the British Empire, in accordance with the resolution passed by the General Committee. Mr. J. E. Clark also made some remarks, and Mr. Charles Stewart replied on behalf of the local meteorologists.

On Saturday, August 19th, a very interesting series of excursions took place to Table Mountain, the parties going and returning by different routes, but meeting at the reservoirs of the Capetown Waterworks, where lunch was served by the kindness of the Capetown Corporation. One party returned through the Woodhead Tunnel, which carries the water-main for a distance of over 2000 feet through the mountain. The exquisite beauty of the surroundings of Capetown in the early spring, and the remarkable hospitality of the people, made the leave-taking very regretful when the last of the British Association party sailed from Table Bay on the night of the 19th.

ON THE USE OF BEAUFORT'S SCALE.

By R. H. CURTIS.

(Continued from p. 140.)

In Vol. XXIII. of the *Quart. Jour. Roy. Met. Soc.* I have given the results of a determination I made of the velocity equivalents of the numbers of Beaufort's scale, for which I employed several thousands of anemometer observations made exclusively at stations where the instruments are satisfactorily exposed. The results are repeated in the following table :—

TABLE I.

Estd. Force by Beaufort's Scale	0	1	2	3	4	5	6	7	8	9	10	11	12
Mean Velocity Equivalent...	2	4	7	10	14	19	25	31	37	44	53	64	77
In miles per hr. (Curtis' method).													

After my results had been published I received a letter from Dr. Köppen, of the Hamburg Seewarte, in which he called my attention to a proposal he had made for obtaining the equivalents by a slightly different method to that I had adopted. My plan had been to group under each point of Beaufort's scale the corresponding anemometrical value for each estimation recorded, and then to find the mean velocity value for each point. Dr. Köppen reversed this process, and got his result by sorting out under each velocity the corresponding estimated forces, and thus finding the mean Beaufort scale value for every mile of velocity. At first sight one might think the results by both methods would be identical, but such is not the case. For the middle numbers of the scale the velocity equivalents are the same, but for the lower numbers they are smaller, and for the higher numbers they are larger by Köppen's method than by mine.

The reason for this difference is as follows :—when we compare a number of observations of a given force with the corresponding anemometer values, we always find that the latter cover a considerable range of velocity. In looking for the cause of this we must remember that an estimated force represents the impression conveyed to the mind of the observer by what he observes at a particular moment, or during a brief period, whilst the anemometer value represents the average speed of the wind during a complete hour, of which the moment of observation is but the mid-way point.

Since the wind does not always blow with uniform strength throughout an hour, it is easy to see how an increase or decrease in its force at some part of the interval will account for some of these variations in the velocity equivalents, whilst others are no doubt due to errors of estimation on the part of the observer himself, whose ultimate award is certainly arrived at, if he be an intelligent observer, through the agency of more than one of his senses.

Thus, in analysing the observations I used for my equivalents, so

as to find the mean velocity-equivalent for the same estimated force, but for winds blowing from different quarters, I found that the mean velocity for a moderate gale (force 7) from the north-east was 11 per cent. *less* than that got from the same observer's estimates of a moderate gale from the west, and for this result the well-known "feel" of the polar wind must, I think, have been largely responsible.

Now Köppen's method enables us to sort out these over and under-estimates (regarding all the differences as such), and to find the velocity which most frequently agrees with each estimated value. If the over-estimates of a given force are equal in number to the under-estimates, they will balance each other, and the result will be the same mean velocity-equivalent, whether the observations are dealt with by the method I employed, or by that of Köppen, and this is what actually happens as regards the middle values of the scale.

But when we come to the lower numbers of the scale it is found that the under-estimates of force somewhat preponderate, and therefore Köppen's method gives distinctly lower velocities as the equivalents of forces below 3. On the other hand, with force 8 and upwards, the over-estimates are the more numerous, and the result is that for these forces Köppen's method yields higher velocity equivalents than are obtained when the observations are dealt with by the method I followed.

The values yielded by Dr. Köppen's method are given in the following Table II. They are obtained from precisely the same observations as were used for Table I., but they progress rather more symmetrically, and form a smoother curve when presented in that form.

TABLE II.

Values of Beau-														
fort's Scale ...	0	1	2	3	4	5	6	7	8	9	10	11	12	
Mean Velocity														
Equivalents ...	0	1	4	9	14	20	26	33	42	51	62	75	92	
In miles per hour.														
(Köppen's method).														

It will be seen that up to the force of "7" the differences between the two sets of equivalents are not serious, but that from force "8" upwards they grow rapidly, the values got by Köppen's method being much higher than those got by my own.

Until now I have not published these figures, although Dr. Köppen has, I believe, done so, I having sent them to him in 1897. My opinion is that upon the whole they are the better ones to adopt, and the only reason I have to offer for their non-appearance earlier, and it is probably an insufficient one, is that I hesitated to disturb so soon values which I had reason to suppose had been pretty generally adopted.

To revert again, now, to the objection made by some to Beaufort's scale on the ground that its sub-divisions of wind-force are too

minute, I should like to make a suggestion by way of concluding this article. The suggestion is this: that whilst those who desire to do so should, of course, continue to use the scale without abridgment—and these will probably include most observers at land stations, as well as all seamen—they should adopt as its basis the velocity equivalents given in Table II. as having been determined by a method of calculation which is, upon the whole, preferable to that used for the values given in Table I.

Those, however, who prefer a scale of fewer numbers might divide the scale into groups, as follows :—

Beaufort's Scale.		Description of Wind.		Equivalent Mean Velocity	
0	.....	Calm.	.....	0	miles per hour.
1 to 3	.....	Light airs.	.....	1 to 10	„ „
4 „ 6	.....	Moderate breezes.	.....	11 „ 30	„ „
7 „ 8	.....	Gale.	.....	31 „ 45	„ „
9 „ 10	.....	Hard gale.	.....	46 „ 65	„ „
11	.....	Storm.	.....	66 „ 80	„ „
12	.....	Hurricane.	.....	81 and above	„ „

It will be noticed that the velocities corresponding to this classification of wind-force arrange themselves in groups, which are very convenient for remembering. The first group of three figures embraces a velocity of 10 miles, and the second group also of three figures a range of 20 miles; the third and fourth groups are each of two figures, and cover a velocity range of 15 miles and 20 miles respectively, whilst the next number has 15 miles, and the maximum limit of the hurricane is literally, as well as figuratively, “in the air”!

SUMMARY OF THE RESULTS OF BRITISH THUNDERSTORM COMMITTEE, 1888—89.

By L. C. W. BONACINA.

THE Committee of British Thunderstorms was appointed by the Council of the Royal Meteorological Society at the end of the year 1887 to organize observations of thunderstorms occurring in the south-east of England. The discussion of these observations, made chiefly in the south-east of England but also in other parts of the country, which was confined to those of the years 1888 and 1889, was undertaken by Mr. W. Marriott (see *Quart. Jour. Roy. Met. Soc.*, January, 1892,) in the absence of the Hon. Ralph Abercromby, the originator of the scheme; and, though the observations only extended over two years, it resulted in the acquisition of some definite knowledge relating to thunderstorms, viz. :—

- (1). The hours of maximum frequency of thunderstorms are from 12 noon to 4 p.m.; those of minimum frequency are 1.0 a.m. to 7.0 a.m.

- (2). The average rate of travel of thunderstorms in ill-defined low pressure systems is about 18 miles per hour, but the rate of those storms that occur in squally cyclonic weather is greater.
- (3). Thunderstorms appear to be unconnected with the absolute height of the barometer, they are connected only with its relative height—*i.e.*, with the distribution of atmospheric pressure.
- (4). Thunderstorms usually occur in ill-defined low pressure systems, or in the space, or “col,” between two anti-cyclones.
- (5). From synoptic charts showing differences of pressure of .02 inch, constructed for the month of June, 1888, it was apparent that the seemingly ill-defined areas of low pressure contained a number of small distinct low pressure systems with wind circulation in many respects similar to ordinary cyclones, and that the districts traversed by these small depressions were those which reported thunderstorms; moreover, from these charts it was also evident that storms occurred where the direction of the surface wind differed from that of the upper currents.
- (6). Thunderstorms apparently circulate round the area or areas of lowest pressure in these “ill-defined” low pressure systems, and travel in the direction of the prevailing wind.
- (7). When thunderstorms accompany large cyclonic depressions they usually occur in the south-eastern quadrant of the latter; (ordinary eastward moving cyclones).
- (8). The movements of thunderstorms seem to be controlled less by the configuration of the land and contour of the hills than by the distribution of atmospheric pressure.
- (9). A violent whirl of wind at some little distance above the surface of the earth is usually associated with thunderstorm depressions; occasionally this whirl of wind is felt at the surface.
- (10). Damage effected by lightning seems to be associated with numerous oscillations of the barographic record; a sudden increase of pressure of three or four hundredths of an inch frequently precedes a heavy fall of rain in thunderstorms.
- (11). Thunderstorms probably do not as a rule exceed an altitude of about 5000 feet above the earth's surface.
- (12). An upward current of air is apparently an essential constituent of a thunderstorm formation.

Two interesting instances of “line” thunderstorms during the two years 1888 and 1889 were reported (May 18th-19th, 1888, and

June 2nd, 1889.) These storms, which directly traversed England from south to north at the rate of 50 miles per hour, were similar in character, and were associated with a similar type of weather, pressure on both occasions being low over the Atlantic and high over Scandinavia. The important question was raised by Mr. Symons as to whether the thunderstorms themselves travelled or whether the thunderstorm *conditions* were transmitted along the traversed path.

In the above summary of the report of the Thunderstorm Committee published in the *Quarterly Journal of the Royal Meteorological Society* for January, 1892, we have only included those apparent facts which may be considered to be representative of thunderstorms in general, and have omitted those which can only be said to relate to the particular storms of 1888 and 1889 upon which the observations were made; obviously, from two years' observations, no light could be thrown upon such questions as the geographical and seasonal distribution of thunderstorms.

The distribution of thunderstorms over England and Wales for the years 1871 to 1887 has been studied by Mr. Marriott, and appears to have been very irregular, showing no definite relation to latitude (see *Q.J. Roy. Met. Soc.*, Jan., 1890, pp. 1-4). We believe that future study of the distribution of thunderstorms over England will show that it is related to the geographical features of the different districts, and scarcely at all to the geographical positions.

[We are much indebted to Mr. Bonacina for undertaking the task of preparing a summary of the reports of the Thunderstorm Committee, which may be looked upon as an excellent preliminary to the formulation of the scheme suggested in our August issue (p. 118) for a systematic study of British Thunderstorms. We shall look forward with interest to developments in this direction, and hope to be able to give publicity to its results from time to time.—Ed. *S.M.M.*]

EXPLORATIONS OF THE ATMOSPHERE.

IN a recent number of *Science* appeared an interesting account of some experiments carried out at St. Louis with *ballons-sondes*, for the purpose of investigating the meteorological conditions at great heights above the American continent. The experiments were a continuation of those described in previous Nos. of the same journal, and were conducted by Mr. Clayton, under the direction of Mr. A. Lawrence Rotch, of the Blue Hill Observatory. The German expanding rubber balloons filled with hydrogen by the vitriolic process were employed, and nine ascents were made during January, February and March, 1905. In all instances but one the balloons and attached instruments were returned, in accordance with the instructions addressed to the finders, and all descended within the eastern half of a circle having its centre at St. Louis and a radius of 285 miles. On January 25th, at an altitude of 48,700 feet, and when a high barometric pressure

prevailed on the earth's surface, a temperature of -111° F. was registered, this being one of the lowest natural temperatures ever recorded. The experiments are to be continued during the present summer, the success hitherto attained having induced the Secretary of the Smithsonian Institution to make a grant of \$1,000 for that purpose from the Hodgkins' fund.

The kite experiments at the Blue Hill Observatory, a short account of which we published in our issue of October last, are also being continued; flights being made in each month on the days appointed by the International Committee for Scientific Aeronautics, whilst in addition they are employed to ascertain the conditions prevailing above the Atlantic Ocean in the Trade wind region. In connection with this enquiry the author continues:—

“Thus the investigation which was first proposed by Mr. Rotch, and which has been persistently advocated by him since, is now in progress, and this was rendered possible through the co-operation of the well-known French meteorologist, M. L. Teisserenc de Bort, who placed his steam yacht at the disposal of Mr. Rotch, on condition that the latter should share the expense of the cruise. Accordingly, on June 3rd, Mr. Clayton sailed from Boston for the Mediterranean on board the White Star steamer *Romanic*, equipped for raising self-recording instruments with kites, as was first done in 1901 by Messrs. Rotch and Sweetland on a voyage from Boston to Liverpool. A despatch from Mr. Clayton, at Gibraltar, announced that flights had been made on six days, and a mean height of 3,000 feet attained. The results of aerial soundings in the region of permanent high pressure around the Azores, and near the northern limit of the north-east trades, are expected to prove of special interest. At Gibraltar, Mr. Clayton is to embark on the *Otaria*, a yacht of 350 tons, which its owner has already employed for kite-flying in European inland waters. The boat will proceed south, touching at Madeira, Canary and Cape Verde Islands, and perhaps go as far as St. Paul, near the equator, returning by a more westerly course to the Azores, the whole voyage occupying about six weeks. On this route the north-east trade-winds and doldrums are traversed, and the south-east trades entered. Should there be too little wind, either at the surface or higher up, the speed of the vessel will enable the kites to rise, and, should the wind at any time be too strong, by steaming with it the pull of the kites can be moderated. By this method it is hoped that all the strata up to a height of 15,000 feet or more will be penetrated, so that their condition as regards temperature, moisture and wind may be investigated. Besides determining the depth of the north-east trade-wind, the supposed south-west, or return trade, which has only been observed on the Peak of Teneriffe, will be sought, and its height above the ocean in different latitudes measured, but in case the kites do not reach a sufficient altitude, it is proposed to liberate small balloons from Madeira, and observe their change of direction as they rise. Professor Hergesell, on board the Prince of Monaco's yacht, executed last summer a series of kite-flights in the region between Spain, the Canaries and the Azores, without encountering the upper anti-trade, and the present expedition expects to make similar soundings in these and lower latitudes, and will also attempt to extend them to greater heights.”

Correspondence.

THE STUDY OF THUNDERSTORMS.

To the Editor of Symons's Meteorological Magazine.

BEFORE commencing any fresh attempt to record thunderstorms, would it not be well to find out what material already exists in the hands of the Committee of the Royal Meteorological Society? You state, on p. 120 of your August number, that they have not made any report since 1889; but the collection of material went on long after that: in fact, I am still recording particulars of thunderstorms in the little books they have supplied, and it may be that many others are doing the same, although I have ceased sending reports to the Committee.

T. W. BACKHOUSE.

West Hendon House, Sunderland, 2nd October, 1905.

ANOTHER NEGLECTED METEOROLOGICAL ITEM.

Is not the recording of the snow lying on, or covering, the ground neglected in this country, although recorded in others? I always record this item, as well as the average depth when the ground is covered. Is it not of some importance, as affecting districts other than the place of observation? Here in winter the bitterest winds we get are from the south, and I incline to attribute this to the larger distance of snow-covered ground in that direction than any other, but this is merely a guess, as one has no information to go by. I do not know how far the coldness of the south wind applies to other stations, nor whether the suggested explanation would apply elsewhere. It would be interesting to hear whether such were the case.

T. W. BACKHOUSE.

West Hendon House, Sunderland, 3rd October, 1905.

HEAVY RAIN IN INDIA.

MR. J. DOUGLAS MAYNARD, writing from Seoni Malwa, in the Central Provinces of India, writes to Mr. T. P. Newman as under, and Mr. Newman has forwarded the extract to us for publication:—

“We have had excellent rains so far, and a good break of fine weather this week, facilitating ploughing and sowing. It looks as if rain were coming up again in force to-night.

“In thirty-six hours ending 8 a.m. on July 8th, we had 19 inches of rain in Seoni, 13 inches within the latter twenty-four hours. There was a great flood (said to be a record), several houses destroyed and cattle drowned, and a section of our only metalled road washed clean away, leaving only the natural soil. A part of the Orphanage boundary wall, which had been built probably during the missionary's temporary absence, and had its lime facing neatly put on before his return, betrayed its construction by ‘flowing down,’ as the people put it.”

Unfortunately, says Mr. Newman, there are other districts, notably the Native State of Rajputana, where the rainfall is very deficient.

BEN NEVIS OBSERVATORY AND THE ARGENTINE REPUBLIC.

THE following letter appeared in *Nature* of September 14th last :—

News has reached me here from the office of the Scottish National Antarctic Expedition in Edinburgh of the appointment of almost the whole of the Ben Nevis Observatory staff to the Argentine Meteorological Office, including the Superintendent, Mr. Angus Rankin, who has been associated with the observatory for more than twenty years, Mr. Robert Macdougall, for many years assistant, and Mr. Bee.

It may be remembered that in March, 1903, the Scottish National Antarctic Expedition set up a first-class meteorological and magnetical station in the South Orkneys, at Scotia Bay, and that, after the wintering of the *Scotia*, I offered to hand over the station, including Omond House and Cope's Observatory, to the Argentine Government, with eighteen months' provisions, as well as to give a passage on board the *Scotia* to Argentine men of Science if the Republic would undertake to continue the work and relieve the party the following year. This was carried through by the energy of Mr. Walter G. Davis, director of the Argentine Meteorological Office, and Mr. Robert C. Mossman, the Scottish expedition's meteorologist, was asked to continue in charge. Now Mr. Mossman has returned after two years' valuable work in the Antarctic, and the station is being kept up a third year—the first time in the history of Antarctic exploration that scientific observations have been carried on in one place for more than two years.

But the Republic is not satisfied; it is to continue the work for still another year, and is even going to increase the number of Antarctic stations. Trained men were required, and since Mr. Mossman's return he has been in communication with Mr. Davis, with the result that these three gentlemen have been appointed to carry on this work, as well as Mr. W. R. Bruce, also of Ben Nevis Observatory, who arrived in Buenos Aires three weeks ago.

The Argentine Republic must be congratulated on its enlightened perspective; but surely while doing so we must hang our heads in shame, for, while our Government has discouraged scientific research, we find this rapidly rising Republic eager to encourage it.

WILLIAM S. BRUCE.

Eggishorn, Switzerland, September 8.

NILE FLOODS AND ATMOSPHERIC PRESSURE.*

THE study of the relations existing between the variations of atmospheric pressure in north-east Africa and the fluctuations of the Nile Flood, has hitherto been considerably handicapped by the assumption that the volume of water brought down by the White Nile, rising in the Equatorial Lakes, was not greatly inferior to that supplied by the Blue Nile, which drains the Abyssinian plateau. It is now, however, recognised that the Blue Nile, when in flood, holds back the waters of the White Nile to such an extent that the latter may be practically ignored as a factor in the seasonal inundations.

Few observations of barometric pressure exist for the upper parts of the Nile Valley, and it is necessary to rely entirely on the records at Cairo, Alexandria and Beirut, for information as to normal conditions and seasonal variations over any long period. The rainfall of Abyssinia is due to the monsoon of eastern Africa, and corresponds to pressure variations affecting a very wide area; a certain degree of similarity to the south-west monsoon rainfall of India is evident. The barometric conditions in northern Egypt may, therefore, be relied upon as giving a very fair approximation to those of the districts further to the south.

Practically the whole of the Abyssinian rainfall is deposited between April and September, 90 per cent. of the annual fall taking place from June to September; it is consequently only in these six months that any relation between pressure and flooding can be expected to exist.

If the yearly variations of pressure from April to September are examined, it will be seen that their oscillations are generally inverse to those of the Nile Flood, as indicated by the gaugings at Aswan, years of high pressure corresponding to those of low rainfall, and *vice-versâ*. In 33 years a mean pressure in excess of the normal occurred with 12 low floods and 7 high ones, while a deficient mean pressure accompanied 14 high floods and no low ones. If the curves of the anomalies of the two elements are compared, it is further evident that the divergencies from the normal of the two curves show a marked tendency to move in the same direction. Of 18 years with an increase of pressure, 2 only had an increase in flood, and in 14 years with a decrease in pressure, but 5 had a smaller flood.

In several of the years in which discrepancies occurred, it is noticeable that the pressure conditions in northern Egypt exhibited marked differences from those of India, and accorded closely with those of the Azores, indicating that the Mediterranean system extended into Egypt on these occasions. It is possible, therefore, that the conditions in Abyssinia were not in these instances fairly represented by the Cairo readings.

* On the Relation between Variations of Atmospheric Pressure in North-East Africa and the Nile Flood. By Capt. H. G. Lyons. Communicated by Dr. W. N. Shaw. *Proc. Roy. Soc.* Vol. A 76 (1905), pp. 66-86. Plate.

The coincidence of the two curves is even more clearly shown if the monthly means are plotted, even brief temporary fluctuations being sometimes traceable. Apparent discrepancies, existing in the six-monthly curves, are also in most cases explained by this means.

Taking the 35 years, 1869–1903, Captain Lyons is of the opinion that in six years out of seven a very fairly accurate prediction of the flood from month to month could have been made.

METEOROLOGICAL NEWS AND NOTES.

WE regret to see announced the death, in his sixty-ninth year, of Dr. W. von Bezold, professor of physics and meteorology at the University of Berlin, and director of the German Meteorological Institute. He was also for many years an honorary fellow of the Royal Meteorological Society.

COMPETITIVE METEOROLOGY.—To many curious competitions must be added a French novelty that is the most curious of them all. It was a tourney meteorological, and its conditions were to divine correctly in advance the weather on 15 consecutive days in fickle September. Seven competitors entered, and three achieved, or are stated to have achieved, success, predicting the weather for the successive days with a precision which is described as almost mathematical. It is a pity that we are not told more of these infallible meteorologists.

IN BERWICKSHIRE AND EAST LOTHIAN serious floods have been caused by a remarkable rainstorm of 48 hours' duration—the first for months. Great stretches of land lay under water, and in at least eight instances houses were flooded, causing the inmates to beat a hasty retreat. Turnips and potatoes were practically washed out of the drills, and the outlook caused grave concern to agriculturists. An exceptionally high tide at the same time made considerable encroachment on land on the Haddington coast.

MR. G. B. BUCKTON, F.R.S., F.L.S., well known for his contributions on entomological and other subjects to the Transactions of the Royal Society, died on September 25th, in his eighty-eighth year. Mr. Buckton had kept a record of rainfall at his residence at Weycombe, near Haslemere, for nearly forty years.

THE COUNCIL OF THE ROYAL METEOROLOGICAL SOCIETY have now appointed a lecturer who is prepared to deliver lectures on Meteorological subjects—*e.g.*, How to Observe the Weather; Weather Forecasting; Climate; Rainfall; Thunderstorms; Meteorology in Relation to Agriculture, Health, &c. The lectures will be illustrated by lantern slides from the large collection in the possession of the Society. The Council are willing to arrange for exhibiting at the gatherings of local scientific societies, institutions or schools, a collection of photographs, diagrams and charts illustrating meteorological phenomena, and various patterns of instruments used for meteorological observations.

NEWS was received on September 29th of the death of Rear-Admiral Sir William James Lloyd Wharton, K.C.B., F.R.S., who succumbed to enteric fever and pneumonia, at Capetown, where he remained after the departure of the British Association party. After being engaged many years in marine surveying, he was appointed Hydrographer to the Admiralty in August, 1884, in which position he remained until his retirement in 1904. Sir William Wharton was the author of "Hydrographical Surveying," and edited the "Journal of Captain Cook's First Voyage Round the World." He was also, for some time, a member of the Meteorological Council.

THE DRY WEATHER of the past summer has had the effect of lately rendering it necessary for some of the large towns to practice economy in the matter of water supply. Liverpool had recently to restrict its service to 13 hours a day, its sources of supply, viz., Lake Vyrnwy and the Rivington Reservoirs, both showing a shortage. At Loughborough also, where the reservoirs are stated to be lower than for twenty years, the same course had to be adopted. A glance at the aggregate table of rainfall shows this district to be within the region of the greatest deficiency, and as for 1904 also, it was within an area well below the average, the cumulative deficiency must be very great. The town of Bath and the Cleveland district have also been among the sufferers, and in many rural districts the scarcity of water has been severely felt. The heavy rains of June, which did much to alleviate the effects of the drought in the south, did not apparently extend far beyond the boundaries of the home counties, and in the Midlands and North of England the three months, May, June and July, were all dry, May and July in a particular degree, and these conditions, combined with the active evaporation of those months, are no doubt accountable for the general shortage of water in those districts.

BOOKS RECEIVED.

- The Croydon Natural History and Scientific Society. Report of the Meteorological Committee for 1904. Prepared by F. Campbell-Bayard, LL.M., Hon. Sec. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 59.
- Results of Meteorological Observations in New South Wales during 1900, 1901, and 1902, under the direction of H. C. Russell, B.A., C.M.G., F.R.S. Sydney, 1904. Size 10×6 . Pp. 216.
- Results of Rain, River and Evaporation Observations made in New South Wales during 1901-2, under the direction of H. C. Russell, B.A., C.M.G., F.R.S. Sydney, 1904. Size $9\frac{1}{2} \times 6$. Pp. 423+xc. Maps and diagrams.
- Jahrbuch des Norwegischen Meteorologischen Instituts für 1904. Herausgegeben von Dr. H. Mohn. Christiania, 1905. Size 13×10 . Pp. 138.
- Osservatorio di Messina. Annuario per l'anno 1904. Messina, 1905. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 87. One plate.
- Annual Report of the Central Meteorological Observatory of Japan for the Year 1902. Part I., Meteorological Observations in Japan. Tokio, 1905. Size 12×8 . Pp. 329.
- Annuario publicado pelo Observatorio do Rio de Janeiro, 1905. Anno XXI. Rio de Janeiro, 1905. Size 7×5 . Pp. 336.

NINE MONTHS' RAINFALL OF 1905.

Aggregate of Rainfall for January—September, 1905.

Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.
	in.			in.			in.	
London	17·74	100	Bolton	28·24	95	Braemar	22·69	91
Tenterden	19·89	106	Wetherby	16·40	85	Aberdeen	19·67	86
Hartley Wintney	17·86	97	Arnccliffe	35·06	83	Cawdor	21·09	99
Hitchin	18·59	107	Hull	14·83	78	Invergarry	39·43	104
Winslow	15·90	84	Newcastle	13·47	68	Bendampf	59·34	103
Westley	16·92	93	Seathwaite	79·98	88	Dunrobin	22·26	103
Brundall	15·72	89	Cardiff, Ely	23·67	81	Killarney	32·45	82
Alderbury	19·70	100	Haverfordwest	28·55	90	Waterford	26·50	98
Winterbourne	20·94	81	Gogerddan	32·45	106	Broadford	23·72	100
Torquay	19·18	81	Llandudno	17·68	86	Carlow	22·45	92
Polapit Tamar	23·01	91	Cargen	25·12	84	Dublin	19·28	98
Bath	17·33	80	Lilliesleaf	20·10	86	Mullingar	24·08	92
Stroud, Upfield	19·57	92	Colmonell	26·06	86	Ballinasloe	22·03	84
Woolstaston	20·10	88	Glasgow	20·26	80	Clifden	45·51	83
Bromsgrove	16·14	91	Inveraray	47·81	112	Crossmolina	30·43	89
Boston	16·48	98	Islay, Eallabus	35·37	112	Seaforde	24·18	89
Hodsock Priory	12·75	72	Mull	38·94	101	Londonderry	26·18	93
Derby	13·10	69	Dundee	14·70	71	Omagh	26·74	100

Another month, characterised by pronounced dryness, has had the effect of still further aggravating the widespread deficiency of rainfall which has now become general in almost all parts of the British Isles. The only area of any size which still shows an aggregate fall since January 1st, 1905, in excess of the average, is situated in the west and north of Scotland, but even in this area, nowhere except in the south of Argyllshire, did the fall surpass the average by more than a trifling amount. Here the two relatively wettest stations, Inveraray and Eallabus, had excesses of 12 per cent. A small area still remains in the south-east of England where the fall is somewhat above the normal amount, and Aberystwyth stands by itself with 106 per cent. of the average. Elsewhere the fall has been consistently in defect, most notably in the North Midlands of England and on the east coast from Dundee to Hull. In both of these areas considerable portions have received less than three quarters of their usual rainfall to the end of September.

Speaking generally the distribution remains remarkably similar to that at the end of August, with a falling off which is most marked in the south-west of England, in Wales and the east of Ireland.

RAINFALL AND TEMPERATURE, SEPTEMBER, 1905.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.]	RAINFALL.				Days on which .01 or more fell.	TEMPERATURE.						No. of Nights below 32°.	
		Total Fall.	Diff. from average, 1870-99.	Greatest in 24 hours.			Max.		Min.					
				Depth.	Date.		Deg.	Date.	Deg.	Date.	Shade	Grass		
		inches	inches.	in.										
I.	London (Camden Square) ...	2.09	— .20	.70	25	12	76.5	3	42.7	15	0	0		
II.	Tenterden.....	2.47	— .15	.80	9	14	74.0	6	40.0	15, 16	0	0		
„	Hartley Wintney	2.16	— .22	.49	25	12	75.0	4	35.0	21	0	1		
III.	Hitchin.....	2.02	— .24	.95	26	14	72.0	3	36.0	14	0	...		
„	Winslow (Addington)	1.42	— .90	.62	25	14	75.0	3	32.0	15	1	3		
IV.	Bury St. Edmunds (Westley) ..	1.42	— 1.07	.55	25	10	74.0	3	39.0	21	0	...		
„	Brundall	2.02	— .55	1.05	24	13	74.0	3	41.0	15, 17	0	0		
V.	Alderbury	1.31	— 1.22	.44	9	12	76.0	4	...	...	...	...
„	Winterbourne Steepleton ...	2.76	— .64	1.22	9	9	72.0	3	35.6	27	0	0		
„	Torquay (Cary Green)	1.86	— 1.19	.82	5	11	72.4	3	43.1	22	0	0		
„	Polapit Tamar [Launceston] ..	1.78	— 1.85	.37	9	17	68.5	4	31.6	22	2	2		
„	Bath	1.66	— 1.23	.59	9	9	69.5	5	36.0	21	0	7		
VI.	Stroud (Upfield) .....	.88	— 1.84	.30	6	10	71.0	4, 5	42.0	14	0	...		
„	Church Stretton (Woolstaston) ..	1.15	— 1.59	.31	9	10	66.0	5	38.0	21, 24	0	...		
„	Bromsgrove (Stoke Newington) ..	.81	— 1.51	.26	8	7	71.0	...	31.0	...	2	...		
VII.	Boston	2.32	+ .02	.61	25	11	70.0	3	37.0	21	0	...		
„	Workshop (Hodsock Priory) ..	1.21	— .97	.37	9	13	72.4	4	31.7	15	1	8		
„	Derby (Midland Railway) ..	1.20	— 1.12	.49	9	13	74.0	4	32.0	26	1	...		
VIII.	Bolton (The Park)	3.26	— 1.12	.89	9	19	62.5	7	38.5	15	0	1		
IX.	Wetherby (Ribston Hall) ...	1.99	— .54	.52	9	15	...	...	...	...	...	...
„	Arncliffe Vicarage	4.59	— .54	1.09	9	22	...	...	...	...	...	...
„	Hull (Pearson Park)	1.44	— .96	.49	9	12	70.0	2	37.0	15	0	3		
X.	Newcastle (Town Moor) ...	1.96	— .40	.29	9	20	...	...	...	...	...	...
„	Borrowdale (Seathwaite) ...	8.25	— 4.51	1.49	9	18	62.1	3	34.1	21	0	...		
XI.	Cardiff (Ely)	1.88	— 2.20	.57	9	13	...	...	...	...	...	...
„	Haverfordwest (High St.) ..	2.25	— 1.96	.81	9	11	68.2	13	34.7	15	0	13		
„	Aberystwyth (Gogerddan) ..	2.94	— 1.26	1.15	9	12	69.0	5, 7, 20	31.0	14a	3	...		
„	Llandudno	1.29	— 1.63	.49	9	15	67.2	5	43.0	21, 27	0	...		
XII.	Cargen [Dumfries]	1.87	— 1.84	.34	1	11	65.0	4	33.0	21	0	...		
„	Lilliesleaf (Riddell)	2.49	— .28	.55	27	21	69.0	4	29.0	20	1	6		
XIII.	Edinburgh (Royal Observatory) ..	1.24	...	.45	27	13	64.7	5	39.7	30	0	0		
XIV.	Colmonell	2.90	— 1.18	.71	1	13	68.0	4	33.0	14, 25	0	...		
XV.	Tighnabruaich	4.19	— 1.34	.61	2	18	58.0	1, 5, 16	39.0	25	0	0		
„	Mull (Quinish)	5.96	+ .49	1.26	6	22	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis) ..	1.15	— 1.40	.45	26	16	70.3	3	36.2	21	0	...		
XVII.	Braemar	1.97	— 1.30	.46	8	16	64.8	18	29.8	21	1	...		
„	Aberdeen (Cranford)	2.42	— .62	.70	26	19	71.0	4	30.0	20	2	...		
„	Cawdor (Budgate)	1.82	— 1.19	.28	25	20	...	...	...	...	...	...
XVIII.	Invergarry	4.27	— .85	1.12	7	9	...	...	...	...	...	...
„	Bendmah	8.89	+ .61	1.10	7	23	...	...	...	...	...	...
XIX.	Dunrobin Castle	2.11	— .60	.30	9	16	66.0	17	38.5	21	0	...		
„	Castletown	3.11	...	.89	2	23	68.0	6	37.0	21	0	...		
XX.	Killarney	2.73	— 1.94	.57	9	21	67.0	1, 5	38.5	15	0	...		
„	Waterford (Brook Lodge) ...	1.84	— 1.24	.54	8	13	70.0	3	35.0	15, 26	0	...		
„	Broadford (Hurdlestown) ...	2.16	— .78	.45	5	20	66.0	5, 6	36.0	12	0	...		
XXI.	Carlow (Browne's Hill)	1.62	— 1.18	.24	6	15	...	...	...	...	...	...
„	Dublin (Fitz William Square) ..	1.23	— .92	.36	27	14	68.1	4	38.5	26	0	0		
XXII.	Ballinasloe	2.11	— 1.06	.39	8	22	67.0	3	33.0	15, 16	0	...		
„	Clifden (Kylemore House) ..	5.28	— 1.44	1.11	8	16	...	...	...	...	...	...
XXIII.	Seaforde	1.05	— 2.32	.21	4	11	68.0	5	37.0	26	0	1		
„	Londonderry (Creggan Res.) ..	2.56	— 1.21	.65	9	21	...	...	...	...	...	...
„	Omagh (Edenfel)	2.44	— 1.11	.46	8	21	65.0	4	32.0	25	1	2		

+ Shows that the fall was above the average; — that it was below it. a and 16, 25.

SUPPLEMENTARY RAINFALL, SEPTEMBER, 1905.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	2·02	XI.	New Radnor, Ednol	2·09
„	Ramsgate, West Cliff.....	2·48	„	Rhayader, Nantgwillt ...	2·38
„	Hailsham	2·90	„	Lake Vyrnwy	2·88
„	Crowborough	2·67	„	Ruthin, Plâs Drâw.....	1·52
„	Osborne	2·59	„	Criccieth, Talarvor.....	1·49
„	Emsworth, Redlands.....	2·21	„	Anglesey, Lligwy	1·92
„	Alton, Ashdell	2·18	„	Douglas, Woodville	2·10
„	Newbury, Welford Park ...	1·80	XII.	Stoneykirk, Ardwell House	2·47
III.	Harrow Weald	1·55	„	Dalry, Old Garroch	2·11
„	Oxford, Magdalen College..	1·16	„	Langholm, Drove Road.....	3·90
„	Banbury, Bloxham Grove...	·99	„	Moniaive, Maxwellton House	2·10
„	Pitsford, Sedgebrook	1·35	XIII.	N. Esk Reservoir [Penicuik]	3·10
„	Huntingdon, Brampton.....	1·55	XIV.	Maybole, Knockdon Farm..	3·07
„	Wisbech, Bank House	3·40	„	Glasgow, Queen's Park	2·06
IV.	Southend	1·62	„	Campbeltown, Redknowe...	2·90
„	Colchester, Lexden.....	1·07	XV.	Inveraray, Newtown.....	5·59
„	Saffron Waldon, Newport...	1·35	„	Ballachulish House.....	9·76
„	Rendlesham Hall	2·89	„	Islay, Eallabus	4·49
„	Swaffham	2·83	XVI.	Dollar	1·35
„	Blakeney	2·05	„	Loch Leven Sluices	1·79
V.	Bishops Cannings	1·39	„	Balquhidder, Stronvar .....	...
„	Ashburton, Druid House ...	2·43	„	Coupar Angus Station	1·36
„	Okehampton, Oaklands.....	1·71	„	Blair Atholl	2·03
„	Hartland Abbey	1·67	„	Montrose, Sunnyside.....	1·51
„	Lynmouth, Rock House ...	2·79	XVII.	Alford, Lynturk Manse ...	2·35
„	Probus, Lamellyn	1·06	„	Keith	3·07
„	Wellington, The Avenue ...	1·59	XVIII.	N. Uist, Lochmaddy	5·26
„	North Cadbury Rectory ...	1·45	„	Aviemore, Alvey Manse ...	1·92
VI.	Clifton, Pembroke Road ...	1·33	„	Loch Ness, Drumnadrochit.	1·84
„	Moreton-in-Marsh, Longboro'	1·18	„	Glencarron Lodge	11·12
„	Ross, The Graig	1·47	„	Fearn, Lower Pitkerrie.....	1·82
„	Shifnal, Hatton Grange.....	1·05	XIX.	Invershin	2·06
„	Wem Rectory	1·32	„	Altnaharra	3·05
„	Cheadle, The Heath House.	1·36	„	Bettyhill	3·11
„	Coventry, Kingswood	1·83	„	Watten	2·38
VII.	Market Overton	2·93	XX.	Cork	1·35
„	Market Rasen	1·79	„	Darrynane Abbey	3·82
„	Bawtry, Hesley Hall.....	1·14	„	Glenam [Clonmel]	1·66
VIII.	Neston, Hinderton.....	1·60	„	Ballingarry, Gurteen	1·83
„	Southport, Hesketh Park...	2·25	„	Miltown Malbay.....	3·39
„	Chatburn, Middlewood	3·59	XXI.	Gorey, Courtown House ...	1·72
„	Cartmel, Flookburgh	4·02	„	Moynalty, Westland	1·56
IX.	Langsett Moor, Up. Midhope	2·14	„	Athlone, Twyford	1·97
„	Scalby, Silverdale	2·10	„	Mullingar, Belvedere.....	1·26
„	Ingleby Greenhow	3·64	XXII.	Woodlawn	2·92
„	Middleton, Mickleton	2·04	„	Westport, Murrisk Abbey..	2·82
X.	Beltingham	2·30	„	Crossmolina, Enniscoe	2·92
„	Font Reservoir, Fallowlees.	2·69	„	Collooney, Markree Obsy...	2·33
„	Ilberton, Lilburn Cottage..	2·85	XXIII.	Enniskillen, Portora	1·78
„	Keswick, The Bank	4·32	„	Warrenpoint	·87
XI.	Llanfrechfa Grange.....	2·59	„	Banbridge, Milltown	1·34
„	Treherbert, Tyn-y-waun ...	4·60	„	Belfast, Springfield	1·99
„	Carmarthen, Friary	3·18	„	Bushmills, Dundarave	2·76
„	Castle Malgwyn	2·00	„	Stewartstown	2·03
„	Plynlimon	5·50	„	Killybegs	2·78
„	Tallyllyn	3·80	„	Horn Head	3·53

METEOROLOGICAL NOTES ON SEPTEMBER, 1905.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—More or less mixed weather prevailed until 11th, with not infrequent R but no great deficiency in sunshine. On 12th more settled conditions set in, with lower night temp. and much sunshine. The last week was dull and rainy with greatly reduced range of temp. After the first ten days of the month there was a conspicuous absence of wind movement. Duration of sunshine 104·1* hours and of R 31·7 hours. Of the latter 11·9 hours occurred on 25th. Mean temp. 57°·1. or 0°·6 below the average.

TENTERDEN.—Rather wet generally except in the third week. Sunshine was deficient, amounting to 109† hours only.

CROWBOROUGH.—Cool and pleasant, with several days of brilliant sunshine. R 18 in. above the average, thus reducing the deficiency for the year to 1·34 in. Prevailing winds S. and W. for the first 13 days and N. and E. for the remainder. Mean temp. 54°·8. TS on 6th.

HARTLEY WINTNEY.—A pleasant month, but rather cool. The first and last weeks were stormy with R, but summer returned from 10th to 25th. Ozone on 25 days with a mean of 3·5. L on 28th.

PITSFORD.—On the whole a pleasant month. R 1·25 in. below the average. Mean temp. 54°·1.

WISBECH.—On 25th 2·20 in. of R fell, the heaviest daily fall since the register was commenced in 1859.

BRUNDALL.—Mean temp. 0°·7 below the average. There were few really warm days and much rough chilly wind. No R fell from 10th to 23rd inclusive.

WINTERBOURNE STEEPLTON.—Another month of deficient R. Of the total, 2·76 in., 2·52 in. fell on 5 days, 5th to 9th, and on 14 consecutive days ending on 27th no R was registered and the weather was generally very fine. Temp. slightly below the average.

TORQUAY.—Duration of sunshine 153·2* hours, or 11·3 hours below the average. Mean temp. 57°·1, being 1°·2 below the average. Mean amount of ozone 4·4; max. 7·0 on 9th with S.W. wind, and min. 2·0 on several days.

POLAPIT TAMAR.—The first 10 days were wet, the remainder dry and seasonable.

NORTH CADBURY.—The day temp. was the lowest in September for nine years, the max. reaching 70° only three times, but the night temp. was about normal. Wet and extremely boisterous during the first ten days, and high wind again in the last eight days: the intervening days being calm and fairly sunny. The wind was from N. or E. almost exclusively after the 10th, and after 13th only 10 in. of R fell.

CLIFTON.—Fine and dry except for a rainy period from 6th to 10th, with strong S. and S.W. winds. N. or N.E. winds prevailed from 10th to the end, with rather low temp. R nearly two inches below the average.

ROSS.—Fine and warm for the first five days, rainy and cool from 6th to 9th, very fine but cool from 10th to 27th, and afterwards gloomy, cold and showery to the end. R only half the average.

BOLTON.—The first half was mild and wet, with S. and W. winds, and the latter cold and dry, with N. or E. winds. Duration of sunshine 69·4* hours, or 17·7 hours below the average. Mean temp. 52°·4, or 1°·7 below the average. Heavy dews from 14th to 22nd.

SOUTHPORT.—Dull and cool throughout, but with S.W. gales and excessive R during the first fortnight, and light N.E. winds and practical absence of R during the remainder. Duration of sunshine 29* hours below the average. R 1·07 in. below the average. Mean temp. 2°·0 below the average.

HULL.—Fine generally, with low R. Duration of sunshine 96* hours. Dense fog on 18th.

LILBURN.—The beginning and end of the month were unsettled, with much R. Warm in the middle and cold later, with frost on 20th, which, however, did little damage. The R was beneficial and much wanted. No gales or TSS.

LLANFRECHFA GRANGE.—A fine month with early harvest, which was mostly housed by 14th. Wheat was good but oats and barley poor. The R in the first nine days improved roots very much.

CARMARTHEN.—Wet and stormy during the first week; afterwards particularly fine with abundant sunshine.

HAVERFORDWEST.—Mild and wet up to 10th, but much colder from that date to the end, it being the driest and coldest September for 50 years. Duration of sunshine 133⁴/₁₀ hours.

ABERYSTWYTH.—The first fortnight was very wet, but there was grand dry weather for the remainder. The wind was chiefly S.W. and S. early in the month, and later E. and S.E. Cold throughout without much sun, but drying winds, making good weather for getting in crops.

SCOTLAND.

CARGEN.—One of the driest Septembers recorded. Damp, muggy weather during the first half interfered with harvest operations in the earlier districts, but there was splendid harvest weather from 15th to 30th.

LANGHOLM.—R 39 in. below the average of 29 years.

INVERARAY.—The first half was very wet, the latter fine and dry enabling harvest operations to be carried on successfully.

MULL, QUINISH.—The incessant R of the first half was followed by N. and E. winds and bright sunshine.

COUPAR ANGUS.—R 75 in. short of the average. There were no extremes of temp., but the maxima were high owing to sunny days. Mean temp. 52°3.

LYNTURK.—The first three weeks had very fine harvesting weather, farmers remarking that they remembered no better. Continuous rainy days in the last week.

DRUMNADROCHIT.—R 91 in. below, and rainy days equal to, the average of 19 years. The middle of the month was cold and clear with some frost, which injured foliage.

DUNROBIN CASTLE.—The first fortnight was wet and showery, but there was good harvest weather between 13th and 25th.

WATTEN.—The opening and closing days were wet and cloudy. For the rest fine harvest weather with light winds.

IRELAND.

CORK.—A cold month, the temp. being 2°3 below the average. Prevailing winds N.W. and N.E.

DARRYNANE.—Although the total R was only 87 per cent. of the average there were but few dry days until the last week.

MILTOWN MALBAY.—Much R in the first half, the second being dry with high easterly winds.

DUBLIN.—A favourable but cool month. Westerly winds prevailed during the first part, north-easterly during the latter, whilst the middle was quiet and dry. The first seven days were warm, the remainder distinctly cool and autumnal. Mean temp. 54°9, or 1°0 below the average.

BANBRIDGE.—R 146 in. below the average of 40 years.

BELFAST.—The driest September since 1895. Average R in the first half with dull weather. Strong N. or N.E. winds towards the end.

OMAGH.—The first half was unsettled, rainy and humid, doing considerable damage to outstanding crops. The latter half, however, accompanied as it was by strong polar and easterly winds, although abnormally ungenial for the time of year, dried the ground and the grain, and resulted in a fairly well saved harvest.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, April, 1905.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	64·7	13	31·6	8	55·6	41·0	41·2	83	108·3	26·4	1·75	19	7·8
Malta.....	...	...	...	...	...	...	...	...	...	...	...	...	...
Lagos.....	92·0	14a	72·0	28	89·4	77·6	75·1	72	145·0	65·0	4·88	9	6·8
Cape Town	87·0	27	38·9	23	73·3	55·5	55·1	74	...	...	·05	1	4·0
Durban, Natal	87·8	24	61·0	27	81·3	63·8	...	...	141·3	...	·89	10	3·1
Johannesburg	74·8	2	44·4	14	70·3	52·0	51·2	73	138·9	39·5	1·54	10	1·4
Mauritius.....	84·4	8	65·7	30	81·4	70·5	68·9	81	147·6	57·1	1·98	16	6·2
Calcutta.....	98·8	9, 19	60·9	2	91·3	71·7	70·7	73	155·9	55·1	4·98	6	4·0
Bombay.....	88·3	17	68·1	1	85·9	73·9	71·1	76	136·8	53·9	·00	0	1·9
Madras	94·7	29	75·4	19	91·6	77·7	74·0	76	149·7	73·9	·56	2	4·3
Kodaikanal	72·5	27	51·8	7	67·3	53·6	52·0	77	144·9	41·4	3·79	20	5·3
Colombo, Ceylon.....	91·7	3	73·6	9	87·8	76·7	74·5	82	152·8	71·8	6·26	16	6·0
Hongkong.....	84·2	27	51·8	4	72·0	63·7	63·7	85	134·8	...	1·24	13	8·6
Melbourne.....	88·4	7	38·8	21	69·6	52·4	50·8	72	144·2	31·5	3·02	8	5·5
Adelaide	91·7	6	47·0	3	73·9	55·3	49·9	61	144·0	40·1	3·66	11	4·6
Coolgardie	92·4	16	42·2	6	77·0	53·6	47·7	52	158·0	34·2	·95	6	4·4
Sydney	79·9	19	50·7	21	71·6	60·2	57·9	79	114·2	44·5	5·87	20	6·0
Wellington	73·2	15	40·0	23	63·0	55·7	48·6	74	124·0	35·5	4·26	11	5·8
Auckland	73·0	1	43·5	23	65·3	53·4	51·7	76	131·0	40·0	3·20	12	5·0
Jamaica, Negril Point..	86·7	18	67·3	3	85·2	71·8	72·0	78	...	...	3·20	10	...
Trinidad	90·0	sev.	61·0	10	89·1	69·4	70·2	73	162·0	62·0	1·79	7	...
Grenada.....	89·4	1	71·2	23	83·6	73·9	70·8	75	150·0	...	2·95	15	3·7
Toronto	67·0	29	24·0	17	51·1	33·2	30·8	66	77·0	17·5	1·43	9	5·8
Fredericton ...	65·7	26	20·1	2	52·8	29·7	21·5	43	...	...	1·24	3	5·5
Winnipeg	78·6	26	12·0	12	49·7	27·0	...	...	...	...	·25	3	4·3
Victoria, B.C.	71·0	23	34·7	8	57·5	43·1	...	...	...	...	·21	4	5·6
Dawson	52·8	29	8·8	3	45·0	21·7	...	...	...	...	·94	4	3·3

a and 15, 17, 22.

Cape Town.—The rainfall was the lowest of any April and 1·88 in. below the average of 63 years.

Mauritius.—Mean temp. of air equal to, dew point 0°·1 above, and R 3·12 in. below, averages. Mean hourly velocity of wind 10·7 miles, or 0·2 above average.

MADRAS.—Persistently low temperature. Bright sunshine 231·6 hours.

KODAIKANAL.—Bright sunshine 164 hours. T and L on 26 days.

COLOMBO.—Mean temp. of air 81°·9 or 0°·6 below, of dew point equal to, and R 4·67 in. below, average. Mean hourly velocity of wind 6·8 miles, prevailing direction S.W. T and L on 5 days; L on 17th.

HONGKONG.—Mean temp. of air 67°·8. Mean direction of wind E.; mean hourly velocity 15·1 miles. Bright sunshine 100·7 hours.

Adelaide.—Mean temp. of air 64°·6 or 1°·2 above, R 1·82 in. above, averages.

Sydney.—Mean temp. of air 1°·3 above, humidity 1·1 above, and R ·24 in. above, averages.

Wellington.—Mean temp. of air 0°·1 above, and R ·45 in. above, averages.

TRINIDAD.—Rainfall ·33 in. below 40 years' average.

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THE BRITISH ASSOCIATION IN SOUTH AFRICA.

[SECOND ARTICLE.]

OUR previous report gave an outline of the voyage of the British Association to Capetown and of the scientific meetings held there so far as these were concerned with meteorological matters.

On August 18th and 19th the party set out for Natal, one group making the long railway journey of 930 miles to Johannesburg and 380 miles thence to Durban, but the great majority going by sea direct from port to port, a distance of 900 miles. The weather was remarkably fine, and the sea on the Agulhas Bank for once belied its reputation, for there was no motion to disturb the most susceptible. The *Saxon* and *Durham Castle* entered the harbour of Durban on the morning of August 22nd. In the afternoon one of the very few interludes of bad weather occurred in the shape of a severe thunderstorm, which spoiled a garden-party given to the visitors by the Mayor, although it did not damp the generous hospitality of the people of Durban. On the 23rd an opportunity was offered of seeing the coast scenery south of Durban in an excursion by rail to Lower Umkomaas, where the beach of white sand and black rocks was being lashed with the surf raised by the fresh South-East Trade. The next two days were spent in Pietermaritzburg, the capital of Natal, where the display of well-organized hospitality was, if possible, greater than ever, and two days more led the party through the scene of the battlefields about Colenso and Ladysmith.

Johannesburg was reached on the morning of August 28th, and that marvellous city provided at least two surprises—one, that the plague of dust was worse than had been anticipated; the other, that this town of fifteen years' growth was not a crowd of mean houses on the bare veld, but a place of stately buildings and handsome suburbs, shaded by the quick-growing gum trees. Here the Association resumed its official functions and the second half of the sectional meetings took place. The attendance was rarely large, but there were several papers of real importance, and meteorology and allied branches of knowledge were represented by the following:—

AUGUST 29th. Tuesday.

Sir Colin Scott Moncrieff—*Presidential Address [on Irrigation].*
(Section G.)

AUGUST 30th. Wednesday.

Prof. J. Milne—*Report of the Seismological Committee, and Recent Advance in Seismology.* (Section A.)

Report of Kites Committee. (Section A.)

Report of Ben Nevis Committee. (Section A.)

Report of Falmouth Observatory Committee. (Section A.)

R. F. Rendall—*Meteorological Notes from the Natal Observatory.*
(Section A.)

C. D. E. Braine—*Notes on Irrigation in South Africa.* (Section E.)

J. Burt-Davy—*Life-Zones of the Transvaal, their Climate and Crops.* (Section K.)

SEPTEMBER 1st. Friday.

H. Ingle—*Pretoria Rain and its Content of Combined Nitrogen.*
(Section B.)

A. J. Herbertson and P. C. Waite—*A New Rainfall Map of Africa.* (Section E.)

C. D. E. Braine—*Irrigation in South Africa.* (Section G.)

No papers were read on Thursday, August 31st, that day being occupied by a visit to Pretoria and the Premier Diamond Mines, at which the largest diamond in the world had recently been discovered.

Mr. R. T. A. Innes, the Director of the Transvaal Meteorological Service, threw his new observatory open to members interested in meteorology and took much trouble in ensuring that everyone should see everything that could be of interest. The observatory is a substantial stone building of one storey on the top of a steep rocky hill in the northern suburbs, too steep and wind swept to be suited for all the purposes of a meteorological station, but the grounds run down to the level on the northern side and an enclosure there contains certain supplementary instruments, including a rain gauge and earth thermometers. The observatory itself is admirably equipped with self-registering instruments of the finest description, and a special feature is a large louvred shed in which thermometers, thermographs and hygrographs are exposed conveniently on tables "in the shade." An evaporation tank has been set up and its readings are likely to prove remarkable on account of the high wind and extremely dry air. As few heights above sea-level have been accurately determined, it is impossible to reduce barometer readings throughout the colony to sea-level. Still serviceable synoptic charts are drawn indicating, not absolute height, but differences from previous readings at the various stations.

The concluding meetings of the Association took place at Johannesburg on the afternoon of September 1st, and after resolutions of thanks for the unprecedented kindness of the welcome afforded it,

the Association resolved itself into its constituent units. South African hospitality, however, did not allow the members to disperse in the usual way, for all those from over sea, with a very few exceptions, were privileged to take part in a unique journey throughout the interior of South Africa in four special trains excellently equipped and perfectly managed, the same, in fact, as the party had already travelled in from Durban.

The first stopping place was Bloemfontein, the prettily-wooded capital of Orange River Colony, in the midst of a bare brown veld, showing the full effect of the end of the dry season, and traversed by an empty water-course which in the previous year had risen in flood and wrecked a considerable part of the town.

Mr. James Lyle, of Grey's College, has charge of the meteorological work of the colony, but although there are numerous stations at work, there is no central office or fully equipped observatory specially devoted to the purpose. A new site has been chosen for Grey's College on the veld beyond the town and there a convenient position will be available for giving an excellent exposure.

All day on September 4th was occupied by the journey southward to the Orange River through the dry veld covered with burnt-up grass and low shrubs, but only wanting irrigation to become extremely fertile. At night the trains passed into Cape Colony and turned northward again toward Kimberley, crossing the Modder river in the early morning and reaching the city of diamonds (and dust) in the forenoon. The night before, like several other nights on the high veld, had produced fine displays of sheet lightning in different parts of the horizon, but thunder was not heard and there was no rain. Indeed, the weather throughout the inland journey was intensely dry and one's hair crackled with electricity when being brushed, while once or twice the crepitations from a silk tie hastily drawn off a flannel shirt could be heard a few feet away.

It was one of the chief pleasures of the visit to Kimberley to see Mr. J. R. Sutton at his observatory in the pretty suburb of Kenilworth. Part of the cost of the shelters and instruments was borne by the De Beers Company, but Mr. Sutton, ably seconded by Mrs. Sutton, takes all the observations without any paid assistance in the intervals of a busy business life. The meteorological equipment is remarkably complete and, in addition to the routine, much experimental work has been carried on, the best we believe that has yet been turned out in any part of Africa. The Cape Meteorological Commission is unhappily very poor, but the duty lies upon it to see that this important station has some surer guarantee of permanence than the unsparing efforts of one man. In addition to meteorology, Mr. Sutton has a telescope for astronomical work and a seismograph for observing Earth movements.

Onward from Kimberley we travelled northward for 715 miles over the dry veld, on which the grass gave place more and more to low thorny shrubs and then to thin forest, with the green leaves

breaking out freshly in advance of the rains, until, on the morning of September 9th, we reached Bulawayo. Everything in this remarkable town was a surprise, and none greater than to find the meteorological station kept up by Father Goetz, S.J., one of the many Roman Catholic clergy engaged in educational work in South Africa. Of this we shall have something to say next month.

After visiting the impressive solitude of the Matopo Hills and seeing the majestic simplicity of the tomb of Cecil Rhodes, the party resumed its northward journey across a stretch of forest country, where the station houses are strongly palisaded against lions and other wild beasts. The trains drew up before daylight on the 12th, within hearing of the Victoria Falls. It was the end of the dry season and the water in the river was at its lowest; on this account the scenery of the rock gorges could be fully seen, not being lost, as when the river is higher, in clouds of spray. Low water as it was, the falls rose superior to description. It is enough to remind the reader that the Zambesi, flowing along level with the flat country in a stream a mile wide from bank to bank in a course so tranquil that canoes can ply to within a few yards of the edge, drops suddenly into a chasm in the black basalt rocks, nearly 400 feet deep and varying from 100 to 240 feet across. From this chasm the only escape is a narrow zig-zag gorge in some places not more than 100 feet wide, and through it the river rushes, while over it a single steel arch carries the Cape to Cairo railway into Central Africa.

On the afternoon of September 13th the trains left the falls, and travelling all night in comfortable sleeping cars, the party spent the greater part of each day in seeing a fresh town and receiving new hospitality—at Bulawayo on the 14th, at Salisbury on the 15th, at Umtali on the 16th, and then, entering Portuguese territory, at Beira on the 17th. At each of these places we visited an efficient meteorological station, and were able to see something of the peculiar conditions which sometimes require special modifications of exposure or protection. At Bulawayo on September 14th the dry bulb temperature in the shade was 85° , the wet bulb only 55° , a depression of 30 degrees, showing an amazingly low relative humidity. Such an observation gives point to the remark of Professor C. V. Boys, in his lecture at Capetown, to the effect that in the interior of South Africa water evaporates as rapidly as alcohol does at home.

At the risk of being tedious we must reiterate our gratitude to the countless friends who smoothed the way of the pilgrims of science at every step, and most of all to the ladies of the smallest and the most attractive town that entertained us, Umtali, where we left Rhodesia and British South Africa with a last outburst of that hearty welcome which was a revelation when we first met it at Capetown and always a delight.

For the return journey the Union Castle Company had put one of their steamers, the *Durham Castle*, on the East Coast route as a special favour, and one greatly appreciated. The units of the British Asso-

ciation went on board at Beira, after being entertained by the Portuguese authorities, on the afternoon of September 17th, called at Mozambique on the 19th, and anchored in Kilindini harbour, Mombasa, on the 22nd. The outline of Pemba Island, the meteorology of which has been frequently reported in these pages, was seen afar off, but Mombasa was the first experience of equatorial land. The sun at noon was so nearly vertical that looking down one could see no shadow, and the shadeless sunshine made a wonderful picture in the narrow streets of tall white houses with glimpses of stately cocoa-nut palms tossing in the strong sea-breeze, massive baobabs and deep green mango trees, with the white surf and blue sea behind. The breeze was so fresh that the solar radiation produced no discomfort, and though we were walking about during three of the hottest hours it did not feel by any means so oppressive as a warm August day at home. Those who lived at the place, however, reminded us that a wet day without wind would have produced a very different impression as to warmth.

We sailed on the 23rd and did not anchor again until October 4th at Suez. In the Red Sea we met the usual southerly wind of the southern half, which, thanks to the slow speed of the steamer, was able to overtake and refresh us; and the northern half of the sea brought a strong warm northerly wind, the temperature of which never exceeded 97° , and so, though with a small margin, it had a cooling effect. A delay of a week in consequence of a block in the Suez Canal, permitted of a visit to Cairo to crown this wonderful expedition, and on the 11th we entered the Mediterranean, disembarked at Marseilles on the 17th, and next evening were inspecting the rain gauges at Camden Square.

THE LOW TEMPERATURE OF OCTOBER, 1905.

THE exceptionally low temperatures experienced during the latter half of October, 1905, particularly in the third week, have called forth a considerable amount of comment. So far as we are able to form an opinion from the information at our disposal, the month ranks among the most notable in the last half century for early and protracted frost.

We have made a brief examination of the October record at Camden Square, and the results as to temperature may be conveniently epitomised in the following table, dealing with the month as a whole:—


OCTOBER.	Mean, 1905.	Diff. from aver., 1858-97.	No. of times lower, 1858-04.	Highest 1905.	No. of times lower, 1858-04.	Lowest 1905.	No. of times lower, 1858-04.	No. of days at or below 32° .
Mean Temperature ...	$45^{\circ}8$	$-4^{\circ}0$	3	$53^{\circ}8$	...	$38^{\circ}4$	...	...
Shade Maximum	$53^{\circ}8$	$-3^{\circ}7$	5	$61^{\circ}0$	3	$46^{\circ}9$	17	...
„ Minimum	$38^{\circ}7$	$-4^{\circ}6$	0	$52^{\circ}1$	7	$27^{\circ}8$	7	5
Minimum on Grass ...	$34^{\circ}0$	$-5^{\circ}0$	1	$48^{\circ}0$	5	$23^{\circ}7$	9	13

This shows that the most noteworthy departure from the average was in the case of the minimum on grass, but that the mean shade minimum alone was absolutely unprecedented. The mean minimum on grass was however only lower on one occasion—in October, 1888, with 33°.1 . The meaning of this is that although there have often been colder individual days in October than occurred on this occasion, there has never before been an October with so low an average of minimum readings. Of the 13 frosts recorded by the exposed thermometer, 11 occurred on consecutive nights from 16th to 26th.

Almost equally prominent with the low mean minima and prevalence of frost was the persistently low day temperature. The maximum temperature reached 60° on one day only, a quite exceptional record, and there have been but three Octobers in the previous 47 years in which the maximum has not exceeded that of the past month. The mean temperature, as will be seen, was as much as 4°.0 below the average, and it has been lower only three times. Unfortunately details of the mean temperature for individual days throughout the record are not readily accessible, but in the present instance it is interesting to note that the mean temperature rose above the average for the month on 7 days only, and was below that point every day from the 14th onwards.

The areas in which the cold weather was most severely felt were, generally speaking, the southern half of England and the inland counties of Scotland and Ireland. In all of these districts temperatures below 25° in the screen were pretty widely recorded. Readings of 20° or lower occurred at some half-dozen stations in the South of England and Wales, and also at Markree Observatory in Sligo. The lowest figures we can quote with confidence were 16° at Llangammarch Wells, and 17° at Polapit Tamar, near Launceston.

Frosts occurred in the screen on 10 days or more over very much the same areas except in Ireland, where so protracted a frost was confined to the south. As many as 15 frosts were recorded at a considerable number of places in the south Midlands of England and at a few stations in the Lowlands of Scotland. At Swerford, in Oxfordshire, frosts were reported on ten consecutive days from 17th to 26th; at Clonmel, in Tipperary, from 15th to 24th. At Farnham there were eight from 15th to 22nd, and at Epsom and Rendlesham seven consecutive frosts. At Ross, in Herefordshire, grass frosts occurred on 13 consecutive nights, from 16th to 28th, a record which we believe to be unprecedented for October.



PERIODICITY OF RAINFALL.

BY ARTHUR P. JENKIN.

REFERRING to my letter in the *Meteorological Magazine* for June, 1904, I am now in a position to carry the investigation a stage farther. I have not had access to many rainfall records, but I find that the reversal to which I called attention will carry back the three-year period through the whole series of Greenwich records, as the following table will show, there being seven or eight periods in each series.

TABLE I.—*Rainfall at Greenwich.*

	in.	in.	in.	in.	in.
Series A	I. 1843...24·47	1846...25·29	1849...23·58	1852...34·01	1855...23·59
	II. 1844...23·20	1847...17·61	1850...19·53	1853...29·99	1856...23·27
	III. 1845...22·34	1848...30·10	1851...23·53	1854...19·01	1857...21·16
	Means... I. 26·19 II. 22·72 III. 23·23				
Series B	I. 1858...17·70	1861...20·45	1864...16·38	1867...28·46	1870...18·55
	II. 1859...25·83	1862...26·32	1865...28·70	1868...25·15	1871...22·30
	III. 1860...31·90	1863...19·66	1866...30·72	1869...24·02	1872...30·02
	Means... I. 21·29 II. 25·07 III. 27·61				
Series C	I. 1873...23·36	1876...24·10			
	II. 1874...19·95	1877...27·28			
	III. 1875...27·97	1878...28·98			
	Means... I. 25·55 II. 22·53 III. 21·21				
Series C	I. 1879...31·36	1882...25·18	1885...24·00	1888...27·51	1891...25·04
	II. 1880...29·68	1883...21·91	1886...24·21	1889...23·28	1892...22·31
	III. 1881...25·72	1884...18·05	1887...19·86	1890...21·86	1893...20·12
	Means... I. 25·55 II. 22·53 III. 21·21				
Series C	I. 1894...26·89	1897...22·13	1900...22·31		
	II. 1895...19·73	1898...18·85	1901...20·29		
	III. 1896...22·42	1899...22·33	1902...19·34		
	Means... I. 25·55 II. 22·53 III. 21·21				

TABLE II.—*Rainfall at Capetown (in percentages).*

Series A	I. 1845 ... 81	1848 ... 90	1851 ... 79	1854 ... 78
	II. 1846 ... 87	1849 ... 95	1852 ... 90	1855 ... 95
	III. 1847 ... 87	1850 ... 130	1853 ... 82	1856 ... 75
	Means... I. 88 II. 92 III. 107			
Series B	I. 1857 ... 85	1860 ... 113		
	II. 1858 ... 86	1861 ... 99		
	III. 1859 ... 142	1862 ... 124		
	Means... I. 112 II. 90 III. 90			
Series B	I. 1863 ... 99	1866 ... 74	1869 ... 125	1872 ... 114
	II. 1864 ... 73	1867 ... 89	1870 ... 109	1873 ... 92
	III. 1865 ... 72	1868 ... 78	1871 ... 78	1874 ... 101
	Means... I. 112 II. 90 III. 90			
Series C	I. 1875 ... 100	1878 ... 159		
	II. 1876 ... 103	1879 ... 72		
	III. 1877 ... 138	1880 ... 69		
	Means... I. 95 II. 110 III. 120			
Series C	I. 1881 ... 99	1884 ... 110	1887 ... 89	1890 ... 102
	II. 1882 ... 113	1885 ... 108	1888 ... 140	1891 ... 117
	III. 1883 ... 124	1886 ... 108	1889 ... 120	1892 ... 159
	Means... I. 95 II. 110 III. 120			
Series C	I. 1893 ... 91	(1896 ... 80)		
	II. 1894 ... 88	(1897 ... 97)		
	III. (1895 ... 92)	(1898 ... 118)		
	Means... I. 95 II. 110 III. 120			

The years between brackets are for the Cape Peninsula.

I have also extracted from *Nature*, Vol. 57, p. 115 and Vol. 71, p. 7, the records for Capetown or the Cape Peninsula for many years, which show the same result, though the number of periods in a series is here six, and the time of reversal does not coincide with Greenwich, which indeed is not to be expected. These are given in Table II.

If then this reversal is to be recognised, it carries back the three-year period through a great many years and over very widely separated stations. The next step is to suggest some reason for the reversal, which I think is not difficult, for I find if one takes a period of three years and a fraction and converts it into a three-year period, reversal occurs in almost exactly the same way as in actual rainfall figures. For example: if a real period of 3·2 years is plotted and then transformed into a period of 3·0 years, reversal takes place at the end of eight periods, as the following table will show. The resemblance between these figures and those of the Greenwich rainfall is very striking. In plotting it is necessary to assume a basis and a range of variation. I have adopted a mean of 30 inches with a variation of 10 inches in either direction.

TABLE III.—*Result of Transforming an Actual Period of 3·2 Years into a Period of 3·0 Years. (Mean taken as 30·0 in. with a variation of 10 up and down).*

Series	in.							
	I.	II.	III.	I.	II.	III.	I.	II.
A	31·0	23·1	33·5	33·5	23·1	31·0	35·8	28·6
	33·5	31·0	28·5	26·0	24·2	23·1	23·1	24·2
	Means... { I. 34·2 II. 28·2 III. 26·7							
B	28·5	36·6	26·0	24·2	33·5	35·8	23·1	23·1
	36·6	26·0	28·6	31·0	33·5	35·8	26·0	24·2
	Means... { I. 25·5 II. 31·5 III. 33·0							

It appears then that the apparent period of three years with reversals is a real period of between *three and four years*, which is just what Sir Norman and Dr. Lockyer have observed in meteorological phenomena in India and other widely separated parts of the Earth, which they connect with the occurrence of solar prominences. The evidence for a period thus seems strong, in spite of the negative results which the French records published in this Magazine for July, 1904, show, for if, as Brückner supposes, there are meteorological zones on the Earth's surface, it might well be that some places would not conform to any general rule, and local conditions, too, have sometimes to be taken into account.

With reference to the period of the Earth's polar motion, referred

to in my letter, it would seem that these very minute changes are of an order of magnitude that might be brought about by widespread barometric changes on the surface of the Earth; for, if my reasoning is correct, the greater equatorial diameter of the Earth forming a belt girdling the globe has, by its additional mass, the effect of steadying the poles. If then we imagine a similar belt placed at an angle of 45° to the equator, the axis of rotation of the Earth would be shifted through an angle of $22^\circ 30'$. What then would be required to shift the poles through an angle of $0^\circ 0' 0'' \cdot 25$, which is the limit of motion? This small angle is $1/324000$ of $22^\circ 30'$, so that a belt at an angle of 45° of a mass $1/324000$ of that at the equator will suffice. The equatorial belt has a thickness of about 70,000 ft. and, supposing the specific gravity to be 2, this will be equal to 140,000 feet of water, or 140,000 inches of mercury, of which half an inch of mercury is $1/280,000$, being more than the requisite amount. It may be pointed out, too, that it is not necessary for the belt to be complete as the parts at or near the equator may be ignored. If, then, pressure varies over large areas in a certain way, it is quite possible that changes would be caused in the polar motion, and in fact Mr. Kimura, who called attention to the polar period, suggests the effect of meteorological conditions (*Astronomische Nachrichten*, No. 3932); and to refer again to the work of Sir Norman and Dr. Lockyer (*Nature*, Vol. 70, p. 177), there seems reason to suppose that some such widespread conditions of pressure may exist.

BOOKS RECEIVED.

Notes on a Daily Weather Chart. By A. S. Helps. [Proc. Cotteswold Nat. Field Club. Vol. XV. Part II. May, 1905.] Gloucester, 1905. Size 10×6 . Pp. 13.

Koninklijk Nederlandsch Meteorologisch Instituut. No. 96. Observations Néerlandaises pour les Etudes Internationales des Nuages, en 1896-1897. Utrecht, 1904. Size $12\frac{1}{2} \times 9\frac{1}{2}$. Tables and diagrams.

Koninklijk Nederlandsch Meteorologisch Instituut. Nos. 97 and 98. Jaarboek, 1903. Meteorologie en Aard-Magnetisme. Utrecht, 1905. Size $12\frac{1}{2} \times 9\frac{1}{2}$. Pp. 246 and 34.

Some Results of the Scottish National Antarctic Expedition. [Including Meteorology by R. C. Mossman.] Edinburgh, 1905. Size $9\frac{1}{2} \times 6$. Pp. 40. Frontispiece and maps.

THE TEN MONTHS' RAINFALL OF 1905.

THE Table of aggregate rainfall for the current year shows that the average of the ten months has been exceeded in the north and west of Scotland, though the excess is slight. In all other parts of the country there is still a deficiency which in two areas at least is somewhat serious. The northern area, in which the rainfall has reached less than 75 per cent. of the average, is a comparatively narrow strip along the east coast from about Hartlepool to near Montrose. The southern area, and apparently the drier, extends from Hull south-westward to beyond Derby. A third, though apparently rather less deficient area, lies in the south-west of England, mainly in Devon, Dorset and Somerset, and in South Wales. The south-east of England has been less affected by the reduction of rainfall than any other part of Great Britain south of the Highlands.

The whole central belt of country from Devonshire north-eastward to Hull and from Hull north-westward to Perthshire has had much less than the average rainfall in 1905, and it is highly improbable that the remaining two months will repair the deficiency there.

In Ireland the deficiency is most marked in the west, but is not so considerable as in Great Britain. Taken as a whole, Scotland shows a general rainfall for the ten months equal to 95 per cent. of the average; England and Wales and Ireland have had about 85 per cent.

So far the year has only had two months which were generally wet, March and June, and from many parts of the country serious complaints have arisen on account of the failure of water supplies.

Although the last three days brought a considerable amount of rain in October, the month as a whole was very dry, and a second dry autumn is a serious menace to water supplies, though it bears the promise of a bountiful harvest next year.

Aggregate of Rainfall for January—October, 1905.

Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.
	in.			in.			in.	
London	19·14	93	Bolton	33·30	97	Braemar	26·54	92
Tenterden	21·77	97	Wetherby	18·10	80	Aberdeen	23·42	90
Hartley Wintney	19·48	91	Arnccliffe	39·50	81	Cawdor	25·27	104
Hitchin	20·08	100	Hull	16·83	76	Invergarry	43·27	100
Winslow	17·08	78	Newcastle	16·53	73	Bendamph	69·10	102
Westley	18·97	91	Seathwaite	91·99	88	Dunrobin	26·12	105
Brundall	19·86	97	Cardiff, Ely	26·43	77	Killarney	35·42	78
Alderbury	21·44	93	Haverfordwest	30·56	82	Waterford	27·24	88
Winterbourne	23·25	77	Gogerddan	35·32	98	Broadford	25·63	95
Torquay	21·48	77	Llandudno	21·78	88	Carlow	23·53	85
Polapit Tamar	25·59	85	Cargen	27·92	82	Dublin	20·48	90
Bath	18·78	75	Lilliesleaf	22·38	84	Mullingar	25·71	87
Stroud, Upfield	21·47	88	Colmonell	30·95	88	Ballinasloe	23·53	79
Woolstaston	22·03	82	Glasgow	22·87	79	Clifden	50·04	79
Bromsgrove	17·10	84	Inveraray	54·11	110	Crossmolina	33·43	86
Boston	18·11	94	Islay, Eallabus	41·38	112	Scaforde	25·77	83
Hodsock Priory	13·92	68	Mull	45·15	101	Londonderry	28·85	88
Derby	14·30	66	Dundee	16·60	71	Omagh	28·84	94

Correspondence.

THUNDERSTORMS.

To the Editor of Symons's Meteorological Magazine.

WITH reference to the correspondence on this subject which has recently appeared in your pages, I may say that I have, for some considerable time past, been actively engaged in collecting information as to the prevalence of thunderstorms in various parts of the United Kingdom, and that I hope to be able to submit the results of the enquiry to the Royal Meteorological Society in the early part of next year. The period dealt with will be the 25 years ending with 1905.

I have already accumulated and plotted data from a large number of stations, but there are some portions of the country which are at present inadequately represented. These are :—

- (a) The interior of South Wales—say, Carmarthen or the neighbourhood of Llandilo.
- (b) Lincoln, Doncaster, or the neighbourhood.
- (c) Essex—somewhere in the neighbourhood of Colchester.
- (d) Somersetshire—preferably the Taunton district.
- (e) The west of Ireland—somewhere in the neighbourhood of Galway or Limerick.
- (f) The south-east of Ireland—the neighbourhood of Wexford or Waterford.

If any of your readers could supply me with records from any of these districts, or could put me in the way of finding them, I should be extremely obliged. The information required is the number of days in each month of the last 25 years upon which thunderstorms, or thunder only, occurred; sheet lightning is not included in the enquiry.

It is very desirable that the records should extend uninterruptedly over the full period of 25 years ending with 1905, but for some ill-represented districts a record for the last 20 years would be acceptable, if that is the best that can be obtained. For the purpose of my enquiry it is not proposed to deal with any set of observations extending over a shorter period than 20 years.

FREDK. J. BRODIE.

12, Patten Road, Wandsworth Common, S.W.

THE RAINFALL OF OCTOBER.

THE peculiarities of October have been worth recording. The barometer was unusually high up to the 29th, with unusually low readings of the thermometers from the 14th to 28th, and the rainfall amounted only to 59 in. On the morning of the 29th the barometer had fallen in 24 hours from 30·01 in. to 29·46 in. From that day to

the end of the month I registered 1·28 in. of rain. The barometer continued to fall to 29·01 in. on the 1st, and the rainfall, which resulted from the continuance of the same persistent depression of one inch, amounted to ·74 in. for November 1st and ·09 in. for the 2nd, making a total of 2·11 in. for the six days after a dry spell of twenty-seven days.

T. W. SIDEBOTHAM.

*The Bourne Vicarage, Farnham,
3rd November, 1905.*

UP to and including the 27th of the month, October had proved remarkably dry here, the total rainfall for the period (9 a.m. Oct. 1st to 9 a.m. Oct. 28th) being only ·43 in.

On the 28th, however, a change set in, and the following falls occurred :—

			For October.
October 28th	·33 in.	}	= 1·94
„ 29th	·11 „		+ ·43
„ 30th	1·30 „		
„ 31st	·20 „		= 2·37 in.
November 1st	·70 „		
Total of 5 days			2·64 in.

D. W. HORNER.

Worthing.

CONTRAST IN TWELVE MONTHS' RAINFALL.

I DON'T know if any of your correspondents have noticed the extraordinary difference in the rainfall in the twelve months from March, 1903, to February, 1904, which was 41·48 in. at this station, and the twelve months immediately following, from March, 1904, to February, 1905, which was 19·16 in., a difference of 22·32 in.

I should think this must be a record difference.

G. B. SHOULTS.

North Finchley, N., Oct. 12th, 1905.

[The contrast pointed out by Mr. Shoults is certainly a striking one, and so far as we can see from a hasty inspection of a limited number of records, few show it to a more marked degree than his. We may quote :—

Station.	Rainfall March—Feb.		Ratio of 1904-5 to 1903-4. per cent.
	1903-4. in.	1904-5. in.	
North Finchley	41·48	19·16	46
Newbury, Welford Park	47·04	21·78	46
London, Camden Square	40·02	17·88	45
Oxford, Magdalen College.....	37·67	16·65	44

ED. S.M.M.]

COLD SOUTH WINDS.

MR. BACKHOUSE, in his letter in the Magazine for October, dated 3rd inst., refers to the cold winds from the south at Sunderland, and suggests snow as the cause. I may remark that here winds from S. and S.W. are often very cold, even in summer, and that there is very little snow.

C. S. PRINGLE.

Whitekirk, Southbourne, Hants, 19th October.

SOME WEATHER PROBLEMS.

THE present year is probably one of maximum sunspots.

A steamer leaving England for the Cape in the end of July, meets (as you tell us) with "surprisingly cool" weather right through the tropics.

Without affirming a causal nexus between these facts (which is obviously unwarrantable), we may be reminded by them of what is perhaps one of the best ascertained relations concerning "sunspots and weather." Some thirty years ago Köppen found in the tropics, heat with minima, coolness with maxima. And recently, Nordmann, bringing the inquiry up to date, arrived at the same result.

"This shows that the sun is hottest (gives out most heat) about minima," say some. Not necessarily. There is more to be said, apparently, for the sun being hottest about maxima. And those who take this view account for the tropical coolness about maxima by increased evaporation, cloud, &c.

Let us now turn to another set of phenomena. It has been shown by Hann that our weather in western Europe, in the winter half especially, is largely ruled by the condition of a permanent low-pressure system having its centre about Iceland. When this is deep, or intense, our coasts get flushed with south-westerly winds, and we have warmth; in the opposite case, there is cold.

Again, there seems to be a sort of see-saw between this low-pressure system and one of high-pressure over the Azores to the south. When the pressure in the latter goes up, that in the former goes down, and *vice versa*. The Azores pressure is generally, but not always, higher than that over Iceland.

Now, there is some reason to believe that our temperature in the early months of the year, March especially, varies with the sunspot cycle, in the sense of warmth with maxima. Thus, about maxima (as shown by Flammarion and others), there is a tendency to earlier springs and earlier vegetation. Curves of early and late flowering of certain plants have been shown to be in agreement with the sunspot curve.

Can we, then, find in the table of Iceland pressures recently given by Hann, indications of sunspot influence? I think we can. The pressure in March agrees in its larger waves very fairly with the sunspot curve, in the sense of low pressures with maxima.

The view I would offer for criticism is briefly this : Sun hottest about maxima. More air then drawn in and up at the equatorial furnace. More air carried over and down in anticyclonic systems north and south. Hence (among other things), more air descending in March over the Azores and lower pressures over Iceland. Hence, in our region at maxima, much south-westerly wind, early spring and early vegetation.

There may be difficulties about this view which I have overlooked. The behaviour of polar ice in relation to the sunspot cycle is a subject which seems likely to come into prominence ere long, and one on which we greatly need more light. Have any differences been observed in polar regions between times of maxima and minima of sunspots ? Some seasons are very open ; others the opposite. How are these distributed in the eleven years' period ?

The low-pressure system over Iceland, when intensified, tends to stimulate the Gulf Stream on the side next us by south and south-westerly winds, and the Labrador Current on the farther side by north and north-easterly winds. In the former case more warm water is carried to northerly regions, affecting, doubtless, the temperature conditions there ; and in the latter more ice tends to be carried down to the Newfoundland region to melt in the warm water of the Gulf Stream. This cooled water, if in that portion of the Stream coming to our shores, probably affects our weather for a time ; but we need further light on the subject.

A very interesting paper by Dr. Meinardus, dealing with some of these relations, will be found in the September number of the *Meteorologische Zeitschrift*.

ALEX. B. MACDOWALL.

METEOROLOGICAL NEWS AND NOTES.

DR. W. VON BEZOLD is, we are happy to learn, alive and well. Our note last month was given on the authority of a scientific paper, which had no doubt been misled by a Berlin newspaper, confounding another Herr von Bezold, who died in September, with the distinguished meteorologist. What makes the fact more striking is that almost on the same date the great geographer Baron von Richthofen, died in Berlin seventeen years after having been the victim of a precisely similar mistake.

A LECTURESHIP ON METEOROLOGY has been established in the University of Manchester, and Mr. George C. Simpson has been appointed to the post. He is, we believe, the first University lecturer on Meteorology in this country, and the University of Manchester is to be congratulated on taking such an important step forward.

THE ANTI-TRADES, or south-westerly steady breezes blowing above the north-easterly surface trade winds, have been known since

Humboldt's famous observation on the Peak of Tenerife, but there was no direct measurement of the height at which the direction changed, or any demonstration of the permanence of these upper winds until Mr. A. Lawrence Rotch and M. Teisserenc de Bort took the matter up last summer. Their assistants, Messrs. Clayton and Maurice, made a series of kite and *ballon sonde* observations in the Atlantic, during July and August, 1905, and they report that they were able to penetrate the trade winds on many occasions. The north-easterly surface winds reached to heights varying from about 1500 to about 12,000 feet, and in each case the upper wind was found to have a southerly or westerly component.

DR. MAURITS SNELLEN has retired from his position as director of the department of Terrestrial Magnetism and Seismology in the Royal Meteorological Institute of the Netherlands at de Bilt.

SYNOPTIC WEATHER MAPS are now being published by the daily newspapers in Australia, showing the isobars for the whole continent. A series of these charts has reached us from the Meteorological Branch of the Sydney Observatory, and at a later date another specimen has been received from an Adelaide paper. It would appear that the several States of the Commonwealth are collecting data and producing separate maps and forecasts.

FORTNIGHTLY CONFERENCES on meteorological work have been instituted by the Director of the Meteorological Office, mainly for the purpose of affording the staff of the office, meteorological observers, and others interested, an opportunity of discussing published meteorological works, especially those of colonial and foreign meteorologists, in an informal way. At the first meeting on November 6th, Professor Hildebrandsson's report on the International Observations on Clouds was discussed. On Tuesday, November 21st, the subject will be Professor Pettersson's and Mr. Knudsen's Report on the physical work of the International Council for the Study of the Sea. Such meetings should prove useful and help to increase the growing interest in scientific meteorology.

THE ROYAL METEOROLOGICAL SOCIETY'S new scheme for extending public interest in Meteorology, is now in operation. The exhibit of the Society, which consists of a typical climatological station, instruments for the exploration of the upper atmosphere, a large collection of photographs illustrating meteorological phenomena, models, diagrams and charts, has been shown during the past month in connection with the following local societies:—October 11th, at the Walsall Literary Institute, in the New Town Hall, Walsall. October 25th, at the Rochester Naturalists' Club, in the Mathematical School, Rochester. November 3rd—4th, at the Rochdale Literary and Scientific Society, in the Town Hall, Rochdale. At the latter place the local society arranged with the Education Committee for the teachers of the town to visit the exhibit, and have it explained to them. We understand that altogether about 1400 people have inspected the exhibit at the places named above.

RAINFALL AND TEMPERATURE, OCTOBER, 1905.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.]	RAINFALL.						Days on which 101 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Diff. from average, 1870-99.	Greatest in 24 hours.		Deg.	Date.		Deg.	Date.				
				Depth.	Date.									
											Shade	Grass		
		inches	inches.	in.										
I.	London (Camden Square) ...	1.40	— 1.45	.36	30	14	61.0	9	27.8	22		5	13	
II.	Tenterden.....	1.88	— 1.72	.83	30	15	58.5	4, 9, 11	26.0	17		7	13	
„	Hartley Wintney	1.62	— 1.46	.52	29	11	57.0	4	23.0	17, 22		10	14	
III.	Hitchin.....	1.49	— 1.23	.51	29	13	58.0	9	26.0	25		12	...	
„	Winslow (Addington)	1.18	— 1.71	.38	29	13	58.0	8	24.0	22, 25		13	16	
IV.	Bury St. Edmunds (Westley) ..	2.05	— .61	.34	4	19	60.0	9	28.5	17		...	...
„	Brundall	4.14	+ 1.16	.48	4	26	58.4	9	28.8	26		5	11	
V.	Alderbury	1.74	— 1.66	.57	31	10	63.0	1, 4	22.0	16		14	...	
„	Winterbourne Steepleton ...	2.31	— 2.02	.64	31	14	62.5	9	22.2	17		13	15	
„	Torquay (Cary Green)	2.30	— 1.79	1.09	31	11	62.1	10	31.9	17		1	8	
„	Polapit Tamar [Launceston] ..	2.58	— 2.39	.58	30	17	63.1	10	17.0	23		12	12	
„	Bath	1.45	— 1.77	.44	31	12	64.5	9	24.0	17		12	19	
VI.	Stroud (Upfield)	1.90	— 1.20	.54	15	14	60.0	9	28.0	21		...	...
„	Church Stretton (Woolstaston) ..	1.93	— 2.06	.35	15	14	59.0	9, 10	26.0	19	a	9	...	
„	Bromsgrove (Stoke Reformatory) ..	.96	— 1.59	.22	31	10	55.0	9	18.0	21		16	...	
VII.	Boston	1.63	— .99	.38	4	15	64.6	9	27.0	27		12	...	
„	Workshop (Hodsock Priory) ..	1.17	— 1.60	.34	4, 15	13	64.1	9	26.4	17		10	22	
„	Derby (Midland Railway) ...	1.20	— 1.57	.39	4	16	61.0	9	27.0	14		5	...	
VIII.	Bolton (The Park)	5.06	+ .34	1.21	14	18	55.6	9	29.1	17		3	17	
IX.	Wetherby (Ribston Hall) ...	1.70	— 1.48	.50	15	12	...	...	...	...		...	...
„	Arncliffe Vicarage	4.44	— 2.11	.87	4	14	...	...	...	...		...	...
„	Hull (Pearson Park)	2.00	— 1.26	.48	14	21	63.0	9	30.0	17		3	19	
X.	Newcastle (Town Moor) ...	3.06	+ .12	.78	14	23	...	...	...	...		...	...
„	Borrowdale (Seathwaite) ...	12.01	— 1.34	3.45	14	15	58.0	10	25.8	20, 22		10	...	
XI.	Cardiff (Ely)	2.76	— 2.05	.65	31	13	...	...	...	...		...	...
„	Haverfordwest (High St.) ..	2.01	— 3.62	.44	29	18	61.6	9	22.2	23		9	15	
„	Aberystwyth (Gogerddan) ..	3.07	— 2.51	.85	26	10	63.0	9, 10	22.0	22		10	...	
„	Llandudno	4.10	+ .02	.78	7	17	58.0	1, 6	31.5	22		1	...	
XII.	Cargen [Dumfries]	2.80	— 1.59	.58	29	11	62.0	9	24.0	17		9	...	
„	Lilliesleaf (Riddell)	2.28	— .96	.56	14	17	62.0	9	25.0	17		9	23	
XIII.	Edinburgh (Royal Observy.) ..	2.20	...	.71	14	13	60.9	9	31.1	18		3	9
XIV.	Colmonell	4.89	— .08	.66	26, 29	15	59.0	9	20.0	19		13	...	
XV.	Tighnabruach	6.07	+ .35	1.25	3	15	56.0	9	27.0	17	b	10	10	
„	Mull (Quinish)	6.21	+ .12	.97	28	27	...	...	...	...		...	...
XVI.	Dundee (Eastern Necropolis) ..	1.90	— .81	.70	31	14	62.1	9	27.0	20		6	...	
XVII.	Braemar	3.85	— .20	1.03	30	24	62.4	10	24.3	20		8	...	
„	Aberdeen (Cranford)	3.75	+ .57	.51	30	25	60.0	9, 10	32.0	13	c	...	...
„	Cawdor (Budgate)	4.18	+ 1.33	1.08	31	23	...	...	...	...		...	...
XVIII.	Invergarry	3.84	— 1.70	1.21	19	8	...	...	...	...		...	...
„	Bendampy	9.76	— .22	1.80	7	28	...	...	...	...		...	...
XIX.	Dunrobin Castle	3.56	+ .54	.94	30	19	58.0	10	30.0	28		3	...	
„	Castletown	5.77	...	.97	30	30	57.0	10	29.0	18, 19		3	6
XX.	Killarney	2.97	— 3.08	.81	31	14	69.5	10	27.0	18		...	...
„	Waterford (Brook Lodge) ...	.74	— 3.26	.27	27	9	67.0	9	22.5	18		11	...
„	Broadford (Hurdlestown) ...	1.93	— 1.19	.68	29	14	56.0	3, 10	27.0	19, 20		8	...	
XXI.	Carlow (Browne's Hill)	1.08	— 2.40	.25	29	12	...	...	...	...		...	...
„	Dublin (Fitz William Square) ..	1.20	— 1.88	.37	2	16	62.9	9	29.0	21		1	13	
XXII.	Ballinasloe	1.50	— 1.95	.40	29	17	66.0	12	...	...		...	...
„	Clifden (Kylemore House) ..	4.53	— 3.40	.75	26	13	...	...	...	...		...	...
XXIII.	Seaforde	1.59	— 2.23	.51	29	10	61.0	8	29.0	18	d	5	8	
„	Londonderry (Creggan Res.) ..	2.67	— 1.78	.54	14	22	...	...	...	...		...	...
„	Omagh (Edenfel)	2.10	— 1.62	.31	3, 28	20	62.0	9	22.0	19		8	11	

+ Shows that the fall was above the average; — that it was below it.
c—and 15, 17, 18. d—and 19, 21.

a and 20, 21, 22. b—and 18, 19.

SUPPLEMENTARY RAINFALL, OCTOBER, 1905.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	1·89	XI.	New Radnor, Ednol	2·55
„	Ramsgate, West Cliff	1·80	„	Rhayader, Nantgwillt	4·75
„	Hailsham	2·65	„	Lake Vyrnwy	3·73
„	Crowborough	2·28	„	Ruthin, Plâs Drâw	2·83
„	Osborne	2·43	„	Criccieth, Talarvor	3·96
„	Emsworth, Redlands	1·57	„	Anglesey, Lligwy	4·04
„	Alton, Ashdell	2·38	„	Douglas, Woodville	3·61
„	Newbury, Welford Park	2·42	XII.	Stoneykirk, Ardwell House	3·08
III.	Harrow Weald	1·28	„	Dalry, Old Garroch	4·81
„	Oxford, Magdalen College	1·28	„	Langholm, Drove Road	3·43
„	Banbury, Bloxham Grove	1·04	„	Moniaive, Maxwellton House	3·59
„	Pitsford, Sedgebrook	·95	XIII.	N. Esk Reservoir [Penicuik]	2·25
„	Huntingdon, Brampton	1·18	XIV.	Maybole, Knockdon Farm	3·37
„	Wisbech, Bank House	1·41	„	Glasgow, Queen's Park	2·61
IV.	Southend	1·00	„	Campbeltown, Redknowe	5·74
„	Colchester, Lexden	·99	XV.	Inveraray, Newtown	6·30
„	Saffron Walden, Newport	1·29	„	Ballachulish House	5·13
„	Rendlesham Hall	1·98	„	Islay, Eallabus	6·01
„	Swaffham	3·02	XVI.	Dollar	3·43
„	Blakeney	3·18	„	Loch Leven Sluices	1·99
V.	Bishops Cannings	1·78	„	Balquhiddy, Stronvar	4·30
„	Ashburton, Druid House	2·45	„	Coupar Angus Station	1·86
„	Okehampton, Oaklands	3·47	„	Blair Atholl	2·44
„	Hartland Abbey	1·94	„	Montrose, Sunnyside	1·77
„	Lynmouth, Rock House	3·33	XVII.	Alford, Lynturk Manse	4·78
„	Probus, Lamellyn	2·07	„	Keith	7·59
„	Wellington, The Avenue	1·96	XVIII.	N. Uist, Lochmaddy	4·09
„	North Cadbury Rectory	2·01	„	Aviemore, Alvey Manse	4·18
VI.	Clifton, Pembroke Road	2·03	„	Loch Ness, Drumnadrochit	3·68
„	Moreton-in-Marsh, Longboro'	1·59	„	Glencarron	8·77
„	Rosa, The Graig	1·57	„	Fearn, Lower Pitkerrie	2·97
„	Shifnal, Hatton Grange	1·24	XIX.	Invershin	4·22
„	Wem Rectory	1·28	„	Altnaharra	4·35
„	Cheadle, The Heath House	2·38	„	Bettyhill	6·35
„	Coventry, Kingswood	1·33	„	Watten	4·67
VII.	Market Overton	1·05	XX.	Cork	·92
„	Market Rasen	2·44	„	Darrynane Abbey	2·13
„	Bawtry, Hesley Hall	1·01	„	Glenam [Clonmel]	·90
VIII.	Neston, Hinderton	1·87	„	Ballingarry, Gurteen	1·49
„	Southport, Hesketh Park	2·87	„	Miltown Malbay	1·85
„	Chatburn, Middlewood	3·81	XXI.	Gorey, Courtown House	·86
„	Cartmel, Flookburgh	3·62	„	Moynalty, Westland	1·50
IX.	Langsett Moor, Up. Midhope	3·75	„	Athlone, Twyford	1·39
„	Scalby, Silverdale	4·48	„	Mullingar, Belvedere	1·63
„	Ingleby Greenhow	4·12	XXII.	Woodlawn	2·04
„	Middleton, Mickleton	1·67	„	Westport, Murrisk Abbey	2·76
X.	Beltingham	2·47	„	Crossmolina, Enniscooe	3·00
„	Font Reservoir, Fallowlees	3·71	„	Collooney, Markree Obsy	3·53
„	Ilderton, Lilburn Cottage	3·98	XXIII.	Enniskillen, Portora	2·14
„	Keswick, The Bank	4·31	„	Warrenpoint	1·08
XI.	Llanfrechfa Grange	2·55	„	Banbridge, Milltown	1·17
„	Treherbert, Tyn-y-waun	4·43	„	Belfast, Springfield	1·65
„	Carmarthen, Friary	2·71	„	Bushmills, Dundarave	3·44
„	Castle Malgwyn	3·27	„	Stewartstown	1·59
„	Plynlimon	8·95	„	Killybegs	3·16
„	Tallyllyn	2·30	„	Horn Head	3·74

METEOROLOGICAL NOTES ON OCTOBER, 1905.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—The weather was fine as a rule, with many exceptionally beautiful days particularly in the middle. The first half was rather sunless and the latter half decidedly cold,† with many frosty nights. Mean temp. $45^{\circ}\cdot 8$, or $4^{\circ}\cdot 0$ below the average. Duration of sunshine $93\cdot 9^*$ hours, and of R $16\cdot 3$ hours.

ABINGER HALL.—Cold and frosty, with N.W. to N.E. winds for the greater part. The last week was showery and warmer, with strong S. and S.W. winds.

TENTERDEN.—Damp at first, but deficient R till the last three days. Very cold from 17th to 26th, but with sunny days generally. Autumn tints and the fall of the leaf began unusually early. Duration of sunshine $113\cdot 2^*$ hours. TS on 30th.

CROWBOROUGH.—Cold but fine, with several brilliant days. Nearly all the R fell during the last week, when the weather became milder. R $1\cdot 91$ in. below the average. Mean temp. $44^{\circ}\cdot 4$. TS with much L and H on 30th.

HARTLEY WINTNEY.—The chief feature was the prolonged period of cold, with persistent N. wind, cloudy days, and absence of fog and gales. The few closing days robbed the month of its distinction as a phenomenally dry one. Ozone occurred on 22 days with a mean of $4^{\circ}\cdot 8$.

PITSFORD.—Altogether cold and uncomfortable, although many days were bright. R $2\cdot 13$ in. below the average. Mean temp. $44^{\circ}\cdot 3$.

BURY ST. EDMUNDS.—Cold, with R in small quantities on 19 days. Ponds and rivers were nearly dry and deep wells were getting low.

BRUNDALL.—An ungenial month. The mean temp., $44^{\circ}\cdot 8$, was the lowest for October since the register was commenced in 1883. The R was excessive, being caused by shallow depressions passing in a southerly direction and affecting the E. coast while the westerly anticyclone kept the weather dry in all places to the W.

TORQUAY.—Mean temp. $49^{\circ}\cdot 3$, or $2^{\circ}\cdot 7$ below the average. Duration of sunshine $133\cdot 0^*$ hours, or $20\cdot 4$ hours above the average. Mean amount of ozone $4\cdot 0$.

NORTH CADBURY.—Remarkable for calmness, sunshine, dryness of air, and temp. in every respect much below the normal. It was, however, a pleasant and healthy month, with roads clean and soil in magnificent working order. There was a complete change on 28th to S.W. winds, normal warmth, low pressure and much R.

CLIFTON.—The first week was showery, then fine and dry with occasional slight R till 25th, with northerly winds, low temp. and night frosts. The last few days were mild and rainy with S.W. winds. R little more than half the average.

ROSS.—Unsettled, with frequent light R till 7th, then cold but very dry till 28th. The last three days were wet. There was continuous ground frost every night from 16th to 28th, an unprecedented length of time.

BOLTON.—A cold but dry month. Mean temp. $43^{\circ}\cdot 9$, or $3^{\circ}\cdot 0$ below the average. The R was above the average, but fell mostly in large amounts, leaving the air remarkably dry. Duration of sunshine $56\cdot 7^*$ hours, or $3\cdot 8$ hours below the average.

SOUTHPORT.—Normal during the first fortnight and towards the close, but remarkably cold from 16th to 26th, under the influence of dry N.N.E. winds. It was exceptionally sunny during the cold period. Mean temp. $3^{\circ}\cdot 3$ below the average. Duration of sunshine 23^* hours above the average. Total

* Campbell-Stokes.

† Jordan.

‡ See p. 177

R 1·07 in. below the average. Mean underground water level lower than in any previous October since the record commenced.

BELTINGHAM.—Very cold nights from 15th to 22nd, especially from 16th to 19th, when the temp. fell to 10° below freezing each night. S on 15th.

LILBURN COTTAGE.—From 1st to 14th seasonable weather prevailed, but on 15th a heavy S storm came on at 3.30 p.m. and lasted for two hours. Heavy S again on 18th. The Cheviots were covered from 15th to the end. R much above the average; very low temp. from the middle till the end.

LLANFRECHFA GRANGE.—Fine with moderate R, but unusually low temp. from 16th to 26th. There was, however, a good deal of warm sunshine.

CARMARTHEN.—Remarkably fine and dry, but cold with morning frosts. Favourable for working on the land, but water supplies getting low.

HAVERFORDWEST.—The coldest and driest October for 56 years, the air being generally dry and keen. Low grass minimum temp. from 16th to 29th. Broken weather from 26th to the end. Duration of sunshine 118·0* hours.

DOUGLAS.—Cold, but with excess of sunshine. The period from 17th to 25th was brilliantly fine. The first and last weeks were wet, the bar. falling to 29·04 in. on 30th, when it was mild and stormy. L on 29th.

SCOTLAND.

CARGEN.—Abnormally cold and dry for the first three weeks. Severe frost from 16th to 25th played serious havoc in the garden and caused an unusually early fall of the leaf.

LANGHOLM.—R 1·47 in. below the average of 29 years. Severe night frost with sunny days from 15th to 25th.

COUPAR ANGUS.—Mean temp. 43°·2, or 1°·4 below the average. Bright sunshine and little R till 15th, followed by severe morning frosts. R again below the average, being with the exception of March the eleventh month in succession with a deficiency.

DRUMNADROCHIT.—R 1·19 in., and rainy days 3·5, greater than the average of 19 years. The chief feature was the unusual cold, culminating in the sharp frosts of 14th to 18th, when the exposed iron pipes for the main water supply were frozen.

BETTYHILL.—There was scarcely a whole dry day throughout the month, and the R was unusually heavy. On two occasions more than 1·25 in. fell in 24 hours. There were frequent high winds.

IRELAND.

CORK.—Remarkable both for low temp. and small R, the min. temp. on 18th and 21st, 26°, being the lowest in October for 23 years. The R was the smallest since 1879.

DARRYNANE.—The driest October in 25 years except in 1899, the R being only 39 per cent. of the average. Of the total, 1·44 in. fell in the last six days. It was a cold month, with constant E. wind for the first three weeks.

WATERFORD.—The driest October for 56 years, and with mean temp. much below the average.

DUBLIN.—Generally favourable with a small but frequent R, and almost continuous low temp. after 13th. Mean temp. 47°·2, or 2°·2 below the average of 30 years. Duration of sunshine 110·7* hours. Prevailing winds N.W. and W. Only one stormy day.

MARKREE OBSERVATORY.—On the first few days R fell heavily at times, with fogs and rather low temp. Frost set in on 17th, remaining for a week, being severe on a few nights. Showery towards the end and cold at times.

OMAGH.—A month of chiefly polar and easterly winds, deficient R, and, during the third week, the lowest mean and actual temp. ever registered in October. It was, notwithstanding, a favourable month for farming operations.

Climatological Table for the British Empire, May, 1905.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	83·2	29	35·1	23	66·1	44·5	44·0	68	128·1	28·4	1·18	9	5·3
Malta.....	89·5	23	53·1	3	74·1	58·9	56·6	76	133·8	48·0	·59	5	2·8
Lagos.....	92·0	5	72·5	25	87·9	75·7	74·4	72	143·0	65·0	7·15	16	6·6
Cape Town ..	79·6	5	41·1	21	65·6	49·4	51·3	82	...	...	4·53	17	5·1
Durban, Natal	83·3	2	49·9	29	76·8	58·6	...	...	137·2	...	·81	5	3·3
Johannesburg	71·2	8	30·0	28	63·9	46·0	39·8	64	129·5	29·2	·35	3	1·3
Mauritius.....	81·7	14	60·6	16	78·6	66·6	65·8	81	140·2	52·2	3·35	20	6·7
Calcutta.....	100·7	23	67·4	10	92·0	76·8	75·6	78	155·8	65·9	10·01	8	5·4
Bombay.....	92·1	16	77·2	1	90·7	80·5	76·7	75	141·0	71·6	·00	0	3·0
Madras	107·9	29	76·1	4	96·8	80·4	74·4	70	144·9	74·1	·06	1	3·8
Kodaikanal	74·7	5	50·9	28	69·9	54·8	52·4	74	149·0	43·7	6·52	13	5·3
Colombo, Ceylon.....	89·4	5	73·8	24	87·2	77·6	75·5	84	151·4	73·0	13·54	26	7·0
Hongkong.....	89·4	20	68·4	4	83·0	74·3	72·1	82	148·5	...	6·83	11	6·6
Melbourne.....	83·7	7	38·4	21	63·7	47·6	48·0	79	131·2	32·0	2·97	10	6·5
Adelaide	85·2	6	40·8	10	67·8	51·1	47·2	66	133·8	36·3	3·58	11	5·4
Coolgardie	86·2	3	38·0	7	68·0	49·6	47·7	66	146·9	35·0	1·63	13	5·6
Sydney	76·1	8	47·7	30	65·8	53·3	51·1	82	106·9	39·7	5·20	26	5·3
Wellington	65·5	14	43·0	15	58·6	48·2	46·0	77	111·0	39·0	5·78	15	5·9
Auckland	68·0	4	45·0	18	61·9	50·7	50·0	80	126·0	42·0	2·29	11	5·4
Jamaica, Negril Point..	87·5	27	69·0	8	85·8	72·2	72·9	80	...	...	9·80	19	...
Trinidad	91·0	1,2a	68·0	30	87·6	71·0	71·9	76	164·0	66·0	4·34	13	...
Grenada.....	86·0	14	72·0	18	83·9	74·7	69·6	73	144·8	...	4·61	17	3·7
Toronto.....	75·6	25	31·9	1	62·5	42·9	45·8	71	89·5	26·6	3·23	15	5·6
Fredericton ..	76·8	26	23·9	13	61·6	38·3	33·6	49	...	...	1·91	11	5·2
Winnipeg	80·5	31	27·0	6	62·5	38·3	...	...	...	...	3·35	11	5·8
Victoria, B.C.	72·2	26	37·8	18	59·2	45·9	...	...	...	...	2·83	13	6·2
Dawson	78·5	25	25·5	2	59·9	38·7	...	...	...	...	·97	4	4·1

Lagos { January 92·0 7 71·0 15 88·8 75·6 70·2 75 139·0 65·0 ·04 1 3·5
 { February 91·0 7,9,16 69·0 6 89·1 71·5 70·2 68 139·0 61·5 1·04 1 2·8

a and 15.

MALTA.—Mean temp. of air 64·8, or 0·6 above average. Mean temp. of sea 64·7. Mean hourly velocity of wind 8·8 miles, or 1·2 below average.

MAURITIUS.—Mean temp. of air 0·2 below, dew point 0·5 above, and R ·34 in. below, averages. Mean hourly velocity of wind 9·6 miles, or 1·7 below average.

MADRAS.—Bright sunshine 211·6 hours. Dust storm on 15th.

KODAIKANAL.—Bright sunshine 206 hours. Frequent TSS.

COLOMBO.—Mean temp. of air 81·8 or 0·6 below, of dew point 0·2 above, and R 1·49 in. above average. Mean hourly velocity of wind 9·4 miles; prevailing direction S.W.

HONGKONG.—Mean temp. of air 78·1. Mean direction of wind E.S.E.; mean hourly velocity 10·1 miles. Bright sunshine 212·0 hours.

ADELAIDE.—Mean temp. of air 1·8 above, R ·83 in. above, averages.

SYDNEY.—Mean temp. of air 1·2, and humidity 5·8 above averages.

WELLINGTON.—Mean temp. of air 0·4 above, and R 1·19 in. above, averages.

TRINIDAD.—Rainfall ·41 in. above 40 years' average.

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VOL. XL.

Obituary.

PIETRO TACCHINI.

1838—1905.

PROFESSOR PIETRO TACCHINI, until recently Director of the Astronomical Observatory and of the Central Meteorological and Geodynamical Institute in Rome, died at his estate at Spilamberto, near Modena, on March 24th. Although meteorology claimed only a share of the attention of the distinguished Italian man of science, the organization of the Italian Meteorological Service owed much of its efficiency to his efforts. Probably, Professor Tacchini will be remembered best for his researches on the physical constitution of the sun, especially his spectroscopic studies of sunspots and prominences. He did scarcely less for the study of earthquakes, having founded, and long presided over, the Italian Seismological Society. Along with Dr. Billwiller, Professor Tacchini was elected an honorary member of the Royal Meteorological Society on May 18th, 1892.

ROBERT BILLWILLER.

2nd August, 1849—14th August, 1905.

DR. ROBERT BILLWILLER, the eminent Swiss meteorologist, died in the fifty-seventh year of his age. Born at St. Gallen, in Switzerland, he studied first in Zurich, and afterwards in the Universities of Göttingen and Leipzig. At that time his attention was given mainly to astronomy and mathematics, but in 1872 he was appointed to a meteorological assistantship in the Federal Observatory at Zurich, of which Dr. Rudolph Wolf was then Director. In less than ten years Billwiller had worked up the small meteorological department of the Observatory into a Central Meteorological Institute for Switzerland, of which he was appointed Director in 1881. A few years later a wealthy citizen of Winterthur left a legacy of £5000 to the Institute, thereby greatly extending its usefulness.

Altogether, the Swiss system included 118 complete meteorological stations, and 270 additional rainfall stations. Amongst these is the first-order station established on the summit of the Säntis, in 1882, by private initiative, but, with a happier fate than befel its slightly younger sister on Ben Nevis, it was taken over by the Government in 1885. Billwiller's work on mountain and on föhn winds were important contributions to meteorology. He was a man of wide culture, known and honoured far beyond his native land. On May 18th, 1892, he was elected an honorary member of the Royal Meteorological Society.

THE RAINFALL OF THE ELEVEN MONTHS.

Aggregate of Rainfall for January—November, 1905.

Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.
	in.			in.			in.	
London	22·22	96	Bolton	38·42	100	Braemar	33·41	101
Tenterden	26·01	102	Wetherby.....	22·34	90	Aberdeen ...	30·25	102
Hartley Wintney	22·67	92	Arnccliffe	46·89	86	Cawdor	28·98	108
Hitchin	22·48	99	Hull	19·78	80	Invergarry ...	49·49	100
Winslow	20·29	83	Newcastle.....	21·03	83	Bendampf ...	77·17	100
Westley	21·13	91	Seathwaite ...	105·91	90	Dunrobin	30·13	107
Brundall	21·81	94	Cardiff, Ely ...	30·65	80	Killarney ...	40·99	80
Alderbury	25·00	95	Haverfordwest	37·49	88	Waterford ...	31·62	90
Winterbourne ...	29·95	86	Gogerddan ...	39·59	97	Broadford ...	28·60	95
Torquay	26·87	85	Llandudno ...	25·64	91	Carlow	26·87	87
Polapit Tamar ...	31·31	91	Cargen	32·67	84	Dublin	24·03	95
Bath	21·86	78	Lilliesleaf ...	25·76	86	Mullingar ...	29·12	88
Stroud, Upfield...	25·24	92	Colmonell	37·63	94	Ballinasloe ...	26·03	78
Woolstaston	25·40	84	Glasgow	26·24	81	Clifden	57·16	80
Bromsgrove	19·39	86	Inveraray ...	60·87	110	Crossmolina ...	41·95	94
Boston	20·56	96	Islay, Eallabus	47·51	113	Seaforde	30·81	88
Hodsock Priory..	16·48	73	Mull	50·95	100	Londonderry..	33·70	91
Derby	16·80	70	Dundee	20·95	80	Omagh	32·70	96

The rainfall of November was above the average at most stations, but not to a marked degree except in the north-east of Scotland. The result was to raise the aggregate general rainfall from 85, 95 and 85 per cent., respectively, for England and Wales, Scotland and Ireland, at the end of October, to 88·5, 99 and 89 per cent. at the end of November. The regional distribution remained almost unchanged; rather more of Scotland had received an average fall, the only conspicuously dry part being in the neighbourhood of Dundee. The relatively dry part of England still stretched from the Humber to the Severn, but the only part of the British Isles in which less than 75 per cent. of the average of the 11 months' rain had fallen, was a comparatively small patch round Derby.

ROYAL METEOROLOGICAL SOCIETY.

THE opening meeting of this Society for the present session was held on Wednesday evening, November 15th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. Richard Bentley, President, in the chair.

Sir John W. Moore, M.D., communicated an interesting paper on "The Rainstorm of August 24—26, 1905, in Counties Dublin and Wicklow," which in the absence of the author was read by the Secretary. The atmospheric disturbance which caused the torrential rainfall was near the shores of Kerry on the 24th, and the next morning it was near the Scilly Islands. Thence it travelled slowly northward up St. George's Channel, its centre passing near Dublin early on the morning of the 26th. At this time the system suddenly changed its course, crossing the Channel eastward to Wales, and finally passing over central England and out to sea at the mouth of the Humber in a north-easterly direction. It appears that the rainfall on the 25th exceeded three inches at all stations in the Counties Dublin and Wicklow, while it rose above four inches and even five inches at stations near the Dublin and Wicklow mountains. The author is of opinion that this remarkable downpour was brought about by the co-operation of four factors: (1) A chill antecedent to the arrival of the rain-bearing depression; (2) the slow progress of the depression; (3) the fact that the Counties Wicklow and Dublin lay to the westward of the cyclonic centre and so got its north-easterly and northerly winds; and (4) the physical configuration of those counties and their coast line. As the result of this remarkable rainstorm a destructive flood occurred over the low-lying parts of the Bray Urban District near the mouth of the Bray River. At Little Bray the water rose to a height of 4 feet in the streets, flooding houses, destroying domestic animals and fowls, wrecking furniture, and covering floors, yards and gardens with a thick alluvial deposit.

Dr. H. R. Mill said that as a result of discussing heavy cyclonic rains he had found they occurred nine times out of ten on the left of the track of the depression, and this instance was a confirmation of the rule. It was very desirable to have as close a network of rain gauges as possible all over the country, for stations half-a-mile apart or less might define the boundary of a heavy fall and be extremely helpful in the elucidation of such phenomena as the one under discussion.

Dr. R. H. Scott remarked that he had visited the district affected by the rainstorm soon after the disaster and could testify as to the damage done.

Mr. F. Gaster said that the Hon. Rollo Russell, in a paper recently read before the Society, had shown how the mingling of different air currents often produced abnormal falls of rain, and he thought that in the present instance it was the dry cold east wind meeting the

hills and bursting in under the upper moist current from the south-west which caused rapid condensation and the rain to come down through the east surface wind.

Mr. F. J. Brodie said it was remarkable that the neighbourhood of Dublin seemed liable to heavy falls of rain.

Captain M. W. C. Hepworth said that in this part of the world steady rain was usually experienced in front of the trough of depressions, but in parts of the southern hemisphere—on the east coasts of the continents—the weather was usually bright and sunny in front of an approaching depression and the rainfall occurred in rear of it.

Mr. W. Marriott urged the importance of observers seeing that their rain gauges were always kept in good order and were capable of holding at least 5 inches, as such an amount might fall on any day. At Scarborough $9\frac{1}{2}$ inches were measured on August 6th, 1857, but the rainfall actually exceeded that amount as the gauge had overflowed.

Mr. Baldwin Latham, Mr. W. B. Tripp, Mr. J. Hopkinson, and the President also took part in the discussion.

A paper by Dr. W. B. Newton, describing "The Aquameter," was in his absence read by Mr. D. A. Louis. This is a new instrument for measuring the amount of aqueous vapour present in the atmosphere by measuring the reduction of volume produced by the absorption of the water-vapour by phosphoric anhydride.

Dr. W. N. Shaw pointed out that instruments precisely similar in principle had already been tried and found wanting.

Mr. F. Gaster, Mr. D. A. Louis, and the President also took part in the discussion.

The following gentlemen were elected Fellows of the Society:—Capt. G. A. Alcock; Lieut.-Col. J. E. Capper, C.B.; Mr. G. A. Denny; Dr. A. T. Gott; Mr. R. G. F. Grain; Mr. E. Holding; Mr. A. R. Hutson; Dr. G. J. Macaura; Dr. E. M. Modi; Mr. A. E. Moore, B.A.; Capt. A. Simpson; Mr. J. F. Unstead, B.A.; Mr. W. Warren; and Dr. W. G. Willoughby.

Correspondence.

AURORAL DISPLAY OF NOVEMBER 15th.

To the Editor of Symons's Meteorological Magazine.

I SEND you a very feeble representation of "magnetic storm" phenomena as seen here last night, and probably throughout the west generally. I have never seen anything like it. The "show" began after sunset in a cloudless sky; a bright red glow shot through with "streamers," in the west, as though a large fire was burning not far off. This continued for some time. About 9 p.m. the glow

spread in streamers towards the zenith, and beyond it to the east. Then it culminated in a "focus," as I have tried to depict it, due south, about 15° to 20° south of the zenith. At the same time the red glow faded from the west, and became brilliant low down in the east, which was flooded with steady red colour—not "spearing." The moon was up about 30° above the horizon.

The focusing lasted about 20 minutes, then gradually faded. For a considerable time the red band extended from west to east, not in an arch, but continuously; I mean not in a rainbow-like arch, such as I have seen depicted, as northern lights are seen in Arctic regions.

When we first noticed the glow in the west it was so brilliant that I thought the farmsteading must be on fire, and I went up there to give the alarm! This was at 7.45 p.m., and at 8.30 the light was the same; then followed the marvellous vision I have described. The sky to the north was quite clear and still throughout.

What puzzles me is that the "fireworks" went on south of the zenith all the time. Surely magnetic phenomena are usually seen as coming from the north and in the north. These came from the west and extended to the east, south of the zenith, and the east-to-west latitudinal line.

G.G.C.

Island of Jura, N.B., 16th November, 1905.

LAST Wednesday evening, (November 15th) there was a faint white aurora borealis from 6.20 to 6.40 p.m. in the N.N.W., with a pink blush to 6.30 p.m.; and a brilliant aurora borealis from 8.45 p.m. to 9.30 p.m.; then a faint white one at 9.40 p.m.; the red colour was in the W. to 9.5 p.m., in N. to N.E. from 9 to 9.15 p.m., and nearly reaching the zenith (with yellow streamers pointing to N.N.W. from 9 to 9.3 p.m.), and in N.N.W. from 9.15 to 9.30 p.m. A N.E. breeze blew all the evening, and the dry and wet bulb thermometers in the screen read $34^{\circ}8$ and $33^{\circ}1$ at 9.17 p.m., G. M. T. Low cirrus cloud came slowly from S.E. up to 6 p.m., and radiated to E.S.E. to 8 p.m.; and soft alto-cumulus from N.E. from 7 to 9.20 p.m. Yesterday four spots were visible on the sun through the telescope at 3 p.m.

EDWIN G. GLYDE.

Statsford, Whitchurch, Tavistock, Nov. 17th, 1905.

A VERY bright aurora was seen in this neighbourhood during the evening of November 15th. The phenomenon first became visible at 7.30 p.m. at a point about due north. A narrow arc of a pale yellow colour spanned the northern horizon (the segment of sky beneath the arc being quite black), from which, at times fitful, wavy rays and streamers rose and fell, their colour varying between a pale pink to a blood-red crimson. The aurora towards 8.45 p.m. brightened considerably, and had risen towards the zenith; the sky

at the time was covered with alto-cumulus moving from a northerly point, a succession of bright lunar coronas being visible, in which the predominant colour was green.

At 8.55 p.m. the aurora had developed an irregular formation, the striking feature noticed was the variability in colour, fading at times to a pale subdued pink, brightening up with a peculiar twitching movement to a deep crimson, the interspaces of the blue sky between the alto-cumulus being illuminated a blood-red crimson.

The general appearance was that of the glow from a large conflagration, but the colour was of a much deeper crimson. The phenomenon lasted to 9.30 p.m., when a clearance of cloud from the sky took place, and by 9.35 p.m. all traces were lost.

The last aurora seen in this district previously was on April 14th, 1904, but was not in any way comparable, owing to the absence of streamers and the presence of considerable cloud.

SPENCER C. RUSSELL.

Ashley Road, Epsom, November 18th, 1905.

[The aurora was seen in all parts of the British Isles, and over a considerable part of the continent. At Ghent and Turnhout in Belgium, alarms of fire were raised when the brilliant glow was first observed. It is noteworthy that in Scotland the auroral display appeared to the south of the zenith, while in the more southerly latitudes it appeared in the north. We regret that we cannot reproduce the effective water-colour sketch, illustrating the first of the letters printed above.—ED., *S.M.M.*]

LOW TEMPERATURES IN OCTOBER.

I WAS much interested in the article on Low Temperatures of October in your Magazine of last month.

My record for the 19th was 14° , and for the 20th and 22nd 15° , so I send you a copy for the month. Sixteen nights had minima below 32° and five reached or fell below 20° . No such low temperatures appear in my records so far as I have examined them (to 1883).

ED. B. MARTEN.

Pedmore, near Stourbridge, 22nd November, 1905.

SOME WEATHER PROBLEMS.

THE inquiry suggested by Mr. Alex. B. MacDowall as to a relation between the behaviour of polar ice and the sunspot cycle is one which might well be carried out by observers stationed in places suitable for recording the nature and extent of local ice floes, and no doubt valuable stores of information could be found in the old log books of the Newfoundland sealing fleet. In March they set out for the ice where the seals are. The reputation of a "sealing king" depends upon his knowledge as to the whereabouts of the ice, which varies

greatly from year to year; but he seldom fails to find it, being guided by experience and his own interests.

As I was in Newfoundland in 1895 I can submit the fact that in the Spring of that year for over two months communication with the outside world was practically cut off owing to Arctic ice packing the harbours. The late Professor G. Holloway, who had observed in that country for twenty-six years, informed me that it was a maximum ice floe period; it will be seen that the date suggests relation to the sunspot maximum.

I am inclined to think that Sir William MacGregor, the present Governor of Newfoundland, will take an interest in this subject and give to science the benefit. We have not forgotten his interesting contribution to the Magazine of last September.

FLEETWOOD C. VARLEY.

Park Villa, Campden, Glouc., November 19th, 1905.

[The movements of Arctic ice are studied and charted by the Danish Meteorological Institute in accordance with an international arrangement, and further data from Newfoundland would be useful and welcome. Many years' data will be required to prove any relationship to other periodic phenomena.—ED. S.M.M.]

CURIOUS EFFECT OF LIGHTNING.

It was my intention to give you the following particulars of a somewhat peculiar effect of lightning a few days after the event; but circumstances have prevented me from doing so until now.

It was as I think on 27th July last that a severe thunderstorm took place over North London, and extended, as I read in various papers, as far south as Croydon, but we had nothing here beyond sultry heavy atmosphere during the day. At about 4.30 p.m. I heard distant thunder occasionally, no doubt over Croydon, 8 or 9 miles distant, but nothing nearer, when a sharp report like a magnified rifle crack startled my daughters and myself as we sat in our room facing west, and at the same time a vivid flash of jagged lightning across the windows caused me to go outside shortly after to see and enquire whether anything in my grounds had been struck. This house and the one next it are about halfway down the slope of the east side of the hills forming the Harestone Valley, and had any of our chimneys or the trees near by been struck I should have been in no way surprised; but the electric current chose a low terra-cotta chimney nestled down among trees half way down my neighbour's garden, punched a round hole of about three inches diameter without splitting the material at all, satisfying itself by breaking out several bricks of the bedwork of the pot, and throwing them through the stoke-hole roof. Careful search has not yielded any find of a so-called "bolt" of any sort. I should add that no fire was alight, nor had there been one to cause any heated air, which is said to attract

the current down a chimney. The trees adjacent are much higher than the greenhouse or its little chimney, but none of them were touched. The isolated stroke of lightning and its effect appear to me sufficiently unusual to be worth notice.

Any comments you make like to make at your leisure will be read with interest.

HENRY HAES.

Bradenhurst, Caterham Valley, Surrey, 3rd Nov., 1905.

[We should be glad to hear our readers' views on this matter.

ED. S.M.M.]

LONG RANGE WEATHER FORECASTING.

THE number of weather-prophets in the United States who issue forecasts for a long period a-head, based on astronomical or other "laws" of their own discovery, induced Professor Willis L. Moore, Chief of the U.S. Weather Bureau, to publish a criticism of some of their claims about a year ago. We have kept the papers issued at that time before us for some months in the hope of dealing somewhat fully with the matter; but the season of endeavouring to clear up arrears of book-notices, so as to start afresh with a new volume, has come, and very reluctantly we must content ourselves with a brief summary. Professor E. B. Garriott deals with the subject in Bulletin 35 of the U.S. Department of Agriculture, Weather Bureau. Professor Moore expresses his views unreservedly in the Letter of Transmittal prefatory to the pamphlet:—

"The success of the United States Weather Bureau in making conservative forecasts of the weather two or three days in advance has created the hope in the minds of the people that it may be possible to foresee the character of the weather for the coming month or season. All scientific men know that at present it is impossible to gratify this wish, and the Government experts so inform all those who make inquiry. But the mistaken investigator of little knowledge, the pseudo-scientist and the astrologer, see their opportunity and at once step into the breach and sell spurious long-range forecasts to a public rendered credulous by the success of the Government scientists. The abuse of the public confidence has become so great that I have thought it justifiable to present to the reader indisputable evidence of the injurious character of monthly or seasonal forecasts."

Professor Moore does not of course question the possibility of scientific research ultimately leading to a safe basis for long-range forecasts, but merely lays stress on the present limitations. An interesting criticism by Professor C. M. Woodward, of Washington University, demolishing a system of "planetary meteorology," is reprinted, as, although published in 1875, the fallacies then refuted are, it is stated, still being exploited in St. Louis. Professor Garriott

sums up his study of the whole question in the following admirable conclusions :—

1.—That systems of long-range weather forecasting that depend upon planetary meteorology ; moon phases, cycles, positions, or movements ; stellar influences, or star divinations ; indications afforded by observations of animals, birds and plants, and estimates based upon days, months, seasons and years have no legitimate bases.

2.—That meteorologists have made exhaustive examinations and comparisons for the purpose of associating the weather with the various phases and positions of the Moon, in an earnest endeavour to make advances in the science along the line of practical forecasting, and have found that while the Moon, and perhaps the planets, exert some influence upon atmospheric tides, the influence is too slight and obscure to justify a consideration of lunar and planetary effects in the actual work of weather forecasting.

3.—That the stars have no appreciable influence upon the weather.

4.—That animals, birds and plants show by their condition the character of past weather, and by their actions the influence of present weather and the character of weather changes that may occur within a few hours.

5.—That the weather of days, months, seasons and years affords no indications of future weather further than showing present abnormal conditions that the future may adjust.

6.—That six and seven day weather periods are too ill-defined and irregular to be applicable to the actual work of forecasting.

7.—That advances in the period and accuracy of weather forecasts depend upon a more exact study and understanding of atmospheric pressure over great areas and a determination of the influences, probably solar, that are responsible for normal and abnormal distributions of atmospheric pressure over the Earth's surface.

8.—That meteorologists are not antagonistic to honest, well-directed efforts to solve the problem of long-range forecasting ; that, on the contrary, they encourage all work in this field and condemn only those who, for notoriety or profit or through misdirected zeal and unwarranted assumptions, bring the science of meteorology into disrepute.

9.—That meteorologists appreciate the importance to the world at large of advances in the period of forecasting and are inclined to believe that the twentieth century will mark the beginning of another period in meteorological science.



THE RELATION BETWEEN THE CIRCULATION OF THE ATLANTIC AND WEATHER.

DR. W. MEINARDUS publishes in the *Meteorologische Zeitschrift* for September the results of an investigation into the relation between the circulation of the water in the North Atlantic Ocean and the weather. The variation of atmospheric pressure between pairs of stations on opposite sides of the ocean was adopted for the purpose of comparing the weather conditions. It became apparent that the air over the whole North Atlantic and the surrounding coasts behaved as one system, in relation to the Icelandic centre of low

pressure, the gradients sometimes steepening and sometimes becoming less marked. When the gradients steepened it was found that the temperature of the Gulf-stream water simultaneously increased also, while when the gradients diminished the temperature of the water simultaneously fell; the pressure difference often being established for some months before the temperature difference appeared. An increase of pressure gradient corresponds also to an increased amount of ice carried southward by the Labrador current, and a diminished gradient to a reduced amount of ice. The latter relationship allows this simple rule for predicting the character of the ice off Newfoundland for the coming summer:—

The amount of ice to be met with off Newfoundland in any particular summer is determined by the atmospheric gradients in the preceding months November to January between the south of Greenland and the mouth of the St. Lawrence, and the amount of ice is directly in proportion to the magnitude of this gradient.

It has been observed also that in most cases years in which much ice is found off Newfoundland are associated with a warm Spring (February to April) in central Europe, and years when there is little ice with a cold Spring. W. Brennecke's investigation of the East Greenland current showed that the position of the limit of ice in summer in the sea east of Greenland was dependent on the magnitude of the gradient of atmospheric pressure between Greenland and northern Scandinavia in the months March to May.

Throwing the whole into a simple form, and remembering that a weak circulation corresponds to a low gradient and a strong circulation to a high gradient, Dr. Meinardus draws these remarkable conclusions; A and B being groups of conditions that are associated together.

A.—1. Weak Atlantic circulation (August—February).

2. Low water temperature on the coasts of Europe (November—April).

3. Low air temperature in Central Europe from February to April.

4. Little ice off Newfoundland in Spring.

5. Much ice off Iceland in Spring.

6. Bad harvests of wheat and rye in western Europe and northern Germany.

B.—1. Strong Atlantic circulation (August—February).

2. High water temperature on the coasts of Europe (November—April).

3. High air temperature in Central Europe from February to April.

4. Much ice off Newfoundland in Spring.

5. Little ice off Iceland in Spring.

6. Good harvests of wheat and rye in western Europe and northern Germany.

The curves which illustrate the paper bear out this relationship in the most striking way.

THE BRITISH ASSOCIATION IN SOUTH AFRICA.

[THIRD ARTICLE.]

WHILE in South Africa we took every opportunity of photographing scenes and objects of meteorological interest, but we had not calculated on the number of films which the attractiveness of the novel sights tempted us to expose, and so we had not a sufficient number of air-tight tin cases in which to bring home the exposed films; hence a certain proportion was lost on account of the deterioration brought about by the heat and dampness of the Red Sea on the homeward voyage. Of the 220 good negatives that came safely through the ordeal, we select four for re-production here. The first shows the standard rain-gauge of the Royal Ob-



THE STANDARD RAIN-GAUGE AT THE ROYAL OBSERVATORY, CAPE TOWN.



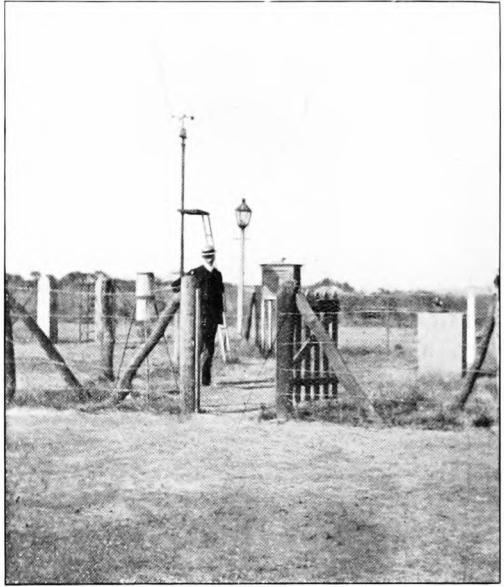
METEOROLOGICAL OBSERVATORY, JOHANNESBURG.

servatory at Cape Town, the diameter of which is about $11\frac{1}{4}$ inches, so as to give an area just double that of an 8-inch gauge, so that when the rain is measured in a glass for an 8-inch gauge the resulting figure divided by 2 gives the actual fall. No other gauge in Cape Colony, so far as we know, has this great diameter, but all are erected as shown on stone pillars, so that the receiving surface is 4 feet above the ground. In consequence of this, from 3 to 4 per cent. should be added to the readings of South African rain-gauges before comparing them with the figures of rainfall in Great Britain. Mr. J. Power, of

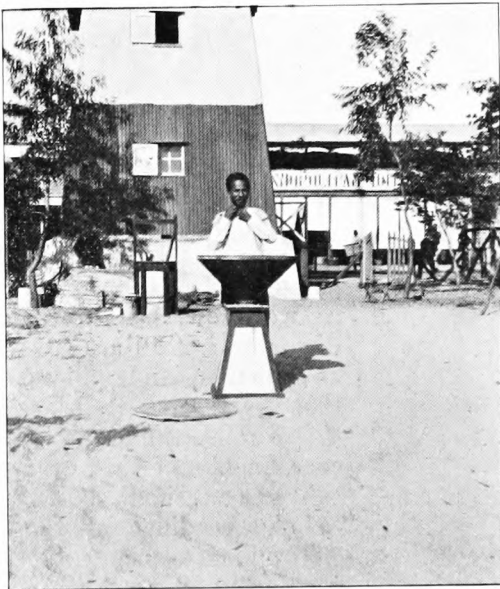
the Cape Observatory, is standing with the gauge on his right hand, and Mr. R. T. A. Innes, of the Johannesburg Observatory, is standing between the two pillars.

The second picture shows Mr. Innes standing beside a 5-inch rain-gauge, set up in an iron stand to a height of 4 feet according to the system in use in the Transvaal. The Johannesburg Meteorological Observatory (see p. 174) is seen on the hill in the background, the tall mast on the building carries the Dines' anemometer, and the large louvered shed is seen farther along the ridge on the right.

The third illustration shows the meteorological



THE METEOROLOGICAL STATION, SALISBURY,
RHODESIA.



RAIN-GAUGE AT BEIRA, PORTUGUESE EAST AFRICA.

station at the Hospital in Salisbury, Rhodesia. The 8 inch rain-gauge, mounted on iron legs, the Robinson anemometer, Stevenson screen, sunshine-recorder, and black-bulb thermometer are all to be seen.

Finally, we give a view of the great rain-gauge at Beira in Portuguese East Africa. Time was pressing, and the native attendant did not speak English, so that we have no particulars of this instrument to impart.

THE BULAWAYO METEOROLOGICAL OBSERVATORY.

By REV. E. GOETZ, S.J.

METEOROLOGICAL observations were started in Bulawayo in 1897, by the Jesuit Fathers, at St. George's School, with the usual set of meteorological instruments. In 1903 they built a regular observatory, and got registering instruments, which have been recording since January, 1904. These are (1) a Richard Anemometer, recording every kilometer of wind, and directly the four directions electrically. The four intermediate directions are recorded by the simultaneous marking of the two component directions. (2) Richard Barograph, Thermograph, and Hair Hygrometer. (3) A Marvin Sunshine Recorder. (4) A Recording Rain Gauge, constructed at the Observatory, after the U.S. Weather Bureau pattern.

The rain gauge is of the usual bucket pattern, each bucket-full representing one-hundreth of an inch of rain. As the bucket falls over when full it touches a contact, and this contact is recorded. The recorder has been constructed in the following way: the minute hand of an ordinary clockwork has been replaced by a crank, which drives a cylinder revolving round a horizontal axis, and one end of the axis has been turned into a screw, of 2.5 mm. thread. The crank is fixed on the pin which bears the minute hand, but enters loosely into a piece of metal at right angles to the axis of the cylinder. The cylinder is thus revolved, and at the same time brought at each revolution 2.5 mm. nearer the clockwork; a fountain pen connected with the armature of a magnet rests on the cylinder, and draws a continuous line. When the bucket in the rain gauge is full and tumbles over, making a contact, the contact draws the pen momentarily to one side, and thus makes a small mark on the continuous line drawn on the cylinder. The cylinder has a circumference of 33 cm., giving thus a run of a little over 5 mm. per minute. Ten to twelve marks are quite distinct in this space, so that rates of 6 to 7 inches an hour are distinctly recorded. Besides the meteorological instruments there is a complete set of magnetic instruments of the Kew pattern; a magnetometer by Nalder Bros., and a Dover dip circle.

The recording instruments are made by Richard, (Paris); the barometer (inch measure) and Fahrenheit thermometers, by Negretti and Zambra; the barometer (mm. measure) and Centigrade thermometer, by Tonnelet (Paris).

Judging from the records of the last eighteen months, the observations seem to be likely to prove of a certain value on account of the great regularity of the weather. The wind, pressure, temperature, and hygrometer records show a remarkable correlation.



REPORT OF THE BRITISH ASSOCIATION KITE COMMITTEE.

Investigation of the Upper Atmosphere by Means of Kites in co-operation with a Committee of the Royal Meteorological Society.—Fourth Report of the Committee, consisting of DR. W. N. SHAW (Chairman), MR. W. H. DINES (Secretary), MR. D. ARCHIBALD, MR. C. VERNON BOYS, DR. A. BUCHAN, DR. R. T. GLAZEBROOK, DR. H. R. MILL, PROFESSOR A. SCHUSTER and DR. W. WATSON.

The following is the substance of the Report presented to the British Association in Johannesburg.

Apparatus for testing and calibrating the meteorographs has been made by Mr. J. J. Hicks, and consists of an ordinary air-pump with a large receiver. Inside the receiver there is a coil of metal tube, through which warm water or a freezing-mixture can be circulated; there is also a small electric fan to ensure uniformity of temperature throughout the enclosed space. The meteorograph is placed inside, and the pressure and temperature altered in any desired way. A record is kept, and is compared with the trace obtained from the meteorograph when it is taken out of the receiver. Inasmuch as the thermal capacity of the heavy glass receiver and metal plate is very considerable, the process of warming or cooling the interior is a slow one. A few tests have been made for ascertaining the extent to which the temperature correction of the barograph is dependent on the pressure, but generally a quicker plan is employed for testing the thermograph. The instrument is placed in a thin metal case with a water-jacket. The lid is also jacketed, and by circulating a liquid through the jacket, and enclosing the whole arrangement in felt or other non-conducting material, there is no difficulty about rapidly bringing the meteorograph to any desired temperature.

The pen of the hygrograph moves in accordance with the change of length of 4 feet of human hair. The approximate scale is a change of length of .45 inch from absolute dryness to complete saturation, but a more exact determination is now being made by hanging a small weight at the end of 4 feet of hair in the open, and taking simultaneous readings of its length and of a wet and dry bulb thermometer.

Continuance of Observations.

The apparatus used on board the "Seahorse" was fitted up at Oxshott at the end of September, 1904, and since that date forty-five ascents, giving good records, with an average height of about 4,400 feet, have been made. These include most of the days appointed by the President of the International Aeronautical Commission. The observations for those days are regularly reported to Professor Hergesell, and will appear in the publications of the International Committee.

Kite Ascents at Oxshott.

		Length of Wire.	Maximum Height.	Temperature Decrease (Degrees Fabr.)	Number of Kites
1904.					
Sept.	30	8,000	5,000	*10	1
Oct.	3	6,200	3,500	14	1
"	5	8,240	4,650	*10	1
"	6	7,300	4,250	17	1
"	7	8,000	5,400	16	1
"	8	4,800	3,250	12	1
Nov.	3	6,100	3,250	4	1
"	8	4,560	3,000	13	1
"	30	7,180	3,800	12	1
Dec.	1	6,700	3,200	*7	1
"	5	6,200	3,850	16	1
"	13	6,400	3,280	9	1
"	16	3,600	2,850	9	1
"	19	6,100	3,250	13	1
"	29	9,560	4,400	10	1
1905.					
Jan.	4	8,000	5,500	17	1
"	5	10,500	5,800	17	1
"	28	6,300	3,600	*—6	1
"	30	5,500	2,700	15	1
Feb.	3	6,000	3,350	11	1
"	4	3,100	2,600	8	1
"	10	11,600	7,900	*15	2
"	17	7,300	4,250	16	1
"	18	8,000	5,200	*5	1
Mar.	2	6,500	4,650	14	1
"	3	4,200	3,170	11	1
"	6	5,400	4,600	12	1
"	8	6,000	4,100	13	1
"	17	5,100	3,300	12	1
"	25	4,500	2,880	10	1
"	28	7,000	4,400	15	1
"	29	8,000	5,600	17	2
"	31	10,000	6,500	26	2
Apr.	1	8,000	4,900	13	2
"	4	9,000	5,470	19	2
"	7	9,000	6,200	15	2
"	13	8,000	5,050	21	1
"	17	5,700	4,000	6	1
"	24	5,100	3,800	11	1
"	25	12,000	7,600	20	2
"	27	10,000	6,000	12	2
"	28	5,000	3,500	10	1
May	5	10,300	7,000	15	2
"	8	6,700	4,300	22	2
June	1	12,000	7,300	31	2

* Indicates a temperature inversion.

Comparatively little trouble has been experienced during the winter with any part of the apparatus. The steam engine that was bought last year did not prove satisfactory while in use on the "Seahorse," but has been altered. The wire that was wound on the reel at Crinan is still in use without a join,

although, of course, pieces have occasionally been lost from the end. The chief requirement is a satisfactory kite, which will combine the three characteristics of flying at a good angle, of being stable and not liable to damage in any wind, and of never exerting an excessive pull. Perhaps such a kite can never be obtained, but there are such an infinite number of ways in which the various types of kite now in use may be altered—and the most trifling alterations of detail are sometimes capable of producing very great effects—that extensive experimental work can hardly fail to develop a kite better than any at present available.

Observations are being continued at Oxshott, but it is not proposed to make any attempt to obtain a vessel for work elsewhere this summer.

The Committee was re-appointed without a grant.

REVIEWS.

Solar Physics Committee. Mean Annual Variations of Barometric Pressure and Rainfall in certain regions, being a study of the mean annual pressure variations for a large number of areas scattered over the Earth's surface in relation to the principal types of mean annual rainfall variations in those areas, made at the Solar Physics Observatory, South Kensington, under the direction of SIR NORMAN LOCKYER. London. Printed for H. M. Stationery Office. 1905. Size 12 × 10. Pp. iv. + 16 and 17 plates. Price 1s. 6d.

THIS forms a convenient collection of types of rainfall distribution throughout the year in a great many places situated all over the world. The source of the data is duly acknowledged, but dealing with so wide a geographical range it was, of course, impossible to secure perfect comparability. The period for which the averages are made is different, and in some cases is not known. In most instances the curve for one typical station is taken as representative of a region; but in other cases the mean of groups of stations is used. Monthly rainfall varies so much that we should place no confidence in means for any one station being representative of the normal incidence of rainfall at that station, unless the period were at least 20 years, and to be in any way satisfactory we would prefer 35 years. When the means of several stations in a region are averaged, the monthly curve becomes much more trustworthy; but we confess that we should feel many qualifications to be necessary in drawing any generalization from the curves as given.

Anleitung zur Anstellung und Berechnung meteorologischer Beobachtungen. [Introduction to the establishment and calculation of meteorological observations.] Berlin: S. Asher & Co. 1904, 1905. Size 11 × 8. Pp. (Pt. I.) 66, (Pt. II.) 50. Plates. Price 2m. each part.

THESE instructions are set forth by the Royal Prussian Meteorological Institute for the use of observers in northern Germany. Part I. deals with second and third order stations, and Part II. with first

order stations. The minuteness of the instructions is noteworthy; extending even to a specimen form of recipe for painting the thermometer screen.

Conseil Permanent International pour l'Exploration de la Mer. General Report on the work of the period, July, 1902—July, 1904. With 10 Appendices. Copenhagen: 1905. Size $11 \times 2\frac{1}{2}$. Pp. 452. Plates.

North Sea Fisheries Investigation Committee. Report on Fishery and Hydrographical Investigations in the North Sea and adjacent waters, conducted for the Fishery Board for Scotland . . . by D'ARCY WENTWORTH THOMPSON, C.B. 1902-1903. London: Printed for H. M. Stationery Office, 1905. [Cd. 2612.] Size $14\frac{1}{2} \times 11$. Pp. viii. + 618. Plates. Price 8s. 9d.

International Fishery Investigations. First Report on Fishery and Hydrographical Investigations in the North Sea and adjacent waters (Southern Area). Conducted for His Majesty's Government by the Marine Biological Association of the United Kingdom. 1902-1903. London: Printed for H. M. Stationery Office, 1905. [Cd. 2670.] Size $14\frac{1}{2} \times 11$. Pp. x. + 378. Plates. Price 8s. 9d.

THESE are merely a selection from the great amount of published data accumulated in the course of the work of the International Council for the Study of the Sea. We notice them because, although the benefits likely to result to meteorology are of the nature of bye-products in the improvement of the fisheries, they are certain to be important. The summary of Dr. Meinardus's work on the influence of the ocean on weather, on another page, will show in what direction the results may be looked for. In the General Report there are two valuable memoirs dealing with the conditions of the North Atlantic and their influence on climate, by Professor Pettersson and Mr. Knudsen. In the Fishery Board Report there is a full translation of a valuable paper by Drs. Sandström and Helland-Hansen on the mathematical investigation of ocean currents, which deserves a wider circulation than a blue-book is likely to afford. A great part of both the Scottish and the English volumes is devoted to the physical study of the northern North Sea and the English Channel, and these are copiously illustrated by maps. The work has been done by Mr. A. J. Robertson at Dundee, and Mr. D. J. Matthews at Plymouth.

Resultats du Voyage du S. Y. Belgica. Météorologie, Rapport sur les observations météorologiques horaires [Report on hourly meteorological observations] par HENRYK ARCTOWSKI. Anvers: 1904. Size, 13×11 . Pp. 52 + 150 + 23 plates.

M. ARCTOWSKI, the enthusiastic meteorologist of the Belgian Antarctic Expedition, presents in this volume his complete report on

the hourly observations made during the first Antarctic winter ever endured by human beings. The *Belgica* was frozen in an icefloe, which during more than a year drifted to and fro between $69^{\circ} 38'$ and $71^{\circ} 36'$ S. latitude and $80^{\circ} 30'$ and $96^{\circ} 40'$ W. longitude. The climate was that of the frozen sea to the north of any Antarctic land that may lie between those meridians, and that land does lie at no very great distance to the south the depths of the sea show quite clearly. The observations were made for the most part by M. Arctowski himself, and always under his immediate supervision. We consider that the discussions gain immeasurably in value from this fact. When a stranger attempts to deal with a mass of figures obtained by others in conditions of which he knows nothing, he is apt to draw wrong conclusions as to the degree of trustworthiness of the observations; while, on the other hand, an observer without the knowledge of a trained meteorologist is apt to miss opportunities or to fail to recognise defects in instruments or methods of work. The *Belgica's* records were made and discussed by a man fully alive to their importance, and singularly competent to undertake both tasks. The hourly readings are printed in full—and how we envy M. Arctowski the splendid breadth of his 9½ in. page!—and the traces of the Richard barograph, thermograph and hygrograph are reproduced exactly as they were taken from the instruments, the action of which seems to have been remarkably good in the trying circumstances.

The mean and extreme monthly temperatures have frequently been quoted as given in the preliminary notices. They are now given in their final form, the means being those of the whole number of hourly readings made in the month, and the extremes the absolutely highest and lowest recorded for any hour in the month. The mean barometric pressure for the year was 29.339 in., the highest reading 30.398 in., and the lowest 28.020 in.

Temperatures in ca. 70° S., 1898-99.

	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	YEAR
Mean °F.	16.0	10.7	20.2	4.1	-10.7	11.6	-1.5	17.9	19.6	27.8	29.8	30.0	14.8
Max. „	31.1	31.1	33.4	32.0	30.0	32.5	33.6	33.4	33.8	36.5	35.2	34.0	36.5
Min. „	-4.5	-15.7	-13.4	-24.2	-34.8	21.6	-45.6	-15.3	-6.5	5.4	16.9	14.4	-45.6

The average daily range was 13.6 Fahrenheit degrees, and the greatest range in any one day (21st July, 1898, a month after mid-winter) was $49^{\circ}.3$.

Jelinek's Anleitung zur Ausführung meteorologischer Beobachtungen.

[Jelinek's Introduction to Meteorological Observing]. Wien: 1905.

Size, 10 x 7. Pp. 124.

THIS is Part I. of the fifth revised edition of the official Austrian handbook for meteorological observers. It is so thoroughly brought up to date as to contain a section dealing with the method of proceeding on finding an unmanned balloon which has fallen with a meteorograph attached.

METEOROLOGICAL NEWS AND NOTES.

THE SYMONS GOLD MEDAL of the Royal Meteorological Society, established in memory of the founder of British Rainfall, has been awarded to Lieutenant-General Richard Strachey, G.C.S.I., for many years Chairman of the Meteorological Council, in recognition of the services he has rendered to the science of Meteorology. The two previous recipients of this medal have been Dr. A. Buchan and Dr. Julius Hann.

NOCTURNAL RADIATION as influenced by water vapour is the subject of a paper by Mr. J. R. Sutton, of Kimberley, in the *Proceedings* of the Royal Dublin Society for August last. He concludes that the fall of temperature at night becomes less rapid as the relative humidity increases, but that the absolute humidity of the air has no influence at all on radiation.

HEAVY RAINS IN THE RHINE DISTRICT on June 17th, 1904, gave Dr. P. Polis, of Aix-la-Chapelle, an opportunity of constructing a detailed rainfall map of some 20,000 square miles of country, making use for this purpose of the observations from 636 stations. Maps of a single day's rainfall constructed on this principle are familiar to readers of "British Rainfall," but Dr. Polis has the advantage of presenting his map on a large scale, and in all the glory of colour-printing, in the pages of *Petermanns Mitteilungen*, for September last. The greatest fall in 24 hours at any station during the storm was 3·20 in., and the total area with a rainfall greater than 2·75 in., was 152 square miles, so that as regards area affected by very heavy rain, it was not very remarkable judged from the standpoint of rain storms in the United Kingdom. The rain was heaviest in patches, fairly regularly placed in three parallel lines, a formation typical of thunderstorms. A second map shows the lines along which the first thunder of the various thunderstorms which brought the rain was heard simultaneously.

THE HIGHEST KITE ASCENT yet made for meteorological purposes was accomplished at the aeronautical observatory at Lindenberg, on 25th November, 1905, according to our contemporary *Das Wetter*. Records were secured at an elevation of 21,096 feet by means of a team of six kites, and a total length of wire paid out of 47,573 feet, or almost exactly nine miles. The pressure at the highest point was 12·99 in., and the temperature $-13^{\circ}0$ F., that on the ground being $40^{\circ}8$ F. This ascent exceeds by 1000 feet the highest previously obtained, by M. Teisserenc de Bort, on a Danish gunboat, in the Baltic; but higher flights have frequently been made by free balloons.

THE LOWEST AIR TEMPERATURE yet observed appears to be that recorded in a free balloon ascent from St. Louis, in December, 1904, when $-122^{\circ}1$ F. was found; but this was practically equalled at Vienna, on 2nd March, 1905, when $-121^{\circ}7$ F. (154° of frost) was registered at a height of 31,880 feet. At greater heights, up to 37,300 feet, the temperature though more than 100° below zero, was not quite so low as that quoted.

RAINFALL AND TEMPERATURE, NOVEMBER, 1905.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.]	RAINFALL.				Days on which -01 or more fell.	TEMPERATURE.				No. of Nights below 32°.		
		Total Fall.	Diff. from average, 1870-99.	Greatest in 24 hours.			Max.		Min.		Shade	Grass	
				Depth.	Date.		Deg.	Date.	Deg.	Date.			
		inches	inches.	in.									
I.	London (Camden Square) ...	3·08	+ ·63	·46	2	19	55·2	26	24·2	21	7	19	
II.	Tenterden.....	4·24	+ 1·02	·71	11	22	56·0	8	28·0	22	7	14	
	Hartley Wintney	3·19	+ ·16	·66	10	20	53·0	3, 23	23·0	22	14	17	
III.	Hitchin.....	2·40	— ·16	·44	26	15	53·0	26	26·0	20	11	...	
	Winslow (Addington)	3·21	+ ·58	·75	26	15	53·0	2, 3a	22·0	21	13	19	
IV.	Bury St. Edmunds (Westley)	2·16	— ·34	·35	26	20	55·0	1	25·0	21	...	...
	Brundall	1·95	— ·76	·55	11	19	54·2	26	23·6	21	9	15	
V.	Alderbury	3·56	+ ·37	·82	10	17	55·0	4	18·0	20	14	...	
	Winterbourne Steepleton ...	6·70	+ 1·88	1·21	10	21	54·3	4	18·3	21	13	21	
	Torquay (Cary Green)	5·39	+ 1·68	·88	12	16	55·7	4	25·8	21	3	19	
	Polapit Tamar [Launceston]	5·72	+ 1·43	1·08	1	21	53·6	4	...	...	...	15	
	Bath	3·08	+ ·02	·59	10, 12	17	55·2	25	24·6	17	13	24	
VI.	Stroud (Upfield)	3·77	+ ·78	·71	10	21	53·0	2	25·0	19	...	...
	Church Stretton (Woolstaston)	3·37	+ ·19	·63	10	20	50·5	8	22·0	19	18	...	
	Bromsgrove (Stoke Reformatory)	2·29	+ ·02	·68	10	16	49·0	2	18·0	19	18	...	
VII.	Boston	2·45	+ ·31	·57	26	14	50·0	12	26·0	18	10	...	
	Workshop (Hodsock Priory)	2·56	+ ·46	·63	10	17	53·0	6	23·5	20	7	22	
	Derby (Midland Railway)	2·50	+ ·22	·42	10	21	53·0	2	23·0	20	8	...	
VIII.	Bolton (The Park)	5·12	+ 1·21	·67	22	23	50·8	11	25·7	18	7	15	
IX.	Wetherby (Ribston Hall) ...	4·24	+ 2·01	·83	1	19	...	...	...	...	...	...
	Arncliffe Vicarage	7·39	+ 1·39	·99	26	25	...	...	...	...	...	...
	Hull (Pearson Park)	2·95	+ ·50	·37	11, 28	22	52·0	2, 26	23·0	18, 19	7	18	
X.	Newcastle (Town Moor) ...	4·50	+ 1·85	·75	1	26	...	...	...	...	...	...
	Borrowdale (Seathwaite) ...	13·92	+ ·01	3·20	22	18	51·3	22	20·4	19	9	...	
XI.	Cardiff (Ely)	4·22	— ·04	·33	10	22	...	...	...	...	...	...
	Haverfordwest (High St.) ...	6·93	+ 1·52	1·30	10	23	53·4	10, 11	25·0	18	7	21	
	Aberystwyth (Gogerddan) ...	4·07	— ·61	·60	10, 22	15	65·0	2	21·0	16, 17	10	...	
	Llandudno	3·86	+ ·48	·94	27	20	56·0	23	27·2	19	3	...	
XII.	Cargen [Dumfries]	4·75	+ ·25	·80	10	16	52·0	3, 23	18·0	19	9	...	
	Lilliesleaf (Riddell)	3·38	+ ·09	·77	1	21	51·0	20	17·0	18	14	15	
XIII.	Edinburgh (Royal Observy.)	3·36	...	·62	3	20	53·2	23	24·0	19	3	11	
XIV.	Colmonell	6·68	+ 1·81	1·58	10	16	52·0	11, 22	18·0	18	10	...	
XV.	Tighnabruaich	6·78	+ ·57	1·10	25	18	46·0	1, 3	25·0	17	8	10	
	Mull (Quinish)	5·80	— ·63	1·19	29	20	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis)	4·35	+ 1·59	·70	26	19	51·9	22	19·0	19	10	...	
XVII.	Braemar	6·87	+ 2·93	·79	1	27	50·0	23	5·2	18	13	...	
	Aberdeen (Cranford)	6·83	+ 3·36	·88	26	23	50·0	1, 2	18·0	18	15	...	
	Cawdor (Budgate)	3·71	+ 1·06	1·06	26	21	...	...	...	...	...	...
XVIII.	Invergarry	6·22	+ ·24	1·15	21	14	...	...	...	...	...	...
	Bendamp	8·07	— 1·72	2·02	22	23	...	...	...	...	...	...
XIX.	Dunrobin Castle	4·01	+ ·75	·63	27	26	53·5	23	26·5	29	8	...	
	Castletown	5·00	...	·68	11	27	48·0	2, 22	25·0	18	7	10	
XX.	Killarney	5·57	— ·28	·85	23	24	58·0	5	22·0	18	...	...
	Waterford (Brook Lodge) ...	4·38	+ ·47	·79	12	21	54·0	3	22·0	19	13	...	
	Broadford (Hurdlestown) ...	2·95	— ·24	·49	29	22	52·0	12	21·0	18	13	...	
XXI.	Carlrow (Browne's Hill)	3·34	+ ·20	·48	4	18	...	...	...	...	...	...
	Dublin (Fitz William Square)	3·55	+ ·95	·68	1	19	55·9	22	23·6	19	6	14	
XXII.	Ballinasloe	2·50	— 1·10	·45	25	22	...	...	...	...	...	...
	Clifden (Kylmore House) ..	7·12	— 1·13	1·55	25	22	...	...	...	...	...	...
XXIII.	Seaforde	5·04	+ 1·10	1·57	10	22	51·0	11	27·0	17, 18	10	13	
	Londonderry (Creggan Res.) ..	4·85	+ ·66	·91	26	27	...	...	...	...	...	...
	Omagh (Edenfel)	3·86	+ ·33	·60	25	21	52·0	22	20·0	17	10	14	

+ Shows that the fall was above the average; — that it was below it. a and 26.

SUPPLEMENTARY RAINFALL, NOVEMBER, 1905.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	4.94	XI.	New Radnor, Ednol	4.49
„	Ramsgate, West Cliff	2.57	„	Rhayader, Nantgwillt	5.88
„	Hailsham	5.68	„	Lake Vyrnwy	5.63
„	Crowborough	6.10	„	Ruthin, Plás Drâw	4.66
„	Osborne	4.66	„	Criccieth, Talarvor	4.88
„	Emsworth, Redlands	4.00	„	Anglesey, Lligwy	5.43
„	Alton, Ashdell	4.25	„	Douglas, Woodville	4.88
„	Newbury, Welford Park ...	4.72	XII.	Stoneykirk, Ardwell House	4.91
III.	Harrow Weald	2.80	„	Dalry, Old Garroch	8.26
„	Oxford, Magdalen College ..	2.57	„	Langholm, Drove Road	5.09
„	Banbury, Bloxham Grove ...	3.72	„	Moniaive, Maxwellton House	5.39
„	Pitsford, Sedgebrook	2.74	XIII.	N. Esk Reservoir [Penicuik] ..	3.65
„	Huntingdon, Brampton	1.95	XIV.	Maybole, Knockdon Farm ..	3.91
„	Wisbech, Bank House	1.85	„	Glasgow, Queen's Park	3.37
IV.	Southend	2.27	„	Campbeltown, Redknowe ...	6.41
„	Colchester, Lexden	1.90	XV.	Inveraray, Newtown	6.76
„	Saffron Walden, Newport ...	2.55	„	Ballachulish House	7.68
„	Rendlesham Hall	2.05	„	Islay, Eallabus	6.13
„	Swaffham	2.31	XVI.	Dollar	6.37
„	Blakeney	1.83	„	Loch Leven Sluices	6.03
V.	Bishops Cannings	3.20	„	Balquhiddar, Stronvar .....	...
„	Ashburton, Druid House ...	6.92	„	Coupar Angus Station	5.07
„	Okehampton, Oaklands	5.23	„	Blair Atholl	3.80
„	Hartland Abbey	5.32	„	Montrose, Sunnyside	7.61
„	Lynmouth, Rock House ...	4.34	XVII.	Alford, Lynturk Manse	8.03
„	Probus, Lamellyn	5.59	„	Keith	8.11
„	Wellington, The Avenue	3.36	XVIII.	N. Uist, Lochinaddy	4.03
„	North Cadbury Rectory ...	4.08	„	Aviemore, Alvey Manse ...	3.33
VI.	Clifton, Pembroke Road ...	3.02	„	Loch Ness, Drumnadrochit ..	4.41
„	Moreton-in-Marsh, Longboro'	3.82	„	Glencarron	7.85
„	Ross, The Graig	3.69	„	Fearn, Lower Pitkerrie	3.23
„	Shifnal, Hatton Grange	2.38	XIX.	Invershin	5.36
„	Wem Rectory	2.62	„	Altnaharra	5.45
„	Cheadle, The Heath House ..	3.78	„	Bettyhill	4.06
„	Coventry, Kingswood	2.89	„	Watten	4.01
VII.	Market Overton	2.92	XX.	Cork	4.64
„	Market Rasen	3.12	„	Darrynane Abbey	5.90
„	Bawtry, Hesley Hall	2.48	„	Glenam [Clonmel]	4.31
VIII.	Neston, Hinderton	3.25	„	Ballingarry, Gurteen	2.46
„	Southport, Hesketh Park ...	4.77	„	Miltown Malbay	3.53
„	Chatburn, Middlewood	4.71	XXI.	Gorey, Courtown House ...	4.31
„	Cartmel, Flookburgh	5.39	„	Moynalty, Westland	3.49
IX.	Langsett Moor, Up. Midhope	6.59	„	Athlone, Twyford	2.87
„	Scalby, Silverdale	5.27	„	Mullingar, Belvedere	3.41
„	Ingleby Greenhow	7.20	XXII.	Woodlawn	2.93
„	Middleton, Mickleton	3.85	„	Westport, Murrisk Abbey ..	5.65
X.	Beltingham	3.36	„	Crossmolina, Enniscoe	8.52
„	Font Reservoir, Fallowles ..	5.60	„	Collooney, Markree Obsy ...	4.70
„	Ilderton, Lilburn Cottage ...	6.01	XXIII.	Enniskillen, Portora	3.02
„	Keswick, The Bank	6.13	„	Warrenpoint	3.60
XI.	Llanfrechfa Grange	4.82	„	Banbridge, Milltown	2.68
„	Treherbert, Tyn-y-waun ...	8.11	„	Belfast, Springfield	3.75
„	Carmarthen, Friary	5.37	„	Bushmills, Dundarave	4.37
„	Castle Malgwyn	5.00	„	Stewartstown	3.50
„	Plynlimon	8.00	„	Killybegs	4.96
„	Tallyllyn	3.20	„	Horn Head	4.51

METEOROLOGICAL NOTES ON NOVEMBER, 1905.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—The most prominent features of an ungenial month were the large amount of gloomy weather with frequent R, and the excessive humidity. There were a few clear cold days in the third week with two sharp frosts, but otherwise no two consecutive days without measurable precipitation. Duration of sunshine 33·5* hours, and of R 68·9 hours. Mean relative humidity 92·2 per cent. Mean temp. 41°·7, or 1°·3 below the average.

TENTERDEN.—A wet month except for the week of frost from 16th to 22nd. Windy on 11th, 23rd and from 26th to 28th. Duration of sunshine 66† hours.

CROWBOROUGH.—Notwithstanding the heavy and continuous R, the month was not unpleasant, having many bright sunny days and mild nights. The only dry days were from 16th to 21st, and the R was 2·44 in. above the average. Mean temp. 41°·3. Severe gale from the night of 25th to 10 p.m. on 26th.

HARTLEY WINTNEY.—Cold, dreary, foggy and wet, with several frosty nights. S.W. gale on 26th. Beautiful display of Aurora on 15th from 5.30 to 9 p.m. Mean amount of ozone 4·2.

PITSFORD.—A few days in the middle were fine and bright, but it was mostly wet and gloomy. R ·32 in. above the average. Mean temp. 39°·5.

COLCHESTER.—Damp and cold with several foggy mornings. Fine displays of Aurora Borealis at 6 p.m. and 8.15 p.m. on 15th.

BURY ST. EDMUNDS.—A month of usual November weather. No severe frost. R was insufficient to fill up ponds and wells.

BRUNDALL.—Mean temp. 41°·0, being 2°·8 below the average, and the lowest in November since 1896. Bright Aurora Borealis on the evening of 15th.

TORQUAY.—Mean temp. 44°·6, or 1°·8 below the average. Duration of sunshine 103·3* hours, or 36·0 hours above the average. Mean amount of ozone 4·2; max. 8·0 on 26th and 27th; min. 1·0 on 14th and 22nd.

WELLINGTON.—Rough and stormy, but with no very violent gales. R about ·25 in. above the average. Temp. generally low after 12th, especially about 18th.

NORTH CADBURY.—The wettest and windiest November in 10 years, and with two exceptions the coldest. There were three bar. depressions with readings below 29 in. A cold spell with some bright days occurred from 16th to 21st.

CLIFTON.—Mild and rainy till 14th, followed by a week of dry cold weather with N.E. wind and night frosts. From 22nd to 30th it was mild and rainy. R ·33 in. below the average.

ROSS.—Very cold till 22nd, especially in the third week, the mean temp. on 22nd being only 27°·2, and that for the whole month being 3°·0 below the average. The first 12 days were wet and R accompanied the gale of 26th. R about 25 per cent. above the average.

BOLTON.—The R was the greatest and the mean bar. the lowest on record. The first part of the month was mild with copious R and no frost. From 15th to 22nd was cold and dry, and from 23rd to the end the temp. was normal. Duration of sunshine 14·7* hours on 12 days, being 10·9 hours below the average. Mean temp. 40°·4, or 2°·5 below the average.

SOUTHPORT.—Characterized by abnormally low mean bar. and decidedly excessive R, but with remarkably light winds except on one day. Mean temp. 2°·9 below the average, owing to a brief period of excessive cold during the third week. Duration of sunshine 7* hours above the average. R 1·50 in. above the average.

UPPER MIDHOPE.—From 1st to 14th was very wet, followed by a spell of wintry weather from 15th to 21st, and again wet from 22nd to 30th, making the wettest November since 1888 except 1901.

LILBURN.—The weather was chiefly remarkable for excessive R and S storms. On 18th and 19th occurred the severest frosts ever remembered in November.

CARMARTHEN.—On the whole fine, the R falling mostly at night. From 15th to 21st the days were bright and fine with frost. There was a storm of considerable severity on the night of the 10th, when 1·02 in. of R fell.

HAVERFORDWEST.—Exceptionally cold, with large R which mostly fell in the night. The fall was the greatest since 1872. Duration of sunshine 76·7* hours. Bright Aurora on 15th.

GOSWELL.—Rather wet and damp, with low bar. but little fog. Stormy towards the end.

DOUGLAS.—The beginning and the end were very wet, with a brilliantly fine but cold period from 12th to 22nd with frost almost nightly. The weather on the whole was unusually quiet, although the bar. was low throughout. A N.W. gale of great violence occurred on 26th.

SCOTLAND.

LANGHOLM.—R 21 in. below the average of 29 years.

INVERARAY.—Variable weather throughout. The Aurora Borealis on the evening of 15th was very beautiful.

MILL, QUINISH.—Very fine until 21st, but thereafter wet and unsettled, with sudden gales of great violence from nearly all points of the compass. Vivid Aurora Borealis on 16th [? 15th—].

COUPAR ANGUS.—Excessive R for the first time since March. The month was noteworthy for a long cold snap following 17th, and the mean temp. was about 2° below the average.

ABERDEEN.—Wet and cold with little sunshine. In upland districts crops were not yet got in and were in bad condition.

LYNCH.—The month was notable for the excessive R, for the fall of 2·18 in. on 11th, and for the min. temp., 7°·2, on 17th.

DRUMSADROCHIT.—R 1·36 in. above, and rainy days equal to, the average of 19 years. The display of Aurora on the 15th was very fine; there had been hardly any Auroræ for years.

CASTLETOWN.—Cold and wet throughout. In farms where harvesting was rather late, the crops were still lying in the fields at the end. Corn and turnip crops were generally below the average and potatoes were badly diseased.

IRELAND.

CORK.—R 58 in. above the average. Mean temp. 6°·3 below the average, being the lowest in 25 years. As usual it was a foggy month.

DARRYNANE ABBEY.—R 91 per cent. of the average. Strong gale from N.W. on 26th, but on the whole rather less wind than usual in November. Sharp frost from 15th to 19th.

DUBLIN.—Cold, foggy, damp and wet. Mean temp. 42°·7, or 2°·7 below the average. S on the ground on 18th and 19th. Bright Aurora on the evening of 15th.

BANBRIDGE.—R 11 in. below the average of 40 years.

BELFAST.—Foggy weather prevailed, with frost at intervals. R slightly under the average.

OMAGH.—With the exception of a short sharp spell of night frost in the third week and again at the close, the weather was damp and dark. The small excess of R did nothing to redress the previous deficiency, and springs had not been so low in November for at least 44 years, probably much longer.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, June, 1905.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
°		°		°	°	°	0-100	°	°	inches			
London, Camden Square	81·9	22	46·2	7	71·3	53·0	53·9	79	129·9	44·7	4·39	17	6·9
Malta.....	93·9	30	59·9	3	81·0	64·7	64·5	79	138·5	55·3	·02	1	2·2
Lagos.....	88·0	15	69·0	13	83·1	73·7	74·6	85	141·0	62·5	25·59	25	8·1
Cape Town ..	70·8	2	40·9	1	60·7	48·7	50·2	81	...	...	13·29	19	5·6
Durban, Natal	79·9	18	45·4	14	72·4	53·8	...	...	132·0	...	11·12	5	3·9
Johannesburg	66·6	5	28·7	12	58·6	39·1	32·8	63	120·2	17·5	·00	0	1·7
Mauritius.....	78·7	9a	53·0	26	76·7	62·6	62·2	80	141·9	45·1	2·67	14	3·2
Calcutta.....	106·1	16	74·1	26	96·7	81·0	78·7	75	161·0	70·9	1·60	4	6·4
Bombay.....	93·9	20	76·6	26	91·3	82·0	77·0	75	144·5	74·8	6·53	15	5·5
Madras	108·2	2	77·2	17	102·4	82·1	71·8	62	149·8	76·0	·98	7	5·3
Kodaikanal	70·9	3	49·7	12	65·5	54·2	52·1	79	146·0	44·4	3·38	17	6·9
Colombo, Ceylon.....	88·2	15b	74·5	20	86·0	77·9	74·5	83	144·0	73·0	4·45	25	7·1
Hongkong.....	88·6	30	69·8	22	85·0	77·4	75·2	83	146·3	...	19·70	20	8·0
Melbourne.....	62·2	8	37·4	16c	56·7	46·6	44·2	79	116·3	30·0	1·32	15	8·7
Adelaide	64·2	7, 21	40·9	13d	59·6	47·8	46·8	80	119·5	35·7	3·71	19	7·9
Coolgardie	70·0	7	34·2	18	61·5	42·1	40·1	65	137·0	24·2	·50	4	3·4
Sydney	68·1	22	40·7	25	61·1	47·8	43·2	77	105·1	31·9	2·19	20	3·8
Wellington	61·7	14	30·5	5	52·6	42·3	41·8	82	102·5	27·0	8·75	21	6·6
Auckland	62·0	14	37·0	5	58·5	47·9	47·3	81	115·0	31·0	6·00	23	6·0
Jamaica, Negril Point..	90·2	23	68·7	7	86·2	73·2	72·9	77	...	...	4·22	7	...
Trinidad	89·0	8, 23	69·0	1e	86·9	70·8	72·0	78	165·0	63·0	6·01	12	...
Grenada.....	86·2	16	71·8	3	83·6	74·7	71·5	79	145·0	...	6·64	25	4·3
Toronto	85·2	20	39·9	1	73·4	53·7	55·5	76	...	33·6	3·19	14	5·9
Fredericton ...	88·7	16	31·2	7	68·7	45·7	45·5	59	...	...	2·43	8	6·4
Winnipeg	84·5	12	35·0	10f	69·3	47·6	...	...	...	...	4·62	15	5·9
Victoria, B.C.	68·7	17	47·3	14	62·8	50·5	...	...	...	...	1·06	8	5·6
Dawson	85·7	24	32·6	11	70·4	48·0	...	...	...	...	·25	2	4·4

a and 12, 19, 20. b and 16, 17. c and 27. d and 20. e and 17, 26. f and 21.

MALTA.—Mean temp. of air 71°·6. Mean temp. of sea 73°·8. Mean hourly velocity of wind 7·1 or 1·6 below average. TSS on 4th.

Capetown.—The rainfall is the greatest ever registered here in one month, the previous record being 11·41 in. in June, 1892.

Durban.—In 24 hours, ending 3 p.m. on 1st, 11·00 in. R fell.

Mauritius.—Mean temp. of air 0°·2, dew point 1°·1, and rainfall ·61 in. above, averages. Mean hourly velocity of wind 8·4 miles, or 2·8 below average.

KODAIKANAL.—Bright sunshine 132 hours. Mean daily wind velocity 398 miles.

COLOMBO.—Mean temp. of air 81°·2 or 0°·1 above, of dew point 0°·3 above, and R 3·72 in. below averages. Mean hourly velocity of wind 11·2 miles.

HONGKONG.—Mean temp. of air 81°·1. Mean direction of wind E.S.E. and mean hourly velocity 11·4 miles. Bright sunshine 144·3 hours.

Adelaide.—Mean temp. of air 0°·3 above, R ·78 in. above, averages. Most cloudy June on record; sunshine 77 hours, or 45 below average.

Sydney.—Mean temp. of air 0°·1 above, and R 3·23 in. below, averages.

Wellington.—Mean temp. of air 2°·4 below, and R 3·77 in. above, averages.

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THE RAINFALL OF 1905.

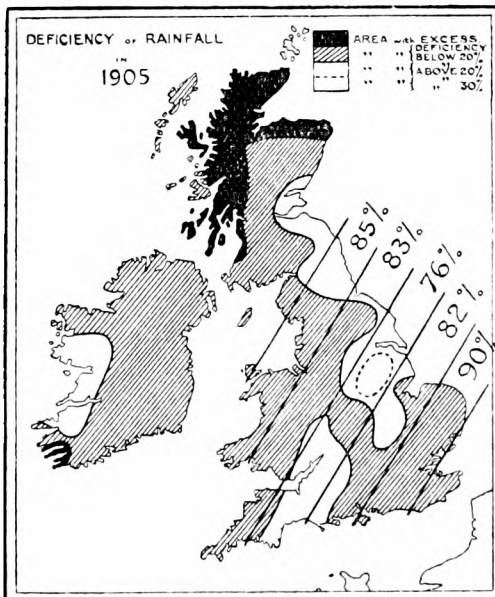
THE Aggregate Table this month takes the form of a summary of the total rainfall for the year in relation to the average. The month of December proved to be dry in all parts of the country and remarkably so in most parts of England, where an absolute drought of 18 days prevailed in many places. The results shown in the following table were supplemented by data from a number of additional stations which were published in a special article in *The Times* of January 12th. The average of 84 well-distributed stations shows that in 1905 the general rainfall of England and Wales was only 83 per cent. of the average, showing a deficiency of 17 per cent., or 5.76 in.; the general rainfall of Ireland was 89 per cent. of the average, a deficiency of 11 per cent., or 4.65 in.; the general rainfall of Scotland was 96 per cent. of the average, the deficiency being unimportant, only 4 per cent., or 1.91 in.; while the general rainfall of the British Isles was 87 per cent., indicating a deficiency of 13 per cent., or 5.10 in. over the whole surface. The year was thus exceptionally dry, and maintains the sequence of one wet year followed by two dry years which has now prevailed for the country as a whole for 15 years. The time of reversal of the three-year period has evidently not yet arrived, though Mr. Jenkins's recent discussion of the matter leads one to expect the present order of things to change and give place to another before very long.

The geographical distribution of the variation from average rainfall is remarkable. The west and north of Scotland had slightly more than the average amount, the relatively wettest part of the British Isles being the district bordering the south shore of the Moray Firth, where the excess exceeded 10 per cent. The south-east of Scotland had a deficiency of more than 20 per cent., and so had almost the whole of north-eastern, central and south-western England. The south-east of England, including Cambridge, Norfolk, Suffolk, Hertford, London, most of Essex and Kent, Surrey and Sussex had a deficiency less than 10 per cent., the rainfall having been relatively greater than in other parts of England. The greatest deficiency was experienced in a diagonal belt of country, fifty miles wide, running south-westward from the East Riding of Yorkshire to South Devon,

Aggregate of Rainfall for January—December, 1905.

Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.
	in.			in.			in.	
London	22·97	91	Bolton	39·20	92	Braemar	35·43	98
Tenterden	26·74	94	Wetherby	22·74	84	Aberdeen	31·19	94
Hartley Wintney	23·38	86	Arncliffe	51·25	84	Cawdor	30·22	103
Hitchin	23·26	94	Hull	20·19	75	Invergarry	55·78	100
Winslow	21·19	79	Newcastle	21·49	77	Bendamph	86·53	100
Westley	21·86	86	Seathwaite	116·92	88	Dunrobin	31·80	101
Brundall	22·96	90	Cardiff, Ely	32·84	77	Killarney	46·37	80
Aldbury	25·78	88	Haverfordwest	39·23	82	Waterford	33·48	85
Winterbourne	31·20	80	Gogerddan	41·21	91	Broadford	30·45	91
Torquay	27·88	80	Llandudno	26·05	84	Carlow	28·80	84
Polapit Tamar	32·85	85	Cargen	34·69	80	Dublin	25·29	91
Bath	22·79	74	Lilliesleaf	26·63	81	Mullingar	31·98	88
Stroud, Upfield	25·94	87	Colmonell	41·44	92	Ballinasloe	28·47	77
Woolstaston	26·16	79	Glasgow	29·62	83	Clifden	63·20	79
Bromsgrove	20·04	82	Inveraray	68·53	109	Crossmolina	47·48	94
Boston	20·99	90	Islay, Eallabus	51·79	109	Seaforde	33·70	87
Hodsock Priory	16·91	68	Mull	56·32	98	Londonderry	36·53	89
Derby	17·43	67	Dundee	22·20	77	Omagh	36·09	95

the general deficiency in which was 24 per cent., or practically one quarter of the average fall. A considerable portion of this belt in the valley of the Trent had a deficiency exceeding 30 per cent., and the lowest percentages of the average rainfall amongst the records dealt with occurred here, at Derby 67 per cent. and at Hodsock Priory, near Worksop, 68 per cent. England and Wales may be



divided into five parallel belts 50 miles wide, two north-east and two south-west of the dry belt, as shown on the accompanying map, which distinguishes regions with more than the average rainfall as black, and those with less than 80 per cent. of the average as white. It is then found that the general rainfall in each belt, taken in order from north-west, diminished to the central one and then increased, the percentages running 85, 83, 76, 82, 90, as given on the side of the map, thus showing that for some reason

the deficiency of rainfall was greatest along the plain which runs from the Severn valley north of the Oolitic escarpment to the Vale of York, and that the deficiency was less and less marked towards the north-west and the south-east. It may be that the tracks of the storm centres crossing England during the year fell so that the zone of maximum rainfall was more frequently to the north and to the south of the central belt than upon it.

In Ireland the driest part relatively lay in the extreme west, the greater part of the counties of Galway, Clare, Limerick and Kerry having a deficiency of more than 20 per cent. The greater part of the north of Ireland and a patch in the south-west had less than 10 per cent. deficiency.

The foregoing discussion is, of course, preliminary and is liable to revision when the whole of the data are critically examined and worked up exhaustively for "British Rainfall, 1905."

COLDEST SPRING ON RECORD IN SOUTH AUSTRALIA.

By SIR CHARLES TODD, Government Astronomer.

THE temperature conditions at the Adelaide Observatory (lat. 34° 56' S., long. 138° 35' E.) have been so remarkable and abnormal that the following brief analysis of the figures and comparison with the average for previous years may be of interest. In South Australia the year may be conveniently divided into two seasons—the summer months commencing with November and ending with March, and the autumn-winter-spring months (April to October), which may be termed the agricultural season, for then the crops are planted and come to maturity. The latter end of August, September and October constitute the spring portion of the year. In the following table are given the mean temperatures for the spring of this year :—

Mean Temperature Table.

1905.	Mean of Daily Maxima.	Average previous 47 years.	Mean of Daily Minima.	Average previous 47 years.	Mean Monthly Temp.	Average previous 47 years.	Highest Reading.	Lowest Reading.
August.....	59°·5	62°·0	43°·5	45°·8	51°·5 <i>a</i>	53°·9	68°·8	34°·8
September	60°·5	66°·4	43°·5	47°·8	52°·0 <i>b</i>	57°·1	75°·1	35°·9
October ...	64°·3	72°·8	46°·1	51°·5	55°·2 <i>c</i>	62°·1	77°·0	38°·9

a. In previous years August mean temperature has only once been lower than this (viz., 49°·9 in 1872).

b. September mean is the record lowest. (Previous min. 53°·8 in 1874.)

c. October " " " " (" " 58°·4 " 1886.)

The departure from normal conditions shown by the above figures (especially during the day) is very marked, but the extraordinary

character of the season is perhaps more clearly seen in the following analysis of the daily maximum and minimum readings :—

Daily Maxima.—Number of Days the Maximum Reading of the Thermometer lay between—

	50°0 & 54°9	55°0 & 59°9	60°0 & 64°9	65°0 & 69°9	70°0 & 74°9	75°0 & 79°9	80°0 & 84°9	85°0 & 89°9	90°0 & 94°9	95°0 & 99°9	100°0 & 104°9	Highest.	On	Lowest.	On
August, 1905	4	15	9	3	...	...	...	...	...	...	...	68·8	4	50·1 ^a	29
Aver. for August (47 years)	1·1	10·2	12·4	5·1	1·8	0·3	0·1	...	...	...	...	82·0	1862	49·5	1882
September, 1905.	2	14	10	3	...	1	...	...	...	...	...	75·1	12	53·7	7
Aver. for Sept. (47 years)	0·3	4·3	10·5	6·9	3·9	2·7	1·2	0·2	...	...	...	90·7	1882	51·0	1880
October, 1905....	...	5	17	5	..	4	...	...	...	...	...	77·0 ^b	5	58·0	30
Aver. for October (47 years) .....	...	0·9	5·2	8·0	6·0	3·7	3·3	2·3	1·2	0·3	0·1	100·5	1859	55·4	1898

a. Coldest day on record for the latter half of August.

b. Lowest monthly maximum on record for October.

Daily Minima.—Number of Nights the Minimum Reading of the Thermometer lay between—

	30°0 & 34°9	35°0 & 39°9	40°0 & 44°9	45°0 & 49°9	50°0 & 54°9	55°0 & 59°9	60°0 & 64°9	65°0 & 69°9	70°0 & 74°9	75°0 & 79°9	Warmest Night	On	Coldest Night	On
August, 1905	1	8	9	11	2	...	...	...	...	...	51·9	25	34·8 ^a	21
Aver. for August (47 years)	0·1	3·3	9·7	12·5	4·4	0·8	0·2	...	...	...	65·1	1871	32·3	1859
September, 1905.	...	8	12	8	2	...	...	...	...	...	52·9	12	35·9 ^b	28
Aver. for Sept. (47 years) .....	...	1·4	7·4	11·4	6·9	2·1	0·6	0·2	...	...	66·3	1873	32·7	1858
October, 1905....	...	1	11	15	3	1	...	...	...	...	58·7 ^c	10	38·9	20
Aver. for October (47 years) .....	...	0·4	3·9	9·7	9·1	4·5	2·2	1·0	0·2	...	77·0	1861	36·1	1858

a. Only once a colder night than this in August.

b. Coldest night on record for latter half of September.

c. Only once before in 47 years has the warmest night in October been under 60° (viz., 59·4 in 1883).

Such a cold spring is unprecedented in the Observatory records ; the nearest approach to the present season being the year 1883 which previously held the record, being much lower than any other spring. This year (1905), however, completely eclipses 1883, as will

be seen from the following comparison of the mean temperature figures for the two years :—

	Mean Max.		Mean Min.		Mean Temp.		Highest Reading.		Lowest Reading.	
	1883	1905	1883	1905	1883	1905	1883	1905	1883	1905
Aug...	60·4	59·5	44·4	43·5	52·4	51·5	67·2	68·8	37·6	34·8
Sept...	62·6	60·5	46·3	43·5	54·4	52·0	76·3	75·1	40·9	35·9
Oct. ...	69·2	64·3	50·1	46·1	59·6	55·2	87·3	77·0	40·5	38·9

ON A SCHEME FOR THE CO-OPERATIVE STUDY OF BRITISH THUNDERSTORMS.

By L. C. W. BONACINA.

IN studying any class of natural phenomena it is of paramount importance that not only the phenomena themselves may be investigated but also the physical circumstances that attend their manifestation; and it is further eminently desirable that all facts that can possibly have any bearing upon the phenomena in question be included in the study, in order that the science of these phenomena which it is proposed to establish may be made as wide as possible and to merge insensibly into the domain of kindred sciences.

Any proper and comprehensive scheme, therefore, for the study of thunderstorms must discuss the storms themselves or their purely meteorological aspect, their relation to time and locality; or their climatological aspect, the extent to which they are influenced by geographical and geological features, what influence they exert upon the living world wherein they have a physiological significance, and the all-important questions of their causes and connection with the general state of the atmosphere.

As three or four observers have already expressed themselves willing to furnish such notices as may be required respecting thunderstorms occurring in their own neighbourhoods, we venture to propose for the consideration of readers of this Magazine the following scheme for the co-operative study of thunderstorms.

We propose that the report of each thunderstorm observed be based upon certain lines of information, viz. :—

- (1). Date, time, and locality of occurrence of storm; full statement as to geographical features of locality and its geological formation in the first report, and the apparent influence exerted by these upon the storm.
- (2). Type of thunderstorm. (See Explanation).
- (3). Intensity of thunderstorm.

- (4). From climatological stations, readings of temperature and humidity before, during and after the storm; amount and character of precipitation; general state of the sky and appearance of clouds; force and direction of the wind.
- (5). Show climatological stations, height of barometer on morning and evening of the day for which the storm is reported.
- (6). Time of commencement and ending of thunder, rain, &c.
- (7). Natural history notes; loss of life, damage to property, &c., affected by the storm.

Explanation :

(1). It is not merely the relation of thunderstorms to geographical *position* that we wish to ascertain, but also their relation to geographical *features*. We suggest, therefore, that the reporting stations as they increase in numbers shall be classified according to the natural conditions of the country, not to the political divisions like the shires. We do not want, for example, to compare the thunderstorms of the *county* of Cumberland with those of the *county* of Kent, or of the *county* of Devon with those of the *county* of Lincoln, because none of those counties represent physical wholes; but we do want to compare the storms of the Lake District with those of the Weald, of Dartmoor with those of the Fen country, and so on, because those areas are well-defined natural divisions. The number of stations required for each of these divisions would of course vary with its size. Ranges of hills, like the North Downs, which separate the Weald from the Lower Thames Valley, should be regarded as distinct divisions and accordingly supplied with observers.

In this way we should soon learn the influence which the physical features of the land exert upon the frequency, intensity and path of travel of thunderstorms. The investigations of the Thunderstorm Committee seem to show that the paths of storms are governed rather by the distribution of atmospheric pressure than by the configuration of the land. The subject is a most interesting one and deserving of careful study.

(2). By the *type* of thunderstorm we mean the type of weather during the prevalence of which the storm occurs, and of which it is a phase. There are many types of weather that in this country are liable to cause thunderstorms. A familiar type of thunderstorm is that which often occurs after a period of high temperature in summer. Another well-known type of storm is that associated with a stagnant and intensely gloomy state of the atmosphere and a temperature often below the normal; thunderstorms of this kind, which are probably the most violent that occur in Britain, are frequently developed in the space between two anticyclones. The Kentish hailstorm of September 10th, 1902, belonged to this type. Then there are the thunder showers that accompany cool, broken weather in summer, and those associated with rough cyclonic conditions in winter. As an example of a thunderstorm of a singularly eccentric nature, we

may mention the one which passed over the metropolitan district on January 23rd, 1895, and which was characterized by a heavy snow-fall together with violent thunder and lightning.

There exists, of course, no line of demarcation between any of these different types of thunderstorms; they merge imperceptibly into one another, so that it is not possible to attempt any systematic classification of thunderstorms according to type. Nor, indeed, is it needful to do so. Let every observer under this heading give what information he cares as to the appearance of the storm he is reporting, and the *general type of weather* during the prevalence of which it occurs. Our own knowledge of the state of weather prevailing over the country as a whole would throw further light upon the type of individual thunderstorms.

(3). The intensity of thunderstorms should not, of course, be judged solely by their effects upon objects, as two storms of similar intensity would never wreak the same amount of damage even in the same locality. It will, however, be easily estimated as slight, moderate, or severe, by the observer, provided he has the ordinary experience of British thunderstorms.

For reporting purposes let us fix the minimum intensity of thunder and lightning—namely, distant thunder or sheet lightning without thunder, as constituting a “thundery” day. In referring to this question of the intensity of thunderstorm phenomena, we must not lose sight of the limit that is imposed upon us by the senses. If the nervous system were sufficiently sensitive, there would probably be few showery days when thunder and lightning would not be perceived by it.

(4). Here we require a knowledge of the atmospheric conditions accompanying the storms reported.

Temperature:—Reports received from observers in possession of climatological stations should contain temperature readings taken before, during and after the storm, whilst a copy of the thermograph's record would be invaluable, and indeed essential to any investigation into many complex physical problems connected with thunderstorms.

Humidity:—Readings of the wet bulb thermometer should be inserted. Theoretically, a low relative humidity combined with a high absolute humidity at the surface of the Earth should represent the conditions most favourable to thunderstorm development.

Precipitation:—The character, duration, and amount of precipitation that occurs in a thunderstorm should be noted. When hail characterizes a thunderstorm, we would urge that a note be made of the directions of motion of the upper and lower clouds of the storm, together with a note upon the localization of the hail in the district reporting it. (See Abercromby in “Weather,” pp. 288—291). It should be borne in mind that hail exhibits a tendency to fall in parallel bands on either side of the central area of the storm where often rain alone falls.

Clouds, Wind, &c.:—Close observations upon the direction and force of the wind, of the forms, changes and movements of the clouds, together with notices of the occurrence of globular lightning, St. Elmo's Fire, and Aurora should form a feature of every thunderstorm report.

(5). Barometric readings, taken morning and evening, for the thundery days must be entered in the reports. Copies of the barometric traces, showing the oscillations so characteristic of thundery weather, would be of the greatest value as these oscillations appear to be the visible effect of a series of atmospheric waves, and to be in some way connected with lightning strokes (Thunderstorm Committee Report). When it will be desired to make a minute study of the distribution of atmospheric pressure during any thundery period, it will be necessary to obtain barometric readings for that period from as many meteorological stations as possible, in order that charts may be constructed showing differences of pressure for hundredths of an inch. The frequent thunderstorms of the month of June, 1888, were thus studied in relation to the accompanying distribution of pressure by Mr. William Marriott in his discussion of the observations of the Thunderstorm Committee, and submitted to this process of analysis they yielded some important knowledge, such as that thunderstorms are comparable to miniature cyclonic systems.

Thunderstorms, as is well known, are the accompaniment of certain types of distribution of atmospheric pressure. It must not be forgotten that often in summer, when the distribution of pressure is favourable to the development of thunder and lightning, that this very distribution has itself been brought about in great measure by the effects of strong solar radiation over the land, which tends to keep atmospheric pressure relatively low over the land and to give rise to local convection currents resulting in rapid condensation of aqueous vapour and increased electrical density.

Let us turn to the Weather Chart issued for 8 a.m. on July 9th, 1905, a date, it will be remembered, when thunderstorms were very general over Great Britain. England and the north of France lay in the space between two high pressure systems, and, as had consequently been anticipated, thunderstorms developed early in the day in many localities. Now the precise distribution of atmospheric pressure that prevailed on that morning favourable to the formation of thunderstorms was, of course, the result of those unknown laws regulating the sequence of changes in the distribution of pressure from day to day and from minute to minute, modified by the disturbing effects normal to the season of strong solar radiation over England, and there can be but little doubt that the weakening of the anticyclone over England that had set in since 8 a.m. on the previous morning was to some extent, to what extent we cannot say, due to the high temperature that had prevailed over the country during the ensuing day, July 8th. The important point to be

remembered is that though the thunderstorms of July 9th would not have occurred had not the distribution of pressure been favourable, the fact that this was favourable must *in this case* be largely attributed to effects of previous hot weather.

To the discussion of such highly interesting questions we hope to devote a future article.

(6). We require to know the time of commencement and ending of thunder, rain and hail, in order that the paths and rate of travel of storms may be ascertained in accordance with the method employed in the discussion of the observations made under the direction of the Thunderstorm Committee.

(7). Observers interested in any branch of natural history would do useful work by supplying short notes concerning any phenomena that they can clearly associate with thundery conditions of the atmosphere. Information as to loss of human life, damage to buildings, cattle, &c., and the circumstances attending the catastrophes might also be added. Of the great forest trees the oak appears to be the most susceptible of lightning stroke, but in most parts of England the oak is the predominant tree, so that on that account alone more instances of injury to this than to less abundant species like the elm, beech and ash, are on record.

The main object of this scheme of study will be fourfold: to determine (1) the geographical and seasonal distribution of thunderstorms over the British Islands; (2) the close relation of thunderstorms to the distribution of atmospheric pressure; (3) the close relation of thunderstorms to atmospheric conditions; (4) the exact causes of thunderstorms.

By studying the geographical and seasonal distributions of thunderstorms together, curious tendencies towards thunderstorm development in certain localities at certain periods of the year, such as that observed by Dr. Mill towards the occurrence of storms in the south-east of England during the last week of July, will be discovered.

Paragraphs 6 and 7. therefore, in accordance with the main object of the scheme as stated above are of lesser importance, but references to them in the reports should never be omitted. To all who volunteer their assistance as observers type-written forms, giving details as to the manner in which it is desired that the reports be drawn up, will be sent, in order that they may be spared unnecessary trouble and expenditure, and we unnecessary labour in interpreting the reports.

We trust that the method of study here laid down may meet with such criticism as may enable defects in it to be remedied and omissions in it to be supplied. During the next few months thunderstorm work will be light, and there will be ample time for fresh suggestions to be received before storms increase again in frequency in the spring.

Let us conclude with the hope that the poetry of thunderstorm phenomena, whether expressed in verse, prose or art, may not be altogether neglected by those who would advance the science of them.

Despite all that is sometimes said to the effect that science is opposed to poetry, we maintain that it is largely the poetic expression of any object or phenomenon, of any land or sea-scape, of any quiet rural scene, that inspires a scientific interest in it and prevents such interest from flagging.

[We gladly publish the above article, and commend it to the attention of observers who are specially interested in thunderstorms; for we consider that the best way to revise and improve such a scheme is to give it a trial that will reveal its weak points and suggest modifications. Observers desirous of taking part should communicate with Mr. Bonacina, at 2, Greencroft Gardens, London, N.W.—ED. *S.M.M.*]

Correspondence.

THE HIGH BAROMETER IN DECEMBER.

To the Editor of Symons's Meteorological Magazine.

YOU will, no doubt, be receiving notices of the high barometric readings of the early part of this week, which I think were quite abnormal. I was at Cardiff, on business, and had my pocket aneroid with me. I noticed its rise on Monday the 11th, and wondered if it had "gone wrong." On Tuesday morning, 12th, at 8 a.m., the needle had gone beyond scale, and was equivalent to 31.12, as near as I could judge without the scale under it. This was at 40 ft. above sea level.

On my return to London on Wednesday, and on each day since, I have compared the aneroid with my Negretti and Zambra mercurial, and find a constant index error of +.12, which would make the Cardiff reading 31.00, subject to correction for 40 ft. above sea level. From the *Times* chart of Wednesday it would seem that the centre of the anti-cyclone was over Cardiff. I shall be interested to see if my readings are confirmed, and whether you will tell us next month that the 12th of December, 1905, is comparable with January 18th, 1882. (See *Symons's Met. Mag.*, 1882, p. 8).

JAMES G. WOOD.

7, New Square, Lincoln's Inn, W.C., December 16th, 1905.

FOR the second time this year, and the fifth since my record commenced in 1878, the barometer has exceeded 30.900; on December 12th, at 10.30 a.m., it attained the height of 30.937, corrected and reduced.

Two points may be noticed—(1.) The rise was unsteady. From 1.30 a.m. to 3 a.m., a rise of 0.070; a very slow rise for the next four hours; steady for two hours from 7 a.m. to 9 a.m., and then a rapid rise from 9 a.m. till 10.30 a.m., also of 0.070. (2.) Some time during the early morning hours of the 12th, while the barometer was above 30.800, there was a slight *shower of rain* (.02 in.).

CHARLES L. BROOK.

Harewood Lodge, Meltham, December 18th, 1905.

[At Camden Square the highest pressure occurred at 10.15 a.m., when the barometer read 30.873 inches, practically identical with that of January 15th, 1902, which was 30.874; but exceeded by January 28th, 1905, with 30.955, by January 9th and 30th, 1896, with 30.934 and 30.927; and by the still unsurpassed reading of January 18th, 1882, which was 30.975 inches. The isobar of 30.90 in. for 6 p.m. on 12th includes the west of Wales and the east of Ireland; but we have not seen any instance of 31.00 inches being observed with verified barometers.—ED. *S.M.M.*]

GREEN FLASH AT SUNSET.

I WOULD call attention to a phenomenon of atmospheric refraction frequently observed, but of which very little has been published. I refer to the green flash seen in clear weather as the last ray of the setting sun disappears. I observed this one evening in the North Atlantic, last month; I also saw it in the North Atlantic in October, 1898; on that last occasion I watched Venus setting a little later, but though the planet turned red occasionally it did not flash green at the last moment; I have, however, seen a planet flash green at setting.

The phenomenon is noticed in *Knowledge*, April, 1889, p. 126, where the colour is given as blue; also in *Nature*, March and April, 1890, pp. 495, 538, and in the Royal Astronomical Society's Notices, May, 1901. In these notices the writers appear to hold different views as to the cause. In "Elementary Meteorology," by Prof. W. M. Davis, p. 50, it is stated that after sunset every solar beam will be broken up into a short vertical spectrum; is this the explanation? if so why should the last flash be green? (according to some accounts of a remarkably vivid green). I would like to see that matter worked out.

J. P. MACLEAR.

Chiddingfold, December 19th, 1905.

[The beautiful phenomenon described by Admiral Maclear is very familiar to those who are on the watch when the sun sets, either on a sea horizon, or a straight strip of low land. We hope to publish an article upon it in an early number.—ED. *S.M.M.*]

CURIOUS EFFECT OF LIGHTNING.

A SIMILAR case to that reported by Mr. Haes was observed by me at Cranleigh in 1889. (*Quarterly Journal R.Met.Soc.*, Vol. 16, p. 229.) A tall tree stood over the gable end of a stable, the gable was struck, but there was no mark on the tree. I believe myself that the upper branches of the tree were highly charged, and when discharged suddenly the lightning preferred the warm moist air from the chimney to the trunk of the tree.

Warm air was probably coming up the chimney in the case related by Mr. Haes, although no fire was alight.

J. P. MACLEAR.

Beaconscroft, Chiddingfold, 20th December, 1905.

THE RAINFALL OF ENGLAND AND THE SOUTH-EAST TRADES.

IF an unknown writer were to assert that there was any connection between the South-East Trade Winds in the South Atlantic and the rainfall of the south of England, we should be inclined to examine his arguments with the same sort of interest as would attach to a homily on Tenterden Steeple and the Goodwin Sands. But when the Director of the Meteorological Office seriously propounds the coincidence in the pages of *Nature*, we feel that the matter is much more than a scientific curiosity. Dr. W. N. Shaw, writing on "The Pulse of the Atmospheric Circulation," in *Nature* for December 21st, 1905, shows that the average curve of the mean monthly velocity of the wind at St. Helena for 1892—1903 is almost exactly similar to the curve of monthly incidence of rainfall for "England South" for 1866—1900. The resemblance in the two curves is certainly exceptional, and in one or two instances of individual years there are also indications of the same relationship. Dr. Shaw feels that the accordance cannot be altogether accidental. He says, "The fact that a seasonal variation of rainfall does show itself in the average of a few years has a meaning, and that its phases are closely similar to those of the arterial pulsations of the general atmospheric circulation accords too much with what may be called common sense to be altogether devoid of significance." The importance of such a relationship, if it can be established and extended, on practical problems of weather prediction can hardly be exaggerated.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1904.

STATIONS. <i>Those in Italics are South of the Equator.</i>	ABSOLUTE.		Minimum.		AVERAGE.				ABSOLUTE.		RAINFALL.		AVER- AGE.	
	Temp.	Date.	Temp.	Date.	Max.	Min.	Mean.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.		Days.	Cloud.
London	91.0	August 4	92.1	November 26	58.1	43.2	50.6	45.0	85	135.9	16.5	2 65	160	0-10
Cape Town ..	100.5	January 23	36.9	June 28	69.4	53.9	61.6	52.9	73	...	...	31.82	112	6.2
Durban	101.1	September 3	48.8	June 21	79.4	61.5	70.4	...	...	159.2	...	34.72	141	4.7
Mauritius	89.9	February 22	50.9	Sept. 21	80.4	66.0	73.2	64.1	...	155.2	42.0	43.12	210	4.1
Calcutta	101.5	April 23	47.0	February 2	87.1	70.5	78.8	68.9	74	163.2	40.4	63.20	82	4.2
Bombay	94.7	March 30	62.3	January 19	86.7	75.5	81.1	71.7	75	141.2	56.5	33.42	90	3.7
Madras	103.5	June 3	61.2	February 1	91.4	74.3	82.9	69.8	71	161.2	56.4	18.15	78	4.3
Kodaikanal ..	77.3	April 6	39.9	January 7	64.3	50.3	57.3	47.8	72	146.2	23.4	46.62	148	4.9
Colombo	92.7	February 25	65.0	Feb. 3, 4	86.1	75.2	80.7	71.8	79	157.7	59.2	76.62	162	5.8
Hong-Kong ..	91.1	June 26	44.8	December 24	76.5	67.9	72.2	62.7	75	149.6	...	80.44	137	6.5
Melbourne	102.0	December 24	31.5	July 23	68.8	46.8	57.8	47.9	73	160.2	26.6	29.72	128	5.9
Adelaide	114.0	December 31	36.9	May 24, July 29	72.2	52.9	62.5	47.8	61	161.0	29.7	20.29	117	4.6
Coolgardie ..	108.6	December 27	32.0	July 14	76.3	52.0	64.1	46.1	54	180.5	23.5	11.77	72	3.8
Sydney	107.5	December 31	39.5	June 30	69.7	56.1	62.9	52.3	73	138.1	29.1	45.95	216	4.9
Wellington ..	82.3	January 21	32.0	July 3	60.9	48.0	54.5	44.5	67	140.0	29.0	60.41	170	6.4
Auckland	79.5	February 18	37.0	July 23, Aug. 5	63.4	52.5	58.0	50.4	76	148.0	29.0	45.70	175	5.4
Jamaica	89.9	July 8, Aug. 5, Sept. 4	63.8	January 7	85.5	71.3	78.4	71.5	78	...	...	64.20	101	...
Trinidad	91.0	May 13	61.0	Feb. 24, 25, 26	86.1	68.4	77.3	72.0	82	167.0	58.0	56.43	188	...
Grenada	91.4	October 31	68.4	Feb. 22, Jun. 7	82.9	73.3	78.1	70.2	75	156.2	...	69.75	254	3.6
Toronto	93.0	July 18	15.1	January 4	51.2	33.9	42.6	37.0	79	122.7	-18.2	35.71	151	6.0
Fredrickton ..	86.1	July 20	35.0	February 6	49.9	27.4	38.7	27.1	58	...	...	41.46	116	5.5
Winnipeg	89.0	June 18	42.0	January 24	...	...	50.4	...	...	...	...	22.86	113	5.3
Victoria, B. C.	82.3	July 21	24.5	February 8	56.0	44.7	50.4	...	...	...	...	26.59	152	6.2
Dawson	80.0	August 9	57.8	January 14	30.8	13.0	21.9	...	...	...	...	12.04	74	4.7

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, December 20th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. Richard Bentley, President, in the chair.

Mr. G. C. Simpson gave an interesting account of his "Attempt to fly Kites for meteorological purposes from the mission ship attached to a deep-sea fishing fleet in the North Sea." These observations, which were made in July and August last, were carried out on behalf of the joint Kite Committee of the Royal Meteorological Society and of the British Association. By the kindness of the Royal National Mission to Deep-Sea Fishermen, the kites were flown from the deck of the mission-ship *Queen Alexandra*, attached to the Red Cross Fleet. Owing to the vessel being almost continuously employed in trawling, the opportunities for flying kites were very limited; nevertheless, Mr. Simpson was able to secure eight ascents without damage to kites or meteorographs during the time he was on board. The greatest height reached by the kites was 5800 feet.

Mr. C. J. P. Cave described his method of flying kites in Barbados in April and May last year, and Mr. W. H. Dines, who had examined the records, said that the humidity traces show generally a value of about 60 per cent. at the surface, rising to 80—90 per cent. at heights of 1000 to 2000 feet, and then falling off again in some cases to 50 per cent. or less as the height increases. These values are lower than might have been expected over a tropical ocean. The increase is of the ordinary kind, but the maximum value occurs at a far lower elevation than is the case in Europe. It is probable that the relative humidity forms an extremely accurate index to the vertical circulation, a low humidity indicating a descending current of air, and so it may be inferred that there is some settling down of the atmosphere over the region of the smaller West Indian Islands in April and May.

Mr. W. H. Dines, F.R.S., read a brief paper on "Temperature changes during the partial solar eclipse of August 30th, 1905, on the surface and at 3000 feet at Oxshott." The under surface of the cloud layer, which in the neighbourhood of London completely obscured the sky, was 2000 feet high. It seems probable that the kite was above the clouds, and that the cloud layer was only a shallow one, for the occupants of a balloon which ascended from London at 12.30 had a clear view of the eclipse; and also when the kite was drawn in at 4.28, and had just passed through the same clouds, it was not at all wet, as it certainly would have been had the descent through the clouds occupied any appreciable time. A trifling rise of temperature occurred as the shadow passed off, but Mr. Dines hardly thinks this was caused by the eclipse, especially as the same temperature was found at 3500 feet elevation at 4.28 as at 1.25 p.m. A meteorograph, which was suspended in a tree from 11.40 a.m. to 4.40 p.m., showed little or no change.

An interesting discussion followed the reading of these papers, in which the President, Dr. W. N. Shaw, Mr. E. S. Bruce, Mr. G. C. Simpson and Mr. W. H. Dines took part.

In the absence of the authors, the following papers were briefly presented by the Secretary :—

“Comparison between Glaisher's Factors and Ferrel's Psychrometric Formula,” by J. R. Sutton, of Kimberley; and “A Rapid Method of Finding the Elastic Force of Aqueous Vapour and the Relative Humidity from Dry-bulb and Wet-bulb Thermometer Readings,” by Dr. J. Ball, of Cairo.

Dr. W. N. Shaw called attention to the great importance of hygrometric observations in this country, and deplored the neglect which has hitherto prevailed.

The following were elected Fellows of the Society :—Mr. W. S. Clark, Rev. D. Kennedy, D.D., Mr. J. Lyle, M.A., Mr. W. J. Marriott, Mrs. E. V. Pereira, Mr. J. M. Phillpott, Mr. C. Salter, Mr. A. C. Saxby, Mr. H. T. Scoble, Mr. R. Shastri, and Rev. H. Vaughan.

THE INVESTIGATION OF THE UPPER AIR.

THE Meteorological Office has issued the following communication to the press, and we publish it with a feeling of gratification that this country is at last taking its proper share in one of the most promising fields of Meteorological research.

In response to representations which have reached them from various quarters, the Meteorological Committee have assigned from the Parliamentary grant under their control a sum for promoting the investigation of the upper air by kites and other means.

The immediate objects in view are :—

1. To establish an experimental station where kite ascents and other experimental investigations can be carried out, especially on the days selected for international co-operation.

2. To develop and extend the instrumental equipment, so that facilities may be afforded for the co-operation of other observers upon sea or land.

3. To provide for the publication of the observations in combination with those of other countries by a contribution to the cost of the international publication undertaken by the president of the International Commission for Scientific Aerostation, Professor H. Hergesell, of Strassburg.

Mr. W. H. Dines, F.R.S., who is well known for the work he has done in connexion with a joint committee of the Royal Meteorological Society and the British Association, has undertaken the direction of the operations for the Meteorological Office. His experiments for the office are carried on at his house at Oxshott.

An endeavour will be made, with fair prospect of success, to enlist the co-operation of marine observers in correspondence with the office. Captain A. Simpson, of the steamship *Moravian*, an observer of long experience, has already expressed his willingness to make a trial of this method of extending

our knowledge of marine meteorology as soon as the necessary gear and instruments can be supplied.

It is hoped that through the assistance of others who are interested in such investigations, and have at their disposal the means of carrying them out, an effective scheme for the investigation of the upper air may be set on foot. Lieutenant-Colonel J. E. Capper, C.B., R.E., of the Aldershot balloon companies, has already facilities for such purposes, and will take part; Mr. G. C. Simpson, Lecturer on Meteorology in the University of Manchester, is making arrangements for occasional observations on the Derbyshire hills; Mr. C. J. P. Cave, who has already made some interesting kite ascents in Barbados, has provided himself with the necessary equipment for experiments at Ditcham Park; and Mr. S. H. R. Salmon has arranged a station on the Downs, near Brighton, and carries out ascents on the International days.

There is, accordingly, a prospect of an effective investigation being commenced.

METEOROLOGICAL NEWS AND NOTES.

MISS JESSIE HILL BUCHAN, for many years the right hand of her uncle, Dr. Alexander Buchan, in the office of the Scottish Meteorological Society, died suddenly on December 7th, to the profound regret of all who knew her, and greatly to the loss of meteorology in this country. Miss Buchan began to work at the Scottish Meteorological Society in 1868, and was Dr. Buchan's sole assistant until 1886. She had charge of the finance of the Society as Treasurer's clerk, and received all the subscriptions for the Ben Nevis Observatory. A large part of the regular work of the office, including the checking of the returns from the Society's stations, fell to her share, and she also did an immense amount of tabulating and computing for the many large and important papers published by Dr. Buchan, especially with reference to his Report on Atmospheric Circulation in the *Challenger* Reports. She was an unfailing helper and friend to all who had occasion to visit the Society's rooms, and her cheerful presence will be sorely missed.

THE CLIMATOLOGICAL SUMMARY FOR THE BRITISH EMPIRE in 1904 is published on another page, and this year we have endeavoured to disarm the criticism which has annually fastened upon this harmless and even official set of figures by refraining from stating in words that Dawson is cooler than Madras, or Coolgardie less humid than Colombo. The Table is there to speak for itself and it presents some features of real interest.

THE ROYAL METEOROLOGICAL SOCIETY has arranged for lectures on a meteorological subject by Mr. W. Marriott, in connection with the work of the local Scientific Societies Committee, on the following dates, at the places mentioned:—January 16th, at Sidcup, to the Literary and Scientific Society; January 23rd, at London, in Exeter Hall, to the Young Men's Christian Association; January 24th, at

Epsom, to the Epsom and District Literary and Scientific Society; February 2nd, at Harpenden, to the Social Union; February 8th, at Reading, to the Natural History Society; February 9th, at Bishop Stortford; February 10th, at Woolwich, to the Royal Arsenal Co-operative Institute; February 24th, at Colchester, one of the Essex Education Committees' Market day lectures; February 28th, at Nantwich; March 2nd, at Derby, to the Municipal Training College; and March 14th, at Doncaster, to the Scientific Society. We hope that all meteorological observers will make an effort to attend the lecture in their neighbourhood.

DR. H. R. MILL HAS ARRANGED TO LECTURE for the Gilchrist Educational Trust, on the subject of "Rain," at Dolgelly, on Wednesday, 14th February; at Portmadoc on Thursday, 15th February; at Holyhead on Friday 16th February; at Worcester on Monday, 12th March; and at Bridgnorth on Tuesday, 13th March. He has also arranged to give a lecture on a similar subject to the Royal Dublin Society, on the afternoon of Wednesday, March 7th.

SOLAR AND CLIMATIC VARIATIONS are discussed by Dr. C. Easton, of Rotterdam, in the August, 1905, number of *Petermanns Mittheilungen*. He shows a remarkable correspondence between the curve of solar activity and the curve of cold winters, and points out the probability of periodic variations of different duration existing, especially the familiar eleven-year sunspot period, and a period including eleven sunspot cycles, or 178 years.

"IRELAND IS ENGLAND'S UMBRELLA," lamented a resident in Donegal, complaining of interminable rains and floods during December. "I wish they would make holes in it," is the despairing comment of the rainfall observer in the drought-distressed Eastern Counties, who forwards the note to us.

REVIEWS.

Proceedings of the Third Convention of Weather Bureau Officials, held at Peoria, Ill., September 20, 21, 22, 1904. Washington: 1904.
Size, 9½ x 6. Pp. 268.

THE practice of holding a three-yearly Convention of the Weather Bureau officials, who are scattered all over the United States in the local weather offices, affords an opportunity for the discussion of meteorological questions by a body of specialists similarly trained but accustomed to work with very different types of climate. This compact volume contains a number of important papers and discussions, but the most remarkable thing in it is the incidental recommendation by Professor Willis Moore in his "Letter of Transmittal," that 5000 copies should be printed. This gives some idea of the extent to which meteorology, and that not of a popular or elementary character, is expected to be appreciated on the other side of the Atlantic.

Seasons in the British Isles from 1878. By W. N. SHAW. Reprinted from the Journal of the Royal Statistical Society. London: 1905.

Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 98.

THIS paper is a summary of the *Weekly Weather Report* of the Meteorological Office since the commencement of that publication, with certain deductions and applications. Dr. Shaw gives a clear statement of the object with which the *Weekly Weather Report* was founded; the treatment of weather on the basis of the week as a unit of time and the district as a unit of area mainly in the interest of agriculture. He then gives a table running to 25 pages, showing each county in the British Isles divided according as its mean annual rainfall is above or below 35 inches, with the agricultural characteristics of each division and the meteorological averages for the corresponding stations. He then deals with the succession of the seasons and gives a number of suggestive instances of the application of the data collected to practical ends. The whole paper is a fine instance of the statistical treatment of observations and the scientific attitude with regard to their ultimate utility.

The Bahama Islands. Edited by GEORGE BURBANK SHATTUCK, PH.D.

New York and London: Macmillan. 1905. Size $10\frac{1}{2} \times 7\frac{1}{2}$.

Pp. xxxii.+630.

THIS beautiful volume is published by the Baltimore Geographical Society and records the researches made and conclusions drawn by an expedition of scientific specialists who visited the islands in 1903. As is well known, the meteorology of the West Indies receives much attention from the Weather Bureau in Washington, and it will not surprise our readers so much as it would astonish the general public to find an important British possession on the verge of the tropics waiting for an adequate scientific description until our American cousins found leisure to take it up. Every aspect of the physical geography of the Bahamas is dealt with in a comprehensive way, earlier records being consulted to support the observations of the expedition, which extended over only five weeks in the islands.

Our concern here can only be the Magnetic and Meteorological chapters, of which there are three, written by the competent hand of Dr. Oliver L. Fassig, who was in charge of that department of the expedition. They deal with Magnetism, Climatology, and Kite Observations. The following summary of the absolute extremes of air temperature at Nassau is interesting in showing how the year of absolute minimum in six months (1869) was followed by the year of absolute maximum in four months (1870).

Extremes at Nassau, New Providence, from 1853 to 1902.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Min.....	49	53	49	54	61	63	66	66	64	63	58	48*
Year.....	1866	1865	1869	1869	1869	1869	1885	1869	1869	1857	1865	1868
Date.....	10	2	2	16	23	12	23	2	7	28	...	25
Max.	96	97	91	96	100	102	106	99	109	96	99	97
Year.....	1871	1871	1856	1872	1856	1870	1870	1871	1870	1872	1877	1870
Date.....	28	16	14	10	10	21	14	2	27	2	8	22

Perhaps the most interesting section is that on the hurricanes for which the West Indies are famous. Two discussions of the frequency of hurricanes in the West Indies in different months are given. These refer to the periods 1493—1855 and 1878—1900. In order to show the monthly frequency together, we have prepared the following table, covering 386 years, though leaving 24 years out of account, from 1856 to 1877.

Frequency of Hurricanes.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR.
No.	8	7	11	6*	6*	13	45	121	105	101	20	10	453
Per cent.	2	1.5	2.5	1.5	1.5	3	10	27	23	22	4	2	100

It is seen that 72 per cent. of the hurricanes occur in the three months August to October. Charts are given showing the tracks of all important hurricanes from 1878 to date.

Five kite ascents were made, the highest reaching 3858 feet, and the mean rate of decrease of temperature observed was 6.1 per 1000 feet.

Report on the Climate and Weather of Baltimore and vicinity. By OLIVER L. FASSIG. Baltimore: The Johns Hopkins Press, 1904, 1905. Size $10\frac{1}{2} \times 7\frac{1}{2}$. Pp. (282). Plates.

THIS deals with the climate of Baltimore, the final instalment being reserved for the weather. The discussion is unusually full and minute, the diurnal variations of the various climatic elements being treated as well as the monthly and annual. A special feature is a series of diagrams combining in one figure the normal diurnal and monthly variations for a whole year. The discussion is so thorough and so full of interest that we greatly regret our lack of space in which to give an epitome of the mode of treatment at least. The memoir may well serve as a pattern for the complete study of the climatological record of a long-established station.

Les gradients verticaux de la Température dans les minima et les maxima barométriques. [Vertical gradients of temperature in barometric maxima and minima]. By S. GRENANDER. Upsala: (London, Wm. Wesley & Son), 1905. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 16. Plates.

AN extract from the mathematico-physical department of the Swedish Academy of Sciences. The author has studied the temperature records of a number of recent kite and balloon experiments and finds confirmation of the law enunciated by M. Teisserenc de Bort to the effect that the fall of temperature with height above a barometric depression is more rapid than above an anticyclone up to the elevation of about 13,000 to 16,000 feet, above which the relation is inverted.

RAINFALL AND TEMPERATURE, DECEMBER, 1905.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.]	RAINFALL.				Days on which ·01 or more fell.	TEMPERATURE.				No. of Nights below 32°.		
		Total Fall.	Diff. from average, 1870-99.	Greatest in 24 hours.			Max.		Min.				
				Depth	Date.		Deg.	Date.	Deg.	Date.			
		inches	inches.	in.								Shade	Grass
I.	London (Camden Square) ...	·74	— 1·38	·17	7	7	57·1	7	29·2	12	6	12	
II.	Tenterden.....	·73	— 2·01	·21	5	15	53·5	7	24·5	12	4	12	
	Hartley Wintney	·71	— 1·84	·18	7	11	55·0	6, 7	24·0	12	7	10	
III.	Hitchin.....	·78	— 1·27	·25	7	9	55·0	7	28·0	10 ^a	7		
	Winslow (Addington)	·90	— 1·37	·37	7	13	55·0	7	26·0	11	11	18	
IV.	Bury St. Edmunds (Westley) ..	·73	— 1·38	·23	7	9	56·0	7	27·5	12			
	Brundall	1·15	— ·98	·34	29	16	55·4	7	28·4	11	9	14	
V.	Alderbury	·78	— 2·04	·29	5	8	56·0	7	26·0	10, 11	11		
	Winterbourne Steepleton ...	1·25	— 2·88	·29	5	15	53·5	7	24·0	12	9	13	
	Torquay (Cary Green)	1·01	— 2·45	·24	27	9	54·5	1	33·8	12	0	12	
	Polapit Tamar [Launceston] ..	1·54	— 2·85	·29	7	15	53·6	7	21·0	4	8	9	
	Bath	·93	— 1·83	·33	7	11	54·6	7	27·0	11	9		
VI.	Stroud (Upfield)	·70	— 1·78	·34	7	10	54·0	7, 8	29·0	11	5		
	Church Stretton (Woolstaston)	·76	— 2·16	·26	29	11	51·0	6, 7	25·0	31	19		
	Bromsgrove (Stoke Reformatory)	·65	— 1·30	·21	7	6	52·0	7	23·0	25	18		
VII.	Boston	·43	— 1·36	·22	28	5	52·0	7	29·0	10	9		
	Worksop (Hodsock Priory) ..	·43	— 1·59	·21	28	10	56·5	7	27·2	13	11	23	
	Derby (Midland Railway) ...	·63	— 1·65	·27	28	15	54·0	7	28·0	10, 31	11		
VIII.	Bolton (The Park)	·78	— 3·41	·13	19	14	50·5	6	30·8	31	2	16	
IX.	Wetherby (Ribston Hall) ...	·40	— 1·79	·13	28	10	...	...	...	...	...	...
	Arnccliffe Vicarage	4·36	— 2·05	1·06	20	17	...	...	...	...	...	...
	Hull (Pearson Park)	·41	— 1·95	·19	28	9	52·0	7	30·0	31	5	16	
X.	Newcastle (Town Moor) ...	·46	— 2·18	·12	25	12	...	...	...	...	...	...
	Borrowdale (Seathwaite) ...	11·01	— 3·69	2·20	20	15	52·1	6	29·1	30	2		
XI.	Cardiff (Ely)	2·19	— 2·24	·59	7	17	...	...	...	...	...	...
	Haverfordwest (High St.) ...	1·74	— 3·48	·38	5	13	52·3	7	29·1	10	2	12	
	Aberystwyth (Gogerddan) ...	1·62	— 2·87	·30	7	10	52·0	7, 25	25·0	24	9		
	Llandudno	·41	— 2·54	·15	20	10	55·0	2	35·0	31	0		
XII.	Cargen [Dumfries]	2·02	— 2·66	·68	5	12	52·0	2	28·0	13, 26			
	Lilliesleaf (Riddell)	·87	— 2·31	·32	25	12	50·0	6	25·0	26, 27	8	8	
XIII.	Edinburgh (Royal Observy.)	1·27	...	·31	25	14	53·2	7	27·0	24	4	6	
XIV.	Colmonell.....	3·81	— 1·01	1·12	24	18	52·0	3	28·0	11	4		
XV.	Tighnabruaich	4·46	— 1·87	·67	24	18	46·0	3, 4	28·0	30	6	6	
	Mull (Quinish)	5·37	— 1·11	·85	5	22	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis)	1·25	— 1·48	·35	24	15	52·3	3	31·2	12	3		
XVII.	Braemar	2·02	— 1·13	·68	5	17	50·8	4	20·2	30			
	Aberdeen (Cranford)	·94	— 2·45	·21	16	16	53·0	3, 4	23·0	12	8		
	Cawdor (Budgate)	1·24	— 1·29	·36	7	11	...	...	...	...	...	...
XVIII.	Invergarry	6·29	— ·38	1·80	6	10	...	...	...	...	...	...
	Bendampy.....	9·36	+ ·32	1·83	5	26	...	...	...	...	...	...
XIX.	Dunrobin Castle.....	1·67	— 1·72	·33	6	14	56·0	2	28·5	7	6		
	Castletown	2·04	...	·34	29	22	53·0	2	26·0	26, 31	5	9	
XX.	Killarney	5·38	— 1·26	1·28	25	19	56·0	7	33·0	13	0		
	Waterford (Brook Lodge) ...	1·86	— 2·45	·40	27	14	54·0	25	26·0	10	2		
	Broadford (Hurdlestown) ...	1·85	— 1·52	·32	24	20	60·0	4	30·0	9	1		
XXI.	Carlow (Browne's Hill)	1·93	— 1·53	·36	18	18	...	...	...	...	...	...
	Dublin (Fitz William Square)	1·26	— 1·13	·27	18	13	55·6	25	34·0	10	0	1	
XXII.	Ballinasloe	2·44	— 1·19	·51	24	21	...	...	...	...	...	...
	Clifden (Kylemore House) ..	6·04	— 2·95	1·36	18	17	...	...	...	...	...	...
XXIII.	Seaforde	2·89	— ·75	·71	18	18	51·0	2, 25	30·0	9	2	2	
	Londonderry (Creggan Res.)	2·83	— 1·48	·68	24	21	...	...	...	...	...	...
	Omagh (Edenfel).....	3·39	— ·38	·60	24	22	52·0	2	33·0	9	...	3	

^T Shows that the fall was above the average; — that it was below it. a and 11 31

SUPPLEMENTARY RAINFALL, DECEMBER, 1905.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	·76	XI.	New Radnor, Ednol	1·35
„	Ramsgate, West Cliff.....	·25	„	Rhayader, Nantgwillt	2·26
„	Hailsham	1·15	„	Lake Vyrnwy	1·42
„	Crowborough	1·28	„	Ruthin, Plas Draw.....	·61
„	Osborne.....	·84	„	Criccieth, Talarvor.....	1·20
„	Ensworth, Redlands.....	·73	„	Anglesey, Lligwy	1·05
„	Alton, Ashdell	·85	„	Douglas, Woodville	1·74
„	Newbury, Welford Park ..	1·34	XII.	Stoneykirk, Ardwell House	1·23
III.	Harrow Weald	·96	„	Dalry, Old Garroch	6·14
„	Oxford, Magdalen College..	·84	„	Langholm, Drove Road.....	3·29
„	Banbury, Bloxham Grove...	·98	„	Moniaive, Maxwellton House	3·61
„	Pitsford, Sedgebrook	·78	XIII.	N. Esk Reservoir [Penicuik]	2·80
„	Huntingdon, Brampton	·95	XIV.	Maybole, Knockdon Farm..	3·54
„	Wisbech, Bank House	·68	„	Glasgow, Queen's Park	3·38
IV.	Southend	·57	„	Campbeltown, Redknowe...	3·17
„	Colchester, Lexden	·61	XV.	Inveraray, Newtown	7·66
„	Saffron Walden, Newport...	·77	„	Ballachulish House.....	8·19
„	Rendlesham Hall	1·04	„	Islay, Eallabus	4·28
„	Swaffham	·92	XVI.	Dollar	3·70
„	Blakeney	·90	„	Loch Leven Sluices	3·18
V.	Bishops Cannings	1·09	„	Balquhitter, Stronvar	7·66
„	Ashburton, Druid House ..	1·87	„	Coupar Angus	1·54
„	Okehampton, Oaklands.....	1·85	„	Blair Atholl	2·30
„	Hartland Abbey	1·32	„	Montrose, Sunnyside	1·45
„	Lynmouth, Rock House ..	1·69	XVII.	Alford, Lynturk Manse ...	·75
„	Probus, Lamellyn	1·99	„	Keith.....	·83
„	Wellington, The Avenue ..	·97	XVIII.	N. Uist, Lochmaddy	3·74
„	North Cadbury Rectory ..	·90	„	Aviemore, Alvey Manse ...	1·61
VI.	Clifton, Pembroke Road ..	1·13	„	Loch Ness, Drumnadrochit.	2·51
„	Moreton-in-Marsh, Longboro'	1·11	„	Glencarron	9·33
„	Ross, The Graig	·56	„	Fearn, Lower Pitkerrie.....	1·04
„	Shifnal, Hatton Grange.....	·99	XIX.	Invershin	1·95
„	Wem Rectory	·50	„	Altnaharra	3·48
„	Cheadle, The Heath House.	·74	„	Bettyhill	2·64
„	Coventry, Kingswood	1·54	„	Watten	1·37
VII.	Market Overton	·65	XX.	Cork	3·58
„	Market Rasen	·51	„	Darrynane Abbey	4·31
„	Bawtry, Hesley Hall.....	·32	„	Glenam [Clonmel]	3·13
VIII.	Neston, Hinderton	·55	„	Ballingarry, Gurteen	2·00
„	Southport, Hesketh Park...	·62	„	Miltown Malbay	2·59
„	Chatburn, Middlewood	1·43	XI.	Gorey, Courtown House ...	1·37
„	Cartmel, Flookburgh	1·52	„	Moynalty, Westland	2·74
IX.	Langsett Moor, Up. Midhope	1·27	„	Athlone, Twyford	1·91
„	Scalby, Silverdale	·66	„	Mullingar, Belvedere.....	2·86
„	Ingleby Greenhow	·49	XXII.	Woodlawn	3·14
„	Middleton, Mickleton	1·08	„	Westport, Murrisk Abbey..	3·53
X.	Beltingham	1·12	„	Crossmolina, Enniscooe	5·53
„	Font Reservoir, Fallowlees.	1·38	„	Collooney, Markree Obsy...	3·46
„	Ilderton, Lilburn Cottage...	·52	XXIII.	Enniskillen, Portora	2·89
„	Keswick, The Bank	3·34	„	Warrenpoint	1·63
XI.	Llanfrecbfa Grange.....	1·28	„	Banbridge, Milltown	1·61
„	Treherbert, Tyn-y-waun ...	3·33	„	Belfast, Springfield	2·78
„	Carmarthen, Friary	1·77	„	Bushmills, Dundarave	2·77
„	Castle Malgwyn	1·53	„	Stewartstown	2·47
„	Plynlimon.....	4·80	„	Killybegs	3·15
„	Tallyllyn	3·00	„	Horn Head	3·90

METEOROLOGICAL NOTES ON DECEMBER, 1905.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—Mild with fairly uniform temp. and great deficiency of sunshine and R. Although the prevailing type of weather was anticyclonic, there was practically no frost and the mean temp. was $41^{\circ}0$, or $1\cdot8$ above the average. Dense fogs occurred in London on 10th and 11th, but on no other day. Duration of sunshine $12\cdot4^*$ hours and of R $28\cdot4$ hours. Absolute drought for 18 days from 9th to 26th.

TENTERDEN.—Dull with some fog and very deficient R, though the first week was showery. Brilliant sunshine on 6th, from 9th to 11th, and on Christmas Day, but on only 6 other days, the total duration amounting to $39\cdot7\dagger$ hours.

CROWBOROUGH.—Dark and gloomy with much mist and deficient R. With the exception of some slight frosts from 9th to 12th and severe frost on 31st, the weather was mild. Absence of strong winds. Mean temp. $39^{\circ}3$.

OSBORNE.—R about two inches below the average of 48 years and the smallest in December since 1890.

HARTLEY WINTNEY.—The driest December ever recorded. Fog and slight showers prevailed during the first week, but the remainder was beautifully fine, dry and warm. Ozone on 13 days with a mean of $3\cdot1$.

BURY ST. EDMUNDS.—Dull and foggy with no sharp frosts. Water was very short in rivers, ponds and deep wells.

BLAKENY.—R $1\cdot15$ in. below the average of 12 years and the lowest in that period. From 9th to 27th, inclusive, only $\cdot03$ in. of R fell.

ALDERBURY.—Although there was very little R, there was great humidity of the atmosphere and roads were unusually and persistently muddy. Much fog and mist.

TORQUAY.—The driest December since 1883. Mean temp. $45^{\circ}1$, or $1^{\circ}5$ above the average. Duration of sunshine $49\cdot9^*$ hours, or $3\cdot4$ hours below the average. Mean amount of ozone $3\cdot8$; max. $6\cdot5$ on 19th with S.W. wind and on 27th with S.E. wind; min. $1\cdot0$ on 4th with N.E. wind.

WELLINGTON.—A great contrast to November, being exceptionally dry with few rough days and an equable temp. from 9th to the end, the max. being always between 40° and 50° . R about one-fourth of the average.

NORTH CADBURY.—The calmest month in 9 years and the driest December in 10 years, the fall being less than half that of the previous driest. Almost absolute calm prevailed for a complete week from 10th to 16th. The mean min. temp. was above that of November and only just below that of October.

CLIFTON.—R $2\cdot25$ in. below the average. From 5th to 8th was rainy, but the remainder dry and dull, with a good deal of fog till 13th. Very little frost.

STROUD.—Fine, mild and warm with bright sunshine. Primroses were in bloom and snowdrops in bud.

ROSS.—The least R in December since 1818 except in 1840, when only $\cdot33$ in. fell. Mean temp. $39^{\circ}8$, or slightly above the average of 40 years.

WOOLSTASTON.—Dry on the whole and favourable for out-door work. Some fog, but not an excessive amount.

WORKSOP.—The driest December for 31 years, though in 1892 there was only $\cdot01$ in. more.

BOLTON.—Mild, cloudy and misty with no frost in the screen till 28th. A great number of calm days. Mean temp. $40^{\circ}6$, or $1^{\circ}9$ above the average. Duration of sunshine $11\cdot4^*$ hours, or $3\cdot9$ hours below the average.

SOUTHPORT.—In several respects a remarkable month. It was the driest December in 35 years, with exceptionally high mean bar., and abnormal equability of temp., due to absence of low minima. It was, however, notable for

* Campbell-Stokes.

† Jordan.

the largest amount of sunshine recorded in December, having 22 hours more than the average. Mean temp. $2^{\circ}8$ above the average.

UPPER MIDHOPE.—Mild, open and very dry till 27th, wet on 28th and 29th, wintry on 30th and 31st. The driest December since 1892. Windy on 22 days and stormy on 9. Fog on 7 days and 6 nights.

NEWCASTLE.—The smallest R in December since 1873, when $\cdot39$ in. fell.

LILBURN COTTAGE.—Extremely dry and mild, but cold at the end. The atmosphere was generally clear with a large amount of sunshine. No gales.

LLANFRECHFA GRANGE.—Fine and mild, with less than a third of the usual amount of R, which was much wanted for springs. Agricultural work was well forward and root crops were good.

CARMARTHEN.—Remarkably dry and fine. Grass was growing during the month and many meadows looked quite green and spring-like.

HAVERFORDWEST.—Wet until 7th, after which it was mostly fine and mild, strawberries and primroses being in bloom. Duration of sunshine $38\cdot1^*$ hours. Gales on 5 days.

DOUGLAS.—Fine and open with no frost or fog and many beautiful days. By far the driest December since records began in 1874. The mean bar. was abnormally high, reaching $30\cdot88$ in. on 12th. There were no violent gales but an excess of rough nights, and severe E. gales on 30th and 31st, which destroyed all garden flowers, of which there were an unusual number.

SCOTLAND.

LANGHOLM.—R $2\cdot33$ in. below the average of 28 years.

LILLIESLEAF.—Very mild and dry. Hunting was not prevented for a single day during the season so far. Ploughing was well forward and farmers quite contented.

INVERARAY.—Very wet till 24th, after which there were a few pleasant, fine and very mild days, the month ending with E. wind and slight frosts.

MULL, QUINISH.—Mild, wet and unsettled till 23rd; thereafter cold and dry with strong S.E. wind.

COUPAR ANGUS.—Favourable weather to 11th with little R and a fair amount of sun, but during the last two weeks, although the temp. kept well above the normal, the incessant light R and cloudy weather kept the roads wretched. There were no storms or gales. Mean temp. $40^{\circ}4$.

DRUMNADROCHIT.—R $1\cdot74$ in., and rainy days 2, below the average of 19 years. The latter half genial, with frost on the last few days. No S so far at this level.

WATTEN.—Fresh and open. The last three weeks were dry and mild.

CASTLETOWN.—The early part was mild and wet with fresh gales from 7th to 9th. Then mild and damp till the last few days when it became colder. Practically no S.

IRELAND.

CORK.—Dull, dark, foggy and mild. Frost occurred in the screen on one day only, and the mean temp. was $4^{\circ}4$ above that of November. Half the total R fell on the last two days.

DARRYNANE ABBEY.—R only $80\cdot1$ per cent. of the average, the first two weeks being dry.

WATERFORD.—The driest December since 1883.

MURDESTOWN.—The driest December on record here.

MILTOWN MALBAY.—Mild, with no frost and R far below the average. Heavy S.E. gale on 30th and 31st.

DUBLIN.—An open month with southerly winds and cloudy sky, closing with a cold S.E. gale, darkness and R. Mean temp. $47^{\circ}1$.

BANBRIDGE.—R $1\cdot20$ in. below the average of 40 years.

BELFAST.—Dull and foggy with hardly any frost and R considerably under the average.

OMAGH.—The weather was remarkably mild with no S and no frost, constituting a record for December.

Climatological Table for the British Empire, July, 1905.

STATIONS. (Those in italics are South of the Equator.)	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.										
	°		°		°	°	°	0-100	°	°	inches			
London, Camden Square	85·3	26	49·8	7	78·5	57·7	57·5	73	134·6	44·4	·96	8	4·9	
Malta.....	94·7	7	68·9	16	88·1	72·7	71·3	77	141·7	63·5	·63	2	1·9	
Lagos.....	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town ...	75·8	15	41·4	11	64·9	52·2	50·8	76	...	...	2·46	10	4·8
Durban, Natal	83·9	11	47·3	9	75·4	53·7	...	...	133·9	...	·71	4	1·7
Johannesburg	66·5	2	30·5	16	60·6	41·2	34·0	61	121·0	12·0	·00	0	0·4	
Mauritius.....	79·1	6	56·5	20	75·9	62·7	60·8	77	139·8	47·5	1·62	14	6·1	
Calcutta.....	93·9	16	74·7	7	88·3	78·1	77·5	86	161·2	73·0	24·84	19	8·8	
Bombay.....	88·2	9	75·4	23	85·4	78·8	77·0	84	133·7	73·8	15·30	28	8·9	
Madras	104·9	3	75·6	29	100·3	80·2	71·7	64	148·3	72·6	2·31	15	5·9	
Kodaikanal	69·4	4	49·7	7	64·6	52·7	50·2	76	146·6	41·7	2·68	14	6·3	
Colombo, Ceylon.....	87·4	8a	76·5	19	86·4	78·6	74·2	80	145·5	74·2	1·25	13	5·4	
Hongkong.....	91·3	18	73·8	7	87·8	78·1	75·4	80	147·5	...	9·02	16	6·3	
Melbourne.....	62·9	21	35·0	4	54·8	43·0	41·3	77	117·8	27·6	3·28	19	6·9	
Adelaide	66·0	8	36·3	31	58·2	45·0	45·6	78	120·0	31·2	3·32	22	6·2	
Coolgardie	71·2	27	32·9	12	63·2	46·0	38·4	61	139·2	24·2	·29	5	3·0	
Sydney	70·0	...	38·6	...	59·1	44·4	39·4	72	98·2	29·3	·39	13	2·6	
Wellington	62·9	23	33·2	3	...	...	41·1	74	100·0	29·5	2·19	14	5·8
Auckland	60·0	23b	40·0	3, 10	55·7	44·6	44·3	81	117·0	36·0	3·88	18	5·7	
Jamaica, Negril Point..	91·6	15c	70·1	2	88·2	73·0	72·7	75	...	...	3·53	12	...
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada.....	85·6	5, 14	69·0	26	83·7	74·9	72·3	80	144·2	...	10·28	28	4·8	
Toronto	92·1	18	51·3	21	78·8	60·6	61·7	76	...	45·4	4·72	14	5·5	
Fredericton ...	87·7	8d	46·0	23	79·2	55·1	55·7	59	...	...	1·76	6	5·2
Winnipeg	86·8	10	46·0	8	76·6	54·0	...	...	...	...	4·35	8	4·5
Victoria, B.C.	84·2	8	50·5	2	69·0	53·5	...	...	...	...	·10	4	2·4
Dawson	83·6	20	35·0	7	70·8	47·8	...	...	...	...	1·93	7	4·6

a and 28, 30. b and 24. c and 19. d and 9, 13.

MALTA.—Mean temp. of air 79·1, or 1·4 above average. Mean temp. of sea 81·8. Mean hourly velocity of wind 6·4, or 1·0 below average.

MAURITIUS.—Mean temp. of air 1·1, dew point 1·4 above, and rainfall ·57 in. below, averages. Mean hourly velocity of wind 9·6 miles, or 2·4 below average.

MADRAS.—Bright sunshine 172·8 hours.

KODAIKANAL.—Bright sunshine 170 hours. Mean daily velocity of wind 389 miles.

COLOMBO.—Mean temp. 82·1 or 1·5 above, of dew point 0·9 above, and E 3·26 in. below averages. Mean hourly velocity of wind 8·4 miles; prevailing direction S.W.

HONGKONG.—Mean temp. of air 82·3. Mean direction of wind S.S.E., and mean hourly velocity 7·8 miles. Bright sunshine 243·5 hours, or 43 hours above average, and E 4·30 in. below 20 years' average.

ADELAIDE.—E 78 in. above average.

SYDNEY.—E 4·26 in. below average.

WELLINGTON.—E 3·64 in. below average.

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