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OUR FIFTY-FIRST VOLUME.

THE month which sees the closing of museums as a measure of war economy is surely inauspicious for the commencement of the second half-century of a scientific journal. Did we see any possibility of contributing in the minutest degree to the speedy victory of the Allies we should, of course, not hesitate for a moment to sacrifice this Magazine. As a matter of fact the production of this Magazine keeps no one fit for more useful work from the service of the country, and we believe that its continuance is in a small way useful now and will prove more useful still in future years. In some departments of science no harm would result, and good might even accrue from the temporary cessation of observations and records; but in the study of climate it is necessary to maintain the chain unbroken, for it is essential to know what variations from a normal course are possible in every season. Records have not yet been carried on so long that we can say that past observations suffice to show what the greatest future variations will be. Had all meteorological observations in these islands ceased at the outbreak of the war we should have passed unnoticed the unprecedented wetness of two consecutive Decembers in parts of the south of England, the unprecedented intensity of twenty-four hours rainfall in the north-east of Scotland, the unprecedented cold of November, and the unprecedented warmth of January in several places. All these phenomena approach to limiting values, and are not merely matters of curious interest. Continuity in rainfall observations is more important to the welfare of the nation than most people suspect. The rainfall which can be relied upon for water-supply for any given area can, as a rule, only be computed by the use of long continuous records, not necessarily kept on the ground in question. In the near future when water-supply will probably cease to be a municipal and become a national responsibility, the continuity of observations may mean a saving of millions of pounds in the cost of water at a time when a million pounds will be a far more formidable sum than it was before the war.

Apart from encouraging continuity in observations, we hope that our fifty-first volume will help in a greater degree than its predecessors to bring home to our readers the unity of the Empire and the vast diversity of its climate. In this number we publish an important contribution from Australia, and at an early date expect to print a report of a remarkable rain-storm in Malta, while last month we gave an illustrated account of intense rainfall in Ceylon. Since the commencement of the war various interesting communications from neutral countries have appeared in our pages, and we have pleasure in stating that the annual meteorological summaries of the observations taken by Belgian missionaries at the observatory of Zi-ka-wei, near Shanghai, which have hitherto appeared in a German publication, will henceforth be printed in our pages. We much regret that at a time when the opportunity of widening our scope presents itself in various directions, it is necessary to continue the restricted size of the last year, but the increase in the cost of production (which necessitates the numbers of this volume appearing in a white instead of a blue cover) and the natural cessation of the growth in circulation require this. We look forward to the close of the war as an opportunity for expansion which will justify all the trouble of holding on through present difficulties.

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### **ROYAL METEOROLOGICAL SOCIETY.**

THE Annual General Meeting of the Society was held on January 19th, at the Surveyors' Institution, Westminster, Major H. G. Lyons, F.R.S., President, in the Chair.

The Council's report for the year 1915 was submitted and a resolution passed for its adoption. The year of national emergency had proved one of difficulty and there was a decrease in the number of Fellows; but, when the exceptional circumstances were taken into account, this could not be regarded as excessive.

By an alteration in Bye-law 14, it was resolved that the Council should have powers to remit the annual contributions of Fellows, provided that the number so remitted should at no time exceed five. The Symons Gold Medal was awarded by the Society to Prof. Alfred Angot, the Director of the Bureau Central Météorologique de France, in consideration of his distinguished work in Meteorological Science.

The following were elected to serve on the Council for the 1916 Session. *President*,: Major H. G. Lyons, D.Sc., F.R.S.; *Vice-Presidents* : Capt. C. J. P. Cave, M.A., Mr. R. H. Hooker, M.A., Mr. Baldwin Latham, C.E., Mr. Carle Salter; *Treasurer* : Mr. F. Druce; *Secretaries* : Mr. W. W. Bryant, Mr. W. Sedgwick;

*Foreign Secretary* : Dr. R. H. Scott, F.R.S. ; *Councillors* : Mr. H. B. Adams, Mr. C. E. P. Brooks, Dr. C. Chree, Mr. J. E. Clark, Dr. H. N. Dickson, Mr. J. S. Dines, Mr. W. H. Dines, F.R.S., Major E. Gold, D.S.O., Mr. A. P. Jenkin, Mr. R. G. K. Lempfert, Lt.-Col. H. Mellish, Col. H. E. Rawson, C.B.

The President gave an address on "Winter Climate of the Eastern Mediterranean." Taking into consideration the special interest in the Eastern Mediterranean at the present time, it was important to study the climatic conditions obtaining there and influencing the allied operations, both naval and military. Meteorological observations and problems had no longer merely theoretical but practical value, and Major Lyons took this opportunity of congratulating Major E. Gold whose services with the Meteorological Staff of the army had been recognised by the award of the D.S.O. The general weather characteristics of the Eastern Mediterranean ranged from the rigorous continental type met with in the high plateau of the Balkan States to the uniform Mediterranean type in Southern Greece and the Levant and the sub-tropical climate of Egypt.

In the Balkan peninsula temperatures of 0° Fahr. had frequently been recorded on the high plateau up to the month of March, and it was only when nearing the Aegean Sea that there was a mean temperature above 32° Fahr. for all the winter months. Associated with the continental type the monthly precipitation was comparatively uniform, taking the form rather of heavy showers than of continuous rain ; but in the coastal regions the winter months had heavy rainfall. In Egypt the rainfall of the winter months was insignificant. Snowfall had been recorded as far south as Athens, but even at Salonica the days with snow were few. Inland the number of days increased to about one-third of the days with precipitation in the Bulgarian Hills. Severe conditions, however, occurred occasionally at Salonica, where in 1903 the sea was frozen for two days to a thickness of 1 cm. In regard to the gales which had been so frequently experienced recently in the Aegean Sea, those from the south-west did not appear to have been common in past years, but might be considered generally as the result of cyclones passing over the north of the Balkan Peninsula or approaching the west of Greece. Such were normally of short duration, seldom lasting above one or two days. The normal winter pressure distribution, however, with anticyclonic conditions over Russia extending to the Balkan plateau, favoured a gravitational flow of cold air from the north ; and when associated with marked cyclonic conditions in the south, northerly gales held for 4, 5 or 6 days.

Dr. Dickson proposed a vote of thanks to the President for his duties during the past year and for his address.

The following were elected fellows of the Society :—Mr. P. Berryman, Mr. B. Lall Chawla, Mr. R. K. Nehra, and Mr. M. Po Thet.



**TEMPERATURE DEPARTURES IN AUSTRALIA, 1915.**

By H. A. HUNT, Commonwealth Meteorologist.

THE accompanying notes and temperature charts on the remarkably warm winter and greater part of the year 1915 in Australia, may be of special interest in view of the very cold Argentine winter,

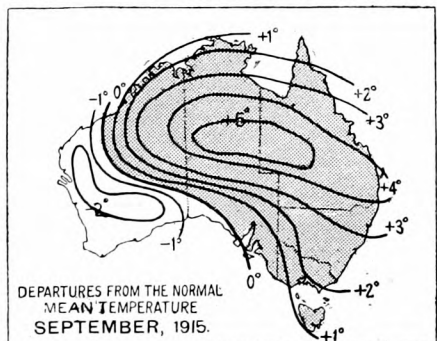
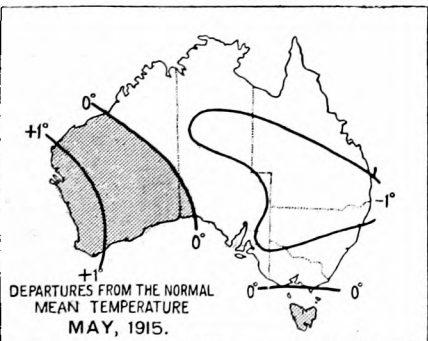
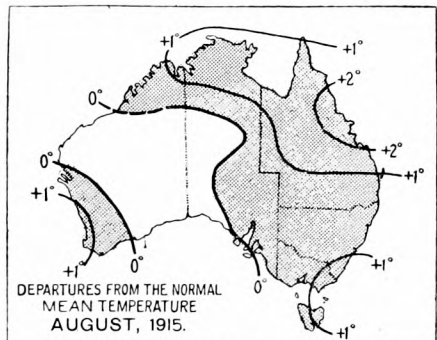
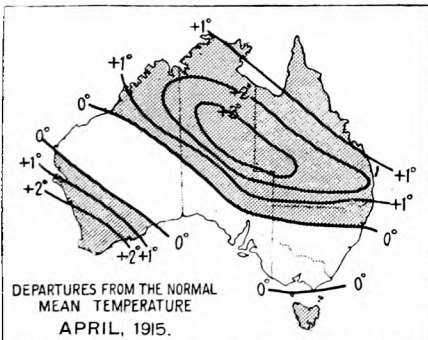
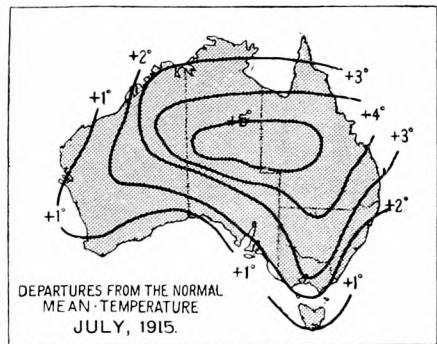
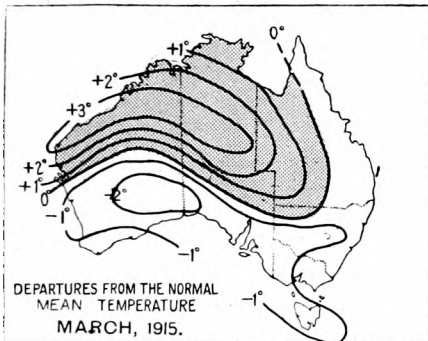
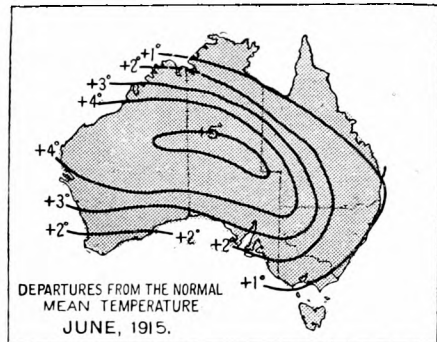
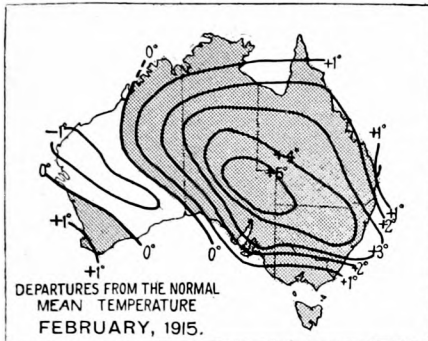
The unusual warmth at most of the representative stations in the Commonwealth was especially noticeable in June and July when every one of them recorded a mean temperature above its previous average, the departure being greatest, above  $5^{\circ}$ , over Central Australia. It is perhaps worthy of note that the tendency throughout the year was for the excess temperatures to be located over the centre of the continent, the northern and north-eastern halves being almost continuously warmer than usual except in May and August, when departures were very slight everywhere. During February, March, and April, a marked tendency to lowered temperatures was shown in a belt lying north-west and south-east over West Australia and during the last two months extending over south-eastern areas also.

Perhaps more significant still is the distribution of the + and — departures from mean minimum temperature. Radiation being so active under the dry and usually cloudless atmosphere of inland areas of the continent, any marked departure from the normal would be mainly governed by variations in the moisture content, whether shown as cloud or in an increased humidity of the lower levels. Should these affect large areas and show definite tendencies to progressive movement it might be possible to obtain some indication from them of the general atmospheric currents tending towards rain production or in the reverse way. For February, March and April the distribution and amount of the + and — departures is much the same as those of the mean temperatures, but in May increased cloudiness or humidity was able over the greater part of the continent and especially in the western half to increase the + departure considerably at Onslow and Lawlers, these excesses being greater than  $7^{\circ}$ , a very large amount. In June the + centre was thrown further west, and in July the + departures were increased generally, which was quite in harmony with the increased rainfall of these months.

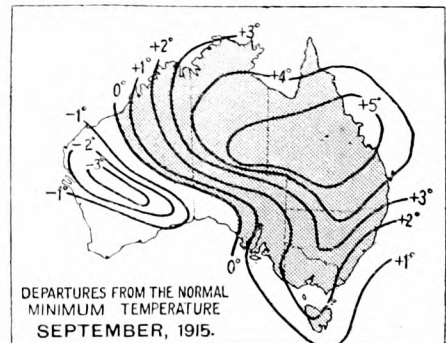
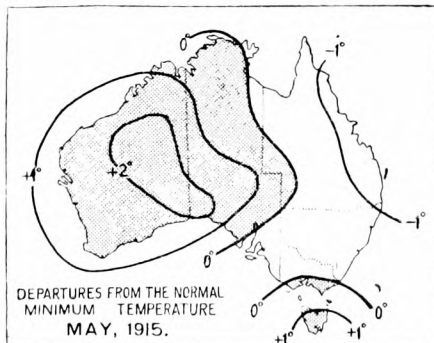
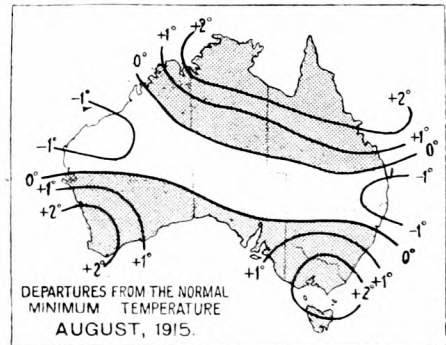
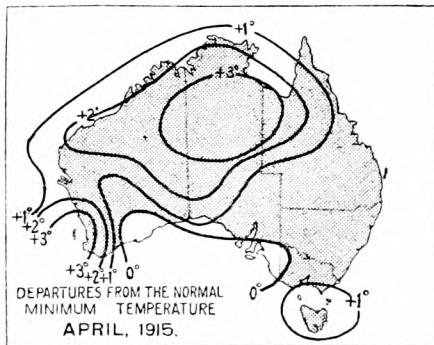
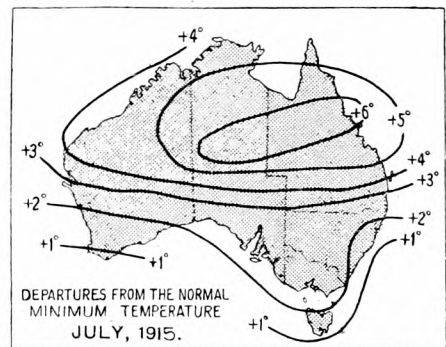
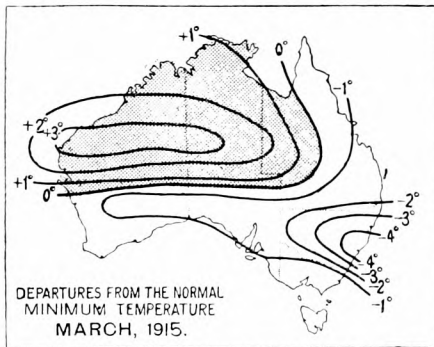
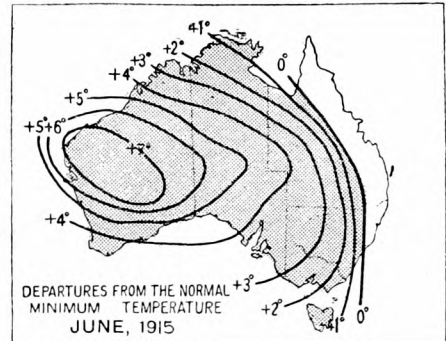
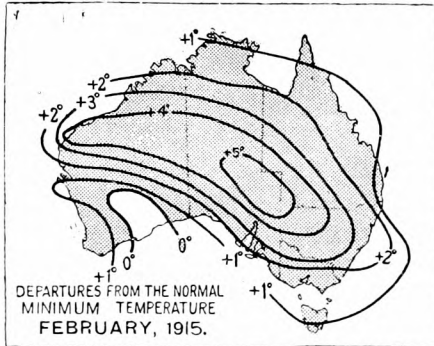
With regard to progressive movements of these temperature departure areas, not much is obvious from the maps except the general tendency for the centres of the departure areas to cling to the tropic, but the subject is well worth further study.

If it is possible to obtain similar data from South Africa some light may be thrown on the temperature distribution during the period over the southern hemisphere.

One would naturally have expected a decided indraft of ocean winds in response to unusual continental heat, but curiously enough over Southern Australia there has been an extraordinary prevalence of northerly winds, and very few with a southerly component.



*The shaded areas are above the average*



The shaded areas are above the average

## THE MILDNESS OF JANUARY, 1916, IN LONDON.

THE mean shade temperature of January for the 50 years, 1860—1909, is  $38^{\circ}\cdot5$ . Only one day in January, 1916, had a mean temperature so low as the average for the month, viz., the 14th, with  $37^{\circ}\cdot8$ . No fewer than five had a mean temperature above  $50^{\circ}$ , and of these the highest reading,  $52^{\circ}\cdot1$ , occurred on the 1st. On that day the maximum temperature rose to  $57^{\circ}\cdot2$ , the highest shade temperature observed in January during the whole period from 1858 to the present time. It is extremely rare for so high a figure to be reached in either December or February. The maximum temperature fell below  $45^{\circ}$  on only one day, the 31st, when it was  $44^{\circ}\cdot0$ . Only two Januaries in the record failed to record at least one maximum below  $40^{\circ}$ , the highest value in the list being  $40^{\circ}\cdot4$  in 1874. The mean maximum temperature in January, 1916, was  $50^{\circ}\cdot7$ , or  $7^{\circ}\cdot1$  above the average, and  $1^{\circ}\cdot8$  higher than the highest previously observed,  $48^{\circ}\cdot9$  in 1890. The shade minimum temperatures were no less remarkable, the mean value,  $40^{\circ}\cdot7$ , being  $6^{\circ}\cdot9$  above the average, and  $0^{\circ}\cdot9$  higher than the previous record of  $39^{\circ}\cdot8$  in 1898. January, 1916, was thus the only January with a mean minimum so high as  $40^{\circ}$ . Since 1858 no February or March and only two Decembers had had so high a mean minimum as January, 1916, whilst 39 Aprils and 48 Novembers in the 58 years have also shown lower values. The highest minimum reading  $50^{\circ}\cdot2$  on the 22nd, had, however, been exceeded 7 times in January. The highest minimum reading ever observed for the month was  $52^{\circ}\cdot3$  on the 1st, 1860. The lowest shade temperature touched in January, 1916, was  $30^{\circ}\cdot2$ . One January only, in 1884, failed to record so low a reading, its minimum having been  $32^{\circ}\cdot2$ .

The temperature readings for the month are summed up in the mean value of  $45^{\circ}\cdot7$ . This is  $7^{\circ}\cdot2$  above the average and exceeds by  $1^{\circ}\cdot8$  the next highest value,  $43^{\circ}\cdot9$ , which occurred in 1884. The temperature of January, 1916, exceeded the average value for any month from November to March inclusive, and comparatively few individual months even in this extended period were milder. There were indeed several years in which April, and one or two in which October, had a lower mean temperature.

It should perhaps be observed that the whole of the temperature records referred to were taken on an open Glaisher screen. When compared with the standard Stevenson screen readings, observations on the open screen frequently show rather higher values in the summer and rather lower in the winter, on account of radiation. In a cloudy and mild winter month such as January, 1916, the differences are not as a rule important, and the mean maxima actually differed by only  $0^{\circ}\cdot1$ . The mean minimum in the Stevenson screen was, however,  $41^{\circ}\cdot9$ , or  $1^{\circ}\cdot2$  higher than that in the Glaisher screen.

## Correspondence.

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

## THE EXTRAORDINARY WARMTH OF JANUARY, 1916.

THERE can be little doubt that January, 1916, has been the warmest on record. Here not a single fleeting spell of cold lowered the month's exceptional figures, even the coldest day having a maximum of 44°. As a result the averages of the month are extraordinary. The mean temperature was 44°·3, and every single January, February, March and December in the last 16 years had a lower mean, while nine Aprils in the same period were also colder. Comparing it with the autumn months back to 1900, two Octobers and fifteen Novembers were colder. The mean maximum temperature was 49°·5, which is higher than any mean maximum since 1900 in January, February or December. The mean minimum was as high as 39°·1 and, not to mention the *winter* months, seven Mays and all the Aprils except one in the last sixteen years had lower night temperatures. There were only three frosts, even by an unscreened instrument, the minimum being 25°.

A comparison between January and last November shows the extraordinary contrast between these two months.

|                |     | Mean Temp. |     | Mean Min. |     | Mean Max. |     | Frosts. |
|----------------|-----|------------|-----|-----------|-----|-----------|-----|---------|
| November, 1915 | ... | 33°·1      | ... | 24°·5     | ... | 41°·6     | ... | 23      |
| January, 1916  | ... | 44°·3      | ... | 39°·1     | ... | 49°·5     | ... | 3       |

In the third week of the month a standard Jargonelle pear in an orchard was in bud, and on the 30th the buds had burst, showing the folded blossom; elms are of a ruddy brown usually associated with mid-March or later. On the 30th a dish of rhubarb, completely unprotected, could be had from the garden. On the nearest (northerly) ridge of the Black Mountains no snow was to be seen at any time in the month, even at 2,300 ft., while on May 13th last year there was an average depth of a foot, and five to six feet in drifts on the same spot.

R. P. DANSEY.

*Kentchurch Rectory, Hereford, February 1st, 1916.*

Our figures respecting the high temperature of January may interest you, we are in the north of England and 480 feet above the sea.

|                        |     | Mean min. |     | Mean max. |     | Mean temp. |
|------------------------|-----|-----------|-----|-----------|-----|------------|
| Jan., 1916             | ... | 39°·1     | ... | 48°·4     | ... | 43°·8      |
| Previous highest, 1898 |     | 38°·1     | ... | 47°·9     | ... | 43°·0      |
| Average 28 years       | ... | —         | ... | —         | ... | 36°·4      |

Coldest night, 13th, 28°·0.

Warmest day (shade) 6th, 55°·0 (1st, 54°·0).

I have a newspaper cutting in my book against January, 1898, which says—

“Mr. R. C. Mossman of Edinburgh writes to the *Scotsman*, that the weather records for the city extend back to 1764—and in no year was the temperature of January as high as in 1898—January 1898 was  $44^{\circ}\cdot6$ , and the only year at all approaching this was 1796 ( $43^{\circ}\cdot8$ ).”

And yet January, 1916 is warmer than 1898 here.

A. R. CROSSLEY.

*Falling Royd, Hebden Bridge, February 4th, 1916.*

THE following figures regarding the screen temperature of January last may be of interest :—

|                    |                        |            |               |
|--------------------|------------------------|------------|---------------|
| Barnstaple.        | Mean Shade Temp. ....  | Jan., 1916 | 49·0          |
|                    | “ “ “ “ .....          | Average    | 41·7          |
|                    | “ Max. “ “ .....       | Jan., 1916 | 51·6          |
|                    | “ Min. “ “ .....       | “ “        | 46·3          |
|                    | Absolute Max. Temp.... | “ “        | 57·0 on 1st.  |
|                    | “ Min. “ “ ...         | “ “        | 33·0 on 14th. |
|                    |                        | Maxima.    | Minimum.      |
| Torrington.....    | 50 on 1st              | 29         | on 23rd       |
| Braunton .....     | 52 „ 4th               | 35         | „ 23rd        |
| Horwood .....      | 55 „ 1st               | 33         | „ 22nd        |
| Morthoe .....      | 54 „ 1st               | 38         | „ 24th        |
| Northam ...        | 56 „ 1st               | 33         | „ 22nd        |
| Chulmleigh .....   | 55 „ 29th              | 34         | „ 25th        |
| Woolacombe .....   | 56 „ 1st               | 38         | „ 23rd        |
| Landeross .....    | 57 „ 1st               | 32         | „ 23rd        |
| Lynton .....       | 54 „ 1st               | 37         | „ 22nd        |
| Heanton Punchardon | 57 „ 1st               | 36         | „ 23rd        |
| Pilton .....       | 58 „ 1st               | 34         | „ 23rd        |
| Castle Hill.. ..   | 53 „ 17th              | 29         | „ 27th        |
| Ilfracombe.....    | 55 „ 1st               | 38         | „ 25th        |

THOS. WAINWRIGHT.

*North Devon Athenæum, Barnstaple, Feb. 1st, 1916.*

## DECEMBER RAINS.—RECENT TEMPERATURES.

ANOTHER wet December in this locality yielded more than seven inches of rain, distributed over twenty-seven days.

Great irregularities in the amount of downpour are of such common occurrence that it may appear a mere superfluity to adduce recent instances. As affecting the questionable utility of short averages I may, however, be pardoned if I mention that six of the last seven Decembers have yielded very excessive rainfall, the figures being as follows, as given for Clifton (in the January number of *Symons's Meteorological Magazine*), and furnished by the late Mr. R. F. Sturge, or from his residence :—

| Year. | Depth.<br>inches. | Diff. from Aver.<br>inches. | Year. | Depth.<br>inches. | Diff. from Aver.<br>inches. |
|-------|-------------------|-----------------------------|-------|-------------------|-----------------------------|
| 1909  | 5.25              | +2.25                       | 1913  | 2.18              | — .82                       |
| 1910  | 5.77              | +2.77                       | 1914  | 7.17              | +4.17                       |
| 1911  | 7.34              | +4.34                       | 1915  | 7.18              | +4.18                       |
| 1912  | 6.57              | +3.57                       |       |                   |                             |

The average for December is about three inches. While the last month of the year has been recently increasing its average, September has exhibited a remarkable deficiency, the aggregate for the last ten years having been less than half the normal fall.

January, 1916, has had a mean temperature of 45°·9, and has furnished one of the mildest periods on record for that month, maximum in shade, 57° on 2nd. The figures from observations here during the last three months are curious, viz. :—

|                      | Mean<br>Temp. | Greenwich<br>Average. |
|----------------------|---------------|-----------------------|
| November, 1915 ..... | 38.5          | 43.5                  |
| December, 1915 ..... | 43.2          | 39.9                  |
| January, 1916 .....  | 45.9          | 38.6                  |

The temperatures observed would apply better to the usual readings in February, March and April, than to the months in which they actually occurred.

W. F. DENNING.

*Horfield, Bristol, February 1st, 1916.*

## LUNAR RAINBOW AND TRIPLE RED SUNSET.

A REMARKABLE lunar rainbow was observed at Bridgwater on January 19th, 1916, between 6 and 7 p.m. The arch was complete during almost an hour, and the outer bow was faintly visible at times, also a fair amount of colour. It was formed on driving misty rain from the sea, almost without clouds. Nearly the whole sky was fairly clear so that the planets and brighter stars were visible in the strong moonlight. During 45 years' observation of such phenomena I have recorded only four or five lunar rainbows, and certainly never saw such a beautiful example of this ghostly object. The rain and clouds increased later, and then it became clearer, but about 9 next morning a rather severe thunder squall came up the Channel, one peal was heard at Bridgwater, and a good many at Burnham, where also hail fell.

The red sunset of January 10th was curious for the long time it lasted and its recrudescence. Immediately after sunset there was a brilliant lighting up of low cumulus with orange light against a green background. After this faded there was a pink light on clouds of cirrus type, and finally ranges of cumulo-stratus glowed dully from reflected light from below the horizon until the moon and stars were shining on an almost dark sky about six o'clock.

HENRY CORDER.

*Bridgwater.*

## A PARTIAL RAIN SPELL.

I AM very grateful to Mr. Hopkinson for his letter pointing out the inadequacy of my definition of a partial rain spell, and thoroughly approve of his suggestion for defining one. My letter was written more with the object of calling attention to the need of such a definition, than of proposing an actual definition.

A. E. SWINTON.

*Swinton House, Duns, Berwickshire, Jan. 31st, 1916.*

## REVIEW.

*Memoirs of the Colombo Observatory.* No. 1. *On the Intensity of Rainfall experienced in Ceylon.* No. 2. *Summary of Barometric Observations, 1870-1913.* By A. J. BAMFORD, B.Sc., B.A. Colombo, 1914. Size, 13 × 8. Pp. 7 and 8. Plates. Price 50 cents each.

THE first of these two memoirs summarizes the available information relative to excessive short period rainfalls in Ceylon. For the great majority of stations twenty-four hourly readings only are available and from these it is shown that only a small part of the island has failed, during a period of at least 10 years' observations, to record at least one daily fall of 8 inches of rain. About half the island chiefly in the east and west coast districts has had a fall of 10 inches or more, a considerable area in the south-west and a small part of the east coast have experienced from 14 to 20 inches, and certain stations in the extreme north-east more than 30 inches. The Colombo automatic records for the 10 years 1904 to 1913 are treated in greater detail and the measured duration is given of all observed rainfalls exceeding .50 inch per hour for intervals of .40 inch upwards, including 302 instances. No month of the year was altogether free from such rainfalls, the most numerous and prolonged appearing to take place in the autumn. The most remarkable record quoted is undoubtedly the great fall of 6 inches in 73 minutes on July 12th, 1907. In this magazine for January, 1916, page 190, a reproduction of the pluviograph trace during this storm was given and provides an interesting comparison with the almost equally remarkable rainfalls of October 27th-28th, 1915, shown in the frontispiece of Vol. 50, which, however, did not come within the scope of the memoir.

The second pamphlet gives summaries of the mean barometric readings for each month over various periods at nine stations, together with the appropriate corrections. These data include a few corrections of those already published in the annual reports and are specially arranged with a view to their utility for purposes of correlation.



## RAINFALL TABLE FOR JANUARY, 1916.

| STATION.                          | COUNTY.              | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|-----------------------------------|----------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                   |                      |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1916.<br>in. |
| Camden Square.....                | London.....          | 51 32      | 0 8                  | 111                            | 1·83                           | 1·30         |
| Tenterden.....                    | Kent.....            | 51 4       | *0 41                | 190                            | 2·14                           | 1·15         |
| Arundel (Patching).....           | Sussex.....          | 50 51      | 0 27                 | 130                            | 2·59                           | 1·47         |
| Fordingbridge (Oaklands).....     | Hampshire.....       | 50 56      | 1 38                 | 135                            | 2·67                           | 1·49         |
| Oxford (Magdalen College).....    | Oxfordshire.....     | 51 45      | 1 15                 | 186                            | 1·78                           | 1·37         |
| Wellingborough (Swanspool).....   | Northampton.....     | 52 18      | 0 41                 | 155                            | 1·90                           | 1·58         |
| Bury St. Edmunds (Westley).....   | Suffolk.....         | 52 15      | *0 40                | 226                            | 1·70                           | 1·49         |
| Geldeston [Beccles].....          | Norfolk.....         | 52 27      | *1 31                | 38                             | 1·53                           | 1·50         |
| Polapit Tamar [Launceston].....   | Devon.....           | 50 40      | 4 22                 | 315                            | 3·59                           | 2·07         |
| Rousdon [Lyme Regis].....         | „.....               | 50 41      | 3 0                  | 516                            | 2·94                           | ·98          |
| Stroud (Field House).....         | Gloucestershire..... | 51 44      | 2 13                 | 226                            | 2·33                           | 1·73         |
| Church Stretton (Wolstaston)..... | Shropshire.....      | 52 35      | 2 48                 | 800                            | 2·51                           | 1·39         |
| Boston.....                       | Lincolnshire.....    | 52 58      | 0 1                  | 11                             | 1·54                           | 1·05         |
| Worksop (Hodsock Priory).....     | Nottinghamshire..... | 53 22      | 1 5                  | 56                             | 1·70                           | ·44          |
| Mickleover Manor.....             | Derbyshire.....      | 52 54      | 1 32                 | 280                            | 1·95                           | 1·66         |
| Macclesfield.....                 | Cheshire.....        | 53 15      | 2 7                  | 501                            | 2·66                           | 1·64         |
| Southport (Hesketh Park).....     | Lancashire.....      | 53 39      | 2 59                 | 38                             | 2·55                           | 1·31         |
| Arncliffe Vicarage.....           | Yorkshire, W. R..... | 54 8       | 2 6                  | 732                            | 6·26                           | 7·54         |
| Goldsborough Hall.....            | „.....               | 54 0       | 1 25                 | 119                            | 1·91                           | 1·01         |
| Hull (Pearson Park).....          | „ E. R.....          | 53 45      | 0 20                 | 6                              | 1·70                           | ·59          |
| Newcastle (Town Moor).....        | Northumberland.....  | 54 59      | 1 38                 | 201                            | 1·90                           | 1·04         |
| Borrowdale (Seathwaite).....      | Cumberland.....      | 54 30      | 3 10                 | 423                            | 13·44                          | 22·80        |
| Cardiff (Ely).....                | Glamorgan.....       | 51 29      | 3 13                 | 53                             | 3·65                           | 3·50         |
| Haverfordwest.....                | Pembroke.....        | 51 48      | 4 58                 | 90                             | 4·69                           | 3·09         |
| Aberystwyth (Gogerddan).....      | Cardigan.....        | 52 26      | 4 1                  | 83                             | 3·91                           | 3·31         |
| Llandudno.....                    | Carnarvon.....       | 53 20      | 3 50                 | 72                             | 2·51                           | 2·50         |
| Cargen [Dumtries].....            | Kirkcudbright.....   | 55 2       | 3 37                 | 80                             | 4·10                           | 6·68         |
| Marchmont House.....              | Berwick.....         | 55 44      | 2 24                 | 498                            | 2·40                           | 2·24         |
| Girvan (Pinmore).....             | Ayr.....             | 55 10      | 4 49                 | 207                            | 4·78                           | 6·43         |
| Glasgow (Queen's Park).....       | Renfrew.....         | 55 53      | 4 18                 | 144                            | 3·53                           | 5·18         |
| Islay (Eallabus).....             | Argyll.....          | 55 47      | 6 15                 | 68                             | 4·78                           | 5·71         |
| Mull (Quinish).....               | „.....               | 56 34      | 6 13                 | 35                             | 5·55                           | 5·89         |
| Balquhider (Stronvar).....        | Perth.....           | 56 21      | 4 23                 | 422                            | 8·74                           | 14·79        |
| Dundee (Eastern Necropolis).....  | Forfar.....          | 56 28      | 2 57                 | 199                            | 2·01                           | 1·84         |
| Braemar.....                      | Aberdeen.....        | 57 0       | 3 24                 | 1114                           | 2·92                           | 4·39         |
| Aberdeen (Cranford).....          | „.....               | 57 8       | 2 7                  | 120                            | 2·36                           | ·91          |
| Gordon Castle.....                | Moray.....           | 57 37      | 3 5                  | 107                            | 1·99                           | 2·09         |
| Drumnadrochit.....                | E. Inverness.....    | 57 20      | 4 29                 | 138                            | 3·63                           | 7·10         |
| Fort William.....                 | „.....               | 56 49      | 5 6                  | 171                            | 9·20                           | 15·19        |
| Loch Torridon (Bendamph).....     | W. Ross.....         | 57 32      | 5 32                 | 20                             | 9·42                           | 16·75        |
| Dunrobin Castle.....              | Sutherland.....      | 57 59      | 3 56                 | 14                             | 2·75                           | 5·14         |
| Killarney (District Asylum).....  | Kerry.....           | 52 4       | 9 31                 | 178                            | 5·94                           | 4·15         |
| Waterford (Brook Lodge).....      | Waterford.....       | 52 15      | 7 7                  | 104                            | 3·78                           | 1·89         |
| Nenagh (Castle Lough).....        | Tipperary.....       | 52 54      | 8 24                 | 120                            | 3·88                           | 3·28         |
| Ennistymon House.....             | Clare.....           | 52 57      | 9 18                 | 37                             | 4·30                           | 4·13         |
| Gorey (Courtown House).....       | Wexford.....         | 52 40      | 6 13                 | 80                             | 3·19                           | 1·47         |
| Abbey Leix (Blandsfort).....      | Queen's County.....  | 52 56      | 7 17                 | 532                            | 3·15                           | 2·02         |
| Dublin (Fitz William Square)..... | Dublin.....          | 53 21      | 6 14                 | 54                             | 2·14                           | 1·40         |
| Mullingar (Belvedere).....        | Westmeath.....       | 53 29      | 7 22                 | 367                            | 3·10                           | 3·51         |
| Crossmolina (Enniscoe).....       | Mayo.....            | 54 4       | 9 16                 | 74                             | 5·35                           | 5·65         |
| Cong (The Glebe).....             | „.....               | 53 33      | 9 16                 | 112                            | 4·79                           | 5·38         |
| Collooney (Markree Obsy.).....    | Sligo.....           | 54 11      | 8 27                 | 127                            | 3·87                           | 3·71         |
| Seaforde.....                     | Down.....            | 54 19      | 5 50                 | 180                            | 3·41                           | 2·30         |
| Ballymena (Harryville).....       | Antrim.....          | 54 52      | 6 13                 | 150                            | 3·73                           | 3·26         |
| Omagh (Edenfel).....              | Tyrone.....          | 54 36      | 7 18                 | 280                            | 3·46                           | 3·72         |

## RAINFALL TABLE FOR JANUARY, 1916—continued.

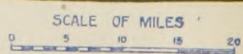
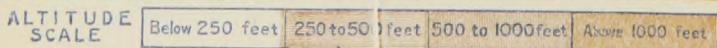
| RAINFALL OF MONTH (con.) |          |                   |             |    | RAINFALL FROM JAN. 1. |       |                      |          | Mean Annual 1875-1909. | STATION.         |
|--------------------------|----------|-------------------|-------------|----|-----------------------|-------|----------------------|----------|------------------------|------------------|
| Diff. from Av. in.       | % of Av. | Max. in 24 hours. | No. of Days |    | Aver. 1875-1909.      | 1916. | Diff. from Aver. in. | % of Av. |                        |                  |
|                          |          | in.               | Date.       |    | in.                   | in.   |                      |          | in.                    |                  |
| — '53                    | 71       | '49               | 2           | 14 | ...                   | ...   | ...                  | ...      | 25'11                  | Camden Square    |
| — '99                    | 54       | '26               | 19          | 17 | ...                   | ...   | ...                  | ...      | 27'64                  | Tenterden        |
| —1'12                    | 57       | '37               | 17          | 16 | ...                   | ...   | ...                  | ...      | 30'48                  | Patching         |
| —1'18                    | 56       | '24               | 4, 17       | 19 | ...                   | ...   | ...                  | ...      | 31'06                  | Fordingbridge    |
| — '41                    | 77       | '54               | 2           | 12 | ...                   | ...   | ...                  | ...      | 24'58                  | Oxford           |
| — '32                    | 83       | '51               | 2           | 14 | ...                   | ...   | ...                  | ...      | 25'20                  | Swanspool        |
| — '21                    | 88       | '57               | 2           | 14 | ...                   | ...   | ...                  | ...      | 25'40                  | Westley          |
| — '03                    | 98       | '49               | 2           | 20 | ...                   | ...   | ...                  | ...      | 23'73                  | Geldeston        |
| —1'52                    | 58       | '44               | 2           | 17 | ...                   | ...   | ...                  | ...      | 38'27                  | Polapit Tamar    |
| —1'96                    | 33       | '17               | 1           | 13 | ...                   | ...   | ...                  | ...      | 33'54                  | Rousdon          |
| — '60                    | 74       | '40               | 2           | 15 | ...                   | ...   | ...                  | ...      | 29'81                  | Stroud           |
| —1'12                    | 55       | '30               | 2           | 19 | ...                   | ...   | ...                  | ...      | 32'41                  | Wolstaston       |
| — '49                    | 68       | '27               | 4           | 16 | ...                   | ...   | ...                  | ...      | 23'35                  | Boston           |
| —1'26                    | 26       | '12               | 2           | 11 | ...                   | ...   | ...                  | ...      | 24'46                  | Hodsock Priory   |
| — '29                    | 85       | '27               | 3           | 19 | ...                   | ...   | ...                  | ...      | 26'65                  | Mickleover       |
| —1'02                    | 62       | '27               | 19          | 15 | ...                   | ...   | ...                  | ...      | 34'73                  | Macclesfield     |
| —1'24                    | 51       | '21               | 6           | 16 | ...                   | ...   | ...                  | ...      | 32'70                  | Southport        |
| +1'28                    | 120      | 1'35              | 1           | 25 | ...                   | ...   | ...                  | ...      | 61'49                  | Arneliffe        |
| — '90                    | 53       | '40               | 1           | 10 | ...                   | ...   | ...                  | ...      | 27'29                  | Goldsbrough Hall |
| —1'11                    | 35       | '11               | 19          | 11 | ...                   | ...   | ...                  | ...      | 26'42                  | Hull             |
| — '86                    | 55       | '30               | 26          | 18 | ...                   | ...   | ...                  | ...      | 27'94                  | Newcastle        |
| +9'36                    | 169      | 2'49              | 7           | 27 | ...                   | ...   | ...                  | ...      | 29'48                  | Seathwaite       |
| — '15                    | 96       | '95               | 2           | 24 | ...                   | ...   | ...                  | ...      | 142'28                 | Cardiff          |
| —1'60                    | 66       | '47               | 17          | 19 | ...                   | ...   | ...                  | ...      | 46'81                  | Haverfordwest    |
| — '60                    | 85       | '33               | 17          | 26 | ...                   | ...   | ...                  | ...      | 45'46                  | Gogerddan        |
| — '01                    | 100      | '41               | 26          | 16 | ...                   | ...   | ...                  | ...      | 30'36                  | Llandudno        |
| +2'58                    | 163      | '80               | 20          | 27 | ...                   | ...   | ...                  | ...      | 43'47                  | Cargen           |
| — '16                    | 93       | '50               | 26          | 14 | ...                   | ...   | ...                  | ...      | 33'76                  | Marchmont        |
| +1'65                    | 135      | '82               | 2           | 31 | ...                   | ...   | ...                  | ...      | 49'77                  | Girvan           |
| +1'65                    | 147      | '78               | 19          | 27 | ...                   | ...   | ...                  | ...      | 35'97                  | Glasgow          |
| + '93                    | 119      | '61               | 2           | 29 | ...                   | ...   | ...                  | ...      | 48'79                  | Eallabus         |
| + '34                    | 106      | '51               | 2           | 31 | ...                   | ...   | ...                  | ...      | 56'57                  | Quinish          |
| +6'05                    | 169      | 2'25              | 3           | 26 | ...                   | ...   | ...                  | ...      | 73'77                  | Stronvar         |
| — '17                    | 92       | '57               | 19          | 14 | ...                   | ...   | ...                  | ...      | 28'64                  | Dundee           |
| +1'47                    | 150      | '69               | 19          | 21 | ...                   | ...   | ...                  | ...      | 34'93                  | Braemar          |
| —1'45                    | 39       | '17               | 2           | 14 | ...                   | ...   | ...                  | ...      | 32'73                  | Aberdeen         |
| + '10                    | 105      | '77               | 12          | 19 | ...                   | ...   | ...                  | ...      | 30'34                  | Gordon Castle    |
| +3'47                    | 198      | '98               | 24          | 25 | ...                   | ...   | ...                  | ...      | 36'13                  | Drumnadrochit    |
| +5'99                    | 165      | 2'18              | 24          | 28 | ...                   | ...   | ...                  | ...      | 75'80                  | Fort William     |
| +7'33                    | 176      | 2'15              | 24          | 28 | ...                   | ...   | ...                  | ...      | 83'93                  | Bendampf         |
| +2'39                    | 187      | '60               | 7           | 21 | ...                   | ...   | ...                  | ...      | 31'90                  | Dunrobin Castle  |
| —1'79                    | 70       | '60               | 1           | 29 | ...                   | ...   | ...                  | ...      | 54'81                  | Killarney        |
| —1'89                    | 50       | '29               | 28          | 21 | ...                   | ...   | ...                  | ...      | 39'57                  | Waterford        |
| — '60                    | 85       | '67               | 1           | 25 | ...                   | ...   | ...                  | ...      | 39'43                  | Castle Lough     |
| — '17                    | 96       | '43               | 6           | 28 | ...                   | ...   | ...                  | ...      | 46'52                  | Ennistymon       |
| —1'72                    | 46       | '24               | 1           | 19 | ...                   | ...   | ...                  | ...      | 34'99                  | Courtown Ho.     |
| —1'13                    | 65       | '34               | 1           | 27 | ...                   | ...   | ...                  | ...      | 35'92                  | Abbey Leix       |
| — '74                    | 66       | '26               | 21          | 16 | ...                   | ...   | ...                  | ...      | 27'68                  | Dublin           |
| + '41                    | 113      | '48               | 19          | 28 | ...                   | ...   | ...                  | ...      | 36'15                  | Mullingar        |
| + '30                    | 106      | '71               | 23          | 28 | ...                   | ...   | ...                  | ...      | 52'87                  | Enniscoe         |
| + '59                    | 112      | '95               | 20          | 25 | ...                   | ...   | ...                  | ...      | 48'90                  | Cong             |
| — '16                    | 96       | '44               | 19          | 29 | ...                   | ...   | ...                  | ...      | 42'71                  | Markree          |
| —1'11                    | 68       | '40               | 26          | 27 | ...                   | ...   | ...                  | ...      | 38'91                  | Seaforde         |
| — '47                    | 87       | '48               | 26          | 26 | ...                   | ...   | ...                  | ...      | 40'84                  | Ballymena        |
| + '26                    | 108      | '38               | 23          | 27 | ...                   | ...   | ...                  | ...      | 39'38                  | Omagh            |

## SUPPLEMENTARY RAINFALL, JANUARY, 1916.

| Div.  | STATION.                        | Rain<br>inches. | Div.   | STATION.                                         | Rain<br>inches. |
|-------|---------------------------------|-----------------|--------|--------------------------------------------------|-----------------|
| II.   | Warlingham, Redvers Road ..     | 1.94            | XI.    | Douglas .....                                    | 2.99            |
| „     | Ramsgate .....                  | .92             | XII.   | Stoneykirk, Ardwell House...                     | 3.22            |
| „     | Hailsham .....                  | 1.68            | „      | Carsphain Shiel .....                            | 12.22           |
| „     | Totland Bay, Aston House...     | 1.24            | „      | Beattock, Kinnelhead .....                       | 9.96            |
| „     | Stockbridge, Ashley .....       | 1.17            | „      | Langholm, Drove Road .....                       | 7.85            |
| „     | Grayshott .....                 | 1.95            | XIII.  | Selkirk, The Hangingshaw..                       | 4.31            |
| III.  | Harrow Weald, Hill House...     | 1.57            | „      | North Berwick Reservoir...                       | 1.84            |
| „     | Pitsford, Sedgebrook.....       | 1.49            | „      | Edinburgh, Royal Observat'y.                     | 2.80            |
| „     | Woburn, Milton Bryant.....      | 1.51            | XIV.   | Maybole, Knockdon Farm ...                       | 4.26            |
| „     | Chatteris, The Priory .....     | .94             | „      | Buchlyvie, The Manse .....                       | 7.71            |
| „     | Elsenham, Gaunts End .....      | 1.39            | XV.    | Ballachulish House .....                         | 13.57           |
| IV.   | Shoeburyness .....              | .75             | „      | Oban.....                                        | 6.86            |
| „     | Colchester, Hill Ho., Lexden .. | .99             | „      | Campbeltown, Witchburn ..                        | 4.95            |
| „     | Ipswich, Rookwood, Copdock ..   | 1.42            | „      | Holy Loch, Ardnadam.....                         | 14.11           |
| „     | Aylsham, Rippon Hall .....      | 1.88            | „      | Tiree, Cornaigmore .....                         | 4.86            |
| „     | Swaffham .....                  | 1.50            | XVI.   | Dollar Academy .....                             | 5.70            |
| V.    | Bishops Cannings .....          | 1.33            | „      | Glenlyon, Meggernie Castle..                     | 13.34           |
| „     | Wimborne, St. John's Hill ...   | 2.03            | „      | Blair Atholl .....                               | 4.52            |
| „     | Ashburton, Druid House.. ...    | 2.93            | „      | Coupar Angus .....                               | 2.94            |
| „     | Cullompton .....                | 1.73            | „      | Montrose, Sunnyside Asylum.                      | .89             |
| „     | Lynmouth, Rock House .....      | 3.19            | XVII.  | Alford, Lynturk Manse .....                      | 1.08            |
| „     | Okehampton, Oaklands.. ...      | 3.54            | „      | Fyvie Castle .....                               | 1.29            |
| „     | Hartland Abbey.....             | 2.07            | „      | Keith Station .....                              | 1.39            |
| „     | Probus, Lamellyn.....           | 1.02            | XVIII. | Rothiemurchus .....                              | 4.66            |
| „     | North Cadbury Rectory. ....     | 1.33            | „      | Loch Quoich, Loan .....                          | 44.05           |
| VI.   | Clifton, Stoke Bishop .....     | 3.14            | „      | Skye, Dunvegan .....                             | 9.30            |
| „     | Ross, The Graig .....           | ..              | „      | Lochmaddy, Bayhead .....                         | 6.49            |
| „     | Shifnal, Hatton Grange.....     | .92             | „      | Fortrose.....                                    | 3.16            |
| „     | Droitwich .....                 | .90             | „      | Glencarron Lodge .....                           | 16.30           |
| „     | Blockley, Upton Wold.....       | 1.61            | XIX.   | Altnaharra .....                                 | 11.68           |
| VII.  | Market Overton.....             | 1.64            | „      | Melvich .....                                    | 5.29            |
| „     | Market Rasen .....              | .86             | „      | Loch More, Achfary .....                         | 14.34           |
| „     | Bawtry, Hesley Hall .....       | .72             | XX.    | Dunmanway, The Rectory ..                        | 5.50            |
| „     | Derby, Midland Railway.....     | 1.50            | „      | Glanmire, Lota Lodge.....                        | 2.30            |
| „     | Buxton .....                    | 3.75            | „      | Mitchelstown Castle .....                        | 2.53            |
| VIII. | Nantwich, Dorfold Hall .....    | 1.17            | „      | Darrynane Abbey.....                             | 3.30            |
| „     | Chatburn, Middlewood .....      | 4.34            | „      | Clonmel, Bruce Villa .....                       | 1.49            |
| „     | Lancaster, Strathspey .....     | 3.18            | „      | Newmarket-on-Fergus,Fenloe                       | 2.92            |
| IX.   | Langsett Moor, Up. Midhope ..   | 3.61            | XXI.   | Enniscorthy, Ballyhyland...                      | 2.21            |
| „     | Scarborough, Scalby .....       | 1.19            | „      | Rothnen, Clonmannon .....                        | 1.54            |
| „     | Ingleby Greenhow .....          | .69             | „      | Ballycumber, Moorock Lodge                       | 2.24            |
| „     | Mickleton .....                 | 5.40            | „      | Balbriggan, Ardgillan .....                      | 1.32            |
| X.    | Bellingham, High Green Manor .. | 4.69            | „      | Castle Forbes Gardens<br>called Newtown Forbes } | 3.72            |
| „     | Ilderton, Lilburn Cottage ..... | 2.16            | XXII.  | Ballynahinch Castle.....                         | 5.70            |
| „     | Thirlmere, The Bank .....       | 7.33            | „      | Woodlawn .....                                   | 3.23            |
| XI.   | Llanfrehfa Grange .....         | 4.06            | „      | Westport, St. Helens .....                       | 4.80            |
| „     | Treherbert, Tyn-y-waun .....    | 12.41           | „      | Dugort, Slievemore Hotel ...                     | 8.62            |
| „     | Carmarthen, The Friary .....    | 3.73            | XXIII. | Enniskillen, Portora .....                       | 3.69            |
| „     | Fishguard, Goodwick Station.    | 2.60            | „      | Dartrey [Cootehill] .....                        | 2.89            |
| „     | Crickhowell, Tal-y-maes .....   | ..              | „      | Warrenpoint, Manor House ..                      | 2.51            |
| „     | New Radnor, Ednol .....         | 3.60            | „      | Belfast, Cave Hill Road .....                    | 3.13            |
| „     | Birmingham WW., Tyrmynydd ..    | 4.82            | „      | Glenam Castle.....                               | 3.76            |
| „     | Lake Vyrnwy .....               | 7.57            | „      | Londonderry, Creggan Res...                      | 3.58            |
| „     | Llangynhafal, Plâs Draw.....    | 1.55            | „      | Dunfanaghy, Horn Head ...                        | 4.10            |
| „     | Dolgelly, Bryntirion .....      | 3.57            | „      | Killybegs .....                                  | 6.03            |
| „     | Bettws-y-Coed, Tyn-y-bryn ..    | 5.84            |        |                                                  |                 |
| „     | Lligwy .....                    | 1.99            |        |                                                  |                 |



# THAMES VALLEY RAINFALL — JANUARY, 1916.





## THE WEATHER OF JANUARY.

THE distribution of atmospheric pressure during January was abnormally constant, being characterized throughout by an unusually persistent anti-cyclone lying over the south-west of Europe, and a series of slowly moving depressions which travelled in an easterly or north-easterly direction in paths well to the north of the British Isles. The conditions were thus favourable for westerly winds which blew practically without intermission. The temperature was in all parts extremely high for the season, maximum readings of between  $50^{\circ}$  and  $55^{\circ}$  occurring with great frequency and minima below  $40^{\circ}$  being uncommon. The high temperature was most remarkable on account of its persistence, there being no interval of wintry weather. Except for very slight and brief touches in the second and fourth weeks there was no frost and there was practically no snow. The highest readings occurred during the first week, especially on the 1st and 6th. On the 1st the shade maximum at Camden Square reached  $57^{\circ} \cdot 2$ , or  $0^{\circ} \cdot 8$  above the previous highest shade temperature recorded in January since the record was commenced in 1858.

The duration of bright sunshine was on the whole fairly normal, but the weather was cloudy in the north-west generally. The durations reported were as follows: Camden Square, 29.9 hours; Plumstead, 28.0 hours; Totland Bay, 46.2 hours; Ipswich, 62.8 hours; Sidmouth, 53.8 hours; Torquay, 50.4 hours; Ashbourne, 36.7 hours; Matlock Bath, 39.0 hours; Bolton, 17.4 hours; Southport, 39.5 hours; Hull, 21.3 hours; Haverfordwest, 47.8 hours; Swinton (Berwickshire), 35.5 hours; Paisley, 33.0 hours; Perth, 51.1 hours.

The distribution of rainfall during the month showed a close relationship to the prevailing wind and to the pressure conditions. In the south generally the month was dry, less than the average falling everywhere, except possibly on the Welsh hills. The rainfall was less than half the average on the south coast and in the south-east of Ireland. Little rain fell also in the English Midlands and on the east coasts of Great Britain and Ireland and less than half the average fell in parts of the north-east of England and of Scotland. The rainfall in the north-west of the British Isles was on the other hand, everywhere above the average, the excess being greatest in the north of Scotland and the West Highlands generally, where more than 50 per cent above the average fell. In the north-west of Ireland the excess was only slight. January is the month when the rainfall of the rainy western uplands is normally most pronouncedly in excess of that in the dry eastern districts, the month being the wettest of the year in the west of Scotland and nearly the driest in the English Midlands. This distribution was thus accentuated during January, 1916, and a very striking contrast between the east and west of the country resulted. The areas with more than 10 inches were unusually large, occupying most of the elevated districts in the west of Scotland, a considerable area in the northern Pennines and parts of Wales. In these districts rain fell nearly every day during the month. In western Inverness-shire, in the English Lake District, and in Snowdonia more than 20 inches fell, whilst records of more than 30 inches occurred at the head of Glenquoich and on the Stye. The very dry areas included a considerable part of Great Britain, less than an inch falling over most of the coast between Peterhead and the Wash, and also in detached areas in the centre and south of England. Over small parts of Yorkshire and Nottinghamshire less than .50 in. fell. In Ireland the contrast was less marked, more than 10 in. falling only in the rainiest districts in the west and less than 2 inches on the coast from Dundalk Bay to Cork.

The general rainfall for England and Wales was 89 per cent. of the average; that for Scotland was 147 per cent.; for Ireland 86 per cent.; and for the British Isles as a whole 109 per cent.

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

| 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. |       |
|                                                                  | Temp.     | Date.  | Temp.    | Date.  |          |       |               |           |                 |                   |            |       |       |
|                                                                  | 78°·3     | 1      | 43°·8    | 30     | 72°·2    | 54°·6 | 55°·0         | 80        | 128°·6          | 44°·2             | 2·27       | 15    | 5·7   |
| London, Camden Square                                            | 95·9      | 4      | 65·1     | 23     | 84·9     | 73·3  | ...           | 87        | 146·0           | ...               | ·41        | 3     | 0·8   |
| Malta ... ..                                                     | 88·0      | 4      | 68·0     | 2      | 82·9     | 73·6  | 71·9          | 80        | 153·0           | 66·0              | 3·52       | 12    | 8·8   |
| Lagos ... ..                                                     | 77·7      | 13     | 43·7     | 5      | 62·5     | 48·8  | 49·1          | 78        | ...             | ...               | 2·05       | 11    | 5·8   |
| Cape Town ... ..                                                 | ...       | ...    | ...      | ...    | ...      | ...   | ...           | ...       | ...             | ...               | ...        | ...   | ...   |
| Natal, Durban ... ..                                             | 76·0      | 29     | 30·0     | 25     | 65·6     | 44·2  | 36·7          | 62        | ...             | 27·6              | ·19        | 1     | 2·5   |
| Johannesburg ... ..                                              | 76·9      | 30     | 54·0     | 22     | 75·0     | 59·5  | 56·7          | 70        | ...             | 45·7              | ·78        | 11    | 4·8   |
| Mauritius ... ..                                                 | 80·5      | 31     | 25·0     | 25     | 68·6     | 57·8  | 35·2          | 58        | ...             | ...               | ·04        | 1     | 1·2   |
| Bloemfontein . ... ..                                            | 93·5      | 13     | 77·2     | 19, 31 | 89·8     | 80·0  | 78·6          | 85        | ...             | 73·6              | 15·91      | 17    | 8·8   |
| Calcutta ... ..                                                  | 87·1      | 19     | 75·4     | 22     | 84·9     | 78·2  | 76·0          | 84        | 131·1           | 63·3              | 8·93       | 25    | 8·5   |
| Bombay ... ..                                                    | 100·0     | 22     | 73·7     | 31     | 95·5     | 79·1  | 73·4          | 72        | 165·7           | 72·5              | 1·20       | 11    | 5·6   |
| Madras ... ..                                                    | 86·4      | 26     | 73·5     | 31     | 85·2     | 77·2  | 74·3          | 83        | 153·7           | 70·1              | ·57        | 8     | 6·8   |
| Colombo, Ceylon ... ..                                           | 93·1      | 25     | 74·2     | 14     | 88·5     | 79·7  | 77·4          | 82        | ...             | ...               | 10·52      | 17    | 6·9   |
| Hongkong ... ..                                                  | 70·9      | 15     | 43·0     | 31     | 63·0     | 48·5  | 42·7          | 61        | 116·9           | 31·3              | 1·24       | 8     | 3·3   |
| Sydney ... ..                                                    | 66·2      | 21     | 36·0     | 19     | 58·0     | 45·7  | 43·9          | 72        | 115·6           | 28·0              | 2·14       | 21    | 6·7   |
| Melbourne ... ..                                                 | 69·8      | 21     | 37·9     | 29     | 61·5     | 46·8  | 46·6          | 76        | 127·2           | 28·5              | 2·53       | 17    | 4·8   |
| Adelaide ... ..                                                  | 75·0      | 17     | 40·0     | 21     | 63·9     | 50·2  | 48·4          | 72        | 134·0           | 33·0              | 7·47       | 23    | 5·9   |
| Perth ... ..                                                     | 78·6      | 28     | 35·0     | 22     | 63·7     | 43·2  | 40·0          | 56        | 134·4           | 31·0              | 1·31       | 12    | 4·4   |
| Coolgardie ... ..                                                | 62·2      | 26     | 32·1     | 31     | 55·3     | 42·6  | 40·0          | 70        | 116·7           | 23·2              | 1·33       | 22    | 6·3   |
| Hobart, Tasmania ... ..                                          | 61·4      | 23     | 32·0     | 18     | 55·8     | 42·3  | 43·0          | 79        | 117·6           | 23·0              | 1·36       | 12    | 6·5   |
| Wellington ... ..                                                | 63·0      | 23, 24 | 38·5     | 1      | 58·7     | 47·9  | 47·9          | 82        | 122·0           | 35·0              | 4·02       | 16    | 5·9   |
| Auckland ... ..                                                  | 93·5      | 3      | 71·6     | 17     | 90·1     | 74·6  | 72·7          | 80        | ...             | ...               | 6·24       | 8     | 5·2   |
| Jamaica, Kingston ... ..                                         | 89·0      | 25     | 71·0     | 5      | 86·0     | 74·0  | ...           | 78        | 136·0           | ...               | 13·01      | 20    | 3·0   |
| Grenada ... ..                                                   | 87·5      | 16     | 40·2     | 31     | 74·4     | 58·1  | 58·9          | 82        | 142·0           | 37·8              | 8·14       | 16    | 5·1   |
| Toronto ... ..                                                   | 85·5      | 1      | 36·0     | 28     | 73·7     | 53·7  | 57·8          | 81        | ...             | ...               | 3·57       | 12    | 5·9   |
| Fredericton ... ..                                               | 75·2      | 6      | 44·5     | 28     | 67·8     | 54·2  | 55·0          | 82        | ...             | ...               | 3·46       | 16    | 6·6   |
| St. John, N.B. ... ..                                            | 86·0      | 10     | 44·9     | 23     | 78·7     | 53·9  | ...           | 72        | 139·2           | 34·5              | 3·25       | 8     | 3·6   |
| Alberta, Edmonton ... ..                                         | 87·9      | 21     | 48·9     | 24     | 70·1     | 53·9  | 52·0          | 72        | 139·3           | 44·0              | ·04        | 1     | 3·1   |
| Victoria, B.C. ... ..                                            |           |        |          |        |          |       |               |           |                 |                   |            |       |       |

*Johannesburg*—Bright sunshine, 302·3 hours.

*Mauritius*—Mean temp. 1°·1 below, dew point 2°·5, and R 1·70 in., below averages. Mean hourly velocity of wind 12 miles.

COLOMBO, CEYLON—Mean temp. 81°·2, same as average, dew point 0°·7 above, and R 1·88 in. below, averages.

HONGKONG—Mean temp. 83°·5, mean hourly velocity of wind 8·9 miles. Bright sunshine 205·3 hours.

*Melbourne*—Mean temp. 0°·8 above, and R ·35 in. above, averages.

*Adelaide*—Mean temp. 0°·2 above, and R ·06 in. above, averages.

*Coolgardie*—Temp. 0°·3 below, and R ·25 in. above, averages.

*Hobart*—Temp. 1°·0 above, and R ·48 in. below, averages.

*Wellington*—Mean temp 0°·6 above, and R 3·30 in. below, averages. Bright sunshine 134·5 hours. Frost on grass on 13 mornings.

JAMAICA, KINGSTON—On the 12th and 13th a hurricane swept over the N. side of the Island, sweeping away everything within its reach, wharves, houses, roads, bridges, and a part of the railway track, houses being carried  $\frac{1}{2}$  mile away like canoes. The storm was similar to the one of August 11th, 1903.

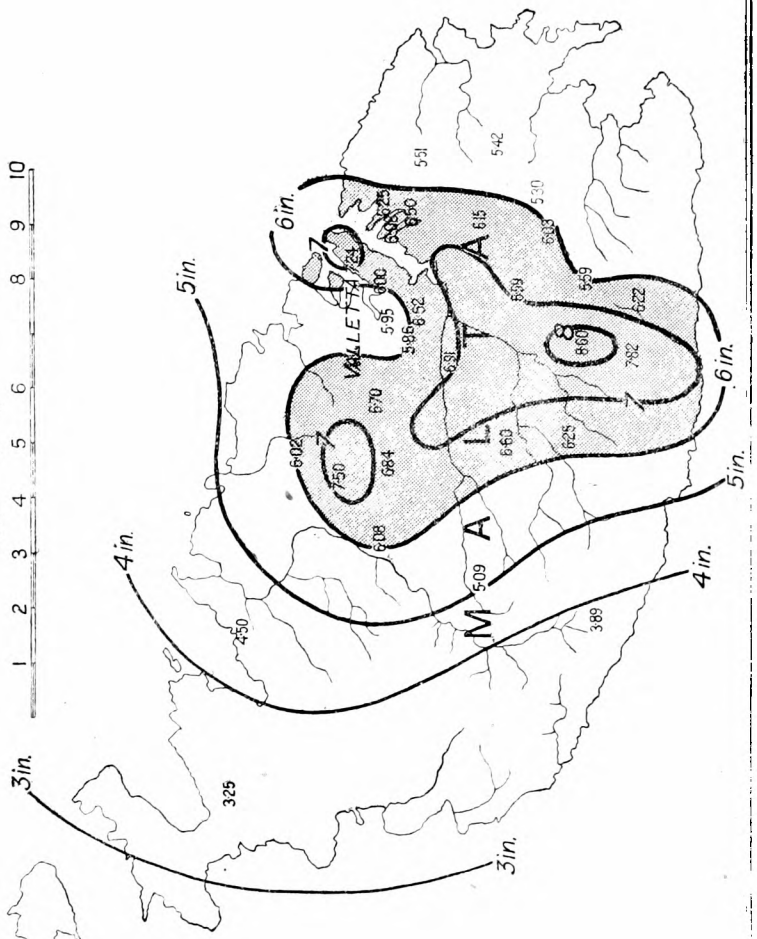
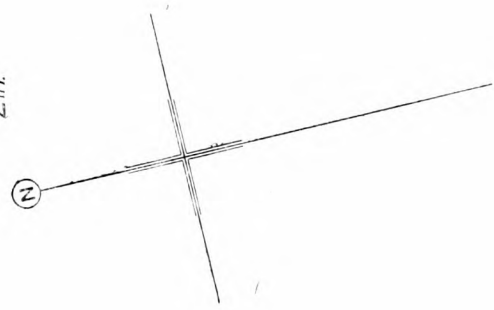
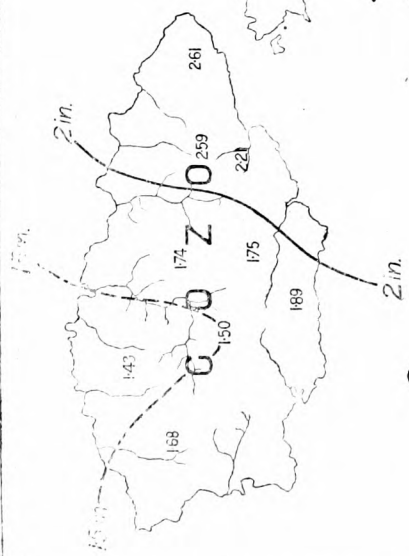


ALTITUDE SCALE  
Below 250 feet    250 to 500 feet    500 to 1000 feet    Above 1000 feet

SCALE OF MILES  
0    5    10    15    20



# RAINFALL 22ND NOVEMBER.1915.



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## EXCEPTIONAL RAIN-STORM IN MALTA.

MR. T. AGIUS, the officer in charge of the Meteorological Observatory of the Malta University has forwarded to us particulars of the rainfall for Monday, November 22nd, 1915, when a rain-storm of quite exceptional violence prevailed over Malta and the neighbouring small islands. It is gratifying to know that rainfall records are kept at the elementary schools in this small possession, and the list contains the readings taken at 39 of these. They are well distributed over the whole area, and a key map having been sent we have been able to plot the results and draw isohyetal lines in exactly the same way as in the section on Heavy Falls on Rainfall Days in *British Rainfall*. This map is reproduced herewith and shows in inches all the falls reported. It will help the reader to realize the scale when it is mentioned that the whole area of the three islands is 117 square miles, exactly the same as that of the county of London. It will be observed that on the day in question not less than about an inch and a half of rain fell over the entire area, while 68 square miles in the main island had more than 5 inches and about 10 square miles in the centre more than 7 inches. The highest reading was 8·60 inches. Had it not been for the great Norfolk rain-storm of August 25th—26th, 1912, we should have been inclined to say that a downpour of this magnitude could not occur in the British Isles, but we have learned caution in expressing opinions as to possible maxima. The great precipitation in Malta was not accompanied by any striking fall in the barometer, the total drop being from 29·987 inches at 8 a.m. on the 21st to 29·810 inches at 8 a.m. on the 22nd, but probably there was a much lower barometric minimum out at sea which influenced the storm. Mr. Agius states that “the amount of rain registered was nearly equal to that recorded on another remarkable outburst known as St. Nicholas’ day, which occurred some forty years ago. . . The rainfall registered at the Observatory was equal to 7·24 inches [on November 22nd, 1915]. Although exceptionally heavy, still this fall is not to be compared with that recorded during the cloud burst of the 16th October, 1913, when 11·57 inches of rain fell in Valletta, the maximum recorded, that at Vittoriosa, reaching the extraordinary amount of 16·3 inches in a few hours of rain.”

## A PRACTICAL APPLICATION OF ANEMOMETRY.

By R. H. CURTIS.

A GOOD many years ago I was asked by a friend to look over his meteorological observatory, upon which he had spent a good deal of money in making it as complete as possible. In the course of my visit I met my friend's father who, after I had expressed my pleasure at what I had seen, said "Well, *Cui bono?*" The same question has, I daresay, been asked of many meteorological Observers, and perhaps a quite satisfying answer has not always been ready; at all events there can be few instances in which such a directly utilitarian use of a meteorological instrument can be shown as in the case of an anemometer at Quilty, a station on the West Clare Railway, an account of which will probably interest readers of this magazine.

The "West Clare" is one of the "Irish Light Railways" with which the name of Mr. A. J. Balfour is intimately associated. It runs from Ennis to Kilkee, and, for 36 miles of that distance it follows the Atlantic sea-board, exposed without the least shelter to the full fury of all westerly gales, and there is probably no other railway in the United Kingdom so utterly exposed as is this stretch of 36 miles.

Derailment of trains in heavy gales has occurred on many lines in various parts of the Kingdom, but here we have not only exceptional exposure, but also a very narrow wheel-base upon which the carriage stands, and it is obvious that the narrower this is the more liable the carriage must be to be overturned; it is therefore not surprising that in the short period which had elapsed between the opening of the line and the beginning of 1909 as many as five "*blow-offs*" had occurred upon it, the gauge being only 3 feet.

Fortunately in these accidents no lives were lost, but on each occasion the carriages were completely smashed, and lives put in great danger. The Board of Trade therefore called for measures to be taken to prevent such accidents and a first attempt was made to do so by throwing up shelter banks upon the windward side of the line, at the most exposed points; this scheme however had to be abandoned as ineffective, and also too expensive, and a method was then sought for giving warning when the wind became dangerous, so that precautionary steps might be taken to prevent accidents.

It was at this point that Mr. W. Barrington, M.Inst., C.E., the Engineer in Chief of the line, consulted the Meteorological Office, and the matter came to me as Superintendent of Instruments. It seemed to me that the Pressure-tube Anemometer could be arranged to give electrically the warning required, and my scheme was carried out by the late Mr. R. Munro.

The arrangement is designed to give two warnings by the ringing of a bell in the station-master's house—the first when the anemometer indicates a wind velocity of 65 miles per hour, and the second if, and when, the velocity rises to 85 miles per hour.

The lightest vehicles on the line require, when empty, a side-pressure of  $15\frac{3}{4}$  pounds per square foot to overturn them, and since the wind-pressure when the first warning is given would be less than 13 pounds per square foot, a considerable margin is left for safety. But when this first warning has been given 24 hundredweights of moveable ballast, kept for the purpose at every station, is placed on each vehicle of any train upon the line, at the first station it reaches ; by so doing its stability is increased so that a pressure of  $25\frac{1}{2}$  pounds per square foot would now be required to overturn it, and therefore the train is allowed to continue its journey. If the wind continues to rise, and reaches a velocity of 85 miles per hour, the second warning is given and the train is then stopped until the storm abates, but since the equivalent pressure per square foot would then be but  $21\frac{1}{2}$  lbs. there is again a good margin for safety. These limits were agreed to by the Board of Trade.

The mechanical arrangement by which these warnings are obtained is very simple. To the cover of the cistern of the Anemometer an ebonite base is attached, and carries two uprights, connected by a horizontal rod some inches above the base. This horizontal rod serves as an axis for two balanced arms, or triggers, each of which supports, very delicately, a sliding weight ; the upper part of each trigger projects forward towards the pen-rod, but at different angles, to the vertical, and the two are far enough apart to allow the pen-rod to pass between them. On either side of the pen-rod is fixed a small projecting pin, and when the rod has risen to a height corresponding to a wind velocity of 65 miles per hour one pin disengages the lower trigger, and thus allows the weight it had supported to fall. This weight completes an electric circuit and a loud bell is rung in the station-master's house, and continues to ring until stopped by the station-master, whose duty it then, is to send the warning up and down the line to every station.

The fallen trigger is not replaced, and the action of the pen-rod continues, but if the wind still rises and reaches a gust velocity of 85 miles per hour the other trigger is disengaged by the second pin, the bell is again rung, and a message stopping all traffic on the line is at once despatched.

Since its installation in December, 1909, I am informed that " the instrument has never failed to give the required warning when the velocity of the wind reached dangerous limits." There has however been one storm-derailment on the line, " but that was entirely due to deliberate disregard of the instructions issued," and not to failure of the instrument to give its warning.

Mr. Barrington in a recent letter to me says : " So far as I have been able to ascertain I do not think any of the warning methods adopted on other lines in England, Wales and Scotland are as reliable as the one we have adopted, and certainly none are more scientific in their application."

## RELATION OF RAINFALL TO CLOUD-LEVEL : A PROBLEM OF CONDENSATION.

By L. C. W. BONACINA.

EARLY in 1907, whilst I was spending a few weeks in a hilly part of Surrey, I was puzzled one rather wet and dismal winter day when the top of the North Downs was obscured in cloud, to find that a decided, though by no means heavy, fall of rain which was taking place at the foot of the range, ceased or degenerated into a drizzle as I mounted into the mist. One cannot, of course, be sure of eliminating the time element when one is observing alone and changes one's location, but I seem to remember (though, unfortunately, I am not sure), that it was raining as before when I came down again.

Latterly, however, questions of this nature have been forced on my attention both summer and winter, in a much more favourable region for observing such effects than the Surrey Downs, namely, the Dartmoor hills in Devonshire, and although I cannot speak with the full confidence of a resident, I have little doubt that the following generalization is substantially true :—on and around Dartmoor, and no doubt the same applies to other hill districts, persistent, heavy rain does not fall when the moor is obscured in mist, but only when the higher summits are clear and beneath the cloud-level. It is, of course, perfectly true that the premonitory stage of approaching bad weather often manifests itself by the rise of thick mist on the hills and tors—just as, curiously enough, the opposite condition of unusual atmospheric transparency also often immediately precedes rain—but it may be taken, I think, as a pretty safe rule that until that mist disperses, or until, as it amounts to, the cloud-level rises above the hills, nothing like heavy or decided general rain will set in, either on or around the moor, or in the lowlands. Whilst making liberal allowance for the lax statements of people who are not meteorologists, especially if uneducated, I have questioned local men on this point, including the tenant of a solitary farmstead on a high and forbidding part of Dartmoor, and their answers all seem to support my conclusion that moorland mist and true rainfall do not, as a general rule, take place together. The mist, of course, is normally very wet, and must contribute largely to the big rainfall figures furnished by gauges set among the high hills ; but it does at first sight appear strange that the conditions for mist and rainfall should occur at different times.

I assume that the only reliable physical criterion of the occurrence of condensation is the attainment of that particular state when the vapour ceases to behave like a gas and becomes saturated. We know that after the point of saturation is reached any further

decrease of temperature usually results in the precipitation of liquid or frozen water—in the form of cloud, rain or snow.

In practice we cannot tell precisely when the point of condensation or precipitation is reached in the atmosphere, because we have to rely on the *visibility* of moisture, which is at best a rough and untrustworthy guide. Quite apart from the question of defective eye-sight, there is a certain range of normal vision through even the densest fog, and it is often very curious to find that a surface fog in London hardly shows up at all across a narrow street. But I only introduce this aspect of the subject as a preliminary to the considerations which follow, and to point out that condensed vapour may to a certain extent exist in the air without always being visible, and that the only true criterion of the stage of condensation is not discernible by the senses, is not apparent, that is to say, to natural observations without the appliances of the physical laboratory.

On Dartmoor, a typical wet English hill district, when anything in the nature of heavy, persistent or general rain sets in, the cloud-level rises, leaving even the highest hills visible through a dense sheet of rain. I am only considering the cloud-level, and am not referring to the not uncommon phenomenon of surface rain-fog which hovers over saturated ground, especially in coombes and hollows. It would appear, that a decided cyclonic up-lift of the air leading to heavy rain is prejudicial to the formation of dense Dartmoor mists. The shifting moorland mists and driving drizzles occur, instead, with non-cyclonic moisture-laden winds, which, being forced upward by the hills, give rise to various forms of local showery precipitation, but leave the lowlands dry because they have no cyclonic uplift in their velocity. The prevailing conception of the processes of condensation and precipitation is, so far as I am aware, that when condensation has advanced beyond a certain stage in a cloud the mist particles run together into transparent rain-drops which, of course, fall as soon as they can no longer be supported by the resistance of the air; in other words that the cloud is *always* the mother of the rain, the latter, in a sense, being squeezed out as from a saturated sponge. Now I confess to have some difficulty in picturing to myself the mechanism of this process. If this *were* the actual process in the case of cyclonic rainfall a little reflection will shew that the lower part of an ascending cloud-mass would have rain falling through it, but that only the upper part would be *condensing* rain—a supposition hardly supported by the facts of observation so far as they go. In the case of heavy rain engendered by a vigorous upward movement of the air-currents. What, however, if in these cases, instead of regarding the clouds as the main source of the rain which is falling beneath them, we regard them as the residue of the moisture, which has been rapidly condensed straight

into a transparent rain sheet and drained off below the cloud-level? Is there any difficulty in supposing that the damp Atlantic air currents which circulate through our cyclonic systems are borne aloft so rapidly that the vapour particles are, in the main at all events, condensed straight into transparent rain drops without first exhibiting the stage of cloud or mist particles? and that at a higher level, above the condensing rain sheet, where the vapour content of the air has become much reduced, or the ascending velocity weakened, there appears a dense cloud canopy in which condensation cannot get beyond the mist stage? This, indeed, is the process which in certain cases suggests itself to my imagination; and certain facts of observation stated above support this theory. If a more or less horizontal non-cyclonic westerly wind has its moisture locally condensed into a cloud or a shower when it is forced to rise against the obstruction of a hill-side, is it conceivable that an equally moist cyclonic wind with a strong vertical component in its own velocity plus the additional uplift imparted to it on meeting the hill, even though the *orographic* rise is less in the case of a wind with a vertical component, will not have any of its moisture condensed *at the level of that same hill slope* where no cloud is produced but heavy rain is falling? Ought we not rather to assume that in the cyclonic case condensation is actually proceeding so much more actively than in the local cloud case *at the hill-level* that the condensed moisture passes direct into heavy rain?

These are questions about which the rain-gauge can give us no information, and I would like to set every rainfall observer in hill districts studying the subject in all its bearings, and in the case of both rain and snow.

My own observations have not long commenced systematically, and then only on the eastern border of Dartmoor in view of Cosdon Beacon, a hill some 1800 feet high.

I should like to append some particular observations made by me at Chagford, Devon, on January 19th and 20th, 1916.

On the 19th a thick driving moorland drizzle prevailed all day with a moderate gale, and it seemed not unlikely that the conditions were quite local, "Dartymoor, born and bred." The higher parts of the moor were invisible from Chagford, but this seemed to be due rather to the limited degree of transparency of the mist than to true mist or cloud on the hills; moreover, the flying sky was in places half blue, and such cloud as there was overhead appeared to be the effect, again, of the low thick drizzle. In other words I think this was an occasion on which condensation into small drizzle occurred at a low level without any cloud residue (*antea*) over the rain sheet. During the ensuing night heavier rain set in, and about 8 o'clock next morning thunder marked the replacement of a muggy south-westerly wind by a colder westerly one. Just about noon a perishing squall of graupel suddenly swooped

down upon the moor from the north-west. The squall clouds were high up above the hills, but as the horizontal, or probably slightly downward wind-current behind the squall struck Cosdon Beacon a local cloud was generated on the hill, so that on the summit the sleet and graupel must have been sweeping through a fog of local and independent origin.

One would very much like to know all that happens on exposed mountain heights; but exposure to the fury of winter weather on our desolate British moorlands is not an experience to be courted.

I do not think that the idea of vapour being condensed straight into transparent raindrops need be more difficult to entertain than that of the passage of mist particles, or still more, uncondensed vapour direct into snow flakes. Moreover, the Hon. Ralph Abercromby in his "Weather," insists on the peculiar way cyclonic rain seems to "grow out of the air," an observation which I can confirm and which has materially helped me to nurture the above conception of condensation as representing what actually obtains very frequently in nature.

Finally I would particularly ask meteorological Observers in the Highlands, Wales, the Pennines and the Lake District to study the cloud behaviour of the mountains in relation to rainfall. Did no one study the *species* or appearance of rain on the top of Ben Nevis when the observatory was in existence?

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Correspondence.

To the Editor of Symons's Meteorological Magazine.

A COLD WINTER FOLLOWING A COLD NOVEMBER.

IN a recent number of your magazine one of your correspondents debates the probability of a cold winter following a cold November. We farmers have an old saying "If there's ice in November that will hold a duck, there'll be nought after but sludge and muck." This is being carried out this year, so far. It might be interesting to ask (and time only can answer), after this January shall we have a late spring; or a cold, wet summer?

S. ARROWSMITH.

Mosley Hall, Whaley Bridge, February 3rd, 1916.

[The November *canard* has also been cited by a Devonshire correspondent and no doubt we shall be reminded presently that, "If Candlemas Day be fair and clear, there'll be two winters in the year." For the second winter has made itself obvious enough in the bitter weather and unmelted snows of the last week of February and the first week of March.—Ed., S.M.M.]

THE SNOW-STORMS IN THE BLACK MOUNTAINS.

THE snowfall of February was the most remarkable I have experienced in my life. From February 20th the wind blew each day from easterly points and we have had as many as thirteen distinct snowstorms. It is very difficult to judge the true depth owing to the very high wind but my estimates of the fall on each day up to March 2nd were as follows :—

Feb. 20th ...	12 inches.	Feb. 28th ...	12 inches.
„ 24th ...	8 „	„ 29th ...	4 „
„ 25th ...	9 „	Mar. 1st ...	1 „
„ 26th ...	12 „	„ 2nd ...	15 „
„ 27th ...	3 „		—
Total depth of undrifted snow Feb. 20th to Mar. 2nd			
<u>76 inches.</u>			

The total depth of undrifted snow during the whole period till the 11th I put at between seven and eight feet.

The railway is, of course, blocked and we are compelled to go on foot eight miles down the valley for food. Our coal is also nearly finished and matters are becoming serious. Old people about here say they have not seen anything like it in their lives ; they have experienced a greater depth of snow in an exceptional storm but not a succession of so many storms in such a short period.

I have noticed that each snowfall during the three weeks was formed in the lower nimbus clouds, and came on suddenly, the air being very damp and misty. There were no high cumuli or cirri, but all seemed to be produced from the lower layers, a condition always favourable for large precipitation in these mountains. On March 10th only were there a few cirrus and high nimbus clouds, and the commencement of the snow appeared to be delayed on that occasion.

J. R. GETHIN JONES.

Blaen-y-Cwm, Forest Coal Pit, near Abergavenny, March 11th, 1916.

OPTICAL PHENOMENA.

SATURDAY morning, October 30th, was very foggy, especially in London, where it was extremely dense. About 11 a.m., as it seemed to be dissipating somewhat, I decided to go to Upper Norwood. On reaching the higher ground the sun slightly broke through the fog ; and by the time I arrived at the Crystal Palace Parade it was shining on the Palace. On walking along the Parade I was much struck by the unusual appearance of the Crystal Palace, for the large Centre Trancept and the North Tower stood out very much larger and clearer than I had ever seen them before. They seemed to be *very near*, and every part was most *sharply defined*.

I was so much impressed by this peculiar appearance that I retraced my steps along the Parade in order to observe this remarkable phenomenon and to make sure that I had not been deceived

over it. I returned along the Parade about an hour later, when the fog had cleared away from the high ground, and there was a slight wind movement, but the appearance of the Palace was then quite normal.

I suppose this peculiar appearance of *nearness* and *largeness* was due to the increased size of the water particles associated with the fog. The Crystal Palace Parade is about 350 feet above sea level.

WM. MARRIOTT.

Egmont, Dulwich Wood Park, S.E.

At sunset this evening an unusual phenomenon was seen. There was a reddish glow on the top of the low clouds on the western horizon, and this glow was not bright, but dull red and reddish as the cloud extended about 10 degrees above the horizon and was dense and dark. Masses of nimbus were scattered about the sky; but on the east the clouds were much less dense and varied in colour from gray to white, with clear blue sky between and only a very indistinct flocculence visible in some parts. During the day there had been slight passing showers of short duration and it felt somewhat warm and muggy. There was no thunder or lightning. In the east from the horizon to the zenith bright rays of light were observed varying in breadth and brightness; but all these rays were narrowest and densest and most deeply coloured at the horizon, and became much broader and fainter towards the zenith. The sky was of a beautiful blue between the thin clouds hovering about and where it was cloudless. Some of the rays were of a deep red at the horizon and faded off upwards into a pale pink, and some were of a bright deep yellow at the horizon and fading to a much lighter yellowish colour above. Some of the rays were about forty times broader than others, and in the spaces between the coloured rays the beautiful blue sky was seen. The rays spread out fan-like. During this time the sun continued setting without any unusual colouring, but no rays appeared on the western side. The rays and the beautiful colouring in the east continued visible for about fifteen minutes, altering slowly in intensity and beauty.

The Chief Officer was good enough to give me the following information as to the position and hour of the occurrence:—

On 28th September, 1915:—

Sun set 5^h59 at S.

Latitude 13°7'45" N.

Longitude..... 26°11'45" W.

130 miles S.W. of Brava Island (Cape Verde).

About 9 to 10 p.m. there was a sharp shower of rain with diffused lightning in the east, but apparently so far away that no thunder was heard.

W. R. SCROGGIE.

Surgeon.

R.M.S.P. "Demerara," Tropical Atlantic, 28th September, 1915.

ROYAL METEOROLOGICAL SOCIETY.

AN ordinary meeting was held at the Society's rooms on February 16th Major H. G. Lyons, F.R.S., President, in the chair.

Mr. C. E. P. Brooks read a paper on "The Rainfall of Nigeria and the Gold Coast." The region investigated consists of the low-lying coastal area, including the delta of the Niger, and the interior plateau, merging into the desert, and intersected by the valleys of the Niger and Benue rivers. The rainfall data for Nigeria were reduced to a common period of 10 years 1904—1913 and maps were constructed showing the average distribution for each month and for the year. The annual rainfall ranges from about 160 inches on the coast to less than 10 inches on the north of the plateau. The monthly maps showed a minimum in January with a range from about 2 inches on the coast to almost rainless conditions in the north, and a maximum in June with about 28 inches in parts of the coast and less than 2 inches in the extreme north-east. The belt of maximum rainfall advanced inland during the first half of the year reaching its most northerly position in August. In this month there were areas of less than one inch along the south-east Gold Coast and in the south-west of Nigeria. In all the months the effect of the low-lying valleys of the great rivers was apparent in producing a smaller rainfall than the surrounding plateau. A special study of the rainfall and pressure observations taken at Zungeru, in the northern provinces of Nigeria, disclosed a fairly regular progression in the correlation coefficients between those elements, from a high positive value in April to a high negative value in August and back in October. The probable explanation was in the annual migrations of the equatorial belt of low pressure and the tropical "highs," the source of the rainfall of Nigeria being the moist indraught to replace the rising air in regions where the sun's rays fell vertically at noon. Popularly expressed: "the rain followed the sun." The oscillations of the pressure belt, with the consequent variations in the annual rainfall, appeared to be the governing factor of the climate.

Sir Napier Shaw, Mr. Carle Salter, and Mr. W. W. Bryant took part in a discussion as to the probable value of a 10-year period for studying tropical rainfall conditions. The President, Mr. W. B. Tripp and Mr. Barry Band also spoke.

A paper on "South African Coast Temperatures" by Dr. J. R. Sutton, was also read. A study of the mean monthly maximum and minimum temperatures for several stations led to the conclusion that the night temperatures of the coast were determined almost entirely by inland conditions whereas the day temperatures were modified by the sea. An explanation was sought in the lowering of the surface temperature of the sea by the churning effect of the spring gales.

Col. H. E. Rawson gave an account of the general pressure conditions in South Africa and their effect on the temperature.

New fellows elected: Capt. E. H. McLeish and Mr. C. E. Young.

REVIEW.

Temperature Inversions in Relation to Frosts. By ALEXANDER McADIE. Cambridge, U.S.A., 1915. Size, $11\frac{1}{2} \times 10$. Pp. 10. 4 plates.

THIS is a study of the temperature conditions during the occurrence of what is commonly known as "Up-bank thaw," illustrated by several figures showing the thermograph curves at the summit, base, and valley stations during typical cases. It is pointed out that when the air is in motion frost is not so likely as when the air is stagnant, and that "frost is more likely to occur when the upper air is dry than when it is moist." To give more definite information of humidity than that afforded by the instruments in general use, the author has invented a "saturation deficit recorder," which gives a continuous record of the weight of the vapour in grains per unit volume.

A considerable portion of the paper is taken up with the various methods employed in the United States for the protection of plants, etc., from injury by frost. It is pointed out that a rapid rise of temperature may do considerable injury to plant tissue, where no damage was originally done by the low temperature. R.C.M.

METEOROLOGICAL NEWS AND NOTES.

A PRESENTATION TO MR. W. MARRIOTT in commemoration of his long service as assistant secretary of the Royal Meteorological Society, was made at a recent meeting of the Council. It was felt that the circumstances of the time made it inappropriate to approach the fellows of the Society as a whole with the object of raising a more substantial mark of the appreciation in which several generations of Fellows have always held Mr. Marriott as an official, a friend and a fellow worker. Subscriptions were, however, offered by a number of past and present members of the Council of the Society, and the presentation took the form of a silver tea service with appropriate inscription and a typewriter. We feel that it will be a satisfaction to many friends and admirers of Mr. Marriott to know that his long and able services to meteorology and to the Society with which he was so completely identified, did not go without this well-deserved recognition.

MR. TH. HESSELBERG has been appointed Director of the Norwegian Meteorological Institute at Christiania.

ERRATUM. In last month's issue, page 13, the average annual rainfall at Seathwaite should read 129.48 inches, and at Cardiff, 42.28 inches.

RAINFALL TABLE FOR FEBRUARY, 1916.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875— 1909. in.	1916. in.
Camden Square.....	London.....	51 32	0 8	111	1'66	3'46
Tenterden.....	Kent.....	51 4	*0 41	190	1'90	4'90
Arundel (Patching).....	Sussex.....	50 51	0 27	130	2'17	5'29
Fordingbridge (Oaklands)...	Hampshire.....	50 56	1 38	135	2'34	5'27
Oxford (Magdalen College)...	Oxfordshire.....	51 45	1 15	186	1'62	3'60
Wellingborough(Swanspool)...	Northampton.....	52 18	0 41	155	1'70	3'21
Bury St. Edmunds(Westley)...	Suffolk.....	52 15	*0 40	226	1'59	4'34
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	1'41	3'61
Polapit Tamar [Launceston]...	Devon.....	50 40	4 22	315	2'95	7'99
Rousdon [Lyme Regis].....	".....	50 41	3 0	516	2'50	5'84
Stroud (Field Place).....	Gloucestershire..	51 44	2 13	226	2'12	...
Church Stretton (Wolstaston)...	Shropshire.....	52 35	2 48	800	2'17	5'07
Boston.....	Lincolnshire.....	52 58	0 1	11	1'53	3'74
Worksop (Hodsock Priory)...	Nottinghamshire	53 22	1 5	56	1'64	3'65
Mickleover Manor.....	Derbyshire.....	52 54	1 32	280	1'71	4'95
Macclesfield.....	Cheshire.....	53 15	2 7	501	2'30	4'27
Southport (Hesketh Park)...	Lancashire.....	53 39	2 59	38	2'07	2'97
Arneliffe Vicarage.....	Yorkshire, W.R.	54 8	2 6	732	4'88	7'60
Goldsborough Hall.....	".....	54 0	1 25	119	1'75	3'51
Hull (Pearson Park).....	" E.R.	53 45	0 20	6	1'78	3'42
Newcastle (Town Moor) ...	Northumberland	54 59	1 38	201	1'63	2'74
Borrowdale (Seathwaite) ...	Cumberland.....	54 30	3 10	423	10'96	12'68
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	3'07	5'88
Haverfordwest.....	Pembroke.....	51 48	4 58	90	3'42	5'27
Aberystwyth (Gogerddan)...	Cardigan.....	52 26	4 1	83	3'09	4'85
Llandudno.....	Carnarvon.....	53 20	3 50	72	2'11	3'71
Cargen [Dumfries].....	Kirkcudbright...	55 2	3 37	80	3'42	4'51
Marchmont House.....	Berwick.....	55 44	2 24	498	2'15	4'21
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	3'87	4'86
Glasgow (Queen's Park) ...	Renfrew.....	55 53	4 18	144	2'70	4'42
Islay (Eallabus).....	Argyll.....	55 47	6 15	68	3'91	5'66
Mull (Quinish).....	".....	56 34	6 13	35	4'45	5'56
Balquhiddier (Stronvar).....	Perth.....	56 21	4 23	422	6'33	9'77
Dundee (Eastern Necropolis)...	Forfar ..	56 28	2 57	199	1'91	2'26
Braemar.....	Aberdeen.....	57 0	3 24	1114	2'55	5'70
Aberdeen (Cranford).....	".....	57 8	2 7	120	2'36	1'80
Gordon Castle.....	Moray.....	57 37	3 5	107	1'95	2'57
Drumnadrochit.....	E. Inverness ...	57 20	4 29	138	2'89	6'16
Fort William ..	".....	56 49	5 6	171	6'85	10'44
Loch Torridon (Bendamph)...	W. Ross.....	57 32	5 32	20	7'53	10'50
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	2'58	3'14
Killarney (District Asylum)...	Kerry.....	52 4	9 31	178	4'99	7'51
Waterford (Brook Lodge)...	Waterford.....	52 15	7 7	104	3'18	4'64
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	2'89	5'54
Ennistymon House.....	Clare.....	52 57	9 18	37	3'44	6'15
Gorey (Courtown House) ..	Wexford.....	52 40	6 13	80	2'75	4'67
Abbey Leix (Blandsfort)....	Queen's County..	52 56	7 17	532	2'55	4'36
Dublin (Fitz William Square)...	Dublin.....	53 21	6 14	54	1'93	3'56
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	2'67	4'29
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 16	74	4'20	7'10
Cong (The Glebe).....	".....	53 33	9 16	112	3'72	5'62
Collooney (Markree Obsy.)...	Sligo.....	54 11	8 27	127	3'20	4'62
Seaforde.....	Down.....	54 19	5 50	180	2'81	3'57
Ballymena (Harryville).....	Antrim.....	54 52	6 13	150	2'99	4'62
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	2'68	4'16

RAINFALL TABLE FOR FEBRUARY, 1916—*continued.*

RAINFALL OF MONTH (<i>con.</i>)					RAINFALL FROM JAN. 1.				Mean Annual 1875- 1909.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.		No. of Days	Aver. 1875- 1909. in.	1916. in.	Diff. from Aver. in.	% of Av.		
		in.	Date.							in.
+1.80	208	.50	25	21	3.49	4.76	+1.27	136	25.11	Camden Square
+3.00	258	.75	28	23	4.04	6.05	+2.01	150	27.64	Tenterden
+3.12	244	.70	10	21	4.76	6.76	+2.00	142	30.48	Patching
+2.93	225	1.34	3	27	5.01	6.76	+1.75	132	31.06	Fordingbridge
+1.98	222	.67	3	19	3.40	4.97	+1.57	146	24.58	Oxford
+1.51	189	.46	14	22	3.60	4.79	+1.19	133	25.20	Swanspool
+2.75	273	.68	23	24	3.29	5.83	+2.54	177	25.40	Westley
+2.20	256	.56	11	23	2.94	5.11	+2.17	174	23.73	Geldeston
+5.04	271	1.62	3	24	6.54	10.06	+3.52	155	38.27	Polapit Tamar
+3.34	234	1.03	3	25	5.44	6.82	+1.38	125	33.54	Rousdon
...	...	...	...	...	4.45	...	...	...	29.81	Stroud
+2.90	234	.78	3	25	4.68	6.46	+1.78	138	32.41	Wolstaston
+2.21	244	.58	24	21	3.07	4.79	+1.72	156	23.35	Boston
+2.01	223	.49	11	20	3.34	4.09	+ .75	122	24.46	Hodsock Priory
+3.24	289	1.25	24	24	3.66	6.61	+2.95	181	26.65	Mickleover
+1.97	186	.70	6	24	4.96	5.91	+ .95	119	34.73	Macclesfield
+ .90	144	.41	10	21	4.62	4.28	— .34	93	32.70	Southport
+2.72	156	.90	15	25	11.14	15.14	+4.00	136	61.49	Arneliffe
+1.76	201	.48	11	23	3.66	4.52	+ .86	123	27.29	Goldsborough Hall
+1.64	192	.41	11	22	3.48	4.01	+ .53	115	26.42	Hull
+1.11	168	.36	27	22	3.53	3.78	+ .25	107	27.94	Newcastle
+1.72	116	2.00	6	19	24.40	35.48	+11.08	145	129.48	Seathwaite
+2.81	191	.67	15	29	6.72	9.38	+2.66	140	42.28	Cardiff
+1.85	154	.88	3	23	8.11	8.36	+ .25	103	46.81	Haverfordwest
+1.76	157	.49	4	22	7.00	8.16	+1.16	117	45.46	Gogerddan
+1.60	176	.57	5	23	4.62	6.21	+1.59	134	30.36	Llandudno
+1.09	132	.67	3	21	7.52	11.19	+3.67	149	43.47	Cargen
+2.06	196	.75	18	24	4.55	6.45	+1.90	142	33.76	Marchmont
+ .99	126	1.40	4	18	8.65	11.29	+2.64	131	49.77	Girvan
+1.72	164	.61	12	22	6.23	9.60	+3.37	154	35.97	Glasgow
+1.75	145	.58	17	24	8.69	11.37	+2.68	131	48.79	Eallabus
+1.11	125	1.13	3	19	10.00	11.45	+1.45	115	56.57	Quinish
+3.44	154	1.53	3	21	15.07	24.56	+9.49	163	73.77	Stronvar
+ .35	118	.40	6	22	3.92	4.10	+ .18	105	28.64	Dundee
+3.15	224	1.06	3	21	5.47	10.09	+4.62	185	34.93	Braemar
— .56	76	.42	15	20	4.72	2.71	—2.01	57	32.73	Aberdeen
+ .62	132	.63	15	23	3.94	4.66	+ .72	118	30.34	Gordon Castle
+3.27	213	.67	12	25	6.52	13.26	+6.74	203	36.13	Drumnadrochit
+3.59	152	1.73	3	21	16.05	25.63	+9.58	159	75.80	Fort William
+2.97	139	1.24	3	20	16.95	27.25	+10.30	161	83.93	Bendamph
+ .56	122	.90	6	15	5.33	8.28	+2.95	155	31.90	Dunrobin Castle
+2.52	150	1.07	2	26	10.93	11.66	+ .73	107	54.81	Killarney
+1.46	146	.58	14	24	6.96	6.53	— .43	94	39.57	Waterford
+2.65	192	.75	15	25	6.77	8.82	+2.05	130	39.43	Castle Lough
+2.71	179	.74	3	23	7.74	10.28	+2.54	133	46.52	Ennistymon
+1.92	170	.80	3	22	5.94	6.14	+ .20	103	34.99	Courtown Ho.
+1.81	171	.66	15	26	5.70	6.38	+ .68	112	35.92	Abbey Leix
+1.63	184	.45	29	26	4.07	4.96	+ .89	122	27.68	Dublin
+1.62	161	.75	3	25	5.77	7.80	+2.03	135	36.15	Mullingar.
+2.90	169	.71	2	23	9.55	12.75	+3.20	134	52.87	Enniscoe
+1.90	151	1.11	14	20	8.51	11.00	+2.49	129	48.90	Cong
+1.42	144	.60	3	20	7.07	8.33	+1.26	118	42.71	Markree
+ .76	127	.57	29	22	6.22	5.87	— .35	94	38.91	Seaforde
+1.63	154	.45	7	23	6.72	7.88	+1.16	117	40.84	Ballymena
+1.48	155	.68	15	23	6.14	7.88	+1.74	128	39.38	Omagh

SUPPLEMENTARY RAINFALL, FEBRUARY, 1916.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road .	5·76	XI.	Lligwy	3·99
„	Ramsgate	3·60	„	Douglas	3·28
„	Hailsham	5·17	XII.	Stoneykirk, Ardwell House...	2·99
„	Totland Bay, Aston House...	4·55	„	Carsphairn Shiel	8·00
„	Stockbridge, Ashley..	6·01	„	Beattock, Kinnelhead	5·50
„	Grayshott	5·98	„	Langholm, Drove Road	4·38
III.	Harrow Weald, Hill House...	4·09	XIII.	Selkirk, The Hangingshaw..	4·83
„	Pitsford, Sedgebrook.....	3·97	„	North Berwick Reservoir...	2·76
„	Woburn, Milton Bryant.....	4·24	„	Edinburgh, Royal Observat'y.	3·21
„	Chatteris, The Priory.....	3·15	XIV.	Maybole, Knockdon Farm ...	3·76
IV.	Elsenham, Gaunts End	3·54	XV.	Buchlyvie, The Manse	5·55
„	Shoeburyness	2·86	„	Ballachulish House	11·96
„	Colchester, Hill Ho., Lexden	3·76	„	Oban.....	6·04
„	Ipswich, Rookwood, Copdock	3·85	„	Campbeltown, Witchburn ..	5·05
„	Aylsham, Rippon Hall	3·97	„	Holy Loch, Ardnadam.....	12·15
„	Swaffham	3·83	„	Tiree, Cornaigmore	4·79
V.	Bishops Cannings	4·37	XVI.	Dollar Academy	4·78
„	Wimborne, St. John's Hill ...	6·06	„	Glenlyon, Meggernie Castle..	10·09
„	Ashburton, Druid House.. ..	9·95	„	Blair Atholl	4·49
„	Cullompton	6·88	„	Coupar Angus	2·95
„	Lynmouth, Rock House	8·20	„	Montrose, Sunnyside Asylum.	2·21
„	Okehampton, Oaklands.. ..	8·58	XVII.	Alford, Lynturk Manse	2·60
„	Hartland Abbey.....	7·04	„	Fyvie Castle	2·36
„	Probus, Lamellyn.....	4·44	„	Keith Station	1·62
„	North Cadbury Rectory.....	5·88	XVIII.	Rothiemurchus	6·76
VI.	Clifton, Stoke Bishop	5·41	„	Loch Quoich, Loan	17·95
„	Ledbury Underdown.....	4·40	„	Skye, Dunvegan	7·75
„	Shifnal, Hatton Grange.....	4·39	„	Lochmaddy, Bayhead	2·60
„	Droitwich.....	3·58	„	Fortrose.....	3·02
„	Blockley, Upton Wold.....	5·01	„	Glencarron Lodge	7·11
VII.	Market Overton.....	5·79	XIX.	Altnaharra	5·31
„	Market Rasen	3·69	„	Melvich	3·00
„	Bawtry, Hesley Hall	3·36	„	Loch More, Achfary	7·53
„	Derby, Midland Railway.....	4·59	XX.	Dunmanway, The Rectory ..	7·39
„	Buxton	6·57	„	Glanmire, Lota Lodge.....	4·37
VIII.	Nantwich, Dorfold Hall	3·37	„	Mitchelstown Castle.....	4·86
„	Chatburn, Middlewood	4·40	„	Darrynane Abbey.....	6·76
„	Lancaster, Strathspey	3·35	„	Clonmel, Bruce Villa	3·79
IX.	Langsett Moor, Up. Midhope	5·92	„	Newmarket-on-Fergus, Fenloe	...
„	Scarborough, Scalby	3·53	XXI.	Enniscorthy, Ballyhyland...	5·96
„	Ingleby Greenhow	3·58	„	Rothnen, Clonmannon	3·51
„	Mickleton	4·80	„	Ballycumber, Moorock Lodge	3·24
X.	Bellingham, High Green Manor	4·19	„	Balbriggan, Ardgillan	2·83
„	Ilderton, Lilburn Cottage ...	3·13	„	Castle Forbes Gardens.....	3·48
„	Thirlmere, The Bank	6·08	XXII.	Ballynahinch Castle.....	6·62
XI.	Llanfrechfa Grange	5·43	„	Woodlawn	3·80
„	Treherbert, Tyn-y-waun	13·01	„	Westport, St. Helens ...	6·12
„	Carmarthen, The Friary	5·02	„	Dugort, Slievemore Hotel ...	7·17
„	Fishguard, Goodwick Station.	3·70	XXIII.	Enniskillen, Portora	4·93
„	Crickhowell, Tal-y-maes.....	6·50	„	Dartrey [Cootehill]	3·47
„	New Radnor, Ednol	7·55	„	Warrenpoint, Manor House ..	3·21
„	Birmingham WW., Tyrmynydd	8·74	„	Belfast, Cave Hill Road	4·09
„	Lake Vyrnwy	6·90	„	Glenarme Castle.....	6·04
„	Llangynhafal, Plâs Drâw.....	4·12	„	Londonderry, Creggan Res...	4·87
„	Dolgelly, Bryntirion.....	5·55	„	Dunfanaghy, Horn Head ...	5·42
„	Bettws-y-Coed, Tyn-y-bryn...	7·02	„	Killybegs	6·31

THE WEATHER OF FEBRUARY.

THE peculiar pressure conditions which characterized January continued in the early days of February, the barometer being high in the south-west of Europe, whilst low pressure systems passed eastwards to the north of the British Isles. In these circumstances the wind blew uninterruptedly from a westerly quarter and the temperature remained high for the time of year. There was a considerable amount of sunshine, especially in the north, but rain was frequent, and on the 3rd more than an inch of rain fell over a large area in the west, accompanied by a south-westerly gale. After about the 8th, pressure conditions became somewhat modified and with lower barometer readings over England the wind shifted intermittently into the north or north-west, and the temperature fell to the normal. The weather continued sunny, especially in England, but precipitation occurred almost daily in all parts of the country, taking the form of snow in the north generally. In the west of Scotland there were winter thunderstorms on several days. About the 12th the westerly type of weather conditions again set in, and the weather was on the whole sunny in the south, where the temperature rather high, though it was normal elsewhere. On the 14th, however, these conditions were temporarily interrupted by the passage of a small secondary disturbance which brought heavy rain and snow in some parts of England. On the 22nd a well-marked high pressure system developed to the north-west of the British Isles, and the wind blew from the north, veering to north-east as the anticyclone spread eastwards. The weather in the north of Scotland under the influence of this anticyclone, though cold, was sunny and dry until the end of the month, but in England gloomy sunless conditions prevailed with low temperature and frequent heavy snow. Over a large part of the country snow lay on the ground continuously from the 22nd well into March, an extremely unusual phenomenon in the south of England so late in the season. The storms were probably most severe in the Black Mountains in Breconshire, where it is estimated that the aggregate depth of snow-fall from the 22nd to the end of the month reached five feet. Over the Cotteswolds and in the Midlands considerable drifting occurred. The total rainfall during the month was most excessive in the south-east of the country generally, more than twice the average falling everywhere south-east of a line drawn from Hull to Cardiff. A small area in Scotland extending from Braemar to Inverness also had about double the average. On the other hand the extreme north-east of Scotland was comparatively dry. The remainder of the country had a fairly uniform excess of about 50 per cent. The general rainfall of the larger divisions of the United Kingdom, expressed as a percentage of the average, was, England and Wales, 193 per cent.; Scotland, 150 per cent.; Ireland, 160 per cent.; British Isles, 170 per cent. Only a very narrow strip of the east coast and a small part of the Cheshire plain had less than 3 in. of rain during the month. More than 5 inches fell over the western and central parts of Scotland, the whole of the Pennines and practically the whole of Wales and the southern counties of England, while more than 8 inches fell over extensive areas in the more elevated districts of the west. In Ireland more than 5 inches fell everywhere in the west and rather less than 3 inches on part of the east coast.

The duration of bright sunshine was :—Camden Square, 65 hours; Totland Bay, 80 hours; Felstead, 83 hours; Ipswich, 67 hours; Weymouth, 77 hours; Sidmouth, 81 hours; Ilfracombe, 60 hours; Matlock, 58 hours; Bolton, 36 hours; Southport, 76 hours; Hull, 45 hours; Haverfordwest, 77 hours; Swinton (Berwickshire), 67 hours; Paisley, 53 hours; Perth, 79 hours.

In London (Camden Square) the mean temperature of the month was $39^{\circ} \cdot 7$, or exactly the average. The duration of rainfall was 90·9 hours, being 51·9 hours above the average of the previous 35 years, and the greatest duration recorded in February since records commenced in 1881.

Climatological Table for the British Empire, September, 1915.

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.										
	80°0	16	35°6	30	69°2	49°9	51°0	0-100	80	128°8	31°9	1°86	5	4·2
London, Camden Square	80°0	16	35°6	30	69°2	49°9	51°0	0-100	80	128°8	31°9	1°86	5	4·2
Malta	89·2	1	64·0	16	78·2	66·8	...	77	138·0	...	2·16	5	0·9	
Lagos	94·0	25	70·0	15	84·4	74·5	73·5	82	154·0	67·0	10·34	24	8·6	
Cape Town	82·2	13	41·8	10	65·0	49·5	54·1	73	...	...	2·55	16	7·2
Natal, Durban ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Johannesburg	77·8	21	29·4	12	68·1	48·0	37·4	58	...	28·0	1°65	4	4·1	
Mauritius	81·0	25	56·7	19	77·5	62·6	59·1	70	...	47·7	1°06	12	5·2	
Bloemfontein	82·4	18	28·7	12	73·4	40·1	40·3	55	...	...	·94	3	4·9
Calcutta... ..	92·3	2	73·8	26	88·8	77·8	77·1	84	...	63·9	10·45	16	7·4	
Bombay... ..	87·5	20	75·4	9	85·5	77·4	76·3	85	133·2	62·1	10·21	14	6·7	
Madras	101·3	10	72·8	17	92·9	77·4	73·8	76	163·5	71·6	10·43	14	6·1	
Colombo, Ceylon	87·1	14	71·6	21	85·0	75·4	74·0	85	161·3	68·8	7·18	26	7·4	
Hongkong	90·0	2	67·6	26	85·4	76·9	72·4	75	...	...	5·72	10	5·2
Sydney	84·0	4	43·9	1	70·8	52·6	45·1	54	135·3	34·4	1·44	12	2·7	
Melbourne	74·1	23	39·9	10	64·3	47·7	44·0	62	127·4	31·8	2·19	18	5·3	
Adelaide	81·1	25	43·6	27	66·0	49·4	47·4	68	133·5	38·1	3·57	20	5·0	
Perth	65·9	11	40·8	18	62·3	51·0	48·9	75	141·4	34·9	4·72	26	7·2	
Coolgardie	90·4	28	35·6	10	68·3	44·4	39·9	48	142·0	32·2	·29	5	2·9	
Hobart, Tasmania ..	74·1	25	34·9	11	59·6	44·1	39·2	58	128·0	26·2	1·27	16	6·2	
Wellington	68·8	28	34·8	8	57·3	45·4	47·2	77	127·8	24·2	1·62	12	7·2	
Auckland	70·0	16	43·5	3	62·6	52·1	51·6	76	132·0	38·0	5·32	20	6·4	
Jamaica, Kingston ..	93·0	23	71·6	2	88·7	74·2	72·4	82	...	...	11·90	9	5·9
Grenada	90·0	27	70·0	3	86·0	75·0	...	79	137·0	...	5·72	19	3·5	
Toronto	87·3	14*	31·4	28	72·9	53·7	55·1	83	139·8	28·8	4·24	12	4·0	
Fredericton	82·0	10	30·0	26	68·5	46·7	50·8	78	...	...	2·93	6	4·9
St. John, N.B.	79·3	11	37·0	26	64·5	49·6	55·6	75	...	...	2·61	7	4·9
Alberta, Edmonton ...	76·6	3	20·8	12	59·5	37·9	...	72	136·0	12·0	1·14	11	6·2	
Victoria, B.C.	72·8	20	44·8	28	63·5	49·6	49·0	80	137·0	36·0	·80	6	4·3	

* and 15

MALTA.—Thunderstorm on the 11th and 12th.

Johannesburg.—Bright sunshine 263·5 hours.

Mauritius.—Mean temp. normal and R ·47 in. below average.

Bloemfontein.—A windy month.

COLOMBO, CEYLON.—Mean temp. 80°·2 or 0°·8 below, dew point 0°·4 above, and R 3·14 in. above, averages.

HONGKONG.—Mean temp. 80°·9, mean hourly velocity of wind, 10·7 miles. Bright sunshine 234·2 hours.

Melbourne.—Mean temp. 2°·0 above, and R ·12 in. below, averages.

Adelaide.—Mean temp. 0°·7 above and R 1·63 in. above, averages. Lowest mean pressure for any month for last 58 years. Gales on 13 days, a record.

Coolgardie.—Temp. 2°·2 below and R nearly half an inch below, averages.

Hobart.—Mean temp. 1°·0 above, and R ·85 in below, averages.

Wellington.—Mean temp. 3°·0 above and R 2·62 in. below average. Bright sunshine 156·8 hours.

Auckland.—Wet warm and cloudy; mean temp. 2°·5 above, and R nearly two inches above, averages.

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VOL. LI.

METEOROLOGICAL OBSERVATIONS AT LU-KIA-PANG, CHINA, for 1914.

By REV. J. DE MOIDREY, S.J.

THE Lu-kia-pang Observatory is primarily intended for magnetic work and is the only one in China at which continuous automatic records are kept. This work had been carried on at Zi-ka-wei, near Shanghai, since 1877, or even since 1874, but the installation of electric tramways made it necessary to select a new site in 1908. Lu-kia-pang was chosen, 40 kilometres distant and halfway between Shanghai and Soochow, in the great, richly-watered and fertile plain of the lower Yang-tse river. The altitude is about 3 metres, the latitude $31^{\circ} 19' N.$, and the longitude $121^{\circ} 2' 26'' E.$, these data being obtained by triangulation.

There is in connection with the Observatory a second order meteorological station equipped with the following instruments: a standard mercury barometer and Richard barograph; a Fuess psychrometer, maximum and minimum thermometers and, in the same screen, a thermograph and hygrograph; a rain gauge; a wind-vane on a mast 18 metres high; an anemometer with telephonic connections; a sunshine recorder of our own make, giving a double trace on one cylinder on the scale of 30 mm. to an hour. There is also a small equatorial telescope for observing sun-spots. The time is obtained each day from Zi-ka-wei by telephone.

Observations are made daily at 8 a.m., 2 p.m. and 8 p.m. Empirical corrections are used to give the daily mean values, which are more accurate than the mean of the three observations.

An annual summary is published in our bulletin, and until 1913 it appeared also in the *Meteorologische Zeitschrift*. An abbreviated summary is also included in our 1914 annual, page 67.

We now send the observations for 1914 and 1915. The pressure records are given in millibars, but the temperature is expressed in degrees centigrade, not in degrees absolute. The hours of maximum and minimum temperatures, but not the values themselves, are taken from the Richard thermograph charts. They may be a few minutes late on account of the sluggishness of the instrument.

1914.

I.—Barometric Pressure. Millibars.

	8 a.m.	2 p.m.	8 p.m.	Daily Mean
Jan.	1026·6	1024·3	1025·9	1025·8
Feb.	1023·7	1022·3	1023·9	1023·4
Mar.	1019·1	1017·6	1018·0	1018·2
April	1015·7	1013·9	1015·1	1014·8
May	1013·2	1011·8	1012·4	1012·4
June	1005·9	1004·8	1005·2	1005·2
July	1003·4	1002·3	1002·7	1002·7
Aug.	1005·7	1004·5	1005·2	1005·0
Sept.	1012·1	1010·9	1012·1	1011·6
Oct.	1020·3	1019·5	1020·0	1019·5
Nov.	1023·2	1021·2	1022·6	1022·2
Dec.	1025·9	1024·1	1025·5	1025·1
Year	1016·2	1014·7	1015·7	1016·5

IV.

Mean amount of
Cloud at 8 a.m.,
2 p.m. & 8 p.m.

Jan. 3·8
Feb. 7·3
Mar. 7·1
April 6·6
May 7·7
June 7·6
July 4·3
Aug. 6·0
Sept. 6·2
Oct. 7·0
Nov. 5·3
Dec. 5·1
Year 6·2

V.

Days with
Thunder-
storms.

Jan. 0
Feb. 1
Mar. 0
April 4
May 2
June 2
July 3
Aug. 7
Sept. 1
Oct. 3
Nov. 2
Dec. 0
Year 25

1914.

II.—Temperature. Degrees Centigrade.

MEAN DAILY.

MINIMUM.

	Mean.	Lowest.	Highest.	Mean.	Hour. A.M. hr. min.	Lowest.	Highest.
Jan.	4·8	—3·3 ^a	13·4	—0·5	5 18	—7·2 ^c	8·9
Feb.	6·0	—0·2	15·2	2·9	4 58	—3·6	10·2
Mar.	9·7	2·8	17·3	5·9	4 45	—0·1	12·7
April	13·3	4·0	19·8	9·4	4 2	1·2	17·0
May	18·1	12·4	23·7	14·3	3 55	6·5	20·6
June	24·4	20·3	29·7	20·7	4 36	13·7	25·9
July	29·3	27·3	32·0 ^b	25·7	4 50	24·3	27·2 ^d
Aug.	27·0	24·0	30·9	23·8	3 47	20·9	26·7
Sept.	22·6	18·1	27·6	19·6	4 2	14·7	24·7
Oct.	18·1	13·4	21·7	14·6	3 12	9·8	20·0
Nov.	12·1	4·7	22·1	8·3	4 34	0·6	19·3
Dec.	6·1	1·4	12·7	2·7	4 25	—2·4	8·9
Year	16·0	—3·3	32·0	12·3	4 22	—7·2	27·2

Latest frost, March 14th; earliest, December 13th.

II.—(con)

MAXIMUM.

RANGE.

	Mean.	Hour. P.M. hr. min.	Lowest.	Highest.	Mean.	Lowest.	Highest.
Jan.	11·3	1 48	1·8 ^e	21·7	11·8	4·3	16·6
Feb.	10·2	1 52	2·3	18·6	7·1	0·3 ^g	16·2
Mar.	14·4	2 26	5·8	24·2	8·6	0·8	17·6
April	18·1	1 46	6·0	25·8	8·7	0·9	14·7
May	29·0	1 48	14·4	29·8	8·7	2·3	13·7
June	29·0	2 32	21·7	34·7	8·3	2·4	15·3
July	34·0	2 13	30·2	37·8 ^f	8·3	4·9	11·2
Aug.	31·7	2 8	26·7	35·8	7·9	4·5	9·9
Sept.	26·7	1 44	19·2	33·0	7·1	1·0	14·2
Oct.	23·0	0 43	17·4	27·8	8·4	1·5	15·8
Nov.	17·1	0 53	8·4	27·4	8·8	0·9	13·7
Dec.	10·6	1 30	5·4	19·4	7·8	1·1	14·3
Year	20·8	1 47	1·8	37·8	8·5	0·3	17·6 ^h

^a Jan. 8. ^b July 21. ^c Jan. 8. ^d July 23. ^e Jan. 7 & 8. ^f July 21. ^g Feb. 20. ^h Mar. 21.

The highest reading in each column is in heavy type, the lowest in italic.

1914.

III.—Relative Humidity. Per cent.

	RELATIVE HUMIDITY.			VAPOUR TENSION.		
	Mean.	Lowest.	Highest.	Mean.	Lowest.	Highest.
Jan.	67	31	88	4.6	2.1	8.9
Feb.	79	58	98	5.8	3.5	13.11
Mar.	78	57	97	7.5	4.1	11.8
April	79	58	96	9.9	4.7	16.3
May	77	47	93	12.7	7.1	19.1
June	79	56	96	18.8	11.3	25.3
July	78	69	84	21.7	22.2	23.9
Aug.	83	66	89	23.0	19.2	25.4
Sept.	86	75	93	18.0	12.8	25.4
Oct.	82	64	98	13.2	7.4	17.8
Nov.	75	59	94	8.5	3.9	16.1
Dec.	73	57	94	5.3	3.3	8.0
Year	78.0	31	99	12.7	2.1	28.9

1914.

VI.—Rainfall.

	(a). INTENSITY. Days with								DAYS WITH		
	mm. 0.1—0.9	1.0—2.9	3.0—4.9	5.0—9.9	10.0—19.9	20.0—39.9	40.0—59.9	60.0 & over	Rain.	Snow.	Total.
Jan.	3	1	—	—	—	—	—	—	4	0	4
Feb.	1	2	2	1	3	1	—	—	10	2	12
Mar.	3	6	1	1	2	1	—	—	14	—	14
April	6	1	1	1	5	1	—	—	15	—	15
May	3	5	3	4	0	1	—	—	16	—	16
June	1	4	2	2	3	0	1	—	13	—	13
July	3	0	0	1	1	0	0	—	5	—	5
Aug.	1	3	0	1	1	2	0	1	9	—	9
Sept.	8	3	1	3	1	2	0	—	18	—	18
Oct.	4	4	2	4	0	1	1	—	16	—	16
Nov.	3	0	0	1	0	1	1	—	6	0	6
Dec.	4	0	2	2	—	—	—	—	8	0	8
Year	40	29	14	21	16	10	3	1	134	2	136

VI.

VI.

(b). Total Rainfall. Millimetres.

(c). Rainless Periods of 10 days or more excluding drizzle.

	8 p.m. —8 a.m.	8 a.m. —8 p.m.	Total.	Began.	Ended.	Lasted.
Jan. ..	1.1	3.6	4.7	Dec. 26, 1913	Jan. 12, 1914	18 dys.
Feb. ..	43.9	47.8	91.7	Aug. 13, 1914	Aug. 24, 1914	11 "
Mar. ..	43.2	29.5	72.7	Nov. 20, 1914	Dec. 1, 1914	11 "
April ..	42.8	66.9	109.7	Dec. 11, 1914	Dec. 20, 1914	10 "
May ..	55.0	28.0	83.0	Dec. 23, 1914	Jan. 3, 1915	12 "
June ..	77.7	56.8	134.5			
July ..	0.7	22.5	23.2			
Aug. ..	115.4	35.8	151.2			
Sept. ..	42.9	63.8	106.7			
Oct. ..	80.8	27.4	108.2			
Nov. ..	69.0	7.3	76.3			
Dec. ..	16.4	6.9	23.3			
Year ..	588.9	396.3	985.2			

1914.

VIII.

Mean Duration of Bright Sunshine.
Hours.

	Fore-noon.	After-noon.	Total.	Per-centage of possible.	Mean amount of Coud.
Jan. ..	2.9	2.7	5.6	54	4.6
Feb. ..	1.7	1.7	3.4	31	6.9
Mar. ..	2.2	2.3	4.5	38	6.2
April ..	2.9	2.8	5.7	44	5.6
May ..	2.3	2.5	4.8	35	6.5
June ..	3.0	3.1	6.1	43	5.7
July ..	5.5	5.4	10.9	78	2.2
Aug. ..	4.5	4.7	9.2	69	3.1
Sept. ..	2.9	2.8	5.7	46	5.4
Oct. ..	2.2	2.0	4.2	37	6.3
Nov. ..	2.6	2.5	5.1	48	5.2
Dec. ..	2.8	3.1	5.9	58	4.2
Year ..	2.9	3.0	5.9	48	5.2

VII.—Wind. (a).

Mean Velocity at 8 a.m., 2 p.m. and 8 p.m. Metres per second.

	Min.	Max.	Mean.
Jan. ..	1.6	7.9	3.4
Feb. ..	0.7	8.4	4.2
Mar. ..	1.2	8.9	3.8
April ..	1.5	7.2	4.1
May ..	0.3	6.1	3.2
June ..	1.4	6.1	3.6
July ..	1.3	11.6	4.4
Aug. ..	2.4	6.0	4.0
Sept. ..	1.5	7.1	4.1
Oct. ..	1.1	5.1	2.5
Nov. ..	1.5	8.0	3.5
Dec. ..	1.0	6.3	3.7
Year ..	0.3	11.6	3.7

The amount of cloud refers to the whole day, excluding the night. Table IV. is limited to the three hours of observation, 8 a.m., 2 p.m. and 8 p.m.

VII. Wind (b).—Direction. Percentage Frequency.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.	Vari-able.
Jan.	7	14	9	16	10	10	13	19	2	0
Feb.	11	21	13	15	4	1	5	25	0	5
Mar.	14	23	7	28	8	4	7	6	3	0
April	15	13	9	24	2	8	10	16	0	3
May	13	24	14	24	7	5	1	9	3	0
June	3	11	13	33	19	18	1	1	1	0
July	4	4	13	44	15	10	1	8	1	0
Aug.	9	8	20	34	7	12	4	6	0	0
Sept.	22	23	16	16	3	4	1	15	0	0
Oct.	12	17	13	18	2	8	9	21	0	0
Nov.	17	15	6	19	10	6	4	23	0	0
Dec.	26	16	2	7	8	10	8	23	0	0
Year	13	16	11	23	8	8	5	14	1	1

(To be continued.)

METEOROLOGICAL NEWS.

THE DEATH OF MR. E. E. GLYDE at Edmonton, Alberta, will be learned with regret by our readers. Mr. Glyde was for many years one of the most indefatigable of meteorological observers. His observations commenced in 1870, in London, but were for the most part carried on in Devonshire at Torquay and Tavistock. He left England in 1911 and since that time has contributed records from Northern Canada to the Climatological Tables for the British Empire which are published in each number of this magazine. He was an example of the best type of ardent amateur, an enthusiastic and persevering Observer and a most helpful collaborator in all investigations on which his work could throw light.

THE GREAT SNOWSTORMS OF 1916.

By L. C. W. BONACINA.

IN default of complete data based upon an organized system of snowfall observation in the British Islands, it is not possible to produce a map, or even a table of statistics, which would give a precise idea of the distribution of the heavy snowfalls of February and March; but from a mass of correspondence and newspaper material sent in to the British Rainfall Organization, I am able to furnish a few particulars regarding the local intensity and other aspects of the snowfall during the two months.

During the first three weeks of February the persistent south-westerly wind, which had brought such warmth in January without, in Eastern Britain, the storms and floods which are the common accompaniment of Atlantic warmth in winter, began to alternate rapidly with cold winds from the west and north-west, and it was during the temporary predominance of these latter that the first snow blizzards began to encroach upon these islands in a series, as it were, of advance-guards, which brought some heavy local falls more especially in Ireland and Scotland. So far as one can gather from the limited information to hand, there does not appear to have been anything abnormal about the snowfall in the Scottish Highlands, and it, therefore, need not be regarded otherwise than as an ordinary seasonal incident in a part of the country whose wild mountain glens and passes are liable in winter and spring, to be choked up with snow, for many weeks together. But about the 21st of February the wind shifted definitely to points between east and north, remaining in that quarter for some six weeks, and then began the great series of severe snowstorms which mainly affected England, Wales and the extreme south of Scotland. The snowfalls began only in the southern half of England at the date mentioned, but by the commencement of March had extended to the northern counties, and with the exception of a brief respite, in the south about February 29th, the snow spell persisted definitely till about March 12th. A rise of temperature after this date sufficed to change the precipitation to a cold rain, except in the uplands, and the rainy weather continued with obstinately leaden skies till about March 22nd, when there was a reversion, in the manner quite characteristic of the month of March, to snow, which culminated in the destructive storm of the 28th, whereby vast numbers of beautiful elm trees in the southern and midland counties were uprooted, and railway traffic hopelessly dislocated on the Midland, London and North-Western and Great Western Companies' lines, in consequence of snow-drifts and the wreckage of fallen telegraph poles. As the snowfall was general throughout England and Wales it is not surprising to find that its intensity was greatest in the hill districts, and I have little doubt that if a map showing the

aggregate depth of snow for the period could be constructed it would exhibit a close relationship to the vertical relief of the land. From the Peak, the Cotteswolds and Exmoor come the same extraordinary reports of snow-bound villages, isolated farms and sheep buried beneath gigantic drifts estimated in some cases as forty feet deep; and I may here add a few notes concerning particular districts.

The North of England and South of Scotland.—The severity of the blizzards in the Pennine Range may be gauged by the almost complete cessation of traffic throughout March on the High Peak railway, and on the line connecting Kirkby Stephen in Westmorland with Barnard Castle in Durham, which climbs to a height of 1,300 feet. In the Southern Uplands of Scotland the intensity of the weather was probably very similar, and early in March the snow in Berwickshire was reported to be lying over six feet deep in certain districts. I see no good reason to doubt the report as an approximation, and in view of the repeated heavy falls which, in a county like Berwick, may each be trusted to have deposited anything between six inches and a foot of snow, there is no escape from the conclusion that the *aggregate* depth in this part of the country was at least six feet, and that the *actual accumulated* depth of undrifted snow may well have approached this order of magnitude in the absence of the intermediate thaws which occurred in the south of England.

Wales.—There seems little doubt that in the high Cambrian ranges the snow at times lay feet deep; and we are fortunate in the correspondence from Mr. Gethin Jones, who estimates the aggregate depth of snow in the Black Mountains during February and March as some 10 feet. Perhaps Mr. Gethin Jones will give us further information as to what depth the snow actually accumulated at various levels in the Black Mountains, and also the date when the last traces of the snow will disappear. His letter in the March number refers to an aggregate depth of 8 feet in less than three weeks, and it is very doubtful if snowfall of this intensity is *normally* exceeded in any part of the world, even in the far-famed Rockies, where the annual aggregate of snowfall is said to range from 20 feet to 30 feet, and where the perennial accumulations give rise to great glaciers as in other high mountain systems.

The West of England.—The West Country newspapers report heavy falls of snow in Somerset, Devon and Cornwall, but state that the experiences of March, 1891, had not in general been repeated. On the whole Exmoor appears to have suffered even more than Dartmoor, and the stories relating to the tunnelling of huge drifts for buried sheep recall to mind the type of storm fixed in literature by Blackmore in the well-known romance of "Lorna Doone," and by the Rev. S. Baring-Gould in "Dartmoor Idylls," the latter perpetuating the blizzard of 1891.

The Midlands and South of England.—Various reports are at hand respecting the snowing up of farms and villages in Warwickshire and Staffordshire, and of the blocking up of roads in Hampshire and Berkshire. In the London district and over much of the south of England a succession of 4-inch snowfalls brings the aggregate up to the neighbourhood of two feet, but as there was a complete absence of hard frost, and as there were marked thaws between the storms the actual accumulated depth was never very great. In the London Squares there were missing the great banks of piled up snow which were so conspicuous in the previous heavy falls early in March, 1909, when the cold was much more severe than in 1916.

As a result of careful recollection of snow year by year, I can assert positively that taking the United Kingdom as a whole and leaving individual local snowstorms out of account, the snow spell of the present year was the greatest the country has suffered since the first half of February in 1900. In "British Rainfall," for that year, the quantity of snow is described as "unprecedented"; and as very low temperatures occurred during that period it was a peculiarly impressive example of the genuine Arctic spell—though curiously it is seldom quoted among records of frost and snow.

Although eclipsed by 1916, the first three months of 1915 were decidedly snowy, and taking advantage of the heavy falls about January 22nd, I asked Observers under the auspices of the British Rainfall Organization to commence furnishing material which, in due course, would give us a knowledge of the seasonal and geographical distribution of snow in the United Kingdom, like that which exists for the United States. The recent experience gives me an opportunity to re-iterate the appeal made last year in the number of this Magazine for February, 1915. It occurs to me that the subject may have suffered neglect on account of the difficulties in the way of recording the depth of snow-fall with any accuracy. But why demand a degree of precision which is not at all necessary? What we desire to get is a general idea how the different parts of the kingdom compare with one another in the amount and frequency of snow, and no intelligent Observer exercising a little judgment should fall into any great error in making a statement as to the approximate depth of undrifted snow after every fall in his locality. Sleet should be regarded as an occurrence of snow and rain together, and, as it does not lie, there is, of course, no depth of *snow* to record.

With regard to the geographical distribution, I suppose we may say at once that Scotland is snowier than England, and England than Ireland; but leaving Scotland out of account, which is the snowiest county or region in England? Probably Yorkshire as a whole will be found to carry off the prize among the counties, but the entire

length of the wild Pennine chain from the Peak to the Cheviots, has a veritable genius for snow, and no doubt represents the great snow zone of the country. Again, it is likely that Cornwall, projecting out into the warm south-west would be generally regarded as getting less snow than any other county, and in the absence of scientific data I certainly do not feel justified in suggesting that any other southerly county gets less. But I do want to emphasize a fact that has long fascinated me very much, namely, that those three counties, Somerset, Devon and Cornwall, which lie in the far west of England, have experienced—climatically influenced as they are by large areas of elevated moorland—some truly classical blizzards, the like of which I do not think have been seen in the "Home" counties, where it may, perhaps, snow more often. The relative liability to snow of different parts of the country cannot be gleaned from the winter isothermal lines with their north-south trend, and I think the "iso-chional" lines will be found to trend east-west. If the temperature more often favours snow in the east than in the west of England, the moister atmosphere in the west favours heavier snowfall in general spells of cold weather.

As regards the seasonal distribution, all we know is that the snow season, at all events in the lowlands of Britain, is well defined, embracing the six months November to April, or the four winter and two spring months. Taking the country as a whole, I suspect that February and March will prove to surpass December and January in respect of frequency, if not aggregate depth, of snow.

In offering these remarks I am actuated by a strong appreciation of the fact that alike in its appearance, its effects and in many of its economic functions, snow is a very different thing from rain, and requires to be studied separately as well as in conjunction with the latter. From the purely scientific point of view the erratic behaviour of snow in time and space makes it perhaps the most interesting feature of British climatology. The experience of each succeeding year strengthens the vivid impression I have always had that although snow is by no means always in evidence during the mild winter in England, it would yet be difficult to beat this country in the severity of its snowstorms and the peculiar intensity of its snow spells when these do occur. It is indeed, difficult to imagine a set of physical conditions better calculated to breed great snowstorms of the type which figures so prominently in Scottish romantic literature than the wild tracts of mountain, fell and moor which cover so much of the northern and western parts of the kingdom, and over which the atmosphere is ever charged with the moisture of the stormy western ocean.

Let us set some machinery going by the commencement of next snow season, November, 1916, designed for the organized observation of the depth and frequency of British snowfall.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE ANOMALOUS FIRST QUARTER OF 1916.

THIS has been a remarkable quarter; January, with a mean temperature of $44^{\circ}7$, was the warmest in my record (1879-1916), being $1^{\circ}6$ above 1898, and probably the warmest since 1796. February had 8.19 in. of rain and snow, and twenty-seven rain days. March, mean temperature $35^{\circ}3$, was colder than any other, except 1883; the maximum being $2^{\circ}0$ below that very cold month and the range only $7^{\circ}2$, much the lowest in March, and with only one month, January, 1897, with $6^{\circ}5$, substantially lower for 36 years. The total snow fall from February 25th to March 26th, was approximately a little over three feet, but on some days it could not be measured accurately owing to the mixture of rain, sleet and snow. It must be a long time since March had a mean temperature $9^{\circ}4$ lower than January in the same year.

C. L. BROOK.

Harewood Lodge, Meltham, 3rd April, 1916.

RAINFALL AND CLOUD LEVEL.

IN answer to Mr. Bonacina's appeal in the last paragraph of his communication on this subject in the March number of the Magazine, I offer the following observation for what it is worth. I had ascended Snowdon one day when its summit was in a cloud. As we were coming down, when we had got well below the cloud-cap, so that a wide view was obtained of the surrounding country it began to rain, and I was interested in watching the process of the rainfall on a somewhat steeper slope than that on which my party were standing. No distinct cloud was there formed. What I noticed was the sudden coming into being of baseless rods of rain at a distance that I estimated at thirty or forty yards from the side of the slope. It was this last point that specially engaged my attention. I was not thinking of the cloudless formation of rain or the occurrence of rain below the level of the cloud. All that was in my mind was the interesting case in refutation of the idea, which it is so difficult to drive out of text-books and so much more difficult to remove from the minds of teachers, that rain is formed by vapour-bearing winds "coming in contact with cold mountain sides."

GEO. G. CHISHOLM.

12, Hallhead Road, Edinburgh, April 4th, 1916.

WINTER THUNDERSTORMS.

At the beginning of the year I asked Rainfall Observers and readers of this Magazine for accounts of thunderstorms occurring during the winter. I have had so many answers that I have been unable to acknowledge all personally. I wish to thank all those correspondents who have sent me information and to assure them that their reports have been of the greatest value. Up to the present I have received 824 accounts of storms which have taken place between December 1st and March 31st. Thunder or lightning was observed somewhere in the British Islands on 72 out of the 122 days during this period. Reports have come from all parts of the British Islands with the exception of the north of Scotland. At some future time I hope to be able to publish a full report of the thunderstorms of the past winter. CHARLES J. P. CAVE.

Meteorological Office, South Farnborough, April 5th, 1916.

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ROYAL METEOROLOGICAL SOCIETY.

A MEETING of the Society was held on March 15th, at the Surveyor's Institution, Major H. G. Lyons, F.R.S., President, in the Chair.

Sir Napier Shaw, F.R.S., gave a lecture on "The Meteorology of the Globe in 1911." He said that such a formidable task as the discussion of the Meteorology of the Globe for any year was undertaken only on the approaching publication of the "*Reseau Mondial, 1911*." The Meteorological Office has authorized the preparation of an annual statement of the meteorological observations at a large number of uniformly distributed points over the land surface of the Earth. These figures for the year 1911 are now on the point of publication, and the work, although French in title, is written in English. The *Reseau Mondial, 1911*, gives particulars of pressure, temperature and rainfall, in the units of millibars, absolute temperature degrees and millimetres, respectively, there being two stations for each ten degrees square of latitude and longitude, omitting the regions beyond 80 degrees north and south. Positive and negative signs are used to indicate differences from the normal, where such normals existed or could be computed. One page is devoted to each ten degrees of latitude, beginning at the equator and working polewards. The stations are arranged in their order round the globe. Although many of the stations employed are unfamiliar it is remarkable that such a number of stations lie in British possessions, a fact which throws a greater responsibility on the British Empire for the furtherance of the study of Meteorology.

The following were elected Fellows of the Society : Miss S. A. Acland and Mr. Joseph Pizzala.

## THE HURRICANE IN JAMAICA, AUGUST 12th and 13th, 1915.

THE following notes are extracted from the official report on the exceptionally severe hurricane of August 12th and 13th, 1915. drawn up by Mr. Maxwell Hall, Government meteorologist.


It appears that the centre of the depression moved westward on a course nearly parallel to the north-eastern coast of the island and fifteen or twenty miles to the north. The maps accompanying the report show that the centre was opposite the east end of Jamaica, about 10 p.m. on August 12th, and opposite, but much further from the west end at about 8 a.m. on August 13th. From Dominica to Jamaica the centre moved at the rate of 19 miles per hour, but subsequently travelled more slowly, passing near Cayman Brac at 11 a.m. on the 13th, and reaching Galveston about mid-day on the 16th. At 11 p.m. on August 12th the wind was from the north nearly all along the northern coast and it was this side of the island which suffered most. The sea driven ashore by the northerly winds swept away everything within its reach; wharves, houses, roads, bridges and part of the railway track. All the towns and villages from Manchioneal to Falmouth along the north coast suffered to a greater or less extent and the total damage was very great, although the wind barely reached hurricane force, or force 12 on the Beaufort Scale.

At Port Maria houses were carried along the street like canoes for a quarter of a mile, wharves and sheds were completely destroyed and 250 to 300 persons were rendered homeless.

A sullen sky in the direction of the sea, heavy roaring billows and a few warnings from the Weather Bureau were the only hints that Annotto Bay had of the visitation of the hurricane, which entirely altered a portion of the town. It was a terrifying sight to see buildings being thrown against each other by the sea. Many of the houses could not subsequently be located, while the road through the entire sea-swept area was unrecognisable.

Over the whole island most of the parishes lost between 80 and 90 per cent. of the bananas, but the loss of cocoanuts was apparently only about 1 per cent. Generally the damage done to buildings was slight compared with that in the hurricanes of 1903 and 1912.

The report includes tabular statements of the pressure and wind observations at the principal meteorological stations. Mr. Maxwell Hall observes that the cyclone exhibited the same regular arrangement of barometric distribution as he has noted on previous occasions, namely that the fall of pressure below the mean at any point varies inversely as the square of the distance from the centre. If this principle can be established it affords facilities for calculating the time of arrival of the centre at any place.



## RAINFALL TABLE FOR MARCH, 1916.

| STATION.                        | COUNTY.           | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|---------------------------------|-------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                 |                   |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1916.<br>in. |
| Camden Square.....              | London.....       | 51 32      | 0 8                  | 111                            | 1'70                           | 4'67         |
| Tenterden.....                  | Kent.....         | 51 4       | *0 41                | 190                            | 1'95                           | 3'27         |
| Arundel (Patching).....         | Sussex.....       | 50 51      | 0 27                 | 130                            | 1'95                           | 4'52         |
| Fordingbridge (Oaklands)...     | Hampshire....     | 50 56      | 1 38                 | 135                            | 2'09                           | 3'12         |
| Oxford (Magdalen College)...    | Oxfordshire....   | 51 45      | 1 15                 | 186                            | 1'45                           | 5'08         |
| Wellingborough (Swanspool)...   | Northampton...    | 52 18      | 0 41                 | 155                            | 1'72                           | 4'52         |
| Bury St. Edmunds (Westley)...   | Suffolk.....      | 52 15      | *0 40                | 226                            | 1'71                           | 3'41         |
| Geldeston [Beccles].....        | Norfolk.....      | 52 27      | *1 31                | 38                             | 1'57                           | 3'05         |
| Polapit Tamar [Launceston]...   | Devon.....        | 50 40      | 4 22                 | 315                            | 2'74                           | 2'80         |
| Rousdon [Lyme Regis].....       | ".....            | 50 41      | 3 0                  | 516                            | 2'30                           | 3'73         |
| Stroud (Field Place).....       | Gloucestershire.. | 51 44      | 2 13                 | 226                            | 2'01                           | 3'47         |
| Church Stretton (Wolstaston)..  | Shropshire.....   | 52 35      | 2 48                 | 800                            | 2'19                           | 2'83         |
| Boston.....                     | Lincolnshire..... | 52 58      | 0 1                  | 11                             | 1'47                           | 4'27         |
| Worksop (Hodsock Priory)...     | Nottinghamshire   | 53 22      | 1 5                  | 56                             | 1'70                           | 3'89         |
| Mickleover Manor.....           | Derbyshire.....   | 52 54      | 1 32                 | 280                            | 1'69                           | 4'50         |
| Macclesfield.....               | Cheshire.....     | 53 15      | 2 7                  | 501                            | 2'50                           | 2'20         |
| Southport (Hesketh Park)...     | Lancashire.....   | 53 39      | 2 59                 | 38                             | 2'11                           | 2'09         |
| Arncliffe Vicarage.....         | Yorkshire, W.R.   | 54 8       | 2 6                  | 732                            | 5'17                           | 4'48         |
| Goldsborough Hall.....          | ".....            | 54 0       | 1 25                 | 119                            | 2'00                           | 4'04         |
| Hull (Pearson Park).....        | " E.R.            | 53 45      | 0 20                 | 6                              | 1'84                           | 3'70         |
| Newcastle (Town Moor)...        | Northumberland    | 54 59      | 1 38                 | 201                            | 2'10                           | 3'64         |
| Borrowdale (Seathwaite)...      | Cumberland.....   | 54 30      | 3 10                 | 423                            | 10'63                          | 3'22         |
| Cardiff (Ely).....              | Glamorgan.....    | 51 29      | 3 13                 | 53                             | 2'89                           | 3'61         |
| Haverfordwest.....              | Pembroke.....     | 51 48      | 4 58                 | 90                             | 3'16                           | 2'21         |
| Aberystwyth (Gogerddan)...      | Cardigan.....     | 52 26      | 4 1                  | 83                             | 3'04                           | 2'52         |
| Llandudno.....                  | Carnarvon.....    | 53 20      | 3 50                 | 72                             | 2'13                           | 1'91         |
| Cargen [Dumtries].....          | Kirkcudbright...  | 55 2       | 3 37                 | 80                             | 3'33                           | 1'76         |
| Marchmont House.....            | Berwick.....      | 55 44      | 2 24                 | 498                            | 2'64                           | 4'42         |
| Girvan (Pinmore).....           | Ayr.....          | 55 10      | 4 49                 | 207                            | 3'62                           | 1'28         |
| Glasgow (Queen's Park)...       | Renfrew.....      | 55 53      | 4 18                 | 144                            | 2'61                           | 1'98         |
| Islay (Eallabus).....           | Argyll.....       | 55 47      | 6 15                 | 68                             | 3'68                           | 1'84         |
| Mull (Quinish).....             | ".....            | 56 34      | 6 13                 | 35                             | 4'28                           | 1'01         |
| Balquhidder (Stronvar).....     | Perth.....        | 56 21      | 4 23                 | 422                            | 6'02                           | 2'25         |
| Dundee (Eastern Necropolis)...  | Forfar.....       | 56 28      | 2 57                 | 199                            | 2'06                           | 3'22         |
| Braemar.....                    | Aberdeen.....     | 57 0       | 3 24                 | 1114                           | 2'87                           | 4'50         |
| Aberdeen (Cranford).....        | ".....            | 57 8       | 2 7                  | 120                            | 2'65                           | 2'18         |
| Gordon Castle.....              | Moray.....        | 57 37      | 3 5                  | 107                            | 2'36                           | 2'21         |
| Drumnadrochit.....              | E. Inverness....  | 57 20      | 4 29                 | 138                            | 3'09                           | 2'47         |
| Fort William.....               | ".....            | 56 49      | 5 6                  | 171                            | 6'39                           | 2'14         |
| Loch Torridon (Bendamph)...     | W. Ross.....      | 57 32      | 5 32                 | 20                             | 7'29                           | 2'94         |
| Dunrobin Castle.....            | Sutherland.....   | 57 59      | 3 56                 | 14                             | 2'64                           | 2'53         |
| Killarney (District Asylum)...  | Kerry.....        | 52 4       | 9 31                 | 178                            | 4'51                           | 1'96         |
| Waterford (Brook Lodge)...      | Waterford.....    | 52 15      | 7 7                  | 104                            | 2'64                           | 1'66         |
| Nenagh (Castle Lough).....      | Tipperary.....    | 52 54      | 8 24                 | 120                            | 2'99                           | 1'88         |
| Ennistymon House.....           | Clare.....        | 52 57      | 9 18                 | 37                             | 3'24                           | 2'44         |
| Gorey (Courtown House)...       | Wexford.....      | 52 40      | 6 13                 | 80                             | 2'28                           | 3'62         |
| Abbey Leix (Blandsfort).....    | Queen's County..  | 52 56      | 7 17                 | 532                            | 2'59                           | 2'25         |
| Dublin (Fitz William Square)... | Dublin.....       | 53 21      | 6 14                 | 54                             | 1'98                           | 3'40         |
| Mullingar (Belvedere).....      | Westmeath.....    | 53 29      | 7 22                 | 367                            | 2'64                           | 2'77         |
| Crossmolina (Enniscoe).....     | Mayo.....         | 54 4       | 9 16                 | 74                             | 4'36                           | 3'38         |
| Cong (The Glebe).....           | ".....            | 53 33      | 9 16                 | 112                            | 3'80                           | 2'63         |
| Collooney (Markree Obsy.)...    | Sligo.....        | 54 11      | 8 27                 | 127                            | 3'33                           | 1'95         |
| Seaforde.....                   | Down.....         | 54 19      | 5 50                 | 180                            | 2'84                           | 2'32         |
| Ballymena (Harryville).....     | Antrim.....       | 54 52      | 6 13                 | 150                            | 3'07                           | 1'83         |
| Omagh (Edenfel).....            | Tyrone.....       | 54 36      | 7 18                 | 280                            | 2'98                           | 1'45         |

RAINFALL TABLE FOR MARCH, 1916—*continued.*

| RAINFALL OF MONTH ( <i>con.</i> ) |          |                   |             |    | RAINFALL FROM JAN. 1. |       |                      |          | Mean Annual 1875-1909. | STATION.         |
|-----------------------------------|----------|-------------------|-------------|----|-----------------------|-------|----------------------|----------|------------------------|------------------|
| Diff. from Av. in.                | % of Av. | Max. in 24 hours. | No. of Days |    | Aver. 1875-1909.      | 1916. | Diff. from Aver. in. | % of Av. |                        |                  |
|                                   |          | in. Date.         |             |    | in.                   | in.   |                      |          | in.                    |                  |
| +2.97                             | 275      | 1.07              | 27          | 22 | 5.19                  | 9.43  | +4.24                | 182      | 25.11                  | Camden Square    |
| +1.32                             | 168      | .62               | 7, 22       | 23 | 5.99                  | 9.32  | +3.33                | 156      | 27.64                  | Tenterden        |
| +2.57                             | 232      | 1.07              | 27          | 20 | 6.71                  | 11.28 | +4.57                | 168      | 30.48                  | Patching         |
| +1.03                             | 149      | .90               | 27          | 21 | 7.10                  | 9.88  | +2.78                | 139      | 31.06                  | Fordingbridge    |
| +3.63                             | 350      | 1.39              | 27          | 14 | 4.85                  | 10.05 | +5.20                | 207      | 24.58                  | Oxford           |
| +2.80                             | 263      | 1.01              | 27          | 21 | 5.32                  | 9.31  | +3.99                | 175      | 25.20                  | Swanspool        |
| +1.70                             | 199      | .70               | 27          | 23 | 5.00                  | 9.24  | +4.24                | 185      | 25.40                  | Westley          |
| +1.48                             | 194      | .55               | 27          | 28 | 4.51                  | 8.16  | +3.65                | 181      | 23.73                  | Geldeston        |
| + .06                             | 102      | 1.16              | 27          | 18 | 9.28                  | 12.86 | +3.58                | 139      | 38.27                  | Polapit Tamar    |
| +1.43                             | 162      | 1.07              | 27          | 16 | 7.74                  | 10.55 | +2.81                | 136      | 33.54                  | Rousdon          |
| +1.46                             | 173      | .85               | 27          | 20 | 6.46                  | 9.52  | +3.06                | 147      | 29.81                  | Stroud           |
| + .64                             | 129      | .42               | 21          | 24 | 6.87                  | 9.29  | +2.42                | 135      | 32.41                  | Wolstaston       |
| +2.80                             | 290      | .88               | 28          | 25 | 4.54                  | 9.06  | +4.52                | 200      | 23.35                  | Boston           |
| +2.19                             | 229      | .63               | 15          | 23 | 5.04                  | 7.98  | +2.94                | 158      | 24.46                  | Hodsock Priory   |
| +2.81                             | 266      | .75               | 15          | 21 | 5.35                  | 11.11 | +5.76                | 208      | 26.65                  | Mickleover       |
| — .30                             | 88       | .45               | 16          | 15 | 7.46                  | 8.11  | + .65                | 109      | 34.73                  | Macclesfield     |
| — .02                             | 99       | .55               | 20          | 15 | 6.73                  | 6.37  | — .36                | 95       | 32.70                  | Southport        |
| — .69                             | 86       | .61               | 11          | 20 | 16.31                 | 19.62 | +3.31                | 120      | 61.49                  | Arncliffe        |
| +2.04                             | 202      | .83               | 15          | 20 | 5.66                  | 8.56  | +2.90                | 151      | 27.29                  | Goldborough Hall |
| +1.86                             | 201      | .43               | 11          | 25 | 5.32                  | 7.71  | +2.39                | 145      | 26.42                  | Hull             |
| +1.54                             | 173      | .46               | 15          | 26 | 5.63                  | 7.42  | +1.79                | 132      | 27.94                  | Newcastle        |
| —7.41                             | 30       | 1.20              | 26          | 12 | 35.03                 | 38.70 | +3.67                | 110      | 129.48                 | Seathwaite       |
| + .72                             | 125      | 1.05              | 27          | 22 | 9.61                  | 12.99 | +3.38                | 135      | 42.28                  | Cardiff          |
| — .95                             | 70       | .68               | 27          | 19 | 11.27                 | 10.57 | — .70                | 94       | 46.81                  | Haverfordwest    |
| — .52                             | 83       | .55               | 20          | 18 | 10.04                 | 10.68 | + .64                | 106      | 45.46                  | Gogerddan        |
| — .22                             | 90       | .80               | 20          | 16 | 6.75                  | 8.12  | +1.37                | 120      | 30.36                  | Llandudno        |
| —1.57                             | 53       | .64               | 19          | 14 | 10.85                 | 12.95 | +2.10                | 119      | 43.47                  | Cargen           |
| +1.78                             | 167      | .64               | 16          | 21 | 7.19                  | 10.87 | +3.68                | 151      | 33.76                  | Marchmont        |
| —2.34                             | 35       | .26               | 26          | 12 | 12.27                 | 12.57 | + .30                | 102      | 49.77                  | Girvan           |
| — .63                             | 76       | .48               | 26          | 15 | 8.84                  | 11.58 | +2.74                | 131      | 35.97                  | Glasgow          |
| —1.84                             | 50       | .47               | 25          | 10 | 12.37                 | 13.21 | + .84                | 107      | 48.79                  | Eallabus         |
| —3.27                             | 24       | .21               | 25          | 12 | 14.28                 | 12.46 | —1.82                | 87       | 56.57                  | Quinish          |
| —3.77                             | 37       | .94               | 25          | 9  | 21.09                 | 26.81 | +5.72                | 127      | 73.77                  | Stronvar         |
| +1.16                             | 156      | 1.00              | 16          | 17 | 5.98                  | 7.32  | +1.34                | 122      | 28.64                  | Dundee           |
| +1.63                             | 157      | .62               | 12          | 21 | 8.34                  | 14.59 | +6.25                | 175      | 34.93                  | Braemar          |
| — .47                             | 82       | .30               | 25          | 26 | 7.37                  | 4.89  | —2.48                | 66       | 32.73                  | Aberdeen         |
| — .15                             | 94       | .25               | 22          | 24 | 6.30                  | 6.87  | + .57                | 109      | 30.34                  | Gordon Castle    |
| — .62                             | 80       | .80               | 3           | 22 | 9.61                  | 15.73 | +6.12                | 164      | 36.13                  | Drumnadrochit    |
| —4.25                             | 33       | .49               | 30          | 18 | 22.44                 | 27.77 | +5.33                | 124      | 75.80                  | Fort William     |
| —4.35                             | 40       | .91               | 30          | 10 | 24.24                 | 30.19 | +5.95                | 125      | 83.93                  | Bendampf         |
| — .11                             | 96       | .64               | 16          | 15 | 7.97                  | 10.81 | +2.84                | 136      | 31.90                  | Dunrobin Castle  |
| —2.55                             | 43       | .30               | 2           | 21 | 15.44                 | 13.62 | —1.82                | 88       | 54.81                  | Killarney        |
| — .98                             | 63       | .49               | 19          | 18 | 9.60                  | 8.19  | —1.41                | 85       | 39.57                  | Waterford        |
| —1.11                             | 63       | .34               | 19          | 18 | 9.76                  | 10.70 | + .94                | 110      | 39.43                  | Castle Lough     |
| — .90                             | 75       | .32               | 13          | 18 | 10.98                 | 12.72 | +1.74                | 116      | 46.52                  | Ennistymon       |
| +1.34                             | 159      | .45               | 16          | 21 | 8.22                  | 9.76  | +1.54                | 119      | 34.99                  | Courtown Ho.     |
| — .34                             | 87       | .35               | 19          | 23 | 8.29                  | 8.63  | + .34                | 104      | 35.92                  | Abbey Leix       |
| +1.42                             | 172      | .70               | 19          | 24 | 6.05                  | 8.36  | +2.31                | 138      | 27.68                  | Dublin           |
| + .13                             | 105      | .48               | 19          | 23 | 8.41                  | 10.57 | +2.16                | 126      | 36.15                  | Mullingar        |
| — .98                             | 78       | .64               | 2           | 21 | 13.91                 | 16.13 | +2.22                | 116      | 52.87                  | Enniscoe         |
| —1.17                             | 69       | .49               | 19          | 20 | 12.31                 | 13.63 | +1.32                | 111      | 48.90                  | Cong             |
| —1.38                             | 59       | .48               | 25          | 19 | 10.40                 | 10.28 | — .12                | 99       | 42.71                  | Markree          |
| — .52                             | 82       | .39               | 19          | 13 | 9.06                  | 8.19  | — .87                | 90       | 38.91                  | Seaforde         |
| —1.24                             | 60       | .35               | 19          | 18 | 9.79                  | 9.71  | — .08                | 99       | 40.84                  | Ballymena        |
| —1.53                             | 49       | .25               | 25          | 22 | 9.12                  | 9.33  | + .21                | 102      | 39.38                  | Omagh            |

## SUPPLEMENTARY RAINFALL, MARCH, 1916.

| Div.  | STATION.                      | Rain<br>inches. | Div.   | STATION.                      | Rain<br>inches |
|-------|-------------------------------|-----------------|--------|-------------------------------|----------------|
| II.   | Warlingham, Redvers Road .    | 5.44            | XI.    | Lligwy .....                  | 1.64           |
| „     | Ramsgate .....                | 2.99            | „      | Douglas .....                 | 1.67           |
| „     | Hailsham .....                | 2.57            | XII.   | Stoneykirk, Ardwell House...  | 1.04           |
| „     | Totland Bay, Aston House...   | 3.55            | „      | Carsphairn Shiel .....        | 1.53           |
| „     | Stockbridge, Ashley.. .....   | 3.42            | „      | Beattock, Kinnelhead .....    | 1.46           |
| „     | Grayshott .....               | 5.21            | „      | Langholm, Drove Road .....    | 3.32           |
| III.  | Harrow Weald, Hill House...   | 4.86            | XIII.  | Selkirk, The Hangingshaw..    | 4.31           |
| „     | Pitsford, Sedgebrook... ..    | 4.49            | „      | North Berwick Reservoir...    | 2.79           |
| „     | Woburn, Milton Bryant.....    | 5.08            | „      | Edinburgh, Royal Observaty.   | 2.86           |
| „     | Chatteris, The Priory.....    | 3.48            | XIV.   | Mayhole, Knockdon Farm...     | 1.00           |
| IV.   | Elsenham, Gaunts End .....    | 3.90            | XV.    | Buchlyvie, The Manse.....     | 2.15           |
| „     | Shoeburyness .....            | 3.45            | „      | Ballachulish House .....      | 2.53           |
| „     | Colchester, Hill Ho., Lexden  | 3.58            | „      | Oban .....                    | .74            |
| „     | Ipswich, Rookwood, Copdock    | 4.12            | „      | Campbeltown, Witchburn ..     | 1.99           |
| „     | Aylsham, Rippon Hall .....    | 3.30            | „      | Holy Loch, Ardnadam.....      | 2.31           |
| „     | Swaffham .....                | 3.61            | „      | Tiree, Cornaigmore .....      | 1.07           |
| V.    | Bishops Cannings .....        | 3.50            | XVI.   | Dollar Academy .....          | ...            |
| „     | Wimborne, St. John's Hill...  | 3.52            | „      | Glenlyon, Meggernie Castle..  | 1.98           |
| „     | Ashburton, Druid House....    | 4.60            | „      | Blair Atholl .....            | 1.11           |
| „     | Cullompton .....              | 3.70            | „      | Coupar Angus .....            | 2.87           |
| „     | Lynmouth, Rock House .....    | 3.27            | „      | Montrose, Sunnyside Asylum.   | 2.82           |
| „     | Okehampton, Oaklands.....     | 4.23            | XVII.  | Alford, Lynturk Manse .....   | 2.89           |
| „     | Hartland Abbey.....           | 4.06            | „      | Fyvie Castle .....            | 3.82           |
| „     | Probus, Lamellyn .....        | 2.84            | „      | Keith Station .....           | 1.68           |
| „     | North Cadbury Rectory.....    | 3.36            | XVIII. | Rothiemurchus .....           | 2.19           |
| VI.   | Clifton, Stoke Bishop .....   | 3.99            | „      | Loch Quoich, Loan .....       | ...            |
| „     | Ledbury Underdown.....        | 3.96            | „      | Skye, Dunvegan .....          | 2.14           |
| „     | Shifnal, Hatton Grange.....   | 3.08            | „      | Lochmaddy, Bayhead .....      | .95            |
| „     | Droitwich .....               | 3.18            | „      | Fortrose .....                | 1.86           |
| „     | Blockley, Upton Wold.....     | 4.76            | „      | Glen carron Lodge .....       | 3.90           |
| VII.  | Market Overton.....           | 4.69            | XIX.   | Altnaharra .....              | 3.61           |
| „     | Market Rasen .....            | 4.23            | „      | Melvich .....                 | 2.06           |
| „     | Bawtry, Hlesley Hall .....    | 4.77            | „      | Loch More, Achfary .....      | 4.30           |
| „     | Derby, Midland Railway.....   | 3.64            | XX.    | Dunmanway, The Rectory ..     | 2.83           |
| „     | Buxton .....                  | 3.30            | „      | Glanmire, Lota Lodge.....     | 1.92           |
| VIII. | Nantwich, Dorfold Hall .....  | 1.95            | „      | Mitchelstown Castle.....      | 1.69           |
| „     | Chatburn, Middlewood .....    | 2.85            | „      | Darrynane Abbey.....          | 2.18           |
| „     | Lancaster, Strathspey .....   | 1.20            | „      | Clonmel, Bruce Villa .....    | 1.89           |
| IX.   | Langsett Moor, Up. Midhope    | 4.05            | „      | Newmarket-on-Fergus, Fenloe   | ...            |
| „     | Scarborough, Scalby .....     | 4.14            | XXI.   | Euniscorthy, Ballyhyland...   | 2.87           |
| „     | Ingleby Greenhow .....        | 4.91            | „      | Rothnen, Clonmannon .....     | 3.29           |
| „     | Mickleton .....               | 2.28            | „      | Ballycumber, Moorrock Lodge   | 1.36           |
| X.    | Bellingham, High Green Manor  | 4.35            | „      | Balbriggan, Ardgillan .....   | 2.76           |
| „     | Iliderton, Lilburn Cottage .. | 3.74            | „      | Castle Forbes Gardens.....    | 1.68           |
| „     | Thirlmere, The Bank .....     | 2.04            | XXII.  | Ballynahinch Castle.....      | 1.85           |
| XI.   | Llanfrehfa Grange .....       | 5.35            | „      | Woodlawn .....                | 2.29           |
| „     | Treherbert, Tyn-y-waun .....  | 4.05            | „      | Westport, St. Helens .....    | 2.45           |
| „     | Carmarthen, The Friary .....  | 2.11            | „      | Dugort, Slievemore Hotel ..   | 2.00           |
| „     | Fishguard, Goodwick Station.  | 1.11            | XXIII. | Enniskillen, Portora .....    | 1.43           |
| „     | Crickhowell, Tal-y-maes.....  | ...             | „      | Dartrey [Cootehill] .....     | 1.54           |
| „     | New Radnor, Ednol .....       | 4.26            | „      | Warrenpoint, Manor House ..   | 2.03           |
| „     | Birmingham WW., Tyrmynydd     | ...             | „      | Belfast, Cave Hill Road ..... | 2.37           |
| „     | Lake Vyrnwy .....             | 3.31            | „      | Glenarme Castle .....         | 2.49           |
| „     | Llangynhafal, Plâs Drâw.....  | 3.73            | „      | Londonderry, Creggan Res...   | 1.89           |
| „     | Dolgelly, Bryntirion.....     | 2.00            | „      | Dunfanaghy, Horn Head .....   | 2.44           |
| „     | Bettws-y-Coed, Tyn-y-bryn...  | 2.96            | „      | Killybegs .....               | 2.11           |





# THAMES VALLEY RAINFALL — MARCH, 1916.



ALTITUDE  
SCALE

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

SCALE OF MILES

0 5 10 15 20

Watershed of River Thames above Teddington, and River Lee above Fulkles Weir

Rainfall Stations reporting  
isohyals

## THE WEATHER OF MARCH.

DURING practically the whole month barometric pressure was high near the Arctic Circle, and low over southern Europe, conditions being thus favourable for northerly and easterly winds, which blew with a strength and persistence unequalled for many years. Deep depressions passed eastward over the south of England on the 2nd, 21st and 28th. Temperature was below the average in all parts of the United Kingdom, the defect as compared with the normal ranging from 2° F. over the east and south-east of England to about 4° F. in the east of Scotland, the south-west of England and the south of Ireland. Except for a few days, about the 18th, and again at the end of the month, the day maximum temperatures were everywhere below 50°, even at places situated on the normally favoured south coast. At Bath, Clifton and Guernsey on the 18th temperature in the screen rose to 59°, and at Norwich on the 19th to 61°. On the last day of the month shade maxima of 57° or 58° were again recorded in many districts. Owing to cloudy skies, the moderate terrestrial radiation and the total absence of anti-cyclonic conditions, no very low temperatures were recorded. On the 4th a shade minimum of 17° was noted at Kilmarnock, a similar value being recorded on the 5th at Llangammarch Wells.

The duration of bright sunshine was much below the normal until quite the close of the month, when a few bright days were experienced. The most sunless weather occurred over the northern half of England, where the daily amount fell short of the average by more than an hour and a half. Over Ireland the deficiency was only half this amount. The durations at individual stations were as follows: Camden Square, 51 hours; Copdock, 66 hours; Weymouth, 88 hours; Sidmouth, 113 hours; Selborne, 81 hours; Totland Bay, 94 hours; Hodsock Priory, 54 hours; Bolton, 33 hours; Southport, 61 hours; Hull, 38 hours; Haverfordwest, 99 hours; Swinton, 70 hours; Paisley, 78 hours; Perth, 88 hours; Markree Castle, 84 hours.

Rainfall as was to be expected with the abnormal pressure conditions, was very unequally distributed over the country. Heavy daily falls were infrequent, that of the 27th over the south and east of England yielding, however, more than an inch, which in many places fell as snow (See ante p. 37). At Camden Square the fall exceeded an inch for the first time on record in March. The west coast was in general much drier than the east, this contrast being more marked in Scotland than in England and Ireland, where the precipitation was comparatively uniform owing to the southern track taken by many of the depressions. In England the wettest areas, with more than 5 inches, occurred in isolated patches over the southern inland regions, while considerably less than 2 inches fell on a narrow strip on the west coast between the Mersey and the Solway Firth, where in some places less than an inch fell. In Scotland the eastern coastal fringe had a relatively small rainfall, the maximum fall—over 4 inches in places—being recorded in the central uplands open to the north and east, and in the counties of Ross and Sutherland. The smallest rainfall which, at some places was less than an inch, occurred on the west coast, where only a quarter of the average fell. In Ireland the rainfall exceeded four inches in three small patches, situated in Co. Down and Co. Wicklow on the east, and over a small area in Connemara in the west. Less than two inches fell over a large part of the north and south-west. The general rainfall, expressed as a percentage of the average, was, England and Wales, 138 per cent.; Scotland, 66 per cent.; Ireland, 78 per cent.; British Isles, 98 per cent.

In the Thames Valley more than 5 inches fell along the North Downs, the Chilterns and in Bucks., and less than 4 inches to the east of London. In London (Camden Square), the mean temperature of the month was 39°·8, or 2°·3 below the average. The duration of rainfall was 133·6 hours, being the greatest in any month since records commenced in 1880, while the rainfall, 4·67 inches, was probably the greatest March fall in London during the last two centuries.

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

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |            |       |                 |
|                                                                  |           |       |          |       |          |      |               | 0-100     |                 |                   | inches     |       |                 |
| London, Camden Square                                            | 68°0      | 12    | 34°8     | 1     | 57°4     | 44°0 | 45°5          | 88        | 107·7           | 30°0              | 2·06       | 12    | 7·6             |
| Malta ... ..                                                     | 80·6      | 2     | 58·5     | 31    | 73·9     | 65·2 | ...           | 77        | 133·0           | ...               | 1·17       | 6     | 2·5             |
| Lagos ... ..                                                     | 88·0      | sev.  | 71·0     | sev.  | 86·1     | 74·8 | 74·1          | 79        | 157·3           | 68·0              | 7·66       | 19    | 7·6             |
| Cape Town ... ..                                                 | 96·7      | 31    | 44·4     | 7     | 69·9     | 53·3 | 52·8          | 71        | ...             | ...               | ·51        | 5     | 4·6             |
| Johannesburg ... ..                                              | 85·4      | 23a   | 39·0     | 17    | 72·6     | 49·7 | 43·5          | 60        | ...             | 36·2              | 4·30       | 7     | 3·0             |
| Mauritius ... ..                                                 | 84·1      | 31    | 55·5     | 12    | 81·5     | 63·6 | 59·7          | 65        | ...             | 47·4              | ·17        | 4     | 4·5             |
| Bloemfontein ... ..                                              | 92·8      | 24    | 37·7     | 8     | 77·4     | 49·5 | 40·6          | 43        | ...             | ...               | 2·90       | 6     | 3·4             |
| Calcutta... ..                                                   | 93·9      | 13    | 73·1     | 26b   | 89·6     | 77·7 | 76·9          | 83        | ...             | 63·9              | 3·90       | 7     | 6·4             |
| Bombay... ..                                                     | 91·1      | 30    | 74·6     | 10    | 86·8     | 77·7 | 75·4          | 81        | 138·0           | 57·1              | 2·55       | 9     | 4·2             |
| Madras ... ..                                                    | 97·7      | 17    | 71·4     | 11    | 91·9     | 77·0 | 74·4          | 78        | 161·1           | 71·9              | 2·64       | 10    | 4·7             |
| Colombo, Ceylon ... ..                                           | 87·4      | 24    | 71·2     | 26d   | 85·5     | 75·4 | 73·6          | 83        | 160·1           | 67·7              | 14·12      | 16    | 6·2             |
| Hongkong ... ..                                                  | 87·8      | 25    | 62·6     | 31    | 82·7     | 75·4 | 70·8          | 75        | ...             | ...               | 11·71      | 10    | 6·7             |
| Sydney ... ..                                                    | 83·9      | 23    | 46·3     | 7     | 72·3     | 55·6 | 45·9          | 47        | 137·5           | 37·3              | ·98        | 10    | 4·6             |
| Melbourne ... ..                                                 | 84·7      | 11    | 34·0     | 6     | 65·6     | 47·7 | 44·0          | 60        | 136·6           | 26·9              | 2·83       | 19    | 6·1             |
| Adelaide ... ..                                                  | 90·0      | 20    | 44·8     | 6     | 70·5     | 51·5 | 46·0          | 56        | 148·9           | 32·8              | ·67        | 11    | 5·6             |
| Perth ... ..                                                     | 83·5      | 4     | 45·9     | 15    | 68·7     | 53·9 | 50·4          | 66        | 145·6           | 39·3              | 2·87       | 14    | 5·6             |
| Coolgardie ... ..                                                | 96·8      | 26    | 36·6     | 14    | 79·6     | 49·2 | 41·9          | 37        | 152·2           | 33·4              | ·21        | 4     | 2·1             |
| Hobart, Tasmania ... ..                                          | 77·6      | 11    | 37·0     | 7     | 61·4     | 45·0 | 40·6          | 59        | 141·0           | 27·2              | 3·83       | 22    | 6·2             |
| Wellington ... ..                                                | 67·0      | 15    | 36·8     | 21    | 62·2     | 51·8 | 49·5          | 76        | 131·2           | 31·4              | 2·50       | 15    | 7·1             |
| Auckland ... ..                                                  | 70·5      | 10b   | 47·0     | 23    | 64·9     | 53·4 | 52·8          | 80        | 143·0           | 42·0              | 3·62       | 20    | 6·5             |
| Jamaica, Kingston ... ..                                         | 92·5      | 15    | 70·8     | 20    | 88·7     | 73·6 | 73·4          | 86        | ...             | ...               | 12·78      | 11    | ...             |
| Grenada ... ..                                                   | 92·0      | 8     | 71·0     | 17b   | 86·0     | 74·0 | ...           | 78        | 137·0           | ...               | 7·98       | 14    | 3·1             |
| Toronto ... ..                                                   | 78·7      | 4     | 30·2     | 25    | 60·0     | 43·8 | 43·4          | 80        | 126·0           | 26·9              | 2·19       | 9     | 4·8             |
| Fredericton ... ..                                               | 75·0      | 13c   | 26·0     | 26    | 58·2     | 37·1 | ...           | ...       | ...             | ...               | 2·23       | 11    | 5·1             |
| St. John, N.B. ... ..                                            | 63·3      | 17    | 31·7     | 23    | 54·5     | 42·3 | 42·8          | 76        | ...             | 28·7              | 3·08       | 10    | 5·2             |
| Alberta, Edmonton ... ..                                         | 71·4      | 15    | 19·0     | 7     | 53·5     | 32·8 | ...           | 70        | 116·0           | 10·5              | ·21        | 5     | 6·2             |
| Victoria, B.C. ... ..                                            | 63·1      | 7     | 43·0     | 30    | 55·5     | 46·7 | 47·0          | 87        | 123·0           | 35·2              | 4·20       | 20    | 6·8             |

a and 24, 25. b and 27. c and 14. d and 28.

MALTA.—Crops and water storage suffering for want of rain.

Johannesburg.—Bright sunshine, 291·2 hours.

Mauritius.—Mean temp. 0°·3 above, dew point 1·9 below, and R 1·11 in. below, averages. Mean velocity of wind 10·3 miles.

Bloemfontein.—The highest rainfall for October on record.

COLOMBO, CEYLON.—Mean temp. 80°·5, or 0°·4 above, dew point 0°·4 below, and R 1·54 in. below, averages. TSS on 4 days.

HONGKONG.—Mean temp. 78°·9, mean hourly velocity of wind 13·9 miles. Bright sunshine 187·3 hours.

Melbourne.—Mean temp. 1°·0 below and R ·25 in. above, averages.

Adelaide.—Mean temp. 1°·0 below and R 1·07 in. below, averages.

Coolgardie.—Temp. 0°·5 above and R half an inch below, averages.

Hobart.—Mean temp. 0°·9 below and R 1·62 in. above, averages.

Wellington.—Mean temp. 2°·9 above and R 1·71 in. below, averages. Bright sunshine 181·1 hours; frosts on three days.

Auckland.—Warm and cloudy. R slightly above average, and mean temp. above.

ALBERTA, EDMONTON.—A dry sunny warm month.

# Symons's Meteorological Magazine.

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## DAYLIGHT SAVING AND SHAM TIME.

THE easiest way out of a difficulty is not always the best, and the device by which the people of Great Britain are induced to rise and encouraged to go to bed an hour earlier in summer than in winter reminds us of the confused sentiments of the careless Sunday-school boy. That urchin when asked for the Scriptural definition of a lie is reported to have answered glibly, "A lie which is an abomination unto the Lord is a very present help in time of trouble." Of course a lie is not a lie when it is a convention as when a Government official dismisses a worthless subordinate in a letter which states that he is the obedient servant of the delinquent, and no doubt the House of Commons in compelling us to keep the time of the enemy meridian of  $15^{\circ}$  E. does not really expect us to believe that German time is our time any more than a seller of teaspoons would expect us to believe that German silver is real silver. The Summer Time Act is undoubtedly a very present help in a time of trouble, but we fear that it involves an abominable principle. The same principle would permit economy in railway mileage to be effected by introducing a short Bill to provide that during certain months Willesden Junction shall be called Euston Station, or promote temperance and attendance at public worship by providing that on Sundays St. Paul's shall be called the Red Lion, and on week days the Red Lion shall be called St. Paul's. We are of opinion that long before he grew to man's estate the silly Sunday-school boy found out that the present help of a lie often led to unpleasant consequences that he never anticipated, but the hasty legislators are more fortunate as being able to throw the unpleasant consequences of their convention on others and so naturally ignore them. Parliament has decreed that Sunday, May 21st, shall consist of 23 hours, and that October 1st shall consist of 25 hours, while the phenomena of Nature will continue on the basis of the 24 hour day all through. How does the Government meet this difficulty in the work of the scientific departments supported by the State? The Act itself exempts astronomy and navigation, and the Meteorological Office has sent out the following circular:—



## METEOROLOGICAL OFFICE,

4th May, 1916.

In view of the proposal for Daylight Saving by altering the clocks which is to come before Parliament on Monday, May 8th, it is necessary to point out that the observations at all meteorological observatories and stations must continue to be taken at the same time of day according to Greenwich Mean Time as heretofore, irrespective of any alteration of the setting of clock hands.

To avoid confusion in the subsequent use of the records it will be necessary in future whenever an hour is mentioned in the meteorological schedules to specify the time standard followed : viz., Greenwich Mean Time for all telegraphic reporting stations and Local Mean Time for those stations of the second order or other orders which have hitherto observed according to Local Mean Time.

All clocks used by observers for regulating their duties should continue to be set according to Greenwich Mean Time.

The hours of attendance at the office and observatories for all duties connected with observing, and with the service of the Daily Weather Reports for the Naval and Military Services must also continue to be regulated according to Greenwich Mean Time, and will, therefore, be nominally one hour later when the public clocks are put forward by one hour.

As the hour of attendance at the Office in the morning is at present an hour in advance of the commencement of work at public offices generally, the hour of attendance during the months when the clocks are moved forward will be reconsidered and order made accordingly.

NAPIER SHAW,

*Director.*

This shows that so far as Government meteorological work is concerned the Act is simply ignored. The ordinary voluntary Observer is in a different position. He must in the great majority of cases, go to work by the altered clock time and take his meals by the same sham time. Hence in most cases at 10 a.m., the true 9 a.m., he will be otherwise employed and unable to take his readings. At 10 p.m., the real 9 p.m., many honest gardeners will be in bed. The temperature, humidity, pressure and cloud observations taken by the sham time refer to a different period of the day, 9 a.m. to a cooler, 9 p.m. to a warmer period. As far as possible we hope that all meteorological Observers will endeavour to continue to use the old times. But we cannot ignore the fact that while most of the hundreds of the complete meteorological statistics will probably be kept up in accordance with the Meteorological Office instructions, very many of the thousands of Observers of rainfall must perforce keep to the 9 a.m. clock time for their readings. The hour of the daily observation was fixed at 9 a.m. of the clock because experience showed that for the people of this country, as a whole, rich and poor, occupied or leisured, that time was the most convenient as regards meal-hours and work hours, and by its use the greatest measure of uniformity could be obtained. An association of voluntary Observers such as the British Rainfall Organisation produces its best work in the condition of maximum convenience, and its Director has to bear this in mind. He cannot say that all Observers "must" do this or that unless he is prepared to refuse to accept such observa-

tions as they may find possible. Perfect uniformity cannot be obtained. It does not exist now. The Irish day differs at any given hour by nearly half an hour from the British day. Some Observers can only observe at 8 a.m., others at 10 a.m. Hence we must endeavour to minimise the errors thrust upon us by the hasty legislation of a Parliament which has been ambushed by well-meaning enthusiasts who see only one side of a question, and our advice to rainfall Observers is—**While the clock shows sham time observe, if possible, at 10 a.m. (9 a.m. true time), but if it is not possible to do so observe at 9 a.m. (clock time) and mark the return "From 21st May to 1st October, 9 a.m., S.T."** Recording instruments should be kept running to true time.

### SOME METEOROLOGICAL CURIOSITIES.

By HY. HARRIES.

THERMOMETERS always look such staid and inoffensive objects that at first sight it might seem absurd to associate them with any mirth-provoking qualities. On close acquaintance, however, there is no doubt that at times it is possible to discover about them something akin to humour—dry or wet.

Recently, at a well-known establishment in the West End, I was shown a couple of thermometers, mounted on porcelain, as very fine examples of the work produced in one of the best London factories. Noticing that they excited my risible faculties, the salesman broke in with "Oh! they have been specially made for use in Egypt!" "Indeed!" was my reply, "I did not guess that Pharaoh's land possessed such an extraordinary climate." The two instruments were graduated, every degree, from below 20° to above 280° F., or to 70° above the boiling point of water!

They reminded me of a thermometer supplied by the maker to an observer in an inland part of England, subject to severe winter cold, occasionally 20° to 30° below the freezing point. The instrument was produced for my inspection. Its graduation commenced at 30° F., and the observer explained that for greater cold than that he had to guess the reading! At the other extreme the graduation extended far beyond anything possible in our climate, even when the instrument is freely exposed to the sun.

At page 38 of the Meteorological Office publication, the *Marine Observers' Handbook*, it is stated, in connection with sea temperature observations, that "The thermometer is graduated on Fahrenheit scale from 26° to 95°." This is for use in all the seas of the globe, between the Equator and the Poles. However, at one of the most popular of our seaside holiday resorts, the local authorities, anxious to gratify the curiosity of their visitors as to the tempera-

ture of the sea every day, invested in a well-protected thermometer, in a copper case, and the pier master was very proud of it. I found it had a range of 86° Fah., from 2° below zero to 84° above ! In reply to my enquiry if the sea temperature had been down to zero yet : " No, Sir ! " was the reply, " you see, we have not had the old-fashioned cold winters for many, many years ! "

At another much-frequented bathing place on the same coast the authorities were faced by the same demand for a knowledge of the water temperature, and, perforce, a thermometer had to be obtained. To insure that everything was quite correct it was decided to obtain the instrument direct from the makers. When I saw it, many months or a year afterwards, it had not been made any use of, for the simple reason that the person in charge had no idea how it was to be manipulated, and the makers had supplied no instructions. It was an elaborate and ponderous contrivance, suitable for obtaining the temperature at a depth of miles instead of at a few inches !

Newspaper meteorology frequently is a fearful and wonderful thing, and this is not surprising when it is known that the great majority of the writers have not the most elementary knowledge of the subject, so that absurdities abound in their contributions. A year or two ago I was hailed by a young gentleman who was hard at work at a pile of statistics. Could I afford him any enlightenment in his difficulties. " Yes, what is their nature ? " " Well, you see, my Editor has asked me to contribute a column article on the wet weather and the floods, and I am copying all the rainfall records from these sheets, but I confess I do not quite understand how to use them now I have got them." He had copied some yards of figures. " Unfortunately, you have wasted the whole of your time," I said ; " these are not rainfall statistics ! " " Not rainfall," he replied, " What are they then ? The sheets are all headed *Wet Bulb* ! "

The mention of rainfall brings to mind a dispute between colonial gentlemen as to the merits or demerits of their rain gauges. One of them insisted that he invariably registered much larger falls than his neighbours, and he knew he was correct because he was always particularly careful in measuring the contents of his gauge. I was appealed to for an explanation. It turned out that when on a visit to London he took a fancy to a rain gauge which he saw in the window of a second-hand shop, and forthwith purchased it for a trifle. Whether it was a 5 in. or an 8 in. gauge he did not know, but there was no graduated measuring glass, and he was not aware that one was necessary. When he found there was water in the gauge he emptied it into any convenient vessel—a tumbler, a jug, or anything else—dipped a foot rule into the water to ascertain its depth, and that gave him the rainfall in inches and points !

## METEOROLOGICAL OBSERVATIONS AT LU-KIA-PANG.

By REV. J. DE MOIDREY, S.J.

(Continued from p. 36.)

1915.

| I.—Barometric Pressure. Millibars. |        |        |        |            | IV.                                             | V.                       |
|------------------------------------|--------|--------|--------|------------|-------------------------------------------------|--------------------------|
|                                    | 8 a.m. | 2 p.m. | 8 p.m. | Daily Mean | Mean amount of Cloud at 8 a.m., 2 p.m. & 8 p.m. | Days with Thunderstorms. |
| Jan. ....                          | 1027·6 | 1025·5 | 1026·9 | 1027·32    | Jan. 6·1                                        | Jan. 0                   |
| Feb. ....                          | 1022·3 | 1020·5 | 1021·5 | 1022·0     | Feb. 7·6                                        | Feb. 3                   |
| Mar. ....                          | 1022·3 | 1020·5 | 1021·6 | 1021·5     | Mar. 6·2                                        | Mar. 1                   |
| April ....                         | 1016·6 | 1015·4 | 1016·1 | 1015·5     | April 8·6                                       | April 2                  |
| May ....                           | 1010·6 | 1009·2 | 1009·7 | 1009·0     | May 6·2                                         | May 2                    |
| June ....                          | 1006·6 | 1005·6 | 1006·0 | 1005·3     | June 8·0                                        | June 1                   |
| July ....                          | 1004·6 | 1003·0 | 1003·6 | 1002·8     | July 5·8                                        | July 4                   |
| Aug. ....                          | 1003·7 | 1002·4 | 1003·2 | 1002·0     | Aug. 6·9                                        | Aug. 8                   |
| Sept. ....                         | 1012·7 | 1011·4 | 1012·4 | 1011·1     | Sept. 6·6                                       | Sept. 2                  |
| Oct. ....                          | 1017·7 | 1015·7 | 1017·1 | 1016·0     | Oct. 6·9                                        | Oct. 0                   |
| Nov. ....                          | 1025·8 | 1023·9 | 1025·3 | 1024·5     | Nov. 7·2                                        | Nov. 0                   |
| Dec. ....                          | 1025·4 | 1023·3 | 1024·5 | 1024·3     | Dec. 4·9                                        | Dec. 0                   |
| Year ....                          | 1016·3 | 1014·7 | 1015·7 | 1015·1     | Year 6·75                                       | Year 23                  |

1915.

## II.—Temperature. Degrees Centigrade.

| MEAN DAILY. |       |                   |                   | MINIMUM. |                     |                   |                   |
|-------------|-------|-------------------|-------------------|----------|---------------------|-------------------|-------------------|
|             | Mean. | Lowest.           | Highest.          | Mean.    | Hour. A.M. hr. min. | Lowest.           | Highest.          |
| Jan. ....   | 3·6   | —6·7 <sub>a</sub> | 11·5              | 0·3      | 4 33                | —9·2 <sub>c</sub> | 8·9               |
| Feb. ....   | 4·8   | —4·0              | 14·3              | 1·9      | 3 43                | —7·4              | 9·4               |
| Mar. ....   | 7·5   | 2·6               | 14·3              | 3·3      | 4 31                | —1·2              | 7·3               |
| April ....  | 12·9  | 7·7               | 21·7              | 9·7      | 2 53                | 2·8               | 15·5              |
| May ....    | 19·9  | 13·1              | 26·7              | 14·8     | 4 28                | 8·9               | 19·2              |
| June ....   | 24·3  | 20·7              | 27·8              | 21·2     | 4 33                | 17·7              | 25·6              |
| July ....   | 27·6  | 21·3              | 30·9 <sub>b</sub> | 24·3     | 3 29                | 20·2              | 27·1 <sub>d</sub> |
| Aug. ....   | 26·8  | 23·5              | 28·9              | 23·6     | 3 43                | 19·7              | 26·3              |
| Sept. ....  | 22·3  | 17·5              | 28·0              | 19·2     | 3 35                | 13·4              | 25·2              |
| Oct. ....   | 19·1  | 13·6              | 24·5              | 15·7     | 3 31                | 10·9              | 20·3              |
| Nov. ....   | 12·8  | 6·5               | 18·3              | 10·2     | 4 23                | 2·2               | 16·8              |
| Dec. ....   | 7·0   | 1·7               | 13·2              | 2·8      | 4 43                | —3·9              | 10·6              |
| Year ....   | 15·7  | —6·7              | 30·9              | 12·3     | 3 35                | —9·2              | 27·1              |

Latest frost, March 30th; earliest, December 13th.

II.—(con.)

| 11.—(con.) |      | MAXIMUM. |                   |      |                   | RANGE.            |       |                  |                   |
|------------|------|----------|-------------------|------|-------------------|-------------------|-------|------------------|-------------------|
|            |      | Mean.    | Hour.<br>hr. min. | p.m. | Lowest.           | Highest.          | Mean. | Lowest.          | Highest.          |
| Jan.       | .... | 8·0      | 1                 | 28   | —4·8 <sub>e</sub> | 16·0              | 7·6   | 1·8              | 15·0              |
| Feb.       | .... | 8·5      | 1                 | 43   | —0·4              | 20·0              | 6·6   | 0·8              | 13·6              |
| Mar.       | .... | 12·9     | 1                 | 59   | 5·3               | 22·5              | 9·6   | 2·0              | 16·2              |
| April      | .... | 17·0     | 1                 | 4    | 11·6              | 28·2              | 7·4   | 1·1              | 15·5              |
| May        | .... | 26·0     | 1                 | 56   | 15·8              | 35·6              | 11·1  | 1·0              | 17·6 <sub>h</sub> |
| June       | .... | 28·5     | 2                 | 5    | 23·0              | 34·9              | 7·4   | 1·6              | 13·0              |
| July       | .... | 31·7     | 2                 | 50   | 22·0              | 36·4 <sub>f</sub> | 7·4   | 1·7              | 11·0              |
| Aug.       | .... | 31·2     | 2                 | 29   | 26·9              | 34·1              | 7·6   | 2·6              | 13·6              |
| Sept.      | .... | 27·0     | 1                 | 17   | 19·2              | 32·6              | 7·8   | 0·7 <sub>g</sub> | 12·7              |
| Oct.       | .... | 23·9     | 1                 | 3    | 16·4              | 30·5              | 8·1   | 1·8              | 14·5              |
| Nov.       | .... | 16·6     | 1                 | 6    | 10·3              | 23·4              | 6·4   | 1·6              | 11·6              |
| Dec.       | .... | 12·4     | 2                 | 4    | 4·3               | 17·1              | 9·5   | 2·8              | 15·9              |
| Year       | .... | 20·3     | 1                 | 45   | —4·8              | 36·4              | 8·0   | 0·7              | 17·6              |

a Jan. 13. b July 12. c Jan. 14. d July 14 e Jan. 13 f July 12. g Sept. 24. h May 30

The highest reading in each column is in heavy type, the lowest in italic.



1915.

## III.—Relative Humidity. Per cent.

|            | RELATIVE HUMIDITY. |         |          | VAPOUR TENSION. |         |          |
|------------|--------------------|---------|----------|-----------------|---------|----------|
|            | Mean.              | Lowest. | Highest. | Mean.           | Lowest. | Highest. |
| Jan. ....  | 75                 | 44      | 97       | 4.8             | 1.2     | 7.9      |
| Feb. ....  | 79                 | 60      | 96       | 5.4             | 2.0     | 11.5     |
| Mar. ....  | 69                 | 54      | 95       | 5.6             | 3.3     | 8.5      |
| April .... | 80                 | 53      | 97       | 9.2             | 4.7     | 16.4     |
| May ....   | 68                 | 48      | 97       | 12.5            | 7.9     | 16.6     |
| June ....  | 79                 | 63      | 96       | 18.2            | 14.7    | 23.0     |
| July ....  | 78                 | 62      | 96       | 22.3            | 17.0    | 25.1     |
| Aug. ....  | 84                 | 73      | 94       | 22.8            | 18.5    | 25.7     |
| Sept. .... | 81                 | 61      | 96       | 16.9            | 9.9     | 22.7     |
| Oct. ....  | 84                 | 66      | 98       | 14.4            | 8.1     | 18.6     |
| Nov. ....  | 80                 | 61      | 98       | 9.5             | 5.8     | 14.2     |
| Dec. ....  | 76                 | 55      | 97       | 6.0             | 2.9     | 9.8      |
| Year ..... | 77.8               | 44.1    | 98.1     | 12.3            | 1.2     | 25.7     |

1915.

## VI.—Rainfall.

|            | (a). INTENSITY. Days with |       |       |       |         |         |         |             | DAYS WITH |       |        |
|------------|---------------------------|-------|-------|-------|---------|---------|---------|-------------|-----------|-------|--------|
|            | mm.<br>0.1—0.9            | 1—2.9 | 3—4.9 | 5—9.9 | 10—19.9 | 20—39.9 | 40—59.9 | 60.0 & over | Rain.     | Snow. | Total. |
| Jan. ....  | 9                         | 2     | 0     | 1     | 1       | 0       | 0       | 0           | 13        | 1     | 14     |
| Feb. ....  | 4                         | 0     | 3     | 1     | 4       | 0       | 0       | 0           | 12        | 2     | 14     |
| Mar. ....  | 4                         | 0     | 1     | 2     | 3       | 0       | 0       | 0           | 10        | —     | 10     |
| April .... | 3                         | 0     | 4     | 5     | 2       | 2       | 0       | 0           | 16        | —     | 16     |
| May ....   | 2                         | 0     | 3     | 1     | 0       | 1       | 0       | 0           | 7         | —     | 7      |
| June ....  | 8                         | 3     | 1     | 3     | 3       | 0       | 2       | 1           | 21        | —     | 21     |
| July ....  | 0                         | 0     | 0     | 2     | 1       | 2       | 1       | 0           | 6         | —     | 6      |
| Aug. ....  | 6                         | 4     | 3     | 0     | 3       | 3       | 0       | 0           | 19        | —     | 19     |
| Sept. .... | 7                         | 3     | 0     | 1     | 3       | 0       | 1       | 0           | 15        | —     | 15     |
| Oct. ....  | 9                         | 1     | 1     | 3     | 1       | 2       | 0       | 1           | 18        | —     | 18     |
| Nov. ....  | 7                         | 2     | 0     | 2     | 2       | 3       | 0       | 0           | 16        | —     | 16     |
| Dec. ....  | 7                         | 0     | 0     | 0     | 0       | 0       | 0       | 0           | 7         | —     | 7      |
| Year ..... | 66                        | 15    | 16    | 21    | 23      | 13      | 4       | 2           | 160       | 3     | 163    |

## VI.

(b). Total Rainfall. Millimetres.

|          | 8 p.m.<br>—8 a.m. | 8 a.m.<br>—8 p.m. | Total. |
|----------|-------------------|-------------------|--------|
| Jan. ..  | 20.0              | 6.5               | 26.5   |
| Feb. ..  | 46.5              | 36.8              | 83.3   |
| Mar. ..  | 43.3              | 15.6              | 58.9   |
| April .. | 86.2              | 43.6              | 129.8  |
| May ..   | 11.1              | 34.3              | 45.4   |
| June ..  | 127.3             | 145.6             | 272.9  |
| July ..  | 49.3              | 78.3              | 127.6  |
| Aug. ..  | 28.0              | 110.3             | 138.3  |
| Sept. .. | 52.5              | 56.6              | 109.1  |
| Oct. ..  | 120.3             | 54.9              | 175.2  |
| Nov. ..  | 75.1              | 72.7              | 147.8  |
| Dec. ..  | 0.3               | 0.0               | 0.3    |
| Year ..  | 660.4             | 655.2             | 1315.6 |

## VI.

(c). Rainless Periods of 10 days or more, excluding dew.

| Began.               | Ended.       | Lasted. |
|----------------------|--------------|---------|
| Jan. 12              | Jan. 25      | 14 dys. |
| April 25             | May 9        | 11 "    |
| May 23               | June 3       | 12 "    |
| Sept. 25             | Oct. 9       | 15 "    |
| Nov. 25 <sup>k</sup> | Jan. 6, 1916 | 43 "    |

<sup>k</sup> In December there were only heavy dews.

1915.

VIII.

VII.—Wind. (a).

*Mean Duration of Bright Sunshine.  
Hours.**Mean Velocity at 8 a.m., 2 p.m.  
and 8 p.m. Metres per second.*

|          | Fore-noon. | After-noon. | Total. | Per-centage of possible. | Mean amount of Cloud. <sup>m</sup> |          | Min. | Max. | Mean.              |
|----------|------------|-------------|--------|--------------------------|------------------------------------|----------|------|------|--------------------|
| Jan. ..  | 2.1        | 2.3         | 4.4    | 43                       | 5.7                                | Jan. ..  | 2.4  | 6.7  | 4.0                |
| Feb. ..  | 1.6        | 2.0         | 3.6    | 32                       | 6.8                                | Feb. ..  | 1.6  | 9.2  | 4.2                |
| Mar. ..  | 3.0        | 2.3         | 5.3    | 45                       | 5.5                                | Mar. ..  | 1.1  | 9.0  | 4.3                |
| April .. | 0.8        | 0.9         | 1.7    | 13                       | 8.7                                | April .. | 1.6  | 7.7  | 3.9                |
| May ..   | 2.4        | 2.2         | 4.6    | 33                       | 6.7                                | May ..   | 1.3  | 8.2  | 4.0                |
| June ..  | 2.3        | 2.7         | 5.0    | 36                       | 6.4                                | June ..  | ..   | ..   | [3.8] <sup>l</sup> |
| July ..  | 4.5        | 4.4         | 8.9    | 63                       | 3.7                                | July ..  | ..   | ..   | [4.9] <sup>l</sup> |
| Aug. ..  | 3.1        | 2.3         | 5.4    | 41                       | 5.9                                | Aug. ..  | 0.9  | 8.1  | 2.9                |
| Sept. .. | 2.7        | 2.8         | 5.5    | 45                       | 5.5                                | Sept. .. | 1.1  | 5.9  | 3.0                |
| Oct. ..  | 2.4        | 1.9         | 4.3    | 37                       | 6.3                                | Oct. ..  | 1.2  | 6.4  | 3.2                |
| Nov. ..  | 2.0        | 1.4         | 3.4    | 32                       | 6.8                                | Nov. ..  | 0.8  | 7.4  | 3.5                |
| Dec. ..  | 2.2        | 2.5         | 4.7    | 46                       | 5.4                                | Dec. ..  | 0.8  | 9.7  | 3.1                |
| Year ..  | 2.4        | 2.3         | 4.7    | 39                       | 6.1                                | Year ..  | 0.8  | 9.7  | [3.7] <sup>l</sup> |

<sup>l</sup> The typhoon of June 28th overturned the anemometer and caused the loss of several days' observations in June and July, thus making the mean values defective.

<sup>m</sup> The amount of cloud refers to the whole day, excluding the night. Table IV. is limited to the three hours of observation, 8 a.m., 2 p.m. and 8 p.m.

## VII. Wind (b.)—Direction. Percentage Frequency.

|            | N.   | N.E. | E.   | S.E. | S.  | S.W. | W.  | N.W. | Calm. | Vari-able. |
|------------|------|------|------|------|-----|------|-----|------|-------|------------|
| Jan. ....  | 19   | 16   | 1    | 14   | 5   | 5    | 13  | 24   | 0     | 3          |
| Feb. ....  | 12   | 23   | 8    | 8    | 2   | 2    | 15  | 30   | 0     | 0          |
| Mar. ....  | 19   | 12   | 11   | 16   | 11  | 7    | 5   | 18   | 0     | 1          |
| April .... | 13   | 23   | 15   | 18   | 10  | 9    | 7   | 4    | 1     | 0          |
| May ....   | 15   | 4    | 5    | 35   | 13  | 13   | 6   | 9    | 0     | 0          |
| June ....  | 4    | 8    | 11   | 33   | 17  | 11   | 4   | 11   | 0     | 1          |
| July ....  | 0    | 2    | 12   | 42   | 19  | 17   | 4   | 2    | 0     | 2          |
| Aug. ....  | 17   | 8    | 12   | 21   | 4   | 7    | 7   | 22   | 0     | 2          |
| Sept. .... | 21   | 30   | 12   | 5    | 6   | 1    | 5   | 19   | 0     | 1          |
| Oct. ....  | 34   | 27   | 17   | 13   | 3   | 1    | 1   | 4    | 0     | 0          |
| Nov. ....  | 23   | 34   | 11   | 5    | 0   | 0    | 4   | 21   | 0     | 2          |
| Dec. ....  | 11   | 20   | 5    | 15   | 9   | 10   | 5   | 23   | 1     | 1          |
| Year ....  | 15.7 | 17.3 | 10.0 | 18.8 | 8.3 | 6.9  | 6.3 | 15.6 | 0.2   | 1.1        |

## ROYAL METEOROLOGICAL SOCIETY.

A MEETING of the Society was held on April 19th, at 10, Victoria Street, S.W., Major H. G. Lyons, F.R.S., President, in the Chair.

Mr. E. V. Newnham, B.Sc., read a paper on "The Persistence of Wet and Dry Weather." The rainfall records of Kew, Aberdeen, and Valencia, for the ten years, 1901-1910, and the twenty-seven years, 1887-1913, at Greenwich, were analysed in order to ascertain to what degree the tendency for wet and fine days or hours to occur in "runs" can be made use of for rain forecasts. It was shown that the chance

of a given day being a "rain day" is increased beyond the normal chance if the preceding day has been wet, and that the probability of rain goes on increasing with continued unsettled weather, and diminishing with protracted drought. On plotting the results from four stations graphically it was seen that they all follow the same general form, in which the probability changes rapidly on passing from wet to fine spells and tends to become constant after long spells. The hourly rain probability was subject to the same laws as the daily probability.

Prof. H. H. Turner suggested the advisability of extending the investigation to include the probability of a day with or without rain to follow a broken run of wet or dry days. Mr. W.W. Bryant pointed out that the curves appeared to be asymptotic, which, since rain could not in any case continue indefinitely was certainly not the case. The persistence of wet or dry spells depended, he thought on the conditions of the atmosphere and not upon the occurrence of previous wet or dry days. Dr. C. Chree considered that the hourly probability was largely dependent on mean diurnal variation, and the daily probability on the seasonal variation of rainfall. The reliability of the curves could best be tested by analysing two successive periods of equal length at the same station and comparing the results.

Prof. H. H. Turner, F.R.S., communicated a second note on "Discontinuities in Meteorological Phenomena," in the course of which he remarked that the Sunderland rainfall, when discussed in "chapters" as suggested in his former paper not only behaved very like the Greenwich rainfall, but showed, as regards mean monthly rainfalls, a close correlation. At Paris, situated an equal distance south of Greenwich, the rainfall has a different character, although the division into "chapters" is still marked. The Paris mean temperatures (*i.e.*, hot and cold periods), from 1801-1915 also respond to the division into "chapters," which are definitely abrupt and not gradual. The variations are apparently periodic but more than one period is involved, the two most marked periods being twenty and twenty-five years, which are also found in tree growth.

Mr. W. Marriott described similar work which he had carried out in connection with the long rainfall records at Greenwich and Rothsay. His results were, on the whole, confirmatory. Mr. Bryant thought that the best test of the truth of the persistence of the periodicities found lay in prediction. Attempts to predict sunspot periods and latitude variations, although resting on a more secure mathematical basis had failed. Mr. Inwards, Mr. J. S. Dines, Dr. Chree, Mr. Jenkin and Mr. Tripp also took part in the discussion. Prof. Turner, in reply, pointed out that he had successfully predicted the past before it was known to him, which he considered an equally good test as predicting the future. The period of  $6\frac{1}{2}$  years was the only meteorological period except the twelve-monthly one, which held as long as a hundred years.

## Correspondence.

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

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### A LONG-LOST BALLOON METEOROGRAPH.

THE following statement may perhaps be of interest. A meteorograph sent up in the usual way from Mungret College, Limerick, on April 12th, 1912, has just been returned. The record is perfectly good and distinct, although it has been presumably exposed to the weather for nearly four years. This is a testimonial to the purity of the air in Ireland. It is very unusual to recover an instrument after the lapse of one year. W. H. DINES.

*Benson Observatory, Oxfordshire, 2nd April, 1916.*

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### RAINFALL AND CLOUD-LEVEL.

THE particular piece of positive evidence adduced by Mr. Chisholm in the April number for the cloudless formation of rain is just what I want, but never, indeed, expected to get. My generalization formulated in the March article about the bulk of *cyclonic* rainfall originating below the cloud level depends only upon circumstantial evidence, and I hope to have opportunities while rambling in the hills of observing *how* rain in such circumstances is generated. It has been suggested to me by more than one person that the incompatibility of hill-mist with real rain is the result of the washing out of the mist particles by the larger rain drops, and this would indeed appear to be a factor to be reckoned with—to the extent, in fact, of rendering my inference from the facts less certain. I had overlooked the “washing out” process at the time of writing the article in question, but have reason to think it is not always a very efficient factor.

I fully appreciate Mr. Chisholm's remarks regarding the inadequate explanation given in geographical text books of orographic rainfall. It is, of course, impossible to understand cause and effect in climatology and meteorology without a thorough ground-knowledge of the rudiments of physics, and as many teachers are probably quite ignorant of the principle of adiabatic cooling consequent upon the expansion of air when relieved of a portion of its pressure, they fall into the easy error of assuming that the hills provoke condensation by direct contact chilling—an action which, if it does to some extent occur, must be quite subsidiary and confined to the winter months when the hill sides are colder than the damp Atlantic winds that impinge against them.

L. C. W. BONACINA.

*April 27th, 1916.*

## HEAVY RAINFALL IN IRELAND.

As you like to have prompt information about any abnormal rainfall I may mention that I have gauged 4.35 in. in the last seventy-two hours; 2.34 in. was in the gauge at 9 a.m. on the 6th, and 1.23 in. at the same hour on the 7th. We had wonderful weather up to the 4th and on that afternoon the atmosphere was extraordinarily clear and we saw the Mourne Mountains in Co. Down quite clearly from this, a distance of over fifty miles. At 2 p.m. the glass began to fall. The wind was a trifle N. by E. on Thursday and Friday, but went round to the north on Saturday. THOS. JACKSON.

*Farmleigh, Stillorgan, County Dublin, 7th May, 1916.*

## APRIL WEATHER—A CONTRAST.

25TH April, 1908. Snow 1.05 in., a drift 4 feet deep on the road near by holding up traffic. Minimum temp. 27°—unfortunately I have not the maximum; but it must have been very low.

25th April, 1916. A brilliant hot day, minimum temp. 45°, maximum 75°.

GEO. CHRYSTIE, Colonel.

*Short Heath Lodge, Farnham, Surrey.*

## THE WINTER OF 1915 IN JOHANNESBURG.

By R. T. A. INNES.

THE temperatures in June and August hardly differed from normal, but July was 2° below normal. The winter was, however, exceptional in that in July the precipitation was no less than 2.76 in. on ten days, whereas the average of the eleven previous Julys was 0.15 in. on one day. After thunder-storms, with mist, hail, and rain on the 15th-18th it snowed all day on the 19th. The barometer was never unusually low, but it rose sharply on the 22nd and 23rd, a rise which ushered in our usual bright dry winter weather.

The previous fall of snow occurred in August 1909. The following table shows the mean temperatures and precipitation recorded at the Union Observatory since 1907.

|      | Mean Shade Temperatures. |       |      | Rainfall, Inches and Days. |                    |                   |
|------|--------------------------|-------|------|----------------------------|--------------------|-------------------|
|      | June.                    | July. | Aug. | June.                      | July.              | Aug.              |
| 1915 | .. 49.4                  | 47.1  | 53.8 | —                          | 2.76 <sub>10</sub> | 0.19 <sub>1</sub> |
| 1914 | .. 48.8                  | 50.8  | 50.4 | 0.19 <sub>1</sub>          | —                  | —                 |
| 1913 | .. 50.2                  | 52.9  | 55.0 | —                          | 0.14 <sub>1</sub>  | 0.93 <sub>3</sub> |
| 1912 | .. 48.9                  | 46.9  | 54.1 | 0.04 <sub>1</sub>          | 0.01 <sub>1</sub>  | —                 |
| 1911 | .. 46.8                  | 48.9  | 52.0 | —                          | 0.24 <sub>2</sub>  | —                 |
| 1910 | .. 45.2                  | 49.9  | 56.1 | 0.28 <sub>3</sub>          | —                  | —                 |
| 1909 | .. 50.3                  | 50.1  | 54.6 | —                          | 0.39 <sub>1</sub>  | 1.39 <sub>2</sub> |
| 1908 | .. 52.8                  | 49.0  | 55.0 | —                          | 0.84 <sub>3</sub>  | 0.16 <sub>3</sub> |
| 1907 | .. 49.9                  | 48.9  | 55.6 | —                          | —                  | —                 |

## REVIEW.

- (1.) *Synopsis Météorologique des Années, 1901-1913. Observations faites dans l'Observatoire Central du Prado.* Montevideo, 1914. Size  $12 \times 9$ . Pp. 8. (2.) *Sinopsis Meteorológica del Año 1913.* Montevideo, 1915. Size,  $11 \times 7\frac{1}{2}$ . Pp. 23. (3.) *Boletín Mensual, 1914.* Montevideo, 1915. Size,  $11 \times 7\frac{1}{2}$ . Pp. 12.

In these three memoirs we have evidence of the increasing activity and promptitude of issue of the results of the work carried on at the Central Bureau of the National Physico-Climatological Institute of Uruguay, under the directorship of Prof. Luis Morandi.

(1.) Gives a general synopsis of the mean monthly seasonal and annual values, based on hourly observations obtained from an elaborate installation of automatic instruments. Montevideo is situated at the mouth of the River Plate, in latitude  $34^{\circ} 53' S$ . The mean annual temperature is  $61^{\circ} 0$ . The warmest months are January and February, each with a mean of  $71^{\circ} 4$ , and the coolest July, with a mean of  $50^{\circ} 5$ . The absolute maximum temperature was  $102^{\circ} 7$ , and the lowest  $24^{\circ} 8$ . The mean annual rainfall is 35.17 in., falling on 66 days, during 286 hours. The maximum daily fall recorded was 5.93 in., in May, 1906, and the greatest hourly fall 1.61 in. A map is given of the mean annual rainfall of Uruguay, deduced from 52 stations, mostly for the eight years 1906-13. This shows that the wettest part of Uruguay, with a rainfall of from 41 to 45 inches, is found over a comparatively broad strip of country contiguous to Brazil. The driest region, with a fall of from 29 to 33 inches, is located some little distance inland from the Atlantic coast. The period is too short and the data insufficient to give a true picture of Uruguay rainfall. Ample material exists which, if worked up by approved methods would yield accurate monthly and annual rainfall maps of Uruguay.

(2.) Gives an abstract of the meteorological results at the central observatory during 1913, and (3.) similar data for 1914, along with monthly and annual values of rainfall for 331 stations during the year. This latter work must have gone to press about July, so that Uruguay, along with Norway and Great Britain, publishes its rain data with remarkable promptitude. The year 1914 was, in common with the Argentine in middle latitudes, an exceptionally wet one in Uruguay, the general fall being from two and a half to three times the normal. At Montevideo 94.47 in. fell, and in some parts of the department of Colonia this amount was considerably exceeded.

It would add considerably to the interest of these memoirs if a map showing the position of the stations and orographical features could be given.

R.C.M.

## RAINFALL TABLE FOR APRIL, 1916.

| STATION.                        | COUNTY.           | Lat.<br>N. | Long.<br>W.<br>[°E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|---------------------------------|-------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                 |                   |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1916.<br>in. |
| Camden Square.....              | London.....       | 51 32      | 0 8                  | 111                            | 1'74                           | 1'31         |
| Tenterden.....                  | Kent.....         | 51 4       | *0 41                | 190                            | 1'77                           | 1'34         |
| Arundel (Patching).....         | Sussex.....       | 50 51      | 0 27                 | 130                            | 1'82                           | '96          |
| Fordingbridge (Oaklands)...     | Hampshire.....    | 50 56      | 1 38                 | 135                            | 1'92                           | '94          |
| Oxford (Magdalen College)...    | Oxfordshire.....  | 51 45      | 1 15                 | 186                            | 1'67                           | '88          |
| Wellingborough (Swanspool)...   | Northampton.....  | 52 18      | 0 41                 | 155                            | 1'78                           | 1'01         |
| Bury St. Edmunds (Westley)...   | Suffolk.....      | 52 15      | *0 40                | 226                            | 1'62                           | 1'66         |
| Geldeston [Beccles].....        | Norfolk.....      | 52 27      | *1 31                | 38                             | 1'55                           | 1'92         |
| Polapit Tamar [Launceston]...   | Devon.....        | 50 40      | 4 22                 | 315                            | 2'34                           | 1'41         |
| Rousdon [Lyme Regis].....       | ".....            | 50 41      | 3 0                  | 516                            | 2'39                           | '60          |
| Stroud (Field Place).....       | Gloucestershire.. | 51 44      | 2 13                 | 226                            | 2'09                           | '84          |
| Church Stretton (Wolstaston)... | Shropshire.....   | 52 35      | 2 48                 | 800                            | 2'20                           | 1'54         |
| Boston.....                     | Lincolnshire..... | 52 58      | 0 1                  | 11                             | 1'57                           | 1'55         |
| Worksop (Hodsock Priory)...     | Nottinghamshire   | 53 22      | 1 5                  | 56                             | 1'62                           | 1'11         |
| Mickleover Manor.....           | Derbyshire.....   | 52 54      | 1 32                 | 280                            | 1'77                           | 1'63         |
| Macclesfield.....               | Cheshire.....     | 53 15      | 2 7                  | 501                            | 2'02                           | 3'36         |
| Southport (Hesketh Park)...     | Lancashire.....   | 53 39      | 2 59                 | 38                             | 1'84                           | 2'37         |
| Arncliffe Vicarage.....         | Yorkshire, W.R.   | 54 8       | 2 6                  | 732                            | 3'73                           | 3'82         |
| Goldsborough Hall.....          | ".....            | 54 0       | 1 25                 | 119                            | 1'89                           | 1'21         |
| Hull (Pearson Park).....        | "..... E.R.       | 53 45      | 0 20                 | 6                              | 1'69                           | 1'05         |
| Newcastle (Town Moor)...        | Northumberland    | 54 59      | 1 38                 | 201                            | 1'84                           | 1'35         |
| Borrowdale (Seathwaite)...      | Cumberland.....   | 54 30      | 3 10                 | 423                            | 6'91                           | 11'93        |
| Cardiff (Ely).....              | Glamorgan.....    | 51 29      | 3 13                 | 53                             | 2'50                           | 1'96         |
| Haverfordwest.....              | Pembroke.....     | 51 48      | 4 58                 | 90                             | 2'82                           | 2'19         |
| Aberystwyth (Gogerddan)...      | Cardigan.....     | 52 26      | 4 1                  | 83                             | 2'48                           | 3'82         |
| Llandudno.....                  | Carnarvon.....    | 53 20      | 3 50                 | 72                             | 1'79                           | 1'57         |
| Cargen [Dumtries].....          | Kirkcudbright...  | 55 2       | 3 37                 | 80                             | 2'50                           | 3'08         |
| Marchmont House.....            | Berwick.....      | 55 44      | 2 24                 | 498                            | 2'28                           | 2'68         |
| Girvan (Pinmore).....           | Ayr.....          | 55 10      | 4 49                 | 207                            | 2'81                           | 4'35         |
| Glasgow (Queen's Park)...       | Renfrew.....      | 55 53      | 4 18                 | 144                            | 1'86                           | 3'24         |
| Islay (Eallabus).....           | Argyll.....       | 55 47      | 6 15                 | 68                             | 2'64                           | 7'20         |
| Mull (Quinish).....             | ".....            | 56 34      | 6 13                 | 35                             | 2'98                           | 3'45         |
| Balquhiddy (Stronvar).....      | Perth.....        | 56 21      | 4 23                 | 422                            | 4'15                           | ...          |
| Dundee (Eastern Necropolis)...  | Forfar.....       | 56 28      | 2 57                 | 199                            | 1'93                           | 1'42         |
| Braemar.....                    | Aberdeen.....     | 57 0       | 3 24                 | 1114                           | 2'30                           | 2'16         |
| Aberdeen (Cranford).....        | ".....            | 57 8       | 2 7                  | 120                            | 2'23                           | 2'54         |
| Gordon Castle.....              | Moray.....        | 57 37      | 3 5                  | 107                            | 1'74                           | 2'72         |
| Drumnadrochit.....              | E. Inverness..... | 57 20      | 4 29                 | 138                            | 1'85                           | 2'80         |
| Fort William.....               | ".....            | 56 49      | 5 6                  | 171                            | 3'65                           | 5'47         |
| Loch Torridon (Bendamph)...     | W. Ross.....      | 57 32      | 5 32                 | 20                             | 4'70                           | 5'93         |
| Dunrobin Castle.....            | Sutherland.....   | 57 59      | 3 56                 | 14                             | 2'02                           | 1'95         |
| Killarney (District Asylum)...  | Kerry.....        | 52 4       | 9 31                 | 178                            | 3'46                           | 6'20         |
| Waterford (Brook Lodge)...      | Waterford.....    | 52 15      | 7 7                  | 104                            | 2'68                           | 2'78         |
| Nenagh (Castle Lough).....      | Tipperary.....    | 52 54      | 8 24                 | 120                            | 2'54                           | 4'07         |
| Ennistymon House.....           | Clare.....        | 52 57      | 9 18                 | 37                             | 2'81                           | 4'51         |
| Gorey (Courtown House)...       | Wexford.....      | 52 40      | 6 13                 | 80                             | 2'37                           | 2'00         |
| Abbey Leix (Blandsfort)...      | Queen's County..  | 52 56      | 7 17                 | 532                            | 2'54                           | 2'70         |
| Dublin (Fitz William Square)... | Dublin.....       | 53 21      | 6 14                 | 54                             | 2'03                           | 1'65         |
| Mullingar (Belvedere).....      | Westmeath.....    | 53 29      | 7 22                 | 367                            | 2'37                           | 3'59         |
| Crossmolina (Enniscoe).....     | Mayo.....         | 54 4       | 9 16                 | 74                             | 3'13                           | 5'40         |
| Cong (The Glebe).....           | ".....            | 53 33      | 9 16                 | 112                            | 2'98                           | 4'28         |
| Collooney (Markree Obsy.)...    | Sligo.....        | 54 11      | 8 27                 | 127                            | 2'52                           | 5'98         |
| Seaforde.....                   | Down.....         | 54 19      | 5 50                 | 180                            | 2'76                           | 2'83         |
| Ballymena (Harryville).....     | Antrim.....       | 54 52      | 6 13                 | 150                            | 2'57                           | 4'85         |
| Omagh (Edenfel).....            | Tyrone.....       | 54 36      | 7 18                 | 280                            | 2'50                           | 4'62         |

RAINFALL TABLE FOR APRIL, 1916—*continued.*

| RAINFALL OF MONTH ( <i>con.</i> ) |          |                   |        |             | RAINFALL FROM JAN. 1. |           |                      |          | Mean Annual 1875-1909. | STATION          |
|-----------------------------------|----------|-------------------|--------|-------------|-----------------------|-----------|----------------------|----------|------------------------|------------------|
| Diff. from Av. in.                | % of Av. | Max. in 24 hours. |        | No. of Days | Aver. 1875-1909. in.  | 1916. in. | Diff. from Aver. in. | % of Av. |                        |                  |
| — 43                              | 75       | 27                | 6      | 15          | 6·93                  | 10·74     | +3·81                | 155      | 25·11                  | Camden Square    |
| — 43                              | 76       | 39                | 6      | 14          | 7·76                  | 10·66     | +2·90                | 137      | 27·64                  | Tenterden        |
| — 46                              | 53       | 24                | 16     | 10          | 8·53                  | 12·24     | +3·71                | 144      | 30·48                  | Patching         |
| — 98                              | 49       | 19                | 16     | 15          | 9·02                  | 10·82     | +1·80                | 120      | 31·06                  | Fordingbridge    |
| — 79                              | 53       | 31                | 19     | 11          | 6·52                  | 10·93     | +4·41                | 168      | 24·58                  | Oxford           |
| — 77                              | 57       | 18                | 16     | 13          | 7·10                  | 10·32     | +3·22                | 145      | 25·20                  | Swanspool        |
| + 04                              | 103      | 35                | 17     | 14          | 6·62                  | 10·90     | +4·28                | 165      | 25·40                  | Westley          |
| + 37                              | 124      | 36                | 6      | 15          | 6·06                  | 10·08     | +4·02                | 166      | 23·73                  | Geldeston        |
| — 93                              | 60       | 34                | 19     | 13          | 11·62                 | 14·27     | +2·65                | 123      | 38·27                  | Polapit Tamar    |
| — 179                             | 25       | 30                | 16     | 10          | 10·13                 | 11·15     | +1·02                | 110      | 33·54                  | Rousdon          |
| — 125                             | 40       | 32                | 19     | 11          | 8·55                  | 10·36     | +1·81                | 121      | 29·81                  | Stroud           |
| — 66                              | 70       | 33                | 16     | 14          | 9·07                  | 10·83     | +1·76                | 119      | 32·41                  | Wolstaston       |
| — 02                              | 99       | 25                | 17     | 15          | 6·11                  | 10·61     | +4·50                | 174      | 23·35                  | Boston           |
| — 51                              | 69       | 40                | 19     | 12          | 6·66                  | 9·09      | +2·43                | 137      | 24·46                  | Hodsock Priory   |
| — 14                              | 92       | 49                | 17     | 15          | 7·12                  | 12·74     | +5·62                | 179      | 26·65                  | Mickleover       |
| + 134                             | 166      | 59                | 11     | 15          | 9·48                  | 11·47     | +1·99                | 121      | 34·73                  | Macclesfield     |
| + 53                              | 129      | 80                | 11     | 14          | 8·57                  | 8·74      | + ·17                | 102      | 32·70                  | Southport        |
| + 09                              | 102      | 95                | 17     | 18          | 20·04                 | 23·44     | +3·40                | 117      | 61·49                  | Arncliffe        |
| — 68                              | 64       | 18                | 19     | 15          | 7·55                  | 9·77      | +2·22                | 130      | 27·29                  | Goldsbrough Hall |
| — 64                              | 62       | 27                | 18     | 13          | 7·01                  | 8·76      | +1·75                | 125      | 26·42                  | Hull             |
| — 49                              | 73       | 27                | 19     | 15          | 7·47                  | 8·77      | +1·30                | 118      | 27·94                  | Newcastle        |
| + 502                             | 173      | 247               | 17     | 18          | 41·94                 | 50·63     | +8·69                | 121      | 129·48                 | Seathwaite       |
| — 54                              | 78       | 33                | 11     | 16          | 12·11                 | 15·05     | +2·94                | 124      | 42·28                  | Cardiff          |
| — 63                              | 78       | 56                | 15     | 11          | 14·09                 | 12·76     | —1·33                | 95       | 46·81                  | Haverfordwest    |
| + 134                             | 154      | 99                | 16     | 16          | 12·52                 | 14·50     | +1·98                | 116      | 45·46                  | Gogerddan        |
| — 22                              | 88       | 31                | 17     | 12          | 8·54                  | 9·69      | +1·15                | 113      | 30·36                  | Llandudno        |
| + 58                              | 123      | 64                | 23     | 21          | 13·35                 | 16·03     | +2·68                | 120      | 43·47                  | Cargen           |
| + 40                              | 118      | 69                | 20     | 15          | 9·47                  | 13·55     | +4·08                | 143      | 33·76                  | Marchmont        |
| + 154                             | 155      | 60                | 12     | 18          | 15·08                 | 16·92     | +1·84                | 112      | 49·77                  | Girvan           |
| + 138                             | 174      | 50                | 24     | 18          | 10·70                 | 14·82     | +4·12                | 138      | 35·97                  | Glasgow          |
| + 456                             | 273      | 80                | 13, 19 | 20          | 15·01                 | 20·41     | +5·40                | 136      | 48·79                  | Eallabus         |
| + 47                              | 116      | 69                | 16     | 22          | 17·26                 | 15·91     | —1·35                | 92       | 56·57                  | Quinish          |
| ...                               | ...      | ...               | ...    | ...         | 25·24                 | ...       | ...                  | ...      | 73·77                  | Stronvar         |
| — 51                              | 74       | 21                | 24     | 15          | 7·91                  | 8·74      | + ·83                | 110      | 28·64                  | Dundee           |
| — 14                              | 94       | 35                | 25     | 17          | 10·64                 | 16·75     | +6·11                | 158      | 34·93                  | Braemar          |
| + 31                              | 114      | 39                | 16, 17 | 17          | 9·60                  | 7·43      | —2·17                | 77       | 32·73                  | Aberdeen         |
| + 98                              | 156      | 74                | 17     | 14          | 8·04                  | 9·59      | +1·55                | 119      | 30·34                  | Gordon Castle    |
| + 95                              | 151      | 48                | 18     | 17          | 11·46                 | 18·53     | +7·07                | 161      | 36·13                  | Drumnadrochit    |
| + 182                             | 150      | 97                | 16     | 23          | 26·09                 | 33·24     | +7·15                | 127      | 75·80                  | Fort William     |
| + 123                             | 126      | 76                | 23     | 19          | 28·94                 | 36·12     | +7·18                | 125      | 83·93                  | Bendampf         |
| — 07                              | 96       | 32                | 16     | 14          | 9·99                  | 12·76     | +2·77                | 128      | 31·90                  | Dunrobin Castle  |
| + 274                             | 179      | 180               | 25     | 24          | 18·90                 | 19·82     | + ·92                | 105      | 54·81                  | Killarney        |
| + 10                              | 104      | 57                | 25     | 18          | 12·28                 | 10·97     | —1·31                | 89       | 39·57                  | Waterford        |
| + 153                             | 160      | 77                | 24     | 19          | 12·30                 | 14·77     | +2·47                | 120      | 39·43                  | Castle Lough     |
| + 170                             | 161      | 123               | 24     | 23          | 13·79                 | 17·23     | +3·44                | 125      | 46·52                  | Ennistymon       |
| — 37                              | 84       | 40                | 22     | 16          | 10·59                 | 11·76     | +1·17                | 111      | 34·99                  | Courtown Ho.     |
| + 16                              | 106      | 37                | 19     | 20          | 10·83                 | 11·33     | + ·50                | 105      | 35·92                  | Abbey Leix       |
| — 38                              | 81       | 35                | 19     | 18          | 8·08                  | 10·01     | +1·93                | 124      | 27·68                  | Dublin           |
| + 122                             | 152      | 65                | 15     | 21          | 10·78                 | 14·16     | +3·38                | 131      | 36·15                  | Mullingar        |
| + 227                             | 173      | 93                | 24     | 20          | 17·04                 | 21·53     | +4·49                | 126      | 52·87                  | Enniscooe        |
| + 130                             | 144      | 99                | 24     | 22          | 15·29                 | 17·91     | +2·62                | 117      | 48·90                  | Cong             |
| + 346                             | 238      | 80                | 24     | 23          | 12·92                 | 16·26     | +3·34                | 126      | 42·71                  | Markree          |
| + 07                              | 103      | 37                | 13     | 15          | 11·82                 | 11·02     | — ·80                | 93       | 38·91                  | Seaforde         |
| + 228                             | 189      | 94                | 24     | 20          | 12·36                 | 14·56     | +2·20                | 118      | 40·84                  | Ballymena        |
| + 212                             | 185      | 83                | 24     | 18          | 11·62                 | 13·95     | +2·33                | 120      | 39·38                  | Omagh            |

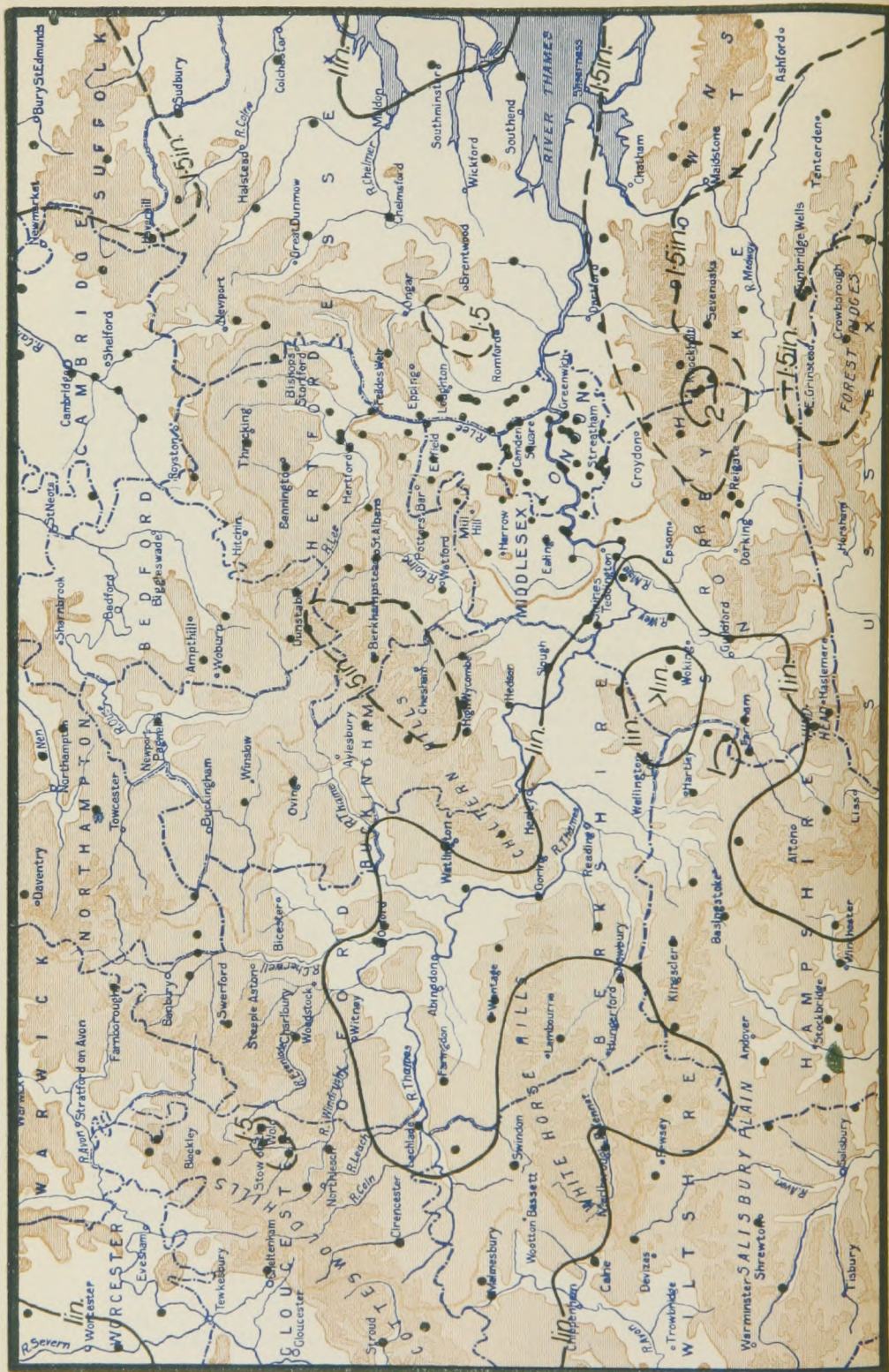


## SUPPLEMENTARY RAINFALL, APRIL, 1916.

| Div.  | STATION.                      | Rain<br>inches. | Div.   | STATION.                      | Rain<br>inches. |
|-------|-------------------------------|-----------------|--------|-------------------------------|-----------------|
| II.   | Warlingham, Redvers Road .    | 1.72            | XI.    | Lligwy .....                  | 1.66            |
| „     | Ramsgate .....                | 1.58            | „      | Douglas .....                 | 3.39            |
| „     | Hailsham .....                | 1.56            | XII.   | Stoneykirk, Ardwell House...  | 3.40            |
| „     | Totland Bay, Aston House...   | .45             | „      | Carsphairn Shiel .....        | 7.66            |
| „     | Stockbridge, Ashley..         | .49             | „      | Beattock, Kinnelhead .....    | 5.15            |
| „     | Grayshott .....               | .96             | „      | Langholm, Drove Road .....    | 4.16            |
| III.  | Harrow Weald, Hill House...   | 1.35            | XIII.  | Selkirk, The Hangingshaw..    | 3.06            |
| „     | Pitsford, Sedgebrook....      | 1.05            | „      | North Berwick Reservoir....   | 1.56            |
| „     | Woburn, Milton Bryant.....    | 1.14            | „      | Edinburgh, Royal Observaty.   | 2.43            |
| „     | Chatteris, The Priory.....    | .87             | XIV.   | Maybole, Knockdon Farm ...    | 3.96            |
| IV.   | Elsenham, Gaunts End .....    | 1.38            | XV.    | Buchlyvie, The Manse .....    | 3.44            |
| „     | Shoeburyness .....            | 1.07            | „      | Ballachulish House .....      | 5.89            |
| „     | Colchester, Hill Ho., Lexden  | 1.45            | „      | Oban .....                    | 4.20            |
| „     | Ipswich, Rookwood, Copdock    | 1.36            | „      | Campbeltown, Witchburn ..     | 3.41            |
| „     | Aylsham, Rippon Hall .....    | 2.07            | „      | Holy Loch, Ardnadam.....      | 7.59            |
| „     | Swaffham .....                | 1.86            | „      | Tiree, Cornaigmore .....      | 2.96            |
| V.    | Bishops Cannings .....        | .82             | XVI.   | Dollar Academy .....          | ...             |
| „     | Wimborne, St. John's Hill...  | .90             | „      | Glenlyon, Meggernie Castle..  | 5.14            |
| „     | Ashburton, Druid House..      | 1.36            | „      | Blair Atholl .....            | 1.76            |
| „     | Cullompton .....              | 1.43            | „      | Coupar Angus .....            | 1.46            |
| „     | Lynmouth, Rock House .....    | 1.58            | „      | Montrose, Sunnyside Asylum.   | 1.67            |
| „     | Okehampton, Oaklands.....     | 1.63            | XVII.  | Alford, Lynturk Manse .....   | 3.85            |
| „     | Hartland Abbey .....          | .93             | „      | Fyvie Castle .....            | 3.49            |
| „     | Probus, Lamellyn.....         | .72             | „      | Keith Station ..              | 2.05            |
| „     | North Cadbury Rectory.....    | 1.27            | XVIII. | Rothiemurchus .....           | 3.14            |
| VI.   | Clifton, Stoke Bishop .....   | 1.13            | „      | Loch Quoich, Loan .....       | 14.90           |
| „     | Ledbury Underdown.....        | 1.05            | „      | Skye, Dunvegan .....          | 5.33            |
| „     | Shifnal, Hatton Grange.....   | 1.53            | „      | Lochmaddy, Bayhead .....      | 2.41            |
| „     | Droitwich.....                | .99             | „      | Fortrose.....                 | 1.57            |
| „     | Blockley, Upton Wold.....     | 1.32            | „      | Glencarron Lodge .....        | 6.13            |
| VII.  | Market Overton.....           | ...             | XIX.   | Altnaharra .....              | 2.63            |
| „     | Market Rasen .....            | 1.38            | „      | Melvich .....                 | 2.33            |
| „     | Bawtry, Hesley Hall .....     | 1.29            | „      | Loch More, Achfary .....      | 4.98            |
| „     | Derby, Midland Railway.....   | 1.62            | XX.    | Dunmanway, The Rectory ..     | 5.33            |
| „     | Buxton .....                  | 4.87            | „      | Glanmire, Lota Lodge.....     | 3.19            |
| VIII. | Nantwich, Dorfold Hall .....  | 1.85            | „      | Mitchelstown Castle.....      | 3.31            |
| „     | Chatburn, Middlewood .....    | 3.17            | „      | Darrynane Abbey.....          | ...             |
| „     | Lancaster, Strathspey .....   | 2.65            | „      | Clonmel, Bruce Villa .....    | 2.42            |
| IX.   | Langsett Moor, Up. Midhope    | 2.19            | „      | Newmarket-on-Fergus, Fenloe   | ...             |
| „     | Scarborough, Scalby .....     | 1.39            | XXI.   | Enniscorthy, Ballyhyland...   | 2.41            |
| „     | Ingleby Greenhow .....        | 1.71            | „      | Rothnen, Clonmannon .....     | 1.28            |
| „     | Mickleton .....               | 2.60            | „      | Ballycumber, Moorock Lodge    | 3.24            |
| X.    | Bellingham, High Green Manor  | 4.52            | „      | Balbriggan, Ardgillan .....   | 1.38            |
| „     | Ilderton, Lilburn Cottage ... | 1.82            | „      | Castle Forbes Gardens.....    | 3.82            |
| „     | Thirlmere, The Bank .....     | 5.08            | XXII.  | Ballynahinch Castle.....      | 5.61            |
| XI.   | Llanfrecfha Grange .....      | 1.39            | „      | Woodlawn .....                | 4.08            |
| „     | Treherbert, Tyn-y-waun .....  | 5.64            | „      | Westport, St. Helens ..       | 4.94            |
| „     | Carmarthen, The Friary .....  | 3.19            | „      | Dugort, Slievemore Hotel ...  | 6.67            |
| „     | Fishguard, Goodwick Station.  | 2.59            | XXIII. | Enniskillen, Portora.....     | 5.35            |
| „     | Crickhowell, Tal-y-maes ..... | 3.00            | „      | Dartrey [Cootehill] .....     | 4.27            |
| „     | New Radnor, Ednol .....       | 2.17            | „      | Warrenpoint, Manor House ..   | 2.68            |
| „     | Birmingham WW., Tyrmynydd     | 5.48            | „      | Belfast, Cave Hill Road ..... | 4.13            |
| „     | Lake Vyrnwy .....             | 4.22            | „      | Glenarme Castle.....          | 5.98            |
| „     | Llangynhafal, Plâs Drâw.....  | 1.72            | „      | Londonderry, Creggan Res...   | 5.55            |
| „     | Dolgelly, Bryntirion.....     | 7.35            | „      | Dunfanaghy, Horn Head ...     | 4.56            |
| „     | Bettws-y-Coed, Tyn-y-bryn...  | 4.49            | „      | Killybegs .....               | 9.41            |



# THAMES VALLEY RAINFALL — APRIL, 1916.



ALTITUDE SCALE

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

SCALE OF MILES

0 5 10 20

## THE WEATHER OF APRIL.

DURING the first three days of the month an anticyclone lay over the British Islands and some rather high temperatures, for the time of the year, were recorded. On the 1st, shade maxima exceeding  $60^{\circ}$  were registered at several widely separated places, including Ireland, the highest reported being  $65^{\circ}$  at Aberdeen. Still higher values occurred on the 3rd when the temperature rose to  $71^{\circ}$  at Tunbridge Wells and Westminster, and to  $70^{\circ}$  at Norwich. Sharp frost was experienced in most localities, the shade minimum on the 2nd falling to  $21^{\circ}$  at Eskdalemuir and  $24^{\circ}$  at Aspatia. From the 4th until about the 24th very changeable weather was experienced. Temperature during this period was periodically below the normal nearly everywhere, but with a good deal of bright sunshine. After the 15th, low pressure areas in the North Sea produced a rainy type of weather accompanied by cold northerly and easterly winds. Low night temperatures were noted on the 6th, 10th and 15th in Scotland, and on the 9th, 10th and 14th in England and Ireland, while as late as the 23rd or 24th shade minima under  $32^{\circ}$  occurred in Scotland, the Midland counties and the north of Ireland. The last week of the month was very warm, and little rain fell. On the 27th the shade temperature at Camden Square rose to  $77^{\circ}$ , and on the 29th Cambridge and Raunds reported  $76^{\circ}$ . The mean temperature of the whole month was slightly above the normal over the greater part of England and in Scotland, and just the average in the north-west of England, the Channel Islands and the south of Ireland. Cool weather prevailed over the north of Ireland where the mean was a degree below the average.

The duration of bright sunshine varied considerably. Over England there was a general daily excess as compared with the normal of three-quarters of an hour, rising to one and a half in the south-west and in the Channel Islands. In Scotland and Ireland a small deficiency occurred.

The durations at individual stations were as follows:—Camden Square, 181 hours; Totland Bay, 231 hours; Weymouth, 228 hours; Sidmouth, 224 hours; Ilfracombe, 205 hours; Bath, 182 hours; Haverfordwest, 221 hours; Copdock, 207 hours; Southport, 192 hours; Hodsock Priory, 162 hours; Perth, 156 hours; Swinton, 146 hours; Paisley, 140 hours; Bolton, 129 hours; Hull, 115 hours; Loch Stack, 108 hours.

The distribution of rainfall compared with the normal showed in general a deficiency over the southern half of England, most pronounced in the Devon-Cornwall peninsula where many stations had only a quarter of the average, and an excess elsewhere. The greatest rainfall, ten inches or more, fell in the normally rainy areas in Kerry, Carmarthen and West Inverness, and the least, about half-an-inch, on the south coast from the Isle of Wight to Torquay. Heavy daily falls were uncommon, the greatest being 2.47 in. at Seathwaite on the 17th. Heavy local thunderstorm rain in East Yorkshire on the 20th yielded quantities slightly under two inches, and in the south-east of Ireland on the 24th and 25th falls of about the same amount were recorded during the passage of a shallow depression secondary to that of the main disturbance in the north-west.

In the Thames Valley the distribution of rainfall was remarkably uniform. A little more than an inch and a half fell along the North Downs and that part of Suffolk on the Thames Valley map. Less than an inch fell to the north of the Thames estuary and over a large portion of the south-western areas.

The general rainfall expressed as a percentage of the average was:—England and Wales, 93 per cent.; Scotland, 138 per cent.; Ireland, 149 per cent.; British Isles, 121 per cent. In London (Camden Square) the mean temperature was  $49^{\circ} \cdot 2$  or  $1^{\circ} \cdot 1$  above the average. Duration of rainfall, 29.6 hours. Evaporation, 1.61 in.

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

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain |       | Aver.<br>Cloud. |           |           |           |           |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|------------|-------|-----------------|-----------|-----------|-----------|-----------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |                 |           |           |           |           |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |            |       |                 |           |           |           |           |
|                                                                  |           |       |          |       |          |      |               | 0-100     |                 |                   |            |       | inches          |           |           |           |           |
| London, Camden Square                                            | 56°6      | 12    | 25°6     | 27    | 45°3     | 33°7 | 35°3          | 86        | 83°8            | 23°3              | 2·31       | 9     | 5·6             |           |           |           |           |
| Malta ... ..                                                     | 77·5      | 9     | 50·0     | 18c   | 68·6     | 59·1 | ...           | 80        | 126·0           | ...               | 7·61       | 4     | 1·0             |           |           |           |           |
| Lagos ... ..                                                     | 90·0      | 15    | 71·0     | 17    | 87·6     | 76·0 | 75·2          | 79        | 157·0           | 68·0              | 4·81       | 12    | 6·3             |           |           |           |           |
| Cape Town ... ..                                                 | 93·6      | 20    | 44·8     | 14    | 74·4     | 56·4 | 54·3          | 67        | ...             | ...               | 1·20       | 6     | 4·8             |           |           |           |           |
| Johannesburg ... ..                                              | 87·7      | 8     | 42·2     | 1     | 73·7     | 53·6 | 50·3          | 69        | ...             | 40·0              | 5·88       | 12    | 4·9             |           |           |           |           |
| Mauritius ... ..                                                 | 87·6      | 20a   | 59·2     | 13    | 83·4     | 67·5 | 62·8          | 67        | ...             | 52·6              | ·64        | 14    | 5·3             |           |           |           |           |
| Bloemfontein .                                                   | 90·8      | 29    | 47·0     | 13    | 79·6     | 53·5 | 49·5          | 53        | ..              | ...               | 1·86       | 7     | 3·2             |           |           |           |           |
| Calcutta... ..                                                   | 90·6      | 1     | 60·2     | 28    | 84·6     | 70·4 | 69·0          | 77        | ...             | 50·3              | 2·33       | 4     | 4·1             |           |           |           |           |
| Bombay... ..                                                     | 91·7      | 11    | 72·1     | 6     | 88·1     | 75·9 | 72·5          | 74        | 139·0           | 53·7              | ·02        | 2     | 2·3             |           |           |           |           |
| Madras ... ..                                                    | 92·7      | 1     | 71·4     | 5, 14 | 86·0     | 74·1 | 73·0          | 85        | 156·4           | 68·1              | 20·79      | 18    | 5·9             |           |           |           |           |
| Colombo, Ceylon                                                  | 88·7      | 30    | 71·2     | 18    | 84·0     | 73·8 | 73·1          | 85        | 157·6           | 68·3              | 25·14      | 22    | 7·6             |           |           |           |           |
| Hongkong ... ..                                                  | 86·1      | 4     | 57·6     | 29    | 75·5     | 66·8 | 61·5          | 70        | ...             | ...               | 1·89       | 13    | 7·2             |           |           |           |           |
| Sydney ... ..                                                    | 97·1      | 14    | 48·3     | 24    | 78·8     | 58·4 | 48·5          | 42        | 146·5           | 38·3              | ·07        | 5     | 3·2             |           |           |           |           |
| Melbourne ... ..                                                 | 92·0      | 4, 9  | 40·7     | 23    | 70·9     | 50·0 | 44·5          | 52        | 146·5           | 33·0              | ·51        | 11    | 5·6             |           |           |           |           |
| Adelaide ... ..                                                  | 93·9      | 17    | 44·3     | 16    | 74·5     | 52·8 | 46·3          | 50        | 147·9           | 36·4              | ·33        | 5     | 4·4             |           |           |           |           |
| Perth ... ..                                                     | 94·0      | 28    | 51·4     | 18    | 78·7     | 59·6 | 53·1          | 56        | 166·6           | 42·0              | ·34        | 6     | 3·1             |           |           |           |           |
| Coolgardie ... ..                                                | 104·4     | 7     | 50·6     | 5     | 89·0     | 56·8 | 45·9          | 33        | 158·6           | ...               | ·03        | 1     | 4·6             |           |           |           |           |
| Hobart, Tasmania                                                 | 80·8      | 17    | 39·0     | 29    | 62·0     | 46·2 | 40·2          | 55        | 143·8           | 33·1              | 2·55       | 22    | 6·4             |           |           |           |           |
| Wellington ... ..                                                | 66·6      | 4     | 42·0     | 10    | 61·9     | 51·6 | 48·5          | 74        | 138·8           | 33·8              | 5·50       | 16    | 7·3             |           |           |           |           |
| Auckland ... ..                                                  | 72·5      | 16b   | 45·0     | 10    | 65·9     | 54·0 | 53·0          | 81        | 146·0           | 45·0              | 5·32       | 23    | 6·8             |           |           |           |           |
| Jamaica, Kingston                                                | 88·7      | 23    | 68·5     | 9     | 85·5     | 71·3 | 71·2          | 77        | ...             | ...               | 2·37       | 11    | ...             |           |           |           |           |
| Grenada ... ..                                                   | 88·0      | 1     | 70·0     | 14    | 85·0     | 74·0 | ...           | 81        | 136·0           | ...               | 9·10       | 18    | 3·6             |           |           |           |           |
| Toronto ... ..                                                   | 61·3      | 1     | 23·7     | 17    | 46·5     | 34·8 | 33·0          | 81        | 112·4           | 20·0              | 1·89       | 12    | 6·4             |           |           |           |           |
| Fredericton ... ..                                               | 57·5      | 2     | 17·0     | 19d   | 41·7     | 29·7 | 31·0          | 84        | ...             | ...               | 3·02       | ...   | 6·7             |           |           |           |           |
| St. John, N.B.                                                   | 52·2      | 2     | 23·5     | 19    | 42·7     | 33·3 | 32·2          | 76        | ...             | 21·5              | 4·20       | 10    | 7·3             |           |           |           |           |
| Alberta, Edmonton                                                | 52·7      | 4     | 4·8      | 12    | 34·8     | 15·4 | ...           | 73        | 99·0            | —8·8              | ·74        | 6     | 5·2             |           |           |           |           |
| Victoria, B.C. ...                                               | 53·7      | 3     | 33·2     | 26    | 47·4     | 39·2 | 40·0          | 87        | 110·5           | 25·6              | 4·57       | 26    | 7·4             |           |           |           |           |
|                                                                  |           |       |          |       |          |      |               |           |                 |                   |            |       |                 | a and 23. | b and 29. | c and 28. | d and 24. |

a and 28. b and 29. c and 28. d and 24.

**MALTA.**—An exceptionally severe TS on the 22nd, with a wind velocity of 28 or 29 miles per hour, and a heavy R.

**Johannesburg.**—Bright sunshine, 258·9 hours.

**Mauritius.**—Mean temp. 0°·2 below, dew point 1·4 below, and R 1·10 in. below, averages.

**COLOMBO, CEYLON.**—Mean temp. 79°·0, or 0°·6 below, dew point same as average, and R 13·12 in. above, averages. TSS on 5 days.

**HONGKONG.**—Mean temp. 70°·9, mean hourly velocity of wind 12·0 miles. Bright sunshine 154·4 hours.

**Melbourne.**—Mean temp. 0°·9 below and R 1·68 in. below, averages.

**Adelaide.**—Mean temp. 3°·5 below and R ·83 in. below, averages.

**Coolgardie.**—Temp. 1°·9 above and R below, averages.

**Hobart.**—Mean temp. 4°·4 below and R ·05 in. above, averages. Exceptionally squally month.

**Wellington.**—Mean temp. 1°·3 above and R 2·12 in. above, averages. Bright sunshine 200·2 hours; T and L on the 6th.

**Auckland.**—Unusually windy. R above and mean temp. below, averages.

**ALBERTA, EDMONTON.**—Dry, sunny and warm. S on 10 days. Fog on 4 days.



# Symons's Meteorological Magazine.

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## ILLUSIONS OF THE UPPER AIR.

Summary of a Lecture at the Royal Institution on Friday, March 10th, 1916, by SIR NAPIER SHAW, Sc.D., F.R.S.

THE lecture was made an occasion for reviewing the progress of meteorological theory in England in the half century that has elapsed since the Meteorological Committee of the Royal Society was appointed to control the Meteorological Office.

The programme of the reconstituted Office was to continue the study of the Meteorology of the sea, and the collection and distribution of daily telegraphic reports of weather and to apply the automatic records of a number of observatories similar to the New Observatory at Richmond to the interpretation of the observed facts of weather. After referring to the activity in the study of weather, and particularly in devising weather charts, which was displayed in the early sixties by FitzRoy at the Meteorological Department of the Board of Trade, by G. J. Symons and James Glaisher, who were interested in British Rainfall and Climatology, and by Francis Galton, who was one of the leading spirits of the British Association and of Kew Observatory, a statement was given of the convection theory of the structure of the atmosphere in relation to cyclones and anticyclones which was generally accepted at the time and for years afterwards. It was pointed out that the ideas about cyclones and anticyclones were at the time necessarily speculative, and it was proposed to confront them with the structure of the atmosphere as disclosed by the investigation of the upper air with kites, ballons-sondes and pilot balloons during the last twenty years. Illustrations of the general results of the investigation were exhibited; and the separation of the atmosphere into the troposphere, the region of convection and the stratosphere, the region of no convection, was explained.

The guiding principle of the convection theory was that air flowed from a centre of high pressure (anticyclone) where cold air was descending, into a centre of low pressure (cyclone) where warm air was ascending. The double spiral paths by which the air proceeds from an anticyclone centre towards a cyclonic centre were commonly

regarded as lines of natural flow from high to low contorted by the rotation of the earth.

The observations of the upper air have shown that this mode of representation is illusory in every essential item; the mistake arose from taking the characteristics peculiar to the surface to be generally representative.

The convergence of the air along the spiral paths is shown to be largely illusory when the facts are carefully examined. Above the first half kilometre the inflow towards the low pressure cannot be identified at all.

Instead of assuming an inflow which cannot be proved it is better, there and elsewhere throughout the upper air, to assume the circulation to be represented by the "uniform" flow of air along the isobars under balanced "forces" arising from the distribution of pressure on the one hand, and the rotation of the earth and the circular path of the air on the other. Instead of a natural flow from high pressure to low pressure we have a natural flow without any change of pressure; the motion of a heavenly body round its sun is taken as the type for the air instead of the motion of a falling stone. The cross flow that is to be found near the surface should be attributed to the friction of the surface reducing the speed of the moving air, below that which is necessary to balance the pressure. Thus the friction which seemed to be an obstacle to the flow across isobars must really be regarded as its cause.

The idea of convective force operating as an upward force in the "low" with a corresponding force in the "high" is shown to be illusory by observations which prove that the air in the high pressure is warmer than that at the same level in the low. The formation of high and low pressure at the surface proceeds therefore *in spite of* a distribution of temperature which opposes it, not *because of* a distribution of temperature which favours it. Nor is the humidity of the air of any importance in forming low pressure. The distribution of pressure at the surface has been shown to be the distribution at a height of 9 kilometres transmitted from above with local changes caused by the varying density of the lower layers.

From the idea of the operation of the varying pressure of the stratosphere upon the troposphere interesting deductions were drawn as to the formation and transformation of different types of cloud. These were followed by a number of numerical calculations of the relation between pressure, temperature, and wind, at different levels which are rendered possible by the fundamental numerical relation between pressure and wind velocity. Two forms of the relation are considered, (1) the geostrophic relation in which air is regarded as moving along a great circle and the effect is entirely due to the rotation of the earth; this is taken as applicable in temperate and polar latitudes. And (2) the cyclostrophic relation

in which the effect of the rotation of the earth is disregarded altogether, and attention is concentrated upon motion in a small circle. The second case is applicable in the equatorial regions, in tropical revolving storms and other circulations of small diameter.

By means of these two equations combined with the ascertained facts of the upper air are explained (1) the absence of strong winds in the central region of an anti-cyclone; (2) the dominance of the stratosphere on the distribution of pressure at the surface; (3) the apparently capricious variations of temperature and wind velocity at different levels; (4) the conditions of application of "Egnell's law" of the flow of equal masses of air at different levels; (5) the falling off of the velocity of wind in the stratosphere; (6) the changes of wind velocity with height in the troposphere, and (7) the maintenance of a cylindrical vortex with its foot on the ground covered by a cap of limited height in the stratosphere.

The lecture concluded with a fantastic but circumstantial suggestion that the Medusa of Greek myth has a subtle reference to the relation of fact to theory in the study of weather.

### JANUARY AND JUNE—A CONTRAST.

THE poet, by way of an extravagant compliment, refers to the coming of his lady as making December June, and perhaps the simile would have been improved in its climatic antithesis as well as in alliteration by making "January June," for indeed in the south of England a day in January is on the average 21 degrees colder than a day in June. This year the poetic metaphor would be deprived of its beauty and return like a boomerang to confute the poet. In our February number we referred to the extraordinary warmth of January 1st, now we note the extraordinary cold of June 4th. The temperature readings at Camden Square on these days were :—

|                              | Max. | Min. | 9 hr. | 21 hr. | Mean per day |
|------------------------------|------|------|-------|--------|--------------|
| Jan. 1 .....                 | 57·2 | 47·2 | 52·8  | 51·4   | 52·2         |
| June 4 .....                 | 56·9 | 42·7 | 54·2  | 53·0   | 51·7         |
| Difference, }<br>June—Jan. } | —0·3 | —4·5 | +1·4  | +1·6   | —0·5         |

Thus the 4th of June was half a degree colder on the whole than the 1st of January, and the June night  $4\frac{1}{2}$  degrees colder than the January night, a satire on the solstitial control of the seasons.



## ROYAL METEOROLOGICAL SOCIETY.

A MEETING of the Society was held in its rooms, 70, Victoria Street, on May 17th, Major H. G. Lyons, F.R.S., in the Chair. Mr. L. C. W. Bonacina read a paper on the Re-adjustment of Pressure Differences : Two Species of Atmospheric circulation and their connection. He said that in ordinary events slightly rarified air, however the reduction in density may be caused, will rise and overflow with marked exaggeration of the original decrease of pressure, so that cyclonic circulation automatically develops under the influence of the Earth's rotation. The air will always try to adjust the pressure difference by the open road of 'cyclonic or "horizontal" circulation provided that the atmosphere is not in a special state of "strain" occasioned by the exigencies of the existing circulation. But when this condition of strain or instability exists, the air chooses a short cut, and adjusts the original slight pressure difference locally by the thunderstorm or "vertical" method. Thus a thunderstorm should be regarded as acting after the manner of a safety-valve, whereby undue development of cyclonic energy is obviated. Thunderstorms occur when the atmospheric signals are set against the course which leads to the development, or further development, of horizontal gradient-winds around a barometric minimum; the physical reason being that the atmosphere, being then unstable, or strained, in consequence of the obstacle to cyclonic development, but the pressure balance having to be restored somehow, chooses a course which obviates the need of cyclonic circulation, and which does not involve such resistance in the general body of the atmosphere to the density-equalizing action of gravity as would be the case if it ultimately overcame the said obstacle, and cyclonic energy were thus to develop uncontrolled.

The following is a synopsis of the cardinal points :—

1. The essential condition that circulation of any description may be started in the free atmosphere is slight variation of density.
2. It is found that while sometimes such variations of density lead to a species of circulation in which horizontal motion takes precedence over vertical and whose very development leads to the awkward circumstance that the difference of pressure becomes much greater than the original; at other times such variations of density are suddenly nullified, or disposed of, by another species of circulation in which horizontal movement is subordinate to vertical.
3. This at once raises the question of a dynamical relationship between the two modes of motion, the connection being illustrated by a consideration of what would happen if the second type had no existence.

4. The connection being established, a theory of "wave" transmission suggested by certain facts of observation was devised in order to explain *how* the two species of circulation are connected and to furnish a picture of the manner in which one is limited by the other.

5. This hypothesis requires testing by an application to the facts of detailed observation ; but as it now stands it leads to the inference that the momentum of the atmosphere is assorted between the two species of motion, and that the total upward momentum is the same whether a *given area* becomes the centre of uniform cyclonic energy, or becomes split up into local patches of concentrated energy arranged along one or more alignments.

6. The principle of the connection brought to light also accounts for the fact that the two species of storm-action are opposite in their seasonal range, cyclonic gales occurring in the depth of winter and thunderstorms at the height of summer—at least in such a climatic belt as that in which Britain lies.

An animated discussion followed the reading of the paper.

The Chairman regretted that the author had not applied rigorous mathematical treatment to the problem.

Mr. W. H. Dines pointed out that upper air observations had shown that the air in a cyclone was relatively cold, probably because it was being forced to ascend whereas thunderstorms were probably convectional phenomena, the two systems of circulation being different in kind.

Major G. I. Taylor, speaking as an aviator, described a recent experience in which both rapidly ascending and rapidly descending currents had been encountered at a height of about 10,000 feet.

Mr. F. J. W. Whipple said that the author was probably right in drawing a sharp line of demarcation between the two types of disturbance, the cyclone and the summer thunderstorm, but that winter thunderstorms were generally incidents in the passage of cyclonic depressions.

Col. H. E. Rawson pointed out that the effect of the accompanying anti-cyclone should be considered in connection with cyclonic movements.

Dr. H. R. Mill welcomed the paper as an attempt to explain the difference between two contrasted atmospheric conditions, and deprecated the tendency to undervalue the part of the imagination in the scientific method of reasoning.

Mr. W. W. Bryant suggested as an analogy to Mr. Bonacina's idea, the fact that a weak electric current would pass around a spirally coiled wire, while a stronger current would overcome the intervening resistance and leap from coil to coil.

Mr. Bonacina in reply stated that he had only begun consideration of the subject, and hoped later to develop it mathematically.

## SUMMER TIME AND METEOROLOGY.

THE Summer Time Act was rushed through Parliament so quickly that our remarks on the subject last month had to be based on the Bill as introduced, if they were to be in time to warn Observers as to the course they should follow on the appointed day. At a later stage a very important amendment was introduced. Meteorology, as well as Astronomy and Navigation was expressly exempted from the provisions of the Act. This is a valuable concession, as it relieves the meteorological Observer from committing an illegal act by calling 9 o'clock "9 o'clock" when he is referring to meteorological work. But mature reflection shows that the advantage is largely illusory, because although Meteorology stands without the Act the meteorologist remains subject to its sway when he requires to take his breakfast or catch a train. So far as the Meteorological Office instructions go the Observer must observe two times instead of one, and he is officially instructed to keep two clocks, one running to the mean solar time of  $0^{\circ}$ , the other to that of  $15^{\circ}$  E. By the former he must make his observations and remarks on meteorological phenomenon, and by the latter he may regulate the less important duties of life. The Meteorological Office suggests that Greenwich mean time should be expressed in hours counted consecutively from 0 at midnight to 24 at the next midnight, so that what used to be 9 p.m. becomes 21 hrs. 0 min. This is a reform which was introduced more than thirty years ago, and the present writer has used it in scientific records and diagrams since 1884, but he found himself almost alone in the practice. We very cordially welcome the change in the official weather service of the country. It goes towards simplification and introduces no ambiguity or difficulty as new units usually do. The advice to use a.m. and p.m. in giving the hours in Summer Time should serve to mark the difference; the fact that the noon referred to is that of Berlin need not cause the patriot to shudder at the change, because in Germany and its subject lands the noon of Petrograd is used to set the summer clock.

The denomination of time has always given rise to confusion in non-scientific minds, and the new legislation does not tend to improve matters. Even when observations are made at the right hour, we fear that many Observers will fail to indicate this so as to place the fact beyond doubt. Let us repeat the new rule for rainfall Observers:—

**Read the rain gauge at 10 a.m., Summer Time, and enter the hour as 9 a.m.**

to which we must add—remember that on and after October 1st clock-time and Greenwich (or Dublin, as the case may be) time are at one again and revert to 9 o'clock readings.

## Correspondence.

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

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### SUMMER TIME.

I READ your remarks *re* Prussian Time with interest. Taking the attitude of a higher critic, I surmise that your school boy was a fifth or sixth form boy at a public school, or, if a Sunday school boy—then an American; and that the true version of what he said is “A lie is an abomination to the Lord, but a very present help in trouble.” I quite agree with all your comment thereon. Would it not be possible another year, if the war goes on, to have a new Bradshaw brought out early in May, to open Banks as now, and leave the clocks alone? The practical conveniences of the present arrangements are so great, and the working of them has come about so smoothly, that people in general quite fail to see the viciousness in principle of the short and easy method that has been chosen. It is deplorable that they should think that Time questions come within the scope of a British Parliament, or can be dealt with satisfactorily by anything less than a Parliament (rather a “Church”) of experts representing the whole civilized world. I hope you will try to influence public opinion in this sense. It seems to me that the plot was sprung on us by a secret cabal and pushed through without time given for consideration. And then the change was meekly accepted by that public which has for fifty years, like an obstinate mule, refused to do anything to improve in practice our cumbrous system of weights and measures which lies like a dead weight on the elementary schools, and wastes who knows how much time and energy?

H. A. BOYS.

*North Cadbury Rectory, Somerset, June 7th, 1916.*

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### THE ATMOSPHERIC SHADES OF MAY.

IF May were merely the month of the greatest profusion of blossom in the year it would be beautiful enough, but when the meteorological conditions are such that all this wealth of flower and fresh foliage is thrown into relief by richly coloured and exquisitely blended atmospheric shades and hues of a kind which are entirely peculiar to the early summer, the effect is enchanting beyond words.

May's own quality of sky, light, and shade is of two kinds. Firstly, there is the cold, damp, stagnant, very gloomy type of day which almost invariably occurs once or twice in the early part of May, and on which the new foliage looms out with a vividness unknown on bright days. This type of atmosphere is in reality extremely beautiful, but its beauty is beyond the perception of some people

who may be heard to liken it to a "November fog." Secondly, and this is May's supreme revelation of meteorological beauty—there are the richly-hued thundery days which are in evidence on several occasions every year, but are not seen during the spells of thundery weather which occur during the following summer months. Picture, as an instance of the climatic phase I mean, a still, hot, steamy evening in the fragrance of full hawthorn-tide, where the landscape is suffused with delicate tints of rose and purple, when the shaggy elms are superbly silhouetted against a black eastern sky, and great banks of dark-flanked cumulus hang motionless in the western light, the atmosphere but too evidently—to those who know the wiles of the English climate—awaiting the morrow's heat for the development of those violent electrical storms for which the Merry Month has a somewhat bad reputation.

With regard to these peculiar atmospheric shades the May of 1916 was quite typical, and with regard to the general character of the weather the second half of the month, as is so often the case, was high summer, although it was only on one day, the 21st, that the heat was really severe. The month opened in a thunder spell, and, as is nearly always the case, closed in one, the storm of the 30th being specially destructive in the West of Ireland, a part of the country which normally suffers comparatively little from the violence of summer hail and thunder.

L. C. W. BONACINA.

*Hampstead, N. W., June 1st, 1916.*

### RAPID RISE IN A CHALK WELL.

FOLLOWING upon my communications to your Magazine for 1915 (vol. 50, pp. 16, 46) upon the subject of the rise of water in the well at Chelsham in 1914-15, I am now sending you these observations in diagram form, together with those for the corresponding period in 1915-16.

The records are very instructive and may, I think, be of interest to your readers. They show the relation between the depth of the water in the well and the rainfall, and how the appearance of the Bourne affects the height of the underground water. That the flow of the Bourne should release the water pent up in the ground and thus reduce its level is easy to understand, but why the water in the well should fall *before* the Bourne begins to flow, is not so clear. The diagram also shows that the spring rainfall, owing, no doubt, to evaporation then becoming active, does nothing to replenish the well.

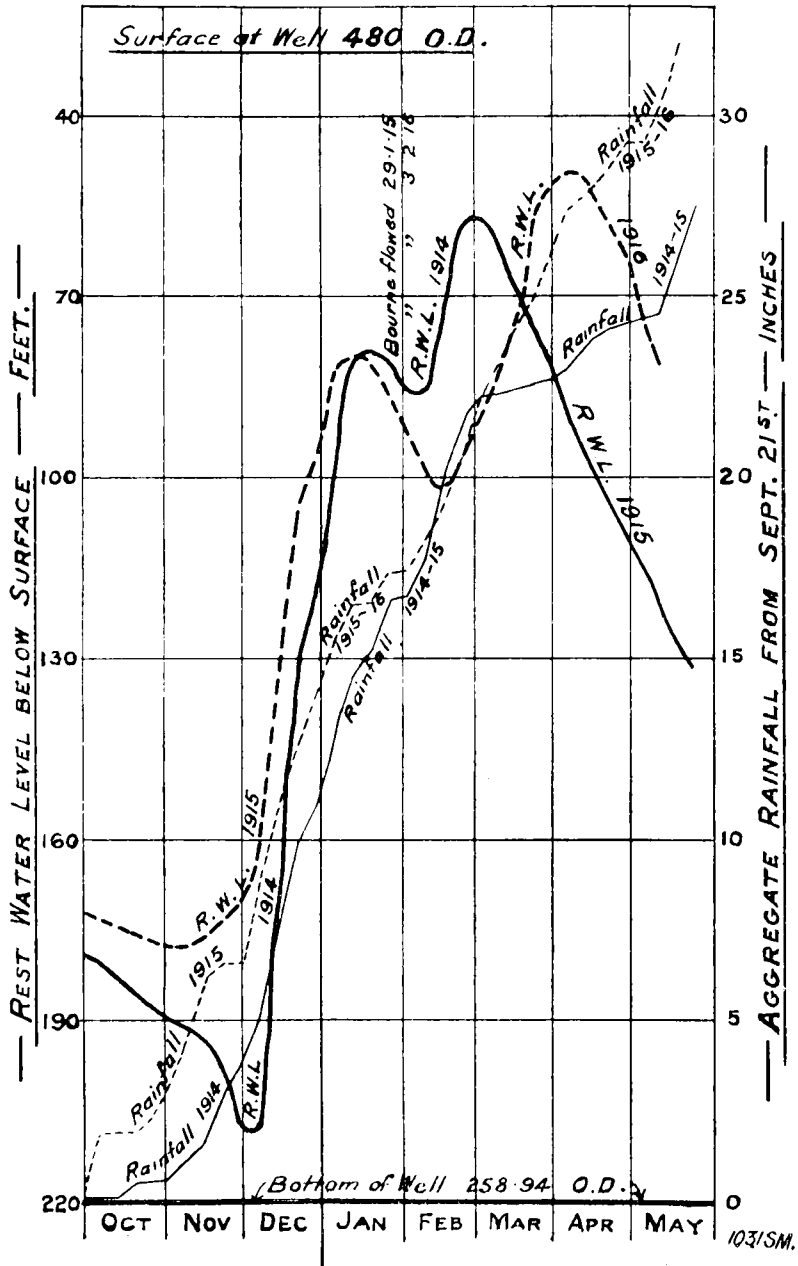
W. VAUX GRAHAM.

*5, Queen Anne's Gate, London, S. W., May 30th, 1916.*

# WELL AT CHELSHAM. SURREY.

DIAGRAM OF REST WATER LEVEL & RAINFALL

OCTOBER - MAY 1914-15 & 1915-16.



**HEAVY THUNDERSTORM, MAY 30th.**

WE had here, on Tuesday, May 30th, about 0-29 p.m., old time, a very heavy thunderstorm which passed right over us from west to east. The fall of rain and hail was quite tropical. In 50 minutes 1-12 in. had fallen into the gauge. Much damage was done to gardens, young seedlings and plants being washed clean out of the ground. Some damage was also done to the roads in places, and the passage and booking-office at the northern approach to Hither Green railway station was flooded out. The thunder and lightning was very sharp, but not so severe as in the storms of May, 1911, and June, 14th, 1914.

G. E. DACEY.

*Lewisham, S.E., June 12th, 1916.*

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**METEOROLOGICAL NEWS AND NOTES.**

THE SOUTH ORKNEYS METEOROLOGICAL OBSERVERS returned to Buenos Aires on March 20th, the Argentine Government having relieved them by a new party (all Scandinavians) to continue the work during the present year. We regret to learn that Mr. H. Basche-Wiig, chief of last year's party lost his life on April 30th, 1915, when ski-ing on the east glacier at Laurie Island, where he was blown over the ice cliff into the sea and drowned. Mr. Basche-Wiig was a lieutenant in the Norwegian Navy and previous to his departure for the South Orkneys in February 1915 was first assistant at the Argentine Central Magnetic Observatory at Pilar. The returning party describe the winter of 1915 as having been the roughest since the station was established in 1903. No precise information regarding the ice and weather conditions during last summer has yet come to hand. No difficulty was experienced by the Argentine relief ship in reaching the South Orkney group (Lat. 61° S.) at the beginning of March. The extremes of temperature noted were 45° F. in January 1916, and -27° F. in June, 1915, both values being in close agreement with the normals of the preceding twelve years.

BRITISH RAINFALL, 1915, is now approaching completion and any Observers who have not yet sent in their returns for 1915, are requested to do so without delay.

MR. R. F. STUPART, Director of the Canadian Meteorological Service has, we are pleased to observe, received the honour of knighthood on the occasion of the King's Birthday. We heartily congratulate Sir Robert Stupart on this public recognition of his services.

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## REVIEWS.

*Department of Marine and Fisheries, Meteorological Service of Canada. Upper Air Investigation in Canada, Part I. Observations by Registering Balloons.* Prepared under the Direction of R. F. STUPART, F.R.S.C., by J. PATTERSON, M.A., Ottawa, 1915. Size,  $10 \times 6\frac{1}{2}$ . Pp. 128.

THIS gives a summary of the work carried on on the upper air by means of balloons in Canada.

The report shows that ninety-four balloons were sent up from Toronto, or Woodstock, between January, 1911, and May, 1915, Fifty-three were recovered, and the results of their records worked out and published at length in this report. In one case the balloon was found thirteen months after being sent up, the record still being quite legible. The balloons were usually sent up about 8 p.m. on the evening preceding the international day, that is to say about six hours earlier than the European ascents, and with the advantage of avoiding disturbance by solar radiation.

Most of the balloons travelled in an easterly direction from the point of departure, only three having been found to the west. The height reached by the balloons in winter was less than in summer in the ratio of 12:15, and the lower level of the stratosphere was found to be at an average height of 11.4 km. (6.3 miles) in winter and 13.4 km. (8.4 miles) in summer. The stratosphere has a lower temperature in summer than in winter, the average of eleven flights in summer showing  $-62^{\circ}3$  C. ( $-80^{\circ}$  F.), and twelve flights in winter showing  $-59^{\circ}$  C. ( $-74^{\circ}$  F.).

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*Observatoire de Zi-ka-Wei. Calendrier-Annuaire pour 1916,*  
[*Observatory of Zi-ka-Wei Calendar Year Book for 1916.*] Zi-ka-Wei, near Shanghai, 1915. Size  $6 \times 3\frac{1}{2}$ . Pp. 174 + 72\*. Plates.

THE Year Book of this famous observatory is naturally concerned mainly with astronomical data for China; but it also contains some interesting meteorological matter, the most important being a concise statement of the climate of Zi-ka-Wei with normal values for 10 day groups, based on the period 1873-1905, and a more detailed discussion of the climate of China month by month under the heads of barometric pressure, wind, fog and rain, temperature being left for treatment in a later year. There is also a meteorological diary for the year July 1914 to June 1915, and there are tabular appendices containing, amongst other things, conversion tables for the various ancient and modern units of measurement used in China and in the Western World.



## RAINFALL TABLE FOR MAY, 1916.

| STATION.                        | COUNTY.             | Lat.<br>N. | Long.<br>W.<br>[°E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|---------------------------------|---------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                 |                     |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1916.<br>in. |
| Camden Square.....              | London.....         | 51 32      | 0 8                  | 111                            | 1'75                           | 1'88         |
| Tenterden.....                  | Kent.....           | 51 4       | *0 41                | 190                            | 1'65                           | 1'82         |
| Arundel (Patching).....         | Sussex.....         | 50 51      | 0 27                 | 130                            | 1'80                           | 1'86         |
| Fordingbridge (Oaklands)...     | Hampshire.....      | 50 56      | 1 38                 | 135                            | 2'09                           | 2'12         |
| Oxford (Magdalen College)...    | Oxfordshire.....    | 51 45      | 1 15                 | 186                            | 1'81                           | 1'83         |
| Wellingborough (Swanspool)...   | Northampton.....    | 52 18      | 0 41                 | 155                            | 1'98                           | 1'93         |
| Bury St. Edmunds (Westley)...   | Suffolk.....        | 52 15      | *0 40                | 226                            | 1'93                           | 1'69         |
| Geldeston [Beccles].....        | Norfolk.....        | 52 27      | *1 31                | 38                             | 1'78                           | ...          |
| Polapit Tamar [Launceston]...   | Devon.....          | 50 40      | 4 22                 | 315                            | 2'08                           | 1'51         |
| Rousdon [Lyme Regis].....       | ".....              | 50 41      | 3 0                  | 516                            | 2'02                           | 2'17         |
| Stroud (Field Place).....       | Gloucestershire..   | 51 44      | 2 13                 | 226                            | 2'10                           | 3'10         |
| Church Stretton (Wolstaston)... | Shropshire.....     | 52 35      | 2 48                 | 800                            | 2'64                           | 3'02         |
| Boston.....                     | Lincolnshire.....   | 52 58      | 0 1                  | 11                             | 1'80                           | 1'75         |
| Worksop (Hodsock Priory)...     | Nottinghamshire..   | 53 22      | 1 5                  | 56                             | 2'08                           | 2'48         |
| Mickleover Manor.....           | Derbyshire.....     | 52 54      | 1 32                 | 280                            | 2'10                           | 2'33         |
| Macclesfield.....               | Cheshire.....       | 53 15      | 2 7                  | 501                            | 2'43                           | 3'57         |
| Southport (Hesketh Park)...     | Lancashire.....     | 53 39      | 2 59                 | 38                             | 2'13                           | 2'45         |
| Arncliffe Vicarage.....         | Yorkshire, W.R.     | 54 8       | 2 6                  | 732                            | 3'55                           | 2'99         |
| Goldsborough Hall.....          | ".....              | 54 0       | 1 25                 | 119                            | 2'16                           | 2'50         |
| Hull (Pearson Park).....        | "..... E.R.         | 53 45      | 0 20                 | 6                              | 1'98                           | 2'79         |
| Newcastle (Town Moor)...        | Northumberland..    | 54 59      | 1 38                 | 201                            | 2'04                           | 2'80         |
| Borrowdale (Seathwaite)...      | Cumberland.....     | 54 30      | 3 10                 | 423                            | 7'50                           | 8'35         |
| Cardiff (Ely).....              | Glamorgan.....      | 51 29      | 3 13                 | 53                             | 2'56                           | 4'01         |
| Haverfordwest.....              | Pembroke.....       | 51 48      | 4 58                 | 90                             | 2'62                           | 2'92         |
| Aberystwyth (Gogerddan)...      | Cardigan.....       | 52 26      | 4 1                  | 83                             | 2'63                           | 5'73         |
| Llandudno.....                  | Carnarvon.....      | 53 20      | 3 50                 | 72                             | 1'86                           | 3'60         |
| Cargen [Dumtries].....          | Kirkcudbright...    | 55 2       | 3 37                 | 80                             | 2'87                           | 4'50         |
| Marchmont House.....            | Berwick.....        | 55 44      | 2 24                 | 498                            | 2'53                           | 3'10         |
| Girvan (Pinmore).....           | Ayr.....            | 55 10      | 4 49                 | 207                            | 2'98                           | 4'72         |
| Glasgow (Queen's Park)...       | Renfrew.....        | 55 53      | 4 18                 | 144                            | 2'40                           | ...          |
| Islay (Eallabus).....           | Argyll.....         | 55 47      | 6 15                 | 68                             | 2'58                           | 5'00         |
| Mull (Quinish).....             | ".....              | 56 34      | 6 13                 | 35                             | 2'99                           | 4'10         |
| Balquhidder (Stronvar).....     | Perth.....          | 56 21      | 4 23                 | 422                            | 4'10                           | ...          |
| Dundee (Eastern Necropolis)...  | Forfar.....         | 56 28      | 2 57                 | 199                            | 2'05                           | 3'73         |
| Braemar.....                    | Aberdeen.....       | 57 0       | 3 24                 | 1114                           | 2'33                           | 2'37         |
| Aberdeen (Cranford).....        | ".....              | 57 8       | 2 7                  | 120                            | 2'40                           | 3'49         |
| Gordon Castle.....              | Moray.....          | 57 37      | 3 5                  | 107                            | 2'10                           | 4'41         |
| Drummadrochit.....              | E. Inverness.....   | 57 20      | 4 29                 | 138                            | 2'33                           | 4'52         |
| Fort William.....               | ".....              | 56 49      | 5 6                  | 171                            | 3'93                           | 4'27         |
| Loch Torridon (Bendamph)...     | "..... W. Ross..... | 57 32      | 5 32                 | 20                             | 4'54                           | 4'62         |
| Dunrobin Castle.....            | Sutherland.....     | 57 59      | 3 56                 | 14                             | 2'19                           | 3'57         |
| Killarney (District Asylum)...  | Kerry.....          | 52 4       | 9 31                 | 178                            | 3'05                           | 4'03         |
| Waterford (Brook Lodge)...      | Waterford.....      | 52 15      | 7 7                  | 104                            | 2'33                           | 3'88         |
| Nenagh (Castle Lough).....      | Tipperary.....      | 52 54      | 8 24                 | 120                            | 2'51                           | 2'78         |
| Ennistymon House.....           | Clare.....          | 52 57      | 9 18                 | 37                             | 2'70                           | 3'26         |
| Gorey (Courtown House)...       | Wexford.....        | 52 40      | 6 13                 | 80                             | 2'24                           | 3'61         |
| Abbey Leix (Blandsfort)...      | Queen's County..    | 52 56      | 7 17                 | 532                            | 2'43                           | 5'10         |
| Dublin (Fitz William Square)... | ".....              | 53 21      | 6 14                 | 54                             | 2'07                           | 4'63         |
| Mullingar (Belvedere).....      | Westmeath.....      | 53 29      | 7 22                 | 367                            | 2'51                           | 4'75         |
| Crossmolina (Enniscoe).....     | Mayo.....           | 54 4       | 9 16                 | 74                             | 3'17                           | 4'63         |
| Cong (The Glebe).....           | ".....              | 53 33      | 9 16                 | 112                            | 2'94                           | 4'83         |
| Collooney (Markree Obsy.)...    | Sligo.....          | 54 11      | 8 27                 | 127                            | 2'80                           | 4'89         |
| Seaforde.....                   | Down.....           | 54 19      | 5 50                 | 180                            | 2'72                           | 6'07         |
| Ballymena (Harryville).....     | Antrim.....         | 54 52      | 6 13                 | 150                            | 2'84                           | 6'43         |
| Omagh (Edenfel).....            | Tyrone.....         | 54 36      | 7 18                 | 280                            | 2'66                           | 5'40         |

## RAINFALL TABLE FOR MAY, 1916—continued.

| RAINFALL OF MONTH (con.) |          |                       |       |             | RAINFALL FROM JAN. 1. |           |                      |          | Mean Annual 1875-1909, in. | STATION.          |
|--------------------------|----------|-----------------------|-------|-------------|-----------------------|-----------|----------------------|----------|----------------------------|-------------------|
| Diff. from Av. in.       | % of Av. | Max. in 24 hours. in. | Date. | No. of Days | Aver. 1875-1909. in.  | 1916. in. | Diff. from Aver. in. | % of Av. |                            |                   |
| + .13                    | 107      | .32                   | 8     | 13          | 8.68                  | 12.62     | +3.94                | 145      | 25.11                      | Camden Square     |
| + .17                    | 105      | .38                   | 12    | 12          | 9.41                  | 12.48     | +3.07                | 133      | 27.64                      | Tenterden         |
| + .06                    | 103      | .39                   | 2     | 10          | 10.33                 | 14.10     | +3.77                | 137      | 30.48                      | Patching          |
| + .03                    | 101      | .82                   | 1     | 15          | 11.11                 | 12.94     | +1.83                | 116      | 31.06                      | Fordingbridge     |
| + .02                    | 101      | .41                   | 12    | 18          | 8.33                  | 12.76     | +4.43                | 153      | 24.58                      | Oxford            |
| - .05                    | 97       | .56                   | 12    | 14          | 9.08                  | 12.25     | +3.17                | 135      | 25.20                      | Swanspool         |
| - .24                    | 88       | .51                   | 12    | 12          | 8.55                  | 12.59     | +4.04                | 147      | 25.40                      | Westley           |
| ...                      | ...      | ...                   | ...   | ...         | 7.84                  | ...       | ...                  | ...      | 23.73                      | Geldeston         |
| - .57                    | 73       | .36                   | 7     | 18          | 13.70                 | 15.78     | +2.08                | 115      | 38.27                      | Polapit Tamar     |
| + .15                    | 107      | .51                   | 1     | 17          | 12.15                 | 13.32     | +1.17                | 110      | 33.54                      | Rousdon           |
| +1.00                    | 148      | .48                   | 24    | 20          | 10.65                 | 13.46     | +2.81                | 126      | 29.81                      | Stroud            |
| + .38                    | 114      | .50                   | 4     | 17          | 11.71                 | 13.85     | +2.14                | 118      | 32.41                      | Wolstaston        |
| - .05                    | 97       | .35                   | 9     | 15          | 7.91                  | 12.36     | +4.45                | 156      | 23.35                      | Boston            |
| + .40                    | 119      | .74                   | 12    | 13          | 8.74                  | 11.57     | +2.83                | 132      | 24.46                      | Hodsock Priory    |
| + .23                    | 111      | .57                   | 4     | 18          | 9.22                  | 15.07     | +5.85                | 164      | 26.65                      | Mickleover        |
| +1.14                    | 132      | 1.31                  | 6     | 12          | 11.91                 | 15.04     | +3.13                | 121      | 34.73                      | Macclesfield      |
| + .32                    | 115      | .60                   | 12    | 16          | 10.70                 | 11.19     | + .49                | 105      | 32.70                      | Southport         |
| - .56                    | 84       | .71                   | 4     | 10          | 23.59                 | 26.43     | +2.84                | 112      | 61.49                      | Arncliffe         |
| + .34                    | 116      | .67                   | 4     | 12          | 9.71                  | 12.27     | +2.56                | 127      | 27.29                      | Goldsborough Hall |
| + .91                    | 140      | .54                   | 4     | 10          | 8.99                  | 11.55     | +2.56                | 128      | 26.42                      | Hull              |
| + .76                    | 137      | .72                   | 4     | 16          | 9.51                  | 11.57     | +2.06                | 122      | 27.94                      | Newcastle         |
| + .85                    | 111      | 4.50                  | 31    | 12          | 49.44                 | 58.98     | +9.54                | 119      | 129.48                     | Seathwaite        |
| +1.45                    | 157      | 1.18                  | 24    | 21          | 14.67                 | 19.06     | +4.39                | 130      | 42.28                      | Cardiff           |
| + .30                    | 111      | .35                   | 8     | 19          | 16.71                 | 15.68     | -1.03                | 94       | 46.81                      | Haverfordwest     |
| +3.10                    | 218      | 1.63                  | 24    | 22          | 15.15                 | 20.23     | +5.08                | 134      | 45.46                      | Gogerddan         |
| +1.74                    | 193      | .68                   | 24    | 21          | 10.40                 | 13.29     | +2.89                | 128      | 30.36                      | Llandudno         |
| +1.63                    | 157      | .84                   | 31    | 21          | 16.22                 | 20.53     | +4.31                | 127      | 43.47                      | Cargen            |
| + .57                    | 122      | .69                   | 5     | 20          | 12.00                 | 16.65     | +4.65                | 139      | 33.76                      | Marchmont         |
| +1.74                    | 158      | .82                   | 5     | 20          | 18.06                 | 21.64     | +3.58                | 120      | 49.77                      | Girvan            |
| ...                      | ...      | ...                   | ...   | ...         | 13.10                 | ...       | ...                  | ...      | 35.97                      | Glasgow           |
| +2.42                    | 194      | .75                   | 31    | 23          | 17.59                 | 25.41     | +7.82                | 145      | 48.79                      | Eallabus          |
| +1.11                    | 137      | 1.05                  | 31    | 22          | 20.25                 | 20.01     | - .24                | 99       | 56.57                      | Quinish           |
| ...                      | ...      | ...                   | ...   | ...         | 29.34                 | ...       | ...                  | ...      | 73.77                      | Stronvar          |
| +1.68                    | 182      | 1.04                  | 5     | 18          | 9.96                  | 12.47     | +2.51                | 125      | 28.64                      | Dundee            |
| + .04                    | 102      | .76                   | 5     | 16          | 12.97                 | 19.12     | +6.15                | 148      | 34.93                      | Braemar           |
| +1.09                    | 146      | 1.17                  | 5     | 15          | 12.00                 | 10.92     | -1.08                | 91       | 32.73                      | Aberdeen          |
| +2.31                    | 211      | .84                   | 6     | 21          | 10.14                 | 14.00     | +3.86                | 138      | 30.34                      | Gordon Castle     |
| +2.19                    | 194      | .92                   | 5     | 17          | 13.79                 | 23.05     | +9.26                | 162      | 36.13                      | Drumnadrochit     |
| + .34                    | 109      | 1.55                  | 31    | 24          | 30.02                 | 37.51     | +7.49                | 125      | 75.80                      | Fort William      |
| + .08                    | 102      | 1.18                  | 31    | 20          | 33.48                 | 40.74     | +7.26                | 122      | 83.93                      | Bendamp           |
| +1.38                    | 164      | .48                   | 2, 7  | 19          | 12.18                 | 16.33     | +4.15                | 134      | 31.90                      | Dunrobin Castle   |
| + .98                    | 132      | .87                   | 5     | 22          | 21.95                 | 23.85     | +1.90                | 109      | 54.81                      | Killarney         |
| +1.55                    | 166      | 1.39                  | 5     | 19          | 14.61                 | 14.85     | + .24                | 102      | 39.57                      | Waterford         |
| + .27                    | 111      | .90                   | 5     | 18          | 14.81                 | 17.55     | +2.74                | 118      | 39.43                      | Castle Lough      |
| + .56                    | 121      | .47                   | 6     | 21          | 16.49                 | 20.49     | +4.00                | 124      | 46.52                      | Ennistymon        |
| +1.37                    | 161      | 1.42                  | 5     | 17          | 12.83                 | 15.37     | +2.54                | 120      | 34.99                      | Courtown Ho.      |
| +2.67                    | 210      | 1.28                  | 5     | 18          | 13.26                 | 16.43     | +3.17                | 124      | 35.92                      | Abbey Leix        |
| +2.56                    | 228      | 1.82                  | 5     | 21          | 10.15                 | 14.64     | +4.49                | 145      | 27.68                      | Dublin            |
| +2.24                    | 189      | 1.58                  | 5     | 18          | 13.29                 | 18.91     | +5.62                | 142      | 36.15                      | Mullingar.        |
| +1.46                    | 146      | .75                   | 5     | 24          | 20.21                 | 26.16     | +5.95                | 129      | 52.87                      | Enniscoe          |
| +1.89                    | 164      | .91                   | 31    | 21          | 18.23                 | 22.74     | +4.51                | 125      | 48.90                      | Cong              |
| +2.09                    | 173      | .74                   | 31    | 23          | 15.72                 | 21.15     | +5.43                | 134      | 42.71                      | Markree           |
| +3.35                    | 223      | 1.62                  | 5     | 19          | 14.54                 | 17.09     | +2.55                | 118      | 38.91                      | Seaforde          |
| +3.59                    | 227      | 1.49                  | 25    | 19          | 15.20                 | 20.99     | +5.79                | 138      | 40.84                      | Ballymena         |
| +2.74                    | 203      | .81                   | 4     | 22          | 14.28                 | 19.35     | +5.07                | 135      | 39.38                      | Omagh             |

## SUPPLEMENTARY RAINFALL, MAY, 1916.

| Div.  | STATION.                     | Rain<br>inches. | Div.   | STATION.                   | Rain<br>inches. |
|-------|------------------------------|-----------------|--------|----------------------------|-----------------|
| II.   | Warlingham, Redvers Road     | 3.49            | XI.    | Lligwy                     | 4.52            |
| "     | Ramsgate                     | 1.75            | "      | Douglas                    | 5.86            |
| "     | Hailsham                     | 2.44            | XII.   | Stoneykirk, Ardwell House  | 6.28            |
| "     | Totland Bay, Aston House     | 1.84            | "      | Carsphairn Shiel           | 4.67            |
| "     | Stockbridge, Ashley          | 1.27            | "      | Beattock, Kinnelhead       | 5.57            |
| "     | Grayshott                    | 1.88            | "      | Langholm, Drove Road       | 3.90            |
| III.  | Harrow Weald, Hill House     | 1.90            | XIII.  | Selkirk, The Hangingshaw   | 4.59            |
| "     | Pitsford, Sedgebrook         | 1.90            | "      | North Berwick Reservoir    | 2.84            |
| "     | Woburn, Milton Bryant        | 1.70            | "      | Edinburgh, Royal Observat. | 3.36            |
| "     | Chatteris, The Priory        | 1.44            | XIV.   | Maybole, Knockdon Farm     | 3.60            |
| IV.   | Elsenhams, Gaunts End        | 1.88            | XV.    | Buchlyvie, The Manse       | 4.35            |
| "     | Shoeburyness                 | 1.38            | "      | Ballachulish House         | 4.98            |
| "     | Colchester, Hill Ho., Lexden | 1.68            | "      | Oban                       | 4.60            |
| "     | Ipswich, Rookwood, Copdock   | 1.81            | "      | Campbeltown, Witchburn     | 4.83            |
| "     | Aylsham, Rippon Hall         | 2.24            | "      | Holy Loch, Ardnadam        | 6.90            |
| "     | Swaffham                     | 2.02            | "      | Tiree, Cornaigmore         | 4.00            |
| V.    | Bishops Cannings             | 1.56            | XVI.   | Dollar Academy             | ...             |
| "     | Wimborne, St. John's Hill    | 1.83            | "      | Glenlyon, Meggernie Castle | 5.13            |
| "     | Ashburton, Druid House       | 2.01            | "      | Blair Atholl               | 3.60            |
| "     | Cullompton                   | 2.94            | "      | Coupar Angus               | 3.53            |
| "     | Lynmouth, Rock House         | 2.25            | "      | Montrose, Sunnyside Asylum | 2.83            |
| "     | Okehampton, Oaklands         | 2.24            | XVII.  | Alford, Lynturk Manse      | 3.92            |
| "     | Hartland Abbey               | 1.77            | "      | Fyvie Castle               | 4.70            |
| "     | Probus, Lamellyn             | ...             | "      | Keith Station              | 4.11            |
| "     | North Cadbury Rectory        | 2.13            | XVIII. | Rothiemurchus              | 3.69            |
| VI.   | Clifton, Stoke Bishop        | 3.93            | "      | Loch Quoich, Loan          | 9.30            |
| "     | Ledbury Underdown            | 2.94            | "      | Skye, Dunvegan             | 5.02            |
| "     | Shifnal, Hatton Grange       | 2.77            | "      | Lochmaddy, Bayhead         | 3.59            |
| "     | Droitwich                    | 2.49            | "      | Fortrose                   | 3.54            |
| "     | Blockley, Upton Wold         | 2.93            | "      | Glencarron Lodge           | 5.51            |
| VII.  | Market Overton               | ...             | XIX.   | Altnaharra                 | 4.02            |
| "     | Market Rasen                 | 2.68            | "      | Melvich                    | 3.06            |
| "     | Bawtry, Hesley Hall          | 2.16            | "      | Loch More, Achfary         | 4.56            |
| "     | Derby, Midland Railway       | 1.92            | XX.    | Dunmanway, The Rectory     | 3.46            |
| "     | Buxton                       | 2.47            | "      | Glanmire, Lota Lodge       | 3.26            |
| VIII. | Nantwich, Dorfold Hall       | 2.06            | "      | Mitchelstown Castle        | 3.18            |
| "     | Chatburn, Middlewood         | 3.06            | "      | Darrynane Abbey            | ...             |
| "     | Lancaster, Strathspey        | 3.54            | "      | Clonmel, Bruce Villa       | 3.60            |
| IX.   | Langsett Moor, Up. Midhope   | 2.40            | "      | Broadford, Hurdlestown     | 4.51            |
| "     | Scarborough, Scalby          | 3.42            | XXI.   | Enniscorthy, Ballyhyland   | 5.20            |
| "     | Ingleby Greenhow             | 2.44            | "      | Rothnen, Clonmannon        | 4.75            |
| "     | Mickleton                    | 3.90            | "      | Ballycumber, Moorock Lodge | ...             |
| X.    | Bellingham, High Green Manor | 3.77            | "      | Balbriggan, Ardgillan      | 6.26            |
| "     | Iliderton, Lilburn Cottage   | 3.36            | "      | Castle Forbes Gardens      | 5.02            |
| "     | Thirlmere, The Bank          | 3.54            | XXII.  | Ballynahinch Castle        | 4.92            |
| XI.   | Llanfrehfa Grange            | 4.24            | "      | Woodlawn                   | 4.26            |
| "     | Treherbert, Tyn-y-waun       | 4.47            | "      | Westport, St. Helens       | 3.50            |
| "     | Carmarthen, The Friary       | 3.14            | "      | Dugort, Slievemore Hotel   | 3.68            |
| "     | Fishguard, Goodwick Station  | 2.64            | XXIII. | Enniskillen, Portora       | 5.37            |
| "     | Crickhowell, Tal-y-maes      | 5.00            | "      | Dartrey [Cootehill]        | 4.63            |
| "     | New Radnor, Ednol            | 3.57            | "      | Warrenpoint, Manor House   | 6.18            |
| "     | Birmingham WW., Tyrmynydd    | 4.54            | "      | Belfast, Cave Hill Road    | 5.36            |
| "     | Lake Vyrnwy                  | 4.89            | "      | Glenarme Castle            | 5.33            |
| "     | Llangynhafal, Plâs Drâw      | 3.36            | "      | Londonderry, Creggan Res.  | 6.05            |
| "     | Dolgelly, Bryntirion         | 4.43            | "      | Dunfanaghy, Horn Head      | 6.66            |
| "     | Bettws-y-Coed, Tyn-y-bryn    | 3.70            | "      | Killybegs                  | 6.33            |



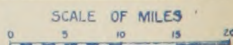
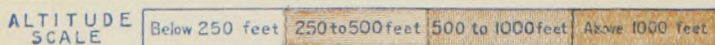
THAMES VALLEY RAINFALL. ——— MAY, 1916.



Symon's Meteorological Magazine

Watershed of River Thames above Teddington, and River Lee above Feltham Weirs.

Rainfall Stations reporting.





## THE WEATHER OF MAY.

DURING the first seventeen days of the month cold, rainy, and sunless weather prevailed, but in the last fortnight these conditions were reversed in most parts of the United Kingdom. The mean temperature of the whole month was slightly under the average in Scotland and Ireland but above the average in England, Wales and the Channel Islands, where there was a general excess of about 2° F., ranging from 3° in the English Channel and the east of England to about a degree in the north-west. During the greater part of the month there was a pronounced tendency for high barometric pressure in the north and low pressure in the south, and in many cases shallow depressions were located over the North Sea. During the first ten days shade frosts were common in Scotland, the north of England and Wales, and in Ireland, the minimum temperature falling to 28° at Cally Gatehouse, on the 10th, and to 29° at several other Scottish stations on the 4th. At Balmoral as late as the 14th a minimum of 28° was recorded. On the other hand temperature did not fall during the month below 40° at the English Channel stations.

About the 17th a period of fine warm weather set in which culminated on the 21st when the temperature rose to 85° at Camden Square, and to 83° at Norwich and Raunds. At Camden Square the above high value has been exceeded only in four Mays back to 1858, while the mean shade maxima from the 18th to the 21st was 81°·2. The last ten days were relatively cool in Scotland, while in Ireland temperature was again below the normal. On the 31st Balmoral reported a shade minimum of 30°.

In Scotland sunshine was deficient throughout the month, but over England and Ireland the last fortnight was sunny. The average daily deficit over the whole country was about an hour, and ranged from two hours in the south-west of England, including the Channel, to half-an-hour per diem in Ireland and the south-east of England.

The durations at individual stations were as follows:—Totland Bay, 212 hours; Sidmouth, 199 hours; Copdock, 191 hours; Southport, 190 hours; Haverfordwest, 170 hours; Loch More, 161 hours; Paisley, 156 hours; Camden Square, 156 hours; Hodsock Priory, 151 hours; Swinton, 146 hours; Perth, 141 hours; Bolton, 127 hours; Hull, 103 hours.

Rainfall was in excess of the average nearly everywhere, except over the extreme south of England, and at a few places in the Midlands. As in April there was a pronounced deficit at coastal stations in the south, including the Devon-Cornwall Peninsula. There was a marked excess in the north-east of Ireland, where more than double the normal fell. The greatest rainfall, ten inches or more, fell in isolated patches in Carnarvon and Conemaara, and the least, slightly under 1½ in., in narrow strips to the north and east of the Isle of Wight, the former extending to the vicinity of Andover and the latter to Bognor. A heavy rain occurred on the last day of the month over the north of Ireland, and the west of England and Scotland. The amounts in general were under two inches, but at Seathwaite as much as 4·50 in. fell. Over nearly the whole of England and Wales, except the normally rainy localities, falls of an inch were rare. On the 5th a depression over the Bay of Biscay travelling north gave falls approaching to two inches in the south of Ireland, and on the 24th and 31st thunderstorms in some southern and western localities caused heavy precipitation.

In the Thames Valley the rainfall showed variations from an inch-and-a-half at the mouth of the Thames, and in patches round Wallingford and Horsebridge, to three inches on the Cotteswolds and North Downs around Caterham.

The general rainfall expressed as a percentage of the average was:—England and Wales, 120 per cent.; Scotland, 147 per cent.; Ireland, 174 per cent.; British Isles, 141 per cent. In London (Camden Square) the mean temperature was 57°·2, or 3°·2 above the average. Duration of rainfall, 34·7 hours. Evaporation, 2·32 in.

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

| 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. |       |
|                                                                  | Temp.     | Date.  | Temp.    | Date. |          |      |               |           |                 |                   |            |       |       |
|                                                                  |           |        |          |       |          |      |               |           |                 |                   |            |       |       |
|                                                                  |           |        |          |       |          |      |               | 0-100     |                 |                   | inches     |       |       |
| London, Camden Square                                            | 56·8      | 10     | 27·6     | 13    | 48·7     | 38·9 | 40·8          | 88        | 78·8            | 25·0              | 5·64       | 22    | 6·3   |
| Malta ... ..                                                     | 70·7      | 9      | 48·3     | 15    | 64·4     | 55·7 | ...           | 92        | 109·0           | ...               | ·75        | 4     | 2·2   |
| Lagos ... ..                                                     | 92·0      | 22, 24 | 71·0     | 9     | 88·9     | 74·8 | 73·5          | 74        | 149·0           | 69·0              | ·00        | 0     | 4·5   |
| Cape Town ... ..                                                 | 96·7      | 29     | 52·5     | 17    | 79·0     | 59·9 | 55·6          | 62        | ...             | ...               | ·51        | 7     | 3·8   |
| Johannesburg ... ..                                              | 81·8      | 19     | 47·1     | 8     | 75·2     | 53·8 | 54·9          | 78        | ...             | 46·9              | 4·27       | 9     | 4·2   |
| Mauritius ... ..                                                 | 90·4      | 10     | 67·6     | 24    | 86·0     | 71·8 | 67·2          | 70        | ...             | 59·9              | 2·16       | 18    | 6·1   |
| Bloemfontein ... ..                                              | 92·3      | 27     | 48·3     | 5     | 84·0     | 57·8 | 50·5          | 50        | ..              | ...               | 3·48       | 8     | 3·9   |
| Calcutta ... ..                                                  | 81·9      | 4      | 52·3     | 20    | 77·7     | 56·5 | 54·9          | 68        | ...             | 40·1              | ·00        | 0     | 1·2   |
| Bombay ... ..                                                    | 87·9      | 1      | 67·3     | 7     | 83·9     | 70·6 | 65·4          | 69        | 135·2           | 50·4              | ·07        | 1     | 1·1   |
| Madras ... ..                                                    | 86·5      | 16     | 63·8     | 5     | 84·4     | 69·9 | 65·9          | 74        | 153·3           | 60·5              | ·41        | 4     | 3·6   |
| Colombo, Ceylon ... ..                                           | 91·7      | 19     | 66·4     | 7     | 85·8     | 71·5 | 69·5          | 78        | 163·0           | 59·8              | 1·49       | 6     | 4·3   |
| Hongkong ... ..                                                  | 80·1      | 8      | 49·5     | 19    | 67·9     | 58·6 | 50·8          | 62        | ...             | ...               | ·78        | 3     | 3·9   |
| Sydney ... ..                                                    | 88·0      | 2      | 53·4     | 22    | 72·6     | 61·6 | 58·3          | 69        | 142·8           | 47·0              | 3·04       | 16    | 7·0   |
| Melbourne ... ..                                                 | 101·0     | 28     | 46·2     | 8     | 73·5     | 54·0 | 49·3          | 58        | 153·8           | 38·1              | ·55        | 6     | 5·4   |
| Adelaide ... ..                                                  | 103·2     | 27     | 48·3     | 6     | 84·6     | 58·1 | 50·0          | 43        | 159·0           | 39·8              | ·06        | 2     | 2·7   |
| Perth ... ..                                                     | 104·6     | 25     | 55·3     | 1     | 86·6     | 63·7 | 53·6          | 48        | 168·7           | 48·0              | ·14        | 3     | 1·8   |
| Coolgardie ... ..                                                | 103·8     | 26     | 48·4     | 1     | 92·4     | 60·1 | 48·0          | 32        | 155·4           | ...               | ·08        | 2     | 2·1   |
| Hobart, Tasmania ... ..                                          | 85·7      | 28     | 43·5     | 27    | 68·6     | 50·4 | 45·7          | 58        | 146·2           | 32·0              | ·21        | 6     | 6·2   |
| Wellington ... ..                                                | 77·6      | 27     | 45·6     | 2     | 67·2     | 55·8 | 52·9          | 74        | 147·0           | 33·6              | 1·21       | 8     | 7·7   |
| Auckland ... ..                                                  | 77·0      | 19     | 48·5     | 3     | 70·1     | 56·8 | 56·3          | 77        | 158·0           | 45·0              | ·54        | 5     | 5·2   |
| Jamaica, Kingston ... ..                                         | 88·1      | 30     | 68·1     | 2     | 85·7     | 70·4 | 69·8          | 79        | ...             | ...               | ·56        | 2     | ...   |
| Grenada ... ..                                                   | 88·0      | 10     | 71·0     | 15    | 85·0     | 74·0 | ...           | 75        | 136·0           | ...               | 5·93       | 23    | 2·0   |
| Toronto ... ..                                                   | 40·6      | 17     | 9·8      | 31    | 33·0     | 22·2 | 23·2          | 86        | 98·5            | 2·6               | 2·52       | 13    | 7·5   |
| Fredericton ... ..                                               | 49·0      | 26     | 1·0      | 16    | 31·4     | 19·1 | 21·5          | 86        | ...             | ...               | 3·88       | 12    | 7·0   |
| St. John, N.B. ... ..                                            | 50·2      | 26     | 8·0      | 31    | 33·7     | 23·2 | 24·7          | 77        | ...             | 2·8               | 4·96       | 16    | 6·8   |
| Alberta, Edmonton ... ..                                         | 41·0      | 3      | —3·9     | 13    | 26·8     | 11·0 | ...           | 83        | 83·0            | —8·8              | ·31        | 9     | 6·1   |
| Victoria, B.C. ... ..                                            | 51·3      | 20     | 27·0     | 36    | 45·1     | 37·8 | 37·0          | 84        | 102·0           | 18·0              | 4·78       | 21    | 7·4   |

*Johannesburg*.—Bright sunshine, 287·3 hours.

*Mauritius*.—Mean temp. 0°·4 above, dew point 0°·7 below, and R 2·70 in. below, averages. Mean hourly velocity of wind, 11·9 miles.

COLOMBO, CEYLON.—Mean temp. 78°·7, or 0°·4 below, dew point 2°·0 below, and R 3·08 in. below, averages. TS on 2 days. Distant T and L on 10 days.

HONGKONG.—Mean temp. 63°·4, mean hourly velocity of wind 10·5 miles. Bright sunshine 214·5 hours.

*Melbourne*.—Mean temp. 0°·8 below and R 1·76 in. below, averages.

*Adelaide*.—Mean temp. 0°·2 above and R ·90 in. below, averages.

*Perth*.—Mean temp. 4°·6 above normal, and the hottest Christmas Day on record.

*Coolgardie*.—Temp. 0°·1 above and R about half-an-inch below, averages.

*Hobart*.—Mean temp. 0°·8 below, and R 1·72 in. below, averages.

*Wellington*.—Mean temp. 1°·1 above and R 2·12 in. below, averages. Bright sunshine 218·3 hours; Bright and sunny month.

*Auckland*.—Mean temp. and sunshine slightly above average, and R more than 2 in. below average.

ALBERTA, EDMONTON.—A warm, dry month. Frost in air and on S every night. Fog on 5 days.

# Symons's Meteorological Magazine.

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## Robert Henry Scott,

Dublin, 28th January, 1833—London, 18th June, 1916.

(For portrait see frontispiece.)

THE death of Dr. R. H. Scott at the age of 83 removes a remarkable landmark in the history of official meteorology. Even after he retired from the Meteorological Office in 1900 Dr. Scott continued to be the most regular and punctual attendant at the meetings of the Royal Meteorological Society, and the oldest Fellows of the Society, as well as those elected only a few years ago, can hardly picture the Secretary's table at the evening meetings without his familiar presence. Dr. Scott was a most conscientious meteorological official who made it his duty to master all the developments of the science which it was his business to apply to the public service, and he always maintained at home and abroad the high character of British Meteorology. His biography is to a great extent the history of the Meteorological Office up to the close of the nineteenth century, and probably no one had a larger share than he in shaping the development of meteorology in England through his administration of the Meteorological Office, and his influence on the Council of the Royal Meteorological Society.

Dr. Scott was the younger son of Mr. James Smyth Scott, Q.C., his mother being a daughter of the Archbishop of Cashel. He was educated at Rugby and at Trinity College, Dublin. He spent some time at the University of Berlin, studying chemistry and physics and attending the meteorological lectures of Prof. H. Dove, and for a short time he was at Munich. He graduated as M.A. of Trinity College, Dublin in 1859, and received the degree of D.Sc. from the same University thirty-nine years later. In 1863 he translated Dove's famous volume on "The Law of Storms." From an early period Scott was interested in mineralogy, and retained this interest throughout his life. In 1862 he was appointed Keeper of Minerals to the Royal Dublin Society, and held this office until 1867, when he received the appointment of Director of the Meteorological Office, newly organised by a Committee of the Royal Society, which had taken over the control of what was formerly the Meteorological Department of the Board of Trade. Admiral FitzRoy, who had



introduced storm warnings when in charge of the old "Department," had been dead for nearly two years, and in that interregnum the change of the management in the Meteorological Office had been brought about, and incidentally the storm warnings had been stopped by the Royal Society on the ground that FitzRoy's method was largely empirical. The storm warnings were speedily resumed on a scientific footing, and as land meteorology was added to the functions of the new office in supplement to marine meteorology and storms, the scope of the work was greatly extended, and the new director had his hands full in organising the new work.

After a few years another Government Committee of Inquiry sat in 1874, and, as a result, the Meteorological Office was re-constituted in 1877 under the charge of a Meteorological Council with a salaried chairman and members appointed by the Royal Society, and Mr. Scott, with the designation of Secretary of the Meteorological Council, remained in charge of the Office, which was then moved to Victoria Street. He was elected a Fellow of the Royal Society in 1870, and joined the Royal Meteorological Society in the following year, acting as Foreign Secretary for forty-five years, except for two breaks when he was Secretary in 1880 and 1881 and President in 1884 and 1885.

He was a leading member of the International Meteorological Committee instituted by the Meteorological Congress at Vienna, 1874, at which he took part, and he held the position of honorary secretary to the committee for twenty-five years. The value of the work of this Committee in securing uniform conditions and hours for observations cannot be over-rated, and the system of weather forecasting by means of synoptic maps which resulted, was carried out with great success by Dr. Scott in the Meteorological Office. He did good service also in making the methods he followed accessible to the public and comprehensible by persons of ordinary intelligence. In this way his two books "Weather Charts and Storm Warnings," published in 1876, and "Elementary Meteorology," published in the International Science Series in 1883, were of real value. The latter book has gone through five editions in England, and has been translated into French and Italian. He took a large share in the authorship of the very numerous official publications of the Meteorological Office, and contributed several papers, mainly on weather forecasting and wind-force, to the Royal Meteorological Society. In conjunction with Mr. W. Galloney he investigated the relations between colliery explosions and the weather, and gave the result in a series of papers, the first of which was published in the *Proceedings* of the Royal Society, and the later in the *Quarterly Journal* of the Royal Meteorological Society.

While Dr. Scott was not great as an original investigator or theorizer he had a remarkably firm, practical grasp of the principles of synoptic meteorology, and he made the weather forecasts for the

United Kingdom as trustworthy as the methods available in his time permitted. Personally Dr. Scott had a full share of the characteristic Irish kindness of heart, and often gave way to impulsive generosity. His conversation was full of humour which often tended towards the grimmer quality. He did not readily accept views put forward by those with whom he was not in sympathy, nor would he patiently consider criticism of his habitual beliefs. But he was for half a century a typical exponent of the meteorological triumphs of the Victorian period.

### THE COLDNESS OF JUNE, 1916.

IN our last number we gave a comparison of the mean temperature of January 1st and June 4th at Camden Square, in which it was shown that the mean temperature of the latter day was half a degree lower than that of New Year's day. A much more striking contrast would have been afforded by a comparison with June 12th as will be seen from the following values :—

| 1916.       | Max. | Min. | 9 hr. | 21 hr. | Mean of Day. |
|-------------|------|------|-------|--------|--------------|
| January 1   | 57·2 | 47·2 | 52·8  | 51·4   | 52·2         |
| June 12     | 53·6 | 44·5 | 48·8  | 46·3   | 48·3         |
| Difference— |      |      |       |        |              |
| June-Jan.   | —3·6 | —2·7 | —4·0  | —5·1   | —3·9         |

Thus the 12th of June was four degrees colder on the whole than the 1st of January.

At Dorman's Park, Surrey, the following is a comparison of the shade maximum and minimum temperatures, and the grass minimum temperatures for two three-day groups comprising January 1st to 3rd, and June 12th to 14th :—

| 1916.          |       | Mean Max. | Mean Min. | Mean Grass Min. |
|----------------|-------|-----------|-----------|-----------------|
| January 1 to 3 | ..    | 52·5      | 45·5      | 37·7            |
| June 12 to 14  | ..    | 51·3      | 44·3      | 36·2            |
| Difference—    |       |           |           |                 |
| June-Jan.      | .. .. | —1·2      | —1·2      | —1·5            |

Thus the three June days under consideration were colder than the three January days by more than a degree.

The actual values for certain days in January and June were:—

| 1916.     |    | Max. | Min. | Mean. | Grass. |
|-----------|----|------|------|-------|--------|
| January 1 | .. | 54   | 45   | 49·5  | 39     |
| January 7 | .. | 51   | 48   | 49·5  | 42     |
| June 8    | .. | 57   | 40   | 48·5  | 31     |
| June 12   | .. | 48   | 43   | 45·5  | 40     |

A further comparison of the values during the first week of January with June gives the following results :—

|                |    | Mean Max. | Mean Min. | Mean. |
|----------------|----|-----------|-----------|-------|
| January 1 to 7 | .. | 52·2      | 44·5      | 48·3  |
| June 1 to 7    | .. | 58·0      | 42·7      | 50·3  |

The low June and high January night values are the most striking.

For the whole month of June the Camden Square temperature values were exceedingly low as will be seen from the following table, in which a comparison is made with June, 1909,\* the coldest observed in the long record commenced by Mr. Symons in 1858. The mean temperature is the average of the highest, lowest, 9 a.m. and 9 p.m.

| June.     |       | Mean Max. | Mean Min. | Mean Temp. |
|-----------|-------|-----------|-----------|------------|
| 1909      | .. .. | 63·9      | 48·5      | 55·6       |
| 1916      | .. .. | 65·0      | 47·9      | 55·7       |
| Average—  |       |           |           |            |
| 1860-1909 | ..    | 70·8      | 50·7      | 60·1       |

Thus the mean temperature of June was 4°·4 below the average, the only colder month of the name occurring in 1909. The mean maximum temperature was 5°·8 under the average, and was lower 63°·9 in 1909, and 64°·7 in 1860. The mean minimum temperature was 2°·8 under the normal, and only one June—that of 1869—had a lower mean minimum value of 46°·9. During the first 22 days of June, 1916, the minima were low, the average being 45°·9, but from the 22nd to the 30th the mean minima rose to 53°·2.

The absolute maximum of 73°·6 recorded on the 22nd was the lowest in the past fifty-nine years except in 1860 when it was 71°·9. The absolute minimum was 40°·3 on the 17th, lower values having been recorded on twelve occasions. The coldness of the month was due to the small amount of sunshine, only 138 hours being noted, and only one day (the 17th) with more than ten hours. In June, 1909, only 92 hours sunshine were registered, and there were seven sunless days against three in the month that has just closed.

The coldness of June has been equally remarkable in the north of the British Isles. At Gordon Castle in Banff, the mean temperature was 50°·6 or 4°·4 below the average of the 152 years 1764-1915. In this long period only one colder June—that of 1797—was experienced, with a temperature 0°·4 lower. It is of interest to note that the departure of the Gordon Castle mean temperature from the normal during June, 1916, is exactly the same as that of the surface sea temperature at Wick, in Caithness, where the sea has been abnormally cold for some months. At Edinburgh during the last century and a half six colder Junes were recorded, all between the years 1830 and 1888, the coldest of all being June, 1860, with a mean of 51°·5, or 1°·4 below the mean of last month.

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\* See *Met. Mag.*, Vol. 44, p. 108.

## THE PHYSICAL CONDITIONS OF THE WEDDELL SEA.

At a meeting of the Royal Geographical Society, held on June 15th, Mr Douglas Freshfield, President, in the chair, Mr. R. C. Mossman, F.R.S.E., read a paper on the "Physical Conditions of the Weddell Sea." After a brief summary of the work carried out by the various expeditions to this area a resumé was given of the oceanography, meteorology, etc., of the region south of lat. 60° S., between the meridian of Greenwich and 70° W. The depth of the Weddell Sea away from land is about 2,500 fathoms. Shallower water is found between the South Sandwich Group and the South Orkneys, and close to Coats Land soundings of 161 and 159 fathoms were recorded two miles from the shore, while close to Luitpold's Land soundings of 62 and 99 fathoms were obtained. On the meridian 30° W. the continental shelf extends as far north as 74½° S. The deep sea deposits south of lat. 60° were either blue mud approximating to red clay, or blue mud and terrigenous matter thus consisting of the material carried off Antarctic lands and deposited through gradual dissolution of icebergs. The surface currents indicate a general circulation clockwise round a barometric minimum in the middle of the Weddell Sea central near the Antarctic Circle in harmony with the prevailing winds. This is well shown from the drift of the "Deutschland" and "Endurance," whose course beset in the ice entirely corroborated the scheme of atmospheric and oceanic circulation deduced from the observations taken on the "Scotia" expedition. It is probable that the sea to the east of the land explored by Nordenskjöld and Larsen is very shallow and full of shoals, as in spite of strong south-west winds the pack is singularly inert, being held up largely by stranded icebergs. It is not unlikely that a chain of islands stretching to the south of where Ross reported an "appearance of land," in lat. 65° S., long. 48° W., contributes to this congestion of the ice. A discussion of the serial sea temperatures taken on the "Endurance" would clear up this point. The series of serial sea temperatures taken by the Scottish Expedition show that from the surface down to about 120 fathoms there is a layer of cold water due to ice melting, but in from about 200 to 700 fathoms a warm wedge, in which the water temperature varies from 32°·5 to 33°·5, is met with. As a general rule below 700 fathoms temperature falls slowly down to about 1,500 fathoms where the mean is 31°·5, but in the next 1,000 fathoms down to the bottom, the curve is isothermal no further fall in temperature being recorded. The paper concluded with a general summary of the meteorological conditions, and some interesting correlations were referred to which suggest that the long series of observations taken at the South Orkneys can now be turned to practical purposes for long range weather forecasting in South America and South Africa.

## SYSTEM OF LUNAR WEATHER TYPES AT STOCKHOLM.

PROF. OTTO PETERSSON has sent us the following scheme of the winter climate of Stockholm in relation to lunar periods which presents some features of interest. The whole scheme is interwoven with 9 years and 8 years, and 10 years periods—all of them moon periods. Thus the 9 years period refers to the node-apside., the 8 years period is that of

$$\begin{aligned} 107 \text{ tropical months} &= 2923.45 \text{ days,} \\ 99 \text{ synodical months} &= 2923.52 \text{ days} \end{aligned}$$

while the 10 years period is that of

$$\begin{aligned} 133.68 \text{ tropical months} &= 3652.40 \text{ days} \\ 123.68 \text{ synodical months} &= 3651.80 \text{ days} \end{aligned}$$

There are also "catastrophal epochs" of 93 years as 1763 and 1856, 1796 and 1889.

In the following table the 8 years period is well shown in the mean winter temperature of Stockholm.

*Showing the Departure from the Normal in  $0^{\circ}$  F. of the Mean Winter Temperature of Stockholm.*

Mean Winter Temperature (Dec., Jan., Feb.) =  $26^{\circ} 2$  F.

NOTE.—The figures on the top line indicate the number of years to be added to those given in the left hand column, *e.g.*, line beginning 1769 +4 = 1773, the value for which is  $+1^{\circ} 3$ .

|         | 0    | 1    | 2    | 3    | 4     | 5    | 6    | 7    | 8    |
|---------|------|------|------|------|-------|------|------|------|------|
| Year.   |      |      |      |      |       |      |      |      |      |
| 1760 .. | —    | —    | —    | —1.1 | +3.6  | —0.5 | —2.0 | —7.2 | —1.6 |
| 1769 .. | +4.1 | —0.5 | —4.7 | —4.5 | +1.3  | —4.5 | —0.2 | —0.4 | —1.3 |
| 1778 .. | +0.2 | +5.4 | —3.1 | —1.6 | —1.3  | —0.9 | —3.4 | —3.2 | —3.4 |
| 1787 .. | +1.8 | —4.0 | —8.1 | +8.8 | +6.5  | —1.1 | +3.1 | +2.5 | —3.8 |
| 1796 .. | +3.8 | +2.5 | +1.6 | —4.7 | —5.2  | +0.9 | —2.3 | —5.8 | —5.6 |
| 1805 .. | —7.2 | —0.2 | +2.2 | —0.5 | —11.5 | +3.4 | —0.4 | +1.3 | —0.9 |
| 1814 .. | —9.0 | +1.4 | —2.5 | +5.2 | —2.2  | +7.0 | —3.2 | —1.1 | +7.7 |
| 1823 .. | —0.2 | +7.7 | +3.4 | +2.5 | —1.6  | +1.1 | —5.6 | —5.2 | —4.0 |
| 1832 .. | +3.8 | +3.2 | +2.5 | +3.8 | —0.7  | +0.2 | —7.0 | +0.7 | 0.0  |
| 1841 .. | —4.1 | +5.9 | +5.0 | —2.9 | —2.2  | 0.0  | —3.6 | +4.1 | +0.4 |
| 1850 .. | —2.2 | +3.4 | +2.3 | +1.1 | 0.0   | —5.6 | —3.2 | +0.2 | +4.7 |
| 1859 .. | +3.6 | —0.9 | —3.2 | —2.5 | +5.9  | +2.2 | —1.4 | +5.6 | —2.5 |
| 1868 .. | —3.1 | +3.6 | +0.5 | —8.8 | +3.2  | +4.7 | +5.9 | —6.3 | —1.3 |
| 1877 .. | —4.1 | +4.5 | —3.1 | +1.6 | —5.8  | +6.5 | +1.1 | +3.6 | +1.6 |
| 1886 .. | +1.6 | +4.1 | —2.0 | +1.6 | +4.7  | —1.4 | +0.2 | —7.6 | +5.4 |
| 1895 .. | —1.6 | +3.8 | —0.2 | +6.1 | +2.7  | +1.4 | —0.2 | —0.5 | +2.0 |
| 1904 .. | +2.9 | +2.0 | +5.4 | +0.5 | +1.8  | +1.8 | +4.3 | —4.1 | +1.4 |
| 1913 .. | +5.0 | +3.8 |      |      |       |      |      |      |      |

Practically similar results are derived for the climate of Berlin Copenhagen, etc., whether temperature, pressure, or rainfall is employed. "For other meridians there will be other numbers, other years, but the same great moon periods will prevail."

# METEOROLOGICAL OBSERVATIONS AT NOTRE DAME DES PINS, MANCHURIA, for 1914.

By REV. J. DE MOIDREY, S.J.

NOTRE DAME DES PINS is the central mission of the Belgian Fathers of Schent and is located in lat.  $41^{\circ} 23' N.$ , long.  $120^{\circ} 37' E.$ , at an altitude of 106 metres above sea-level. The meteorological installation was presented by the Chinese monks. An electrically recording Richard anemometer is placed on a tower, and on another tower is the wind vane. A Newton sunshine recorder and a sun dial stand upon pillars in a position where the exposure is good. In the screen are dry and wet bulb thermometers, maximum and minimum also a Richard thermograph and hygrograph. The barometer, by Tonnelet has a compensated scale, and there is a Richard barograph. The observations from 1900 to 1910 are summarised in the annual calendar of Zi-ka-wei for 1912, pp. 141-163. From 1911 to 1913 the data are given in the "Meteorologische Zeitschrift."

## I.—Barometric Pressure. Millimetres.

## II.—Relative Humidity.

|           | 2 hr.<br>mm. | 8 hr.<br>mm. | 14 hr.<br>mm. | 20 hr.<br>mm. | Max.<br>mm. | 8 hr. | 14 hr. | 20 hr. |
|-----------|--------------|--------------|---------------|---------------|-------------|-------|--------|--------|
| Jan. ..   | 756.97       | 757.91       | 756.52        | 757.20        | 757.15      | 57.5  | 24.4   | 41.0   |
| Feb. ..   | 59.70        | 60.00        | 58.52         | 58.99         | 59.30       | 30.3  | 6.5    | 21.3   |
| March ..  | 54.63        | 54.95        | 53.17         | 53.17         | 53.98       | 25.0  | 6.6    | 24.4   |
| April ..  | 51.73        | 52.32        | 51.07         | 51.33         | 51.61       | 53.6  | 39.5   | 43.4   |
| May ..    | 48.15        | 48.58        | 46.92         | 47.28         | 47.73       | 39.2  | 31.0   | 38.2   |
| June ..   | 43.41        | 43.46        | 42.34         | 42.71         | 42.98       | 59.6  | 44.8   | 58.0   |
| July ..   | 43.18        | 43.50        | 42.58         | 42.54         | 42.95       | 78.5  | 63.8   | 81.0   |
| August .. | 45.55        | 46.05        | 45.21         | 45.54         | 46.40       | 72.4  | 56.7   | 76.6   |
| Sept. ..  | 50.67        | 51.34        | 50.29         | 50.89         | 50.80       | 73.9  | 52.1   | 74.4   |
| Oct. ..   | 54.95        | 55.31        | 53.79         | 54.64         | 54.67       | 74.0  | 45.0   | 64.7   |
| Nov. ..   | 57.94        | 57.85        | 56.81         | 56.06         | 57.17       | 78.1  | 64.1   | 72.1   |
| Dec. ..   | 59.01        | 59.08        | 57.81         | 59.04         | 58.73       | 87.4  | 51.9   | 65.9   |
| Year ..   | 752.16       | 52.53        | 51.25         | 51.62         | 51.96       | 60.8  | 40.5   | 55.1   |

## III.—Temperature, ° Centigrade.

## Daily Range.

|          | Min.  | Max. | 20 hr. | Mean. | Min. | Max. | Mean. |
|----------|-------|------|--------|-------|------|------|-------|
| Jan. ..  | —15.4 | 5    | —7.4   | —7.1  | 8.2  | 26.1 | 16.9  |
| Feb. ..  | —12.8 | 3.5  | —4.5   | —4.6  | 5.2  | 23.5 | 16.3  |
| Mar. ..  | —5.7  | 9.2  | 1.9    | 1.8   | 3.9  | 23.1 | 14.9  |
| April .. | 2.9   | 19.3 | 11.0   | 11.1  | 5.4  | 28.6 | 16.4  |
| May ..   | 11.2  | 28.9 | 19.7   | 19.9  | 3.2  | 27.4 | 17.6  |
| June ..  | 15.5  | 30.2 | 22.4   | 22.7  | 4.5  | 23.4 | 14.7  |
| July ..  | 20.1  | 31.2 | 24.8   | 25.4  | 3.1  | 21.0 | 11.1  |
| Aug. ..  | 18.3  | 31.6 | 23.6   | 24.4  | 5.8  | 23.3 | 13.3  |
| Sept. .. | 11.5  | 25.3 | 16.9   | 17.9  | 4.0  | 21.6 | 13.8  |
| Oct. ..  | 5.4   | 20.0 | 11.9   | 12.4  | 4.4  | 22.5 | 14.6  |
| Nov. ..  | —6.9  | 3.5  | —2.8   | —2.1  | 1.0  | 21.0 | 10.1  |
| Dec. ..  | —15.5 | —0.5 | —9.2   | —8.4  | 9.1  | 22.3 | 14.3  |
| Year ..  | 2.4   | 17.0 | 9.0    | 9.5   | 1.0  | 28.6 | 14.5  |

IV.—*Number of Days of*

|          | Thunder. | Light-<br>ning. | Thunder-<br>storms. | Hail. | Fog. | Dew. | Hoar.<br>Frost. | Rain. | Snow. |
|----------|----------|-----------------|---------------------|-------|------|------|-----------------|-------|-------|
| Jan. ..  | 0        | 0               | 0                   | 1     | 0    | 0    | 0               | 0     | 2     |
| Feb. ..  | 0        | 0               | 0                   | 3     | 0    | 0    | 0               | 0     | 1     |
| Mar. ..  | 0        | 0               | 0                   | 3     | 0    | 0    | 4               | 1     | 6     |
| April .. | 0        | 0               | 0                   | 3     | 0    | 0    | 2               | 2     | 1     |
| May ..   | 2        | 0               | 0                   | 2     | 0    | 0    | 0               | 5     | 0     |
| June ..  | 3        | 0               | 1                   | 0     | 1    | 1    | 0               | 12    | 0     |
| July ..  | 0        | 1               | 3                   | 0     | 2    | 0    | 0               | 14    | 0     |
| Aug. ..  | 0        | 0               | 3                   | 0     | 3    | 0    | 0               | 10    | 0     |
| Sept. .. | 0        | 0               | 6                   | 1     | 2    | 0    | 0               | 9     | 0     |
| Oct. ..  | 0        | 0               | 0                   | 5     | 2    | 1    | 2               | 6     | 0     |
| Nov. ..  | 0        | 0               | 0                   | 0     | 0    | 0    | 12              | 4     | 1     |
| Dec. ..  | 0        | 0               | 0                   | 2     | 0    | 0    | 12              | 0     | 1     |
| Year     | 5        | 1               | 13                  | 20    | 10   | 2    | 32              | 63    | 12    |

## V.

|         | CLOUD %. |         |           | SUNSHINE.<br>Hours<br>per day. | RAIN.<br>mm. | DRY PERIODS<br>of 10 days or more. |         |         |
|---------|----------|---------|-----------|--------------------------------|--------------|------------------------------------|---------|---------|
|         | Bright.  | Cloudy. | Overcast. |                                |              | Began.                             | Ended.  | Lasted. |
| Jan.    | 77       | 5       | 18        | 6.24                           | 1.8          | Jan. 8                             | Feb. 4  | 28 days |
| Feb.    | 79       | 3       | 18        | 6.80                           | 0.5          | Feb. 6                             | Mar. 4  | 27      |
| Mar.    | 62       | 9       | 29        | 6.95                           | 28.6         | Apr. 17                            | May 17  | 32      |
| April   | 65       | 9       | 26        | 6.99                           | 1.1          | Dec. 3                             | Jan. 6, | 35      |
| May     | 66       | 11      | 23        | 7.65                           | 21.7         |                                    | 1915    |         |
| June    | 56       | 9       | 35        | 6.73                           | 94.6         |                                    |         |         |
| July    | 38       | 15      | 44        | 5.01                           | 132.9        |                                    |         |         |
| Aug.    | 54       | 15      | 31        | 7.83                           | 103.8        |                                    |         |         |
| Sept.   | 58       | 12      | 30        | 7.26                           | 195.7        |                                    |         |         |
| Oct.    | 66       | 5       | 29        | 6.94                           | 26.9         |                                    |         |         |
| Nov.    | 68       | 7       | 25        | 6.00                           | 50.5         |                                    |         |         |
| Dec.    | 81       | 4       | 15        | 6.13                           | 2.0          |                                    |         |         |
| Year 64 | 9        | 24      | 6.71      | 658.1                          |              |                                    |         |         |

The highest reading is in heavy type, the lowest in italic.

VI.—*Wind Velocity.**Frequency of Wind in Percentages.*

|                |    |    | Frequency of Wind in Percentages. |      |    |      |    |      |    |      |    |
|----------------|----|----|-----------------------------------|------|----|------|----|------|----|------|----|
| Kms. per hour. |    |    | N.                                | N.E. | E. | S.E. | S. | S.W. | W. | N.W. |    |
| Jan.           | .. | .. | 4.4                               | 9    | 50 | 1    | 0  | 5    | 17 | 5    | 12 |
| Feb.           | .. | .. | 4.8                               | 4    | 71 | 2    | 0  | 2    | 13 | 2    | 7  |
| Mar.           | .. | .. | 8.6                               | 5    | 51 | 1    | 0  | 1    | 30 | 1    | 11 |
| April          | .. | .. | 8.8                               | 11   | 44 | 1    | 0  | 6    | 22 | 13   | 2  |
| May            | .. | .. | 9.0                               | 10   | 24 | 0    | 0  | 1    | 50 | 9    | 7  |
| June           | .. | .. | 7.2                               | 13   | 15 | 1    | 2  | 3    | 50 | 6    | 9  |
| July           | .. | .. | 3.4                               | 3    | 39 | 0    | 3  | 2    | 44 | 4    | 3  |
| August         | .. | .. | 4.8                               | 7    | 46 | 0    | 2  | 3    | 35 | 4    | 3  |
| Sept.          | .. | .. | 4.6                               | 2    | 41 | 0    | 0  | 6    | 40 | 0    | 11 |
| Oct.           | .. | .. | 4.4                               | 8    | 43 | 0    | 0  | 1    | 41 | 1    | 6  |
| Nov.           | .. | .. | 5.1                               | 11   | 66 | 0    | 0  | 0    | 15 | 1    | 7  |
| Dec.           | .. | .. | 3.7                               | 5    | 70 | 4    | 0  | 0    | 8  | 5    | 8  |

## Correspondence.

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

## COLD JUNE AT TOTLAND BAY.

I HAVE taken the meteorological readings at Totland Bay during the past 30 years. This year's June gave us a mean temperature of  $54^{\circ}\cdot 7$  F. Only one preceding June, that of seven years ago, was colder, with a mean temperature for the June month of  $54^{\circ}\cdot 3$  F. The warmest day June, 1916, gave us a true shade temperature of only  $65^{\circ}\cdot 4$  F. This is a striking figure compared with all the preceding 29 years of which I give you the following table of the warmth of the hottest day of each, entered to the nearest whole number thus  $65^{\circ}\cdot 5$  up to  $66^{\circ}\cdot 4$  is entered as  $66^{\circ}$ .

*Hottest Day of June.*

|            |            |            |
|------------|------------|------------|
| 1887 .. 79 | 1897 .. 75 | 1907 .. 67 |
| 1888 .. 76 | 1898 .. 75 | 1908 .. 82 |
| 1889 .. 79 | 1899 .. 77 | 1909 .. 67 |
| 1890 .. 73 | 1900 .. 76 | 1910 .. 72 |
| 1891 .. 74 | 1901 .. 78 | 1911 .. 80 |
| 1892 .. 73 | 1902 .. 77 | 1912 .. 72 |
| 1893 .. 84 | 1903 .. 80 | 1913 .. 78 |
| 1894 .. 80 | 1904 .. 72 | 1914 .. 76 |
| 1895 .. 77 | 1905 .. 75 | 1915 .. 72 |
| 1896 .. 79 | 1906 .. 73 | 1916 .. 65 |

JOHN DOVER.

*Aston House, Totland Bay, Isle of Wight.*

## SUMMER TIME.

FROM the letters in your esteemed Magazine it appears that Summer Time has created something of a stir among meteorologists. Many of the remarks, however, seem to be based on a wrong supposition as to what time, or rather the time of day, really is.

The difference in time between one place and another, whether true time or mean time, depends on the difference in longitude, 4 minutes of time for each degree. Taking the longitudes from your rainfall tables for May, I find that the longitude of Geldeston, in Norfolk is  $1^{\circ} 31'$  E., and that of Islay is  $6^{\circ} 15'$  W., so that the difference in time between these two stations is just about 31 minutes. In the days when travelling was slow and infrequent, these differences due to longitude were not of much importance, but with the introduction of railways it became necessary to establish a standard time and then, by Act of Parliament, Greenwich Mean Time was fixed



for the whole of Great Britain. I should like to emphasise the fact that Greenwich Mean Time was fixed by *Act of Parliament*, for it is this time which your correspondents are treating as immutable, and one has even questioned the right of Parliament to alter it.

For meteorological purposes it strikes me that Greenwich Mean Time is an anomaly, for the sun certainly plays the most important part in all matters meteorological, and Greenwich Mean Time takes no account of the position of the sun at the place of observation. To be consistent, meteorologists ought certainly to revert to apparent time. In addition to this it seems to me that in order to be of the greatest practical use, observations ought to be taken at periods which are equal subdivisions of the time between sunrise and sunset on each day in the year, one of which should end at midday. Of course this would be somewhat irksome to many of your Observers, but I should like to convince a few of them that Greenwich Mean Time does not possess those virtues which are apparently attributed to it. Naturally my remarks do not apply to rainfall observations, for the total rainfall is the main consideration, no matter when the partial falls are measured during the day.

JOSEPH HARRY FRY.

64, Craven Park, Willesden, N.W.

### ROYAL METEOROLOGICAL SOCIETY.

THE final meeting of this Society for the present Session was held on Wednesday afternoon, the 21st June, at 70, Victoria Street, Westminster, Major H. G. Lyons, D.Sc., F.R.S., President, in the chair.

Mr. J. E. Clark and Mr. H. B. Adams presented their "Report on the Phenological Observations for 1915." The year did not depart appreciably from the mean for the 25 years record, being, on the whole, a shade earlier. 1914 was seven days earlier than 1915, of which the outstanding features were the mild and very wet winter the following drought, interrupted in most parts through July and early August, in others almost continuous through October; the genial conditions, as a whole, in April and June, but with cold spells and frosts in May and June; the cold, sunless, wet July followed by a mild Autumn ending in the unprecedented November frosts. Speaking generally, garden and field came through fairly well, the hay and strawberry crops being the chief exceptions, and large proportion of apples malformed from the May set-back. Roses and herbaceous flowers were above the average in summer and autumn. The cold periods in spring affected migrants adversely, the mean date being April 26th compared with April 24th in 1914, and April 23rd for the 20 years' mean of the records, 1877 to 1896.

The President (Major H. G. Lyons) said the Society was greatly indebted to Mr. Clark for contributing this report which had the great advantage of being dealt with in successive years by the

same author. Col. Rawson, C.B., referred to the relation between the swaying of the anticyclonic belt of the Northern Hemisphere, and the variation from year to year in the dates of flowering.

A paper by Messrs. Miller Christy, and W. Marriott, dealing with the "Audibility of the Gun Firing in Flanders over the South-east of England, September, 1914-April, 1916," was also read. The sound of the firing in Flanders has been repeatedly heard in many parts of the south-east of England since an early period of the war. Mr. Christy says that the sound varies considerably; sometimes, slow and deliberate firing is heard, at the rate of 3 to 12 shots a minute, each shot being quite loud and distinct. This is probably the firing of the monitors and other warships bombarding the German positions on the Belgian coast. Usually, however, the firing has been much more rapid, much less distinct, and apparently more distant. This is no doubt the sound of the firing further inland, say, around Ypres, Dixmude or Arras; it varies in rapidity from perhaps four or five shots to the minute up to more than 100. This sound is, as a rule, quite faint, though easily perceptible and quite unmistakeable; it resembles more nearly a dull and distant thud, which is rather felt than heard. From the records collected it appears that the gunfiring has been heard at one time or another over the counties, Essex, London, Kent, Surrey and Sussex; the most distant place being about 150 miles from Ypres. Mr. Marriott has discussed the meteorological conditions under which the gunfiring was heard. On days of marked audibility there was generally a cloudy or overcast sky, thus lending support to the view that the sound travelled better then than when the sky was clear. The weather charts show in general a somewhat irregular, or not definitely defined, distribution of barometric pressure, but mostly with a region of high pressure-wedged in between areas of slightly lower pressure. These conditions are such as to produce light winds at the surface, mostly between north and east, over the neighbourhood of the North Sea. Aspect and elevation are also important factors for the hearing of the firing.

The President referred to the occurrence of an intermediate silent zone where the explosions are not often heard, and an outer zone of abnormal audibility where they are heard generally. Distances up to 200 miles were none too great for violent explosions to be heard.

Mr. Charles Harding, M. Carvalho, Mr. W. W. Byrant, Dr. H. R. Mill and others also spoke.

A third paper, by Lieut. E. H. Chapman, R.E., on "The Relation between Atmospheric Pressure and Rainfall at a Single Station," which, but for the lateness of the hour would have given rise to a lively discussion, was summarised by Mr. Whipple.

The following gentlemen were elected Fellows of the Society, Prof. C. M. de Carvalho, J. M. Dyer, M.A., H. Norman Edge, A. H. Goodhall, J. Boon Hugh, J. H. Pease, J.P., Prof. H. H. Turner, F.R.S.

## RAINFALL TABLE FOR JUNE, 1916.

| STATION.                        | COUNTY.            | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|---------------------------------|--------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                 |                    |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1916.<br>in. |
| Camden Square.....              | London.....        | 51 32      | 0 8                  | 111                            | 2'28                           | 2'19         |
| Tenterden.....                  | Kent.....          | 51 4       | *0 41                | 190                            | 2'03                           | 2'36         |
| Arundel (Patching).....         | Sussex.....        | 50 51      | 0 27                 | 130                            | 2'13                           | 2'98         |
| Fordingbridge (Oaklands)...     | Hampshire.....     | 50 56      | 1 38                 | 135                            | 1'93                           | 2'45         |
| Oxford (Magdalen College)...    | Oxfordshire.....   | 51 45      | 1 15                 | 186                            | 2'27                           | 1'61         |
| Wellingborough(Swanspool)...    | Northampton.....   | 52 18      | 0 41                 | 155                            | 2'14                           | 1'69         |
| Bury St. Edmunds(Westley)...    | Suffolk.....       | 52 15      | *0 40                | 226                            | 2'21                           | 2'21         |
| Geldeston [Beccles].....        | Norfolk.....       | 52 27      | *1 31                | 38                             | 1'77                           | ...          |
| Polapit Tamar [Launceston]...   | Devon.....         | 50 40      | 4 22                 | 315                            | 2'18                           | 1'67         |
| Rousdon [Lyme Regis].....       | ".....             | 50 41      | 3 0                  | 516                            | 2'18                           | 1'68         |
| Stroud (Field Place).....       | Gloucestershire..  | 51 44      | 2 13                 | 226                            | 2'43                           | 1'81         |
| Church Stretton (Wolstaston)..  | Shropshire.....    | 52 35      | 2 48                 | 800                            | 2'59                           | 2'42         |
| Boston.....                     | Lincolnshire.....  | 52 58      | 0 1                  | 11                             | 1'95                           | 2'65         |
| Worksop (Hodsock Priory)...     | Nottinghamshire... | 53 22      | 1 5                  | 56                             | 2'06                           | 1'83         |
| Mickleover Manor.....           | Derbyshire.....    | 52 54      | 1 32                 | 280                            | 2'55                           | 1'69         |
| Macclesfield.....               | Cheshire.....      | 53 15      | 2 7                  | 501                            | 2'85                           | 3'13         |
| Southport (Hesketh Park)...     | Lancashire.....    | 53 39      | 2 59                 | 38                             | 2'26                           | 2'10         |
| Arncliffe Vicarage.....         | Yorkshire, W.R.    | 54 8       | 2 6                  | 732                            | 3'63                           | ...          |
| Goldsborough Hall.....          | ".....             | 54 0       | 1 25                 | 119                            | 2'22                           | 1'98         |
| Hull (Pearson Park).....        | " E.R.             | 53 45      | 0 20                 | 6                              | 2'09                           | 3'05         |
| Newcastle (Town Moor).....      | Northumberland...  | 54 59      | 1 38                 | 201                            | 2'04                           | 2'03         |
| Borrowdale (Seathwaite)...      | Cumberland.....    | 54 30      | 3 10                 | 423                            | 6'94                           | 7'22         |
| Cardiff (Ely).....              | Glamorgan.....     | 51 29      | 3 13                 | 53                             | 2'55                           | 4'28         |
| Haverfordwest.....              | Pembroke.....      | 51 48      | 4 58                 | 90                             | 2'74                           | 2'16         |
| Aberystwyth (Gogerddan)...      | Cardigan.....      | 52 26      | 4 1                  | 83                             | 2'97                           | 2'80         |
| Llandudno.....                  | Carnarvon.....     | 53 20      | 3 50                 | 72                             | 1'97                           | 2'24         |
| Cargen [Dumtries].....          | Kirkcudbright...   | 55 2       | 3 37                 | 80                             | 2'84                           | 1'95         |
| Marchmont House.....            | Berwick.....       | 55 44      | 2 24                 | 498                            | 2'38                           | 2'08         |
| Girvan (Pinmore).....           | Ayr.....           | 55 10      | 4 49                 | 207                            | 3'04                           | 2'68         |
| Glasgow (Queen's Park).....     | Renfrew.....       | 55 53      | 4 18                 | 144                            | 2'41                           | ...          |
| Islay (Ballabus).....           | Argyll.....        | 55 47      | 6 15                 | 68                             | 2'80                           | 1'60         |
| Mull (Quinish).....             | ".....             | 56 34      | 6 13                 | 35                             | 3'30                           | 2'13         |
| Balquhiddier (Stronvar).....    | Perth.....         | 56 21      | 4 23                 | 422                            | 4'07                           | 2'45         |
| Bundee (Eastern Necropolis)...  | Forfar.....        | 56 28      | 2 57                 | 199                            | 2'06                           | 2'89         |
| Braemar.....                    | Aberdeen.....      | 57 0       | 3 24                 | 1114                           | 2'18                           | 2'19         |
| Aberdeen (Cranford).....        | ".....             | 57 8       | 2 7                  | 120                            | 2'02                           | 4'57         |
| Gordon Castle.....              | Moray.....         | 57 37      | 3 5                  | 107                            | 2'13                           | 6'08         |
| Drumnadrochit.....              | E. Inverness.....  | 57 20      | 4 29                 | 138                            | 2'26                           | 4'75         |
| Fort William.....               | ".....             | 56 49      | 5 6                  | 171                            | 3'77                           | 1'84         |
| Loch Torridon (Bendamph)...     | W. Ross.....       | 57 32      | 5 32                 | 20                             | 4'07                           | 5'43         |
| Dunrobin Castle.....            | Sutherland.....    | 57 59      | 3 56                 | 14                             | 2'10                           | 2'99         |
| Killarney (District Asylum)...  | Kerry.....         | 52 4       | 9 31                 | 178                            | 2'92                           | 3'24         |
| Waterford (Brook Lodge)...      | Waterford.....     | 52 15      | 7 7                  | 104                            | 2'79                           | 3'39         |
| Nenagh (Castle Lough).....      | Tipperary.....     | 52 54      | 8 24                 | 120                            | 2'70                           | 3'03         |
| Ennistymon House.....           | Clare.....         | 52 57      | 9 18                 | 37                             | 3'18                           | 2'84         |
| Gorey (Courtown House).....     | Wexford.....       | 52 40      | 6 13                 | 80                             | 2'59                           | 2'30         |
| Abbey Leix (Blandsfort)....     | Queen's County..   | 52 56      | 7 17                 | 532                            | 2'58                           | 3'00         |
| Dublin (Fitz William Square)... | Dublin.....        | 53 21      | 6 14                 | 54                             | 2'00                           | 2'36         |
| Mullingar (Belvedere).....      | Westmeath.....     | 53 29      | 7 22                 | 367                            | 2'72                           | 2'73         |
| Crossmolina (Enniscoe).....     | Mayo.....          | 54 4       | 9 16                 | 74                             | 3'17                           | 2'76         |
| Cong (The Glebe).....           | ".....             | 53 33      | 9 16                 | 112                            | 3'18                           | 2'57         |
| Collooney (Markree Obsy.)...    | Sligo.....         | 54 11      | 8 27                 | 127                            | 3'11                           | 3'19         |
| Seaforde.....                   | Down.....          | 54 19      | 5 50                 | 180                            | 2'88                           | 2'35         |
| Ballymena (Harryville).....     | Antrim.....        | 54 52      | 6 13                 | 150                            | 2'89                           | 2'30         |
| Omagh (Edenfel).....            | Tyrone.....        | 54 36      | 7 18                 | 280                            | 2'82                           | 2'36         |

## RAINFALL TABLE FOR JUNE, 1916—continued.

| RAINFALL OF MONTH (con.) |          |                       |             |       | RAINFALL FROM JAN. 1. |           |                      |          | Mean Annual 1875-1909. | STATION.          |
|--------------------------|----------|-----------------------|-------------|-------|-----------------------|-----------|----------------------|----------|------------------------|-------------------|
| Diff. from Av. in.       | % of Av. | Max. in 24 hours. in. | No. of Days | Date. | Aver. 1875-1909. in.  | 1916. in. | Diff. from Aver. in. | % of Av. |                        |                   |
| - '09                    | 96       | '34                   | 10          | 16    | 10'96                 | 14'81     | +3'85                | 135      | 25'11                  | Camden Square     |
| + '33                    | 116      | '42                   | 26          | 15    | 11'44                 | 14'84     | +3'40                | 130      | 27'64                  | Tenterden         |
| + '85                    | 140      | '61                   | 4           | 16    | 12'46                 | 17'08     | +4'62                | 137      | 30'48                  | Patching          |
| + '52                    | 127      | '48                   | 10          | 14    | 13'04                 | 15'39     | +2'35                | 119      | 31'06                  | Fordingbridge     |
| - '66                    | 71       | '26                   | 11          | 16    | 10'60                 | 14'37     | +3'77                | 136      | 24'58                  | Oxford            |
| - '45                    | 79       | '26                   | 8           | 19    | 11'22                 | 13'94     | +2'72                | 124      | 25'20                  | Swanspool         |
| - '00                    | 100      | '47                   | 12          | 16    | 10'76                 | 14'80     | +4'04                | 137      | 25'40                  | Westley           |
| ...                      | ...      | ...                   | ...         | ...   | 9'61                  | ...       | ...                  | ...      | 23'73                  | Geldeston         |
| - '51                    | 77       | '34                   | 29          | 18    | 15'88                 | 17'45     | +1'57                | 110      | 38'27                  | Polapit Tamar     |
| - '50                    | 77       | '40                   | 27          | 13    | 14'33                 | 15'00     | + '67                | 105      | 33'54                  | Rousdon           |
| - '62                    | 74       | '45                   | 11          | 17    | 13'08                 | 15'27     | +2'19                | 117      | 29'81                  | Stroud            |
| - '17                    | 93       | '90                   | 4           | 15    | 14'30                 | 16'27     | +1'97                | 114      | 32'41                  | Wolstaston        |
| + '70                    | 136      | '47                   | 9           | 18    | 9'86                  | 15'01     | +5'15                | 152      | 23'35                  | Boston            |
| - '23                    | 89       | '73                   | 29          | 15    | 10'80                 | 13'40     | +2'60                | 124      | 24'46                  | Hodsock Priory    |
| - '86                    | 66       | '48                   | 4           | 15    | 11'77                 | 16'76     | +4'99                | 143      | 26'65                  | Mickleover        |
| + '28                    | 110      | 1'37                  | 4           | 14    | 14'76                 | 18'17     | +3'41                | 123      | 34'73                  | Macclesfield      |
| - '16                    | 93       | '76                   | 4           | 13    | 12'96                 | 13'29     | + '33                | 103      | 32'70                  | Southport         |
| ...                      | ...      | ...                   | ...         | ...   | 27'22                 | ...       | ...                  | ...      | 61'49                  | Arncliffe         |
| - '24                    | 89       | '90                   | 4           | 17    | 11'93                 | 14'25     | +2'32                | 120      | 27'29                  | Goldsborough Hall |
| + '96                    | 146      | '55                   | 10          | 15    | 11'08                 | 14'60     | +3'52                | 132      | 26'42                  | Hull              |
| - '01                    | 100      | '31                   | 24          | 18    | 11'55                 | 13'60     | +2'05                | 118      | 27'94                  | Newcastle         |
| + '28                    | 104      | 1'69                  | 4           | 14    | 56'38                 | 66'20     | +9'82                | 117      | 129'48                 | Seathwaite        |
| +1'73                    | 168      | '84                   | 4           | 21    | 17'22                 | 23'34     | +6'12                | 136      | 42'28                  | Cardiff           |
| - '58                    | 79       | '44                   | 4           | 13    | 19'45                 | 17'84     | -1'61                | 92       | 46'81                  | Haverfordwest     |
| - '17                    | 94       | '78                   | 4           | 15    | 18'12                 | 23'03     | +4'91                | 127      | 45'46                  | Gogerddan         |
| + '27                    | 114      | '50                   | 6           | 15    | 12'37                 | 15'53     | +3'16                | 125      | 30'36                  | Llandudno         |
| - '89                    | 69       | '35                   | 1           | 17    | 19'06                 | 21'48     | +2'42                | 113      | 43'47                  | Cargen            |
| - '30                    | 87       | '78                   | 24          | 14    | 14'38                 | 18'73     | +4'35                | 130      | 33'76                  | Marchmont         |
| - '36                    | 88       | '60                   | 1           | 17    | 21'10                 | 24'32     | +3'22                | 115      | 49'77                  | Girvan            |
| ...                      | ...      | ...                   | ...         | ...   | 15'51                 | ...       | ...                  | ...      | 35'97                  | Glasgow           |
| -1'20                    | 57       | '38                   | 3           | 15    | 20'39                 | 27'01     | +6'62                | 132      | 48'79                  | Eallabus          |
| -1'17                    | 65       | '52                   | 3           | 13    | 23'55                 | 22'14     | -1'41                | 94       | 56'57                  | Quinish           |
| -1'62                    | 60       | '55                   | 22          | 10    | 33'41                 | 40'94     | +7'53                | 123      | 73'77                  | Stronvar          |
| + '83                    | 140      | '86                   | 24          | 15    | 12'02                 | 15'36     | +3'34                | 129      | 28'64                  | Dundee            |
| + '01                    | 100      | '35                   | 6           | 17    | 15'15                 | 21'31     | +6'16                | 140      | 34'93                  | Braemar           |
| +2'55                    | 226      | 1'29                  | 24          | 20    | 14'02                 | 15'49     | +1'47                | 111      | 32'73                  | Aberdeen          |
| +3'95                    | 285      | 1'31                  | 24          | 18    | 12'27                 | 20'08     | +7'81                | 164      | 30'34                  | Gordon Castle     |
| +2'49                    | 210      | '81                   | 24          | 18    | 16'05                 | 27'80     | +11'75               | 174      | 36'13                  | Drumnadrochit     |
| -1'93                    | 49       | '40                   | 24          | 18    | 33'79                 | 39'35     | +5'56                | 117      | 75'80                  | Fort William      |
| +1'36                    | 134      | 1'31                  | 6           | 18    | 37'55                 | 46'17     | +8'62                | 123      | 83'93                  | Bendamp           |
| + '89                    | 142      | '78                   | 24          | 14    | 14'28                 | 19'32     | +5'04                | 135      | 31'90                  | Dunrobin Castle   |
| + '32                    | 111      | '50                   | 30          | 18    | 24'87                 | 27'09     | +2'22                | 109      | 54'81                  | Killarney         |
| + '60                    | 122      | '68                   | 21          | 16    | 17'40                 | 18'24     | + '84                | 105      | 39'57                  | Waterford         |
| + '33                    | 112      | '56                   | 3           | 17    | 17'51                 | 20'58     | +3'07                | 118      | 39'43                  | Castle Lough      |
| - '34                    | 89       | '85                   | 3           | 14    | 19'67                 | 23'33     | +3'66                | 118      | 46'52                  | Ennistymon        |
| - '29                    | 89       | '48                   | 30          | 15    | 15'42                 | 17'67     | +2'25                | 115      | 34'99                  | Courtown Ho.      |
| + '42                    | 116      | '63                   | 14, 30      | 14    | 15'34                 | 19'43     | +3'59                | 123      | 35'92                  | Abbey Leix        |
| + '36                    | 118      | '63                   | 30          | 18    | 12'15                 | 17'00     | +4'85                | 140      | 27'68                  | Dublin            |
| + '01                    | 100      | '65                   | 3           | 14    | 16'01                 | 21'64     | +5'63                | 135      | 36'15                  | Mullingar         |
| - '41                    | 87       | '68                   | 22          | 15    | 23'38                 | 28'92     | +5'54                | 124      | 52'87                  | Ennisceoe         |
| - '61                    | 81       | '48                   | 3           | 17    | 21'41                 | 25'31     | +3'90                | 118      | 48'90                  | Cong              |
| + '08                    | 103      | '39                   | 3           | 17    | 18'83                 | 24'34     | +5'51                | 130      | 42'71                  | Markree           |
| - '53                    | 82       | '37                   | 3           | 14    | 17'42                 | 19'44     | +2'02                | 112      | 38'91                  | Seaforde          |
| - '59                    | 80       | '60                   | 1           | 16    | 18'09                 | 23'29     | +5'20                | 129      | 40'84                  | Ballymena         |
| - '46                    | 84       | '45                   | 22          | 15    | 17'10                 | 21'71     | +4'61                | 127      | 39'38                  | Omagh             |

## SUPPLEMENTARY RAINFALL, JUNE, 1916.

| Div.  | STATION.                        | Rain<br>inches. | Div.   | STATION.                      | Rain<br>inches. |
|-------|---------------------------------|-----------------|--------|-------------------------------|-----------------|
| II.   | Warlingham, Redvers Road ..     | 3.87            | XI.    | Lligwy .....                  | 1.28            |
| „     | Ramsgate .....                  | 1.72            | „      | Douglas .....                 | 2.79            |
| „     | Hailsham .....                  | 2.93            | XII.   | Stoneykirk, Ardwell House ..  | 2.02            |
| „     | Totland Bay, Aston House ..     | 2.27            | „      | Carsphain Shiel .....         | 3.99            |
| „     | Stockbridge, Ashley .....       | 1.86            | „      | Beattock, Kinnelhead .....    | 2.56            |
| „     | Grayshott .....                 | 2.38            | „      | Langholm, Drove Road ..       | 2.88            |
| III.  | Harrow Weald, Hill House ..     | 3.09            | XIII.  | Selkirk, The Hangingshaw ..   | 1.68            |
| „     | Pitsford, Sedgebrook .....      | 1.23            | „      | North Berwick Reservoir ..    | 3.47            |
| „     | Woburn, Milton Bryant .....     | 2.97            | „      | Edinburgh, Royal Observatory. | 3.01            |
| „     | Chatteris, The Priory .....     | 1.94            | XIV.   | Maybole, Knockdon Farm ..     | 1.55            |
| IV.   | Elsenham, Gaunts End .....      | 2.71            | XV.    | Buchlyvie, The Manse .....    | 2.11            |
| „     | Shoeburyness .....              | 1.72            | „      | Ballachulish House .....      | 3.27            |
| „     | Chichester, Hill Ho., Lexden .. | 2.65            | „      | Oban .....                    | 2.25            |
| „     | Ipswich, Rookwood, Copdock ..   | 3.72            | „      | Campbeltown, Witchburn ..     | 1.41            |
| „     | Aylsham, Rippon Hall .....      | 3.70            | „      | Holy Loch, Ardnadam .....     | 2.85            |
| „     | Swaffham .....                  | 2.26            | „      | Tiree, Cornaigmore .....      | 1.02            |
| V.    | Bishops Cannings .....          | 2.46            | XVI.   | Dollar Academy .....          | ...             |
| „     | Wimborne, St. John's Hill ..    | 2.22            | „      | Glenlyon, Meggernie Castle .. | 2.93            |
| „     | Ashburton, Druid House .....    | 2.77            | „      | Blair Atholl .....            | 1.55            |
| „     | Cullompton .....                | 2.77            | „      | Coupar Angus .....            | 2.38            |
| „     | Lynmouth, Rock House .....      | 1.76            | „      | Montrose, Sunnyside Asylum.   | 3.66            |
| „     | Okehampton, Oaklands .....      | 2.54            | XVII.  | Alford, Lynturk Manse .....   | 3.85            |
| „     | Hartland Abbey .....            | 1.83            | „      | Fyvie Castle .....            | 5.58            |
| „     | Probus, Lamellyn .....          | ...             | „      | Keith Station .....           | 7.17            |
| „     | North Cadbury Rectory .....     | 1.89            | XVIII. | Rothienurachus .....          | 4.07            |
| VI.   | Clifton, Stoke Bishop .....     | 3.53            | „      | Loch Quoich, Loan .....       | 5.05            |
| „     | Ledbury Underdown .....         | 1.80            | „      | Skye, Dunvegan .....          | 2.81            |
| „     | Shifnal, Hatton Grange .....    | 1.50            | „      | Lochmaddy, Bayhead .....      | ...             |
| „     | Droitwich .....                 | 1.81            | „      | Fortrose .....                | 4.24            |
| „     | Blockley, Upton Wold .....      | 2.07            | „      | Glencarron Lodge .....        | 4.78            |
| VII.  | Grantham, Saltersford .....     | 1.47            | XIX.   | Altnaharra .....              | 5.13            |
| „     | Market Rasen .....              | 2.98            | „      | Melvich .....                 | 4.01            |
| „     | Bawtry, Hesley Hall .....       | 1.26            | „      | Loch More, Achfary .....      | 7.11            |
| „     | Derby, Midland Railway .....    | 1.28            | XX.    | Dunmanway, The Rectory ..     | 2.77            |
| „     | Buxton .....                    | 3.82            | „      | Glanmire, Lota Lodge .....    | 2.66            |
| VIII. | Nantwich, Dorfold Hall .....    | 1.91            | „      | Mitchelstown Castle .....     | 2.64            |
| „     | Chatburn, Middlewood .....      | 2.75            | „      | Darrynane Abbey .....         | ...             |
| „     | Lancaster, Strathspey .....     | 2.38            | „      | Clonmel, Bruce Villa .....    | 2.84            |
| IX.   | Langsett Moor, Up. Midhope ..   | 2.54            | „      | Broadford, Hurdlestown .....  | 3.38            |
| „     | Scarborough, Scalby .....       | 2.26            | XXI.   | Enniscorthy, Ballyhyland ..   | 3.53            |
| „     | Ingleby Greenhow .....          | 2.17            | „      | Rothne, Clonmannon .....      | 2.00            |
| „     | Mickleton .....                 | 2.50            | „      | Ballycumber, Moorock Lodge .. | ...             |
| X.    | Bellingham, High Green Manor .. | 3.32            | „      | Balbriggan, Ardgillan .....   | 2.47            |
| „     | Ilderton, Lilburn Cottage ..... | 2.76            | „      | Castle Forbes Gardens .....   | 2.46            |
| „     | Thirlmere, The Bank .....       | 3.58            | XXII.  | Ballynahinch Castle .....     | 3.13            |
| XI.   | Llanfrehfa Grange .....         | 3.32            | „      | Woodlawn .....                | 2.81            |
| „     | Treherbert, Tyn-y-waun .....    | 5.82            | „      | Westport, St. Helens .....    | 3.13            |
| „     | Carmarthen, The Friary .....    | 3.28            | „      | Dugort, Slievemore Hotel ..   | 4.94            |
| „     | Fishguard, Goodwick Station ..  | 1.85            | XXIII. | Enniskillen, Portora .....    | 3.13            |
| „     | Crickhowell, Tal-y-maes .....   | 3.50            | „      | Dartrey [Cootehill] .....     | 2.45            |
| „     | New Radnor, Ednol .....         | 2.41            | „      | Warrenpoint, Manor House ..   | 2.30            |
| „     | Birmingham WW., Tyrmynydd ..    | 3.01            | „      | Belfast, Cave Hill Road ..... | 2.30            |
| „     | Lake Vyrnwy .....               | ...             | „      | Glenarne Castle .....         | ...             |
| „     | Llangynhafal, Plas Drâw .....   | 1.34            | „      | Londonderry, Creggan Res ..   | 2.66            |
| „     | Dolgelly, Bryntirion .....      | 3.72            | „      | Dunfanaghy, Horn Head .....   | 1.90            |
| „     | Bettws-y-Coed, Tyn-y-bryn ..    | 2.78            | „      | Killybegs .....               | 3.78            |





# THAMES VALLEY RAINFALL — JUNE, 1916.



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

SCALE OF MILES 0 5 10 15 20

## THE WEATHER OF JUNE.

THE characteristic features of the weather of June, speaking generally, were an exceptionally low mean temperature, scanty sunshine, and moderate precipitation. The mean temperature was low everywhere, the general value for the whole country being  $3^{\circ}6$  F. under the average, the defect being greatest  $4^{\circ}5$  in the south-east of England and  $4^{\circ}3$  in the midlands, and least  $2^{\circ}5$  in the north of Scotland, and  $2^{\circ}9$  in the south of Ireland. Nowhere did the temperature, except in one or two favoured localities, exceed the normal for the month for even a few days, and the absence of high maxima was a noticeable feature. Until after the middle of the month maximum readings over  $70^{\circ}$  were practically absent, and the absolute maximum of the month nowhere exceeded  $75^{\circ}$ , which was the value recorded at Little Massington on the 25th, and at Killarney on the 15th. Until about the 24th the exposed thermometer in many districts fell frequently below the freezing point, and even frost in shade was not uncommon. Winds from the north and east were frequent, and were often associated with low pressure areas over the North Sea. The cyclonic centres were particularly well developed on the 2nd, 5th to 10th, 12th, 13th and 24th. On no occasion, however, were these depressions associated with general gales, strong winds being of brief duration and restricted to the more exposed parts of our coasts.

In a month characterised by such a monotonous uniformity of cold, cheerless weather, it is desirable to generalise instead of giving a running commentary of the weather conditions from day to day. For this reason our usual method of treating the data in this manner is dispensed with.

Sunshine was very scanty in most parts, the daily deficit being nearly three hours in the east of Scotland, and over two and a half hours in the eastern part of England. On the other hand in the west of Scotland, and north of Ireland the deficiency was slight, and in the south of Ireland there was a daily excess of about half an hour. Expressed as a percentage of the possible the amount varied from 42 per cent. in the Channel Islands and 40 per cent. in the south of Ireland to 18 per cent. in Scotland north and 20 per cent. in Scotland east. The weather was exceptionally dull on the whole eastern and south-eastern coast, where less than a quarter of the possible was recorded, but relatively sunny conditions prevailed in the west. The durations at individual stations were as follows :—Haverfordwest, 227 hours ; Totland Bay, 200 hours ; Sidmouth, 193 hours ; Southport, 185 hours ; Paisley, 176 hours ; Camden Square, 138 hours ; Copdock, 134 hours ; Perth, 132 hours ; Bolton, 127 hours ; Swinton, 119 hours ; Loch More, 94 hours ; Hull, 88 hours.

Rainfall in general was under the average, particularly on the west and south coasts of the whole country. For the third month in succession a marked deficit prevailed from the Isle of Wight to Torquay, where a narrow strip contiguous to the coast, had less than two inches. Some places on the west of Scotland and in Co. Antrim had also less than two inches. The month was very wet in the north and north-east of Scotland, particularly in Banff and Aberdeenshire, where some stations had three times the normal. The west coast areas where the heaviest rains are usually experienced had all less than their average fall. A dry spell lasting ten days prevailed pretty generally from about the 10th to the 20th, and heavy daily falls were uncommon.

In the Thames Valley more than three inches fell around Cirencester, Brackley, and on the Chilterns and North Downs, and slightly under two inches in the Thames Estuary and in the Wey Valley.

The general rainfall expressed as a percentage of the average was :—England and Wales, 101 per cent. ; Scotland, 112 ; Ireland, 97 ; British Isles, 103 per cent. In London (Camden Square) the mean temperature was  $55.7$  or  $4.4$  below the average. Duration of rainfall, 30.3 hours. Evaporation, 2.20 in.



## Climatological Table for the British Empire, January, 1916.

| 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. |       |
|                                                                  | Temp.     | Date.  | Temp.    | Date. |          |      |               |           |                 |                   |            |       |       |
|                                                                  |           |        |          |       |          |      |               |           |                 |                   |            |       |       |
| London, Camden Square                                            | 57.2      | 1      | 32.2     | 23    | 59.7     | 40.7 | 41.9          | 87        | 75.7            | 26.8              | 1.30       | 13    | 7.1   |
| Malta ... ..                                                     | 61.7      | 9      | 48.1     | 15    | 58.7     | 52.0 | ...           | 86        | 108.0           | ...               | 3.42       | 5     | 2.2   |
| Lagos ... ..                                                     | 90.3      | 25     | 65.4     | 8     | 87.8     | 73.8 | 70.4          | 71        | 140.2           | 61.0              | .06        | 1     | 6.3   |
| Cape Town ... ..                                                 | 100.0     | 25     | 54.1     | 19    | 79.5     | 61.4 | 56.8          | 64        | ...             | ...               | .43        | 3     | 3.4   |
| Johannesburg ... ..                                              | 86.0      | 28     | 46.8     | 21    | 76.6     | 55.6 | 54.2          | 75        | ...             | 46.5              | 4.37       | 9     | 4.8   |
| Mauritius ... ..                                                 | 87.3      | 5, 24  | 69.3     | 6     | 83.8     | 73.4 | 71.2          | 80        | ...             | 60.4              | 11.36      | 27    | 7.7   |
| Bloemfontein ... ..                                              | 92.6      | 29     | 45.2     | 21    | 83.9     | 57.1 | 52.1          | 55        | ...             | ...               | 3.97       | 10    | 1.8   |
| Calcutta ... ..                                                  | 82.9      | 22     | 49.4     | 6, 7  | 77.6     | 54.9 | 53.1          | 64        | ...             | 37.7              | .00        | 00    | 1.1   |
| Bombay ... ..                                                    | 88.7      | 13     | 64.5     | 3     | 84.2     | 69.3 | 64.9          | 68        | 136.5           | 46.4              | .00        | 0     | 0.6   |
| Madras ... ..                                                    | 86.5      | 30     | 62.6     | 19    | 85.1     | 66.4 | 64.7          | 71        | 152.3           | 58.4              | .04        | 1     | 2.1   |
| Colombo, Ceylon ... ..                                           | 90.5      | 21     | 64.3     | 8     | 87.2     | 69.4 | 66.2          | 71        | 162.0           | 56.1              | .31        | 2     | 2.2   |
| Hongkong ... ..                                                  | 75.1      | 2      | 39.3     | 24    | 65.5     | 56.3 | 52.4          | 72        | ...             | ...               | 4.08       | 7     | 5.2   |
| Sydney ... ..                                                    | 97.0      | 11     | 61.0     | 30    | 80.7     | 66.4 | 60.8          | 65        | 156.2           | 49.2              | 1.47       | 7     | 5.1   |
| Melbourne ... ..                                                 | 104.2     | 16     | 50.0     | 26    | 78.5     | 58.2 | 58.2          | 57        | 160.0           | 39.1              | 4.42       | 10    | 4.9   |
| Adelaide ... ..                                                  | 107.5     | 5      | 48.8     | 12    | 86.3     | 61.5 | 52.6          | 44        | 168.4           | 42.6              | .70        | 5     | 3.6   |
| Perth ... ..                                                     | 97.3      | 19     | 51.9     | 6     | 80.9     | 62.4 | 56.2          | 58        | 169.0           | 44.0              | 1.19       | 8     | 4.3   |
| Coolgardie ... ..                                                | 104.0     | 13     | 50.8     | 9     | 89.6     | 61.9 | 51.9          | 41        | 157.2           | 43.0              | 1.36       | 7     | 2.4   |
| Hobart, Tasmania ... ..                                          | 95.4      | 23     | 44.0     | 26    | 70.2     | 53.7 | 50.2          | 65        | 151.2           | 35.0              | 5.22       | 11    | 6.0   |
| Wellington ... ..                                                | 85.0      | 30     | 47.8     | 10    | 70.2     | 57.2 | 53.4          | 69        | 138.6           | 36.6              | .58        | 7     | 6.4   |
| Auckland ... ..                                                  | 78.0      | 21     | 53.0     | 1, 9  | 71.8     | 59.3 | 58.4          | 79        | 155.0           | 48.0              | 2.04       | 15    | 5.5   |
| Jamaica, Kingston ... ..                                         | 87.9      | 2      | 64.1     | 23    | 85.9     | 67.1 | 65.7          | 72        | ...             | ...               | .09        | 2     | ...   |
| Grenada ... ..                                                   | 86.0      | 27     | 70.0     | *     | 82.0     | 72.0 | ...           | 75        | 135.0           | ...               | 4.20       | 24    | 2.5   |
| Toronto ... ..                                                   | 53.2      | 31     | 0.9      | 14    | 37.2     | 23.0 | 24.4          | 85        | ...             | ...               | ...        | ...   | ...   |
| Fredericton ... ..                                               | 47.0      | 22, 23 | 15.0     | 19    | 26.7     | 5.8  | 12.3          | 81        | ...             | ...               | 2.43       | 15    | 5.2   |
| St. John, N.B. ... ..                                            | 44.9      | 22     | 9.0      | 18    | 29.0     | 12.0 | 18.2          | 71        | ...             | 9.0               | 2.80       | 18    | 5.2   |
| Alberta, Edmonton ... ..                                         | ...       | ...    | ...      | ...   | ...      | ...  | ...           | ...       | ...             | ...               | ...        | ...   | ...   |
| Victoria, B.C. ... ..                                            | 47.8      | 22     | 15.0     | 11    | 33.8     | 25.2 | 24.0          | 76        | 100.0           | 10.5              | 4.21       | 15    | 7.0   |

\* Various.

*Johannesburg.*—Bright sunshine, 277.0 hours.*Mauritius.*—Mean temp. 1°.4 above, dew point 1°.1 below, and R 3.60 in. above averages.

COLOMBO, CEYLON.—Mean temp 78°·3, or 0°·6 below, dew point 3°·5 below, and R 2.64 in. below, averages. Mean hourly velocity of wind, 7.2 miles.

HONGKONG.—Mean temp. 60°·7, mean hourly velocity of wind 10.6 miles. Bright sunshine 170.9 hours.

*Melbourne.*—Mean temp. 1°·0 above and R 2.61 in. above, averages*Adelaide.*—Mean temp. 0°·2 above and R .02 in. below, averages*Perth*—Rainfall in excess of average.*Coolgardie.*—Temp. 1°·6 below and R above averages.*Hobart.*—Rainfall 3.47 in. above averages.*Wellington.*—Mean temp. 0°·8 above, and R 2.88 in. below, averages Bright sunshine 263.5 hours; T and L and H on 3rd,*Auckland*—Bright sunshine 197.5 hours.

# Symons's Meteorological Magazine.

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## “BRITISH RAINFALL, 1915.”

THE fifty-fifth annual volume of *British Rainfall*, compiled by Dr. H. R. Mill and Mr. Carle Salter, has been completed, is now in the press, and will be issued at an early date.

The new volume is a little thinner than its immediate predecessors, a fact which is not due to any appreciable falling off in the data available, but merely to the dearth of paper and the increased cost of production in all departments. The saving of space has been made systematically in all three parts of the work.

Part I. contains the Annual Report of the Director to the Trustees, the usual subscription lists, two original papers on rainfall matters, viz., a discussion of the Average Annual Rainfall of the Forth Valley, with a map, and a discussion of the 100-years' rainfall record at Greenwich, the latter by Mr. W. C. Nash. There is also a summary of the changes in the Staff of Observers in the form this year of a mere skeleton table, and, finally, a list of Observers deceased during the year, with a few short obituary notices.

The Report refers to the effect of the war on the work of the British Rainfall Organization. Curiously enough there is only a falling off of 41 in the total number of rain records received, 5,412, and there is no increase in the length of the Obituary list, a fact no doubt due to the small number of young men who are Rainfall Observers. Thus, out of 92 deaths recorded the ages of 67 were known and averaged 72, only three being below 40. The chief effect has been a shrinkage of the income from subscriptions for the publications, and the depletion of the Office Staff by enlistment.

Part II., though retaining its rather too comprehensive title “Rainfall and Meteorology of 1915,” has been modified by the inclusion of the articles on Evaporation and Percolation, and on the Camden Square meteorological record, formerly given in Part I., and by the exclusion of the Observers' Notes on the Days and on the Year. The omission of these notes was the only possible way of saving space without sacrificing matter of more definite scientific value. The usual full discussion is given of the number

of rain days, the Duration of Rain, Heavy Rains in Short Periods and Heavy Falls on Rainfall Days. This last section has been undergoing a gradual evolution during the last fifteen years, and is now modified a little more in the direction of the cartographic study of all days the distribution of rainfall on which was remarkable or interesting, even if the amount of precipitation fell far short of that dealt with in the old discussions of maximum falls in which this section originated. Rain-spells and droughts, monthly and seasonal rainfall are discussed in the same manner as before, and the final treatment of the relation of the total rainfall of the year to the average takes the same form and includes the coloured map as given in the nine previous volumes. It is now possible to compare these ten maps of differences from the average with interesting results. As in last year's volume the Extremes of Rainfall for the year are dealt with on a regional and not on a statistical basis, thus overcoming the difficulty of deciding whether the lowest and highest rainfalls reported for the year were accurate—it being obvious that the risk of error in extreme figures is always greater than in those of more normal magnitude.

Part III. consists of the General Table of Rainfall at about 5,400 stations, and here the only means of economizing space was by the omission of the series of maps showing the divisions in which the stations are grouped. This omission is a war measure, and it is hoped that it may not be necessary another year.



## REVIEWS.

*A Study of the Radiation of the Atmosphere.* By ANDERS ÅNGSTRÖM. Washington, 1915. Size,  $9\frac{1}{2} \times 6\frac{1}{2}$ . Pp. 159.

THIS investigation, was made by the aid of the Hodgkins Fund of the Smithsonian Institution. The work includes an analysis of the effect of certain factors—humidity, temperature, haze, clouds—upon the radiation of the atmosphere. These results are summarized at the beginning of the volume, and several important conclusions are arrived at. The following abstract will indicate the scope and value of Prof. Ångström's deductions. The variations of the total radiation of the atmosphere are at lower altitudes than 4,500 metres, principally caused by variations in temperature and humidity, the total radiation received being very nearly proportional to the fourth power of the temperature at the observing station. The effect of an increase in water vapour is to increase the radiation, and this has been expressed by an exponential law. Increased pressure of water vapour is found to decrease the effective radiation from the earth to every point of the sky, the diminution being much larger for large zenith angles than

for small ones. The radiation of the upper, dry atmosphere would be approximately 50 per cent. of that of a black body at the temperature of the place of observation. The radiation during the day time appears to be subject to the same laws that hold for nocturnal radiation. An increase in altitude affects the radiation of a blackened body according to the temperature and humidity gradient. An increase of the humidity or a decrease of the temperature gradient tends to shift the height (3,000 metres), at which the effective radiation is attained, to higher altitudes. The influence of clouds is very variable, whilst haze exerts an almost inappreciable effect. It is probable that the radiation from large water surfaces is almost constant at different temperatures and consequently in different latitudes.

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*Road Amundsen's Antarctic Expedition Scientific Results: Meteorology.*  
By H. MOHN. Size, 11 × 7. Kristiania, 1915. Pp. 78.

THIS is a discussion of observations at Framheim, lat. 78° 38' S., long. 163° 37' W., the nearest fixed point to the South Pole at which observations have been made. The period of observation extends from April 1st, 1911, to January 31st, 1912.

The tri-daily observations are given *in extenso* and analysed in great detail. The mean temperature reduced to the 5 years' means from McMurdo Sound is  $-11^{\circ}4$  F., that of McMurdo Sound being  $0^{\circ}7$  F. or  $12^{\circ}$  higher. From May to September Framheim is on the average  $18^{\circ}$  colder than McMurdo Sound, showing that a pole of cold lies over the ice-barrier, where calms are much more frequent than in the vicinity of Victoria Land. The effect of Föhn in McMurdo Sound also increases the normal temperature difference between the two stations. The coldest month is August and the warmest December, with mean temperatures of  $-34^{\circ}2$  F. and  $25^{\circ}0$  F. respectively. The temperature never rose to  $32^{\circ}$ , the minimum was  $-74^{\circ}2$ . The mean barometric pressure was 29.13 ins., the maximum being 30.19 ins. in December, and the minimum 28.07 in. in May. In connection with the pressure observations it is noted that both the barometers (Wild Fuess No. 361 and Adie No. 839) reached Framheim in good condition. Satisfactory comparisons of the two instruments were made there, but, owing to an accident, both instruments were broken at Colon on the way home. In view of this it is remarkable that no reference has been made to the comparison with the standard of the Argentine Meteorological Office at Buenos Aires in 1912 and 1913. For more than a year after the expedition the *Fram* barometers were placed side by side with the Argentine standard, the results being eminently satisfactory.

R.C.M.

## METEOROLOGY OF DAVIS STRAIT AND BAFFIN BAY.

At a meeting of the Challenger Society on the 31st May last, a paper upon the Meteorology of Davis Strait and Baffin Bay was contributed by Captain Campbell Hepworth, C.B., who mentioned that his information upon this subject was obtained from a set of meteorological charts of those regions which have been prepared at the Meteorological Office, and are now in course of publication.

He stated that these charts, which refer to the six months May to October, were based on observations that had been contributed by the commanders and officers of exploring and whaling ships ; and number 39,100 in all. For the construction of similar charts of the remaining six months of the year the data available were insufficient. The chief points that are brought out in these charts are as follows :—

The distribution of pressure over Davis Strait, Baffin Bay and the lands adjoining is mainly subordinate to the general distribution of pressure over the polar regions of the Western Hemisphere, but partly to local conditions.

The distribution of surface temperature is the result, for the most part, of the commingling of the (1) warm Atlantic water from the south, and (2) the cold current from the north, which is modified (3) by the ice that is carried direct from the north, that which has its origin in the Strait and Bay, and in the Greenland Fjords ; also in a measure by the east Greenland current that rounds Cape Farewell and flows up the west coast.

Variations in air temperature are attributable to (1) variations in the temperature of the sea surface ; (2) variations in the temperature of the adjoining lands ; (3) changes in distribution and quantity of floating and fast ice in the Strait, Bay, and on the land, by direct contact ; (4) the direction and force of wind ; also in its persistency.

The direction of the wind over the Strait and Bay is dominated by the general distribution of pressure over the Atlantic Quadrant of North Polar Regions, but is modified by the pressure gradient referable to a temperature gradient between land and sea ; also, indirectly to the paths followed by depressions over these regions through the control they exercise on the direction and force of the wind. Wind direction is characterized also by its tendency to follow the course of the Strait and the Bay, *i.e.*, to flow in either a south-easterly or a north-westerly direction. The winds of least frequency are those from south-west, north and north-east. The deflection of the wind coast-wise particularly in the neighbourhood of the land is probably due to a pressure gradient caused by differences of temperature between land and sea.

Winds that attain to gale force in the Strait and Bay are chiefly from south-easterly or from north-westerly directions. An increase of wind to gale force is attributable to the influence of an invading

depression, which on its passage travels generally from west eastward. Gales from south-westward are rarely experienced because the low pressure over the south of Greenland diminishes the pressure gradient when the path of the approaching depression lies to the north of it.

The principal currents in Davis Strait and Baffin Bay are ice bearing polar currents emerging from Smith Sound, Lancaster Sound, and Jones Sound, which unite, and flow southward on the west side of the Bay, Strait, and along the Labrador coast, from which coast this current takes its name. The velocity of the current depends mainly upon the direction and force of the wind. Another current which issues from the East Greenland Sea, through Denmark Strait flows down the east and up the west coast of Greenland, penetrating in May and June to  $74^{\circ}\text{N}$ . and in July and August to as far north as Smith Sound. Flowing north its volume is diminished by the diversion of its outer edge westward and southward, this water forming what is known as the *Middle Current*. An undercurrent of relatively warm saline water, partly of equatorial origin, enters the Strait and spreads northward, layers of which come to the surface in Baffin Bay and Disco Bay. The ice in Baffin Bay, not of local origin, is derived from Arctic Seas, issuing from Smith, Lancaster and Jones Sounds. A dense mass of ice collects in the Bay, and extends to the northern part of the Strait; in all but three months of the year this ice mass is impenetrable. In contrast to this ice congestion a relatively ice-free sheet of water is found in the months of summer and early autumn in Baffin Bay. It is not, as has been supposed, located in the same part of the Bay each month, but it is, nevertheless, evidently identical with what is known as the *North Water*. The ice in Davis Strait is received mainly from the north through the Bay, but also from the East Pack, or *Storis*, partly, however, it is of local origin.

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### COLD SNAP IN MELBOURNE.

MR. H. F. HUNT, Commonwealth Meteorologist, has forwarded to us an interesting account of the unprecedented cold experienced in Melbourne, in the last week of May this year. In that city frosts are very rare, and wintry conditions such as are familiar in England excite as much public interest as a burst of tropical heat in summer does in England. The figures quoted below show how rarely such cold snaps occur, and the importance of the inter-relation between the weather of the northern and southern hemispheres, makes the occurrence of such an exceptional phenomenon of more than Australian interest.

The following information has been supplied by the Australian Meteorological Office :—

|              | Minimum<br>(in Screen). | Minimum<br>(on Grass). |
|--------------|-------------------------|------------------------|
| May 25 ..... | 33·2                    | 22·2                   |
| „ 26 .....   | 32·3                    | 21·1*                  |
| „ 27 .....   | 33·8                    | 24·0                   |
| „ 28 .....   | 31·9                    | 24·5                   |
| „ 29 .....   | 29·9*                   | 22·3                   |
| „ 30 .....   | 35·3                    | 28·5                   |

\* Record.

Lowest ever recorded in 61 years for May, 31°·3, on 26th May, 1895.

Lowest terrestrial in 61 years for May, 23°·2, on 21st May, 1897.

Apart from 1895, the most recent cold day in May was 29th May, 1913. The “terrestrial” on that day was 28·5, and it was preceded by another day of frost, the terrestrial reading being 31·1.

In May, 1895, there were three days of frost, viz., 17th (minimum 37·6, terrestrial 28·5), 22nd (minimum 39·1, terrestrial 30·0), and 26th (minimum 31·3, terrestrial 31·0).

In May, 1897, the following were days of frost :—

|           | Min. | Terri. |           | Min. | Terri. |
|-----------|------|--------|-----------|------|--------|
| 8th ....  | 37·9 | 28·1   | 20th .... | 34·9 | 24·6   |
| 9th ....  | 34·9 | 25·8   | 21st .... | 33·5 | 23·2   |
| 10th .... | 39·2 | 29·2   | 22nd .... | 33·5 | 23·7   |
| 11th .... | 41·1 | 27·7   | 23rd .... | 37·0 | 26·5   |

In this month there were two periods of four consecutive frosts, viz., 8th to 11th inclusive, and 20th to 23rd, inclusive.

The present spell of cold weather, 6 days consecutively of frosts, is the most severe that has occurred in Melbourne, three out of the five days breaking all previous records, although in May, 1912, there were five days of frost, but only two consecutive days, as the others were scattered throughout the month. The average number of frosty mornings during May in Melbourne is 1·2, or six in five years.

Frosts were recorded in parts of the country on May 25th, more particularly in the north and north central districts, the Mallee, Gippsland and Western districts not reporting any. On the next day frosts were almost prevalent throughout the inland parts, except the Mallee. On May 27th another cold day was experienced in the Western district, but frosts were not very pronounced there, nor in the Wimmera and the Mallee, while Gippsland was still free.

On May 29th frosts and fogs were reported inland. In the Mallee, Wimmera, Gippsland and parts of the western district, temperatures appeared to be normal, and frosts absent. In the north-eastern parts they are the most severe, but north-central districts are almost as bad.

## Correspondence.

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

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### SUMMER TIME.

IN answer to Mr. J. H. Fry's letter in the July Magazine it may be safely asserted that none of the considerations which have been set out by him were forgotten by those who do object very strongly to having the clocks put wrong by an hour, and he misses the point of their objection.

Meteorologists know, no men better, that for some purposes they have to use local time, which, for those purposes is the true time ; and also that for other purposes they must use *a* standard time. Comparisons of temperature, say at Penzance and Ramsgate at 8 a.m., noon, and 4 p.m., to be of any use would of necessity be made by the local times of those two places ; whereas if one were tracing the passage of a storm, *e.g.*, the famous hurricane of March 24th, 1895, which travelled from Milford Haven to Lowestoft in about 5 hours, this would necessarily be done in terms of *a* standard time, which happens, in our case, to be that of Greenwich.

No superstitious veneration is felt by meteorologists for Greenwich time. Greenwich is *not* ideally the best place for England to reckon from, Cheltenham, two degrees westward, would divide the country much more fairly. But when railways made *a* standard time a necessity for railway purposes, Parliament, for many obvious reasons, hardly could have selected any other spot. There the necessary apparatus already was. Parliament did not create it, but found it.

Moreover, it is perfectly possible for a provincial town to keep *a* standard time for its railways, and local time for its own purposes ; as was done in France, and may still be done for aught that I know, *e.g.*, at Marseilles many a passenger off a steamer has blessed the quarter of an hour difference between Marseilles and Paris time that just enabled him to catch a train ! Such a practice has great advantages in educating people in true ideas about time.

Had days and nights been of equal length all over the globe, sunrise and sunset would have continued to be the starting points for time reckoning, as they were for the rough calculations of primitive mankind ; but men have been driven by the facts to take noon and midnight as the only possible moments to reckon from ; and action by Parliament, which obscures this, and decrees other starting points, is educating the people in a wrong direction, and is *action different in kind* from that which appointed the time of Greenwich to be the railway time for the whole country.

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

*North Cadbury Rectory, August 2nd, 1916.*



### SUNSET COLOURING.

On the evening of July 9th, shortly after sunset, an unusual optical phenomenon was observed in the north-western sky from near Benson, Oxon. A small bank of cloud was lying above the horizon and behind this could be seen the top of a distant cumulus. From the top of the cumulus a purple band of colour stretched up into the sky for an estimated distance of about  $20^{\circ}$ . Near the upper end of this band there was a patch of cirrus which showed a brilliant pink in the sunset rays, and the contrast between the purple of the band and the pink of the cloud was most striking. There was a sheet of high stratus or cirro-stratus cloud over most of the sky at the time which made the evening rather dark and served to show up the colour effects the more. It appeared at first as though where the purple band crossed the patch of cirrus it hid the colour of the latter rendering the pink less bright, but a few minutes later this effect was not noticeable so that it may have been an illusion.

The phenomenon was first observed about five minutes after sunset (it was probably visible earlier, but no observation was made). For five minutes it remained strikingly brilliant, and then rapidly faded away, and by fifteen minutes after sunset all colouring had disappeared. The band, which at first appeared to be a pure purple, took on a slightly greenish tint before disappearing. It did not rise quite vertically from the top of the cumulus throughout, but sloped a few degrees to the right when first seen, and then, after passing through the vertical position, lent over to the left at the end. There can be little doubt that it was pointing directly from the position of the sun below the horizon throughout. If the band had looked merely dark against the sky we might ascribe it to the shadow of the cumulus showing on the dust of the atmosphere, but whence the purple colouring? It may be mentioned that earlier in the evening a rather brilliantly coloured fragment of the  $22^{\circ}$  halo had been visible in a small piece of high cloud.

J. S. DINES.

*66, Sydney Street, Chelsea.*

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### REMARKABLE DROUGHT IN DEVONSHIRE.

MAY I draw your attention to the remarkable July drought in this district? Even when the temperature failed to reach  $70^{\circ}$  (as it did up to the 19th) we had very little rain;  $\cdot 88$  in. on the 6 days, of which  $\cdot 57$  in. fell on one day (the 6th). Since the 12th July we have had no rain at all here, and as during the last week or so it has been extremely hot, everything in the garden is perishing for want of water. It is curious, however, how winds from some northerly

quarter still predominate here. I append herewith maximum and minimum temperatures and direction of wind at 9 a.m. and 9 p.m. (G.M.T.) for the last 10 days of July.

| Date          | Max. temp. | Min. temp. | Wind direction. |        |
|---------------|------------|------------|-----------------|--------|
|               |            |            | 9 a.m.          | 9 p.m. |
| July 22 ..... | 77         | 57         | E.              | N.     |
| „ 23 .....    | 78         | 55         | N.E.            | N.E.   |
| „ 24 .....    | 80         | 51         | N.E.            | W.     |
| „ 25 .....    | 82         | 60         | N.E.            | N.W.   |
| „ 26 .....    | 77         | 51         | S.E.            | E.     |
| „ 27 .....    | 75         | 53         | W.N.W.          | W.     |
| „ 28 .....    | 75         | 54         | W.N.W.          | N.W.   |
| „ 29 .....    | 73         | 50         | N.W.            | N.W.   |
| „ 30 .....    | 76         | 48         | W.              | W.     |
| „ 31 .....    | 80         | 59         | N.E.            | N.E.   |

The warmest day throughout during the period was the 25th (mean temp. 71°). The highest 9 a.m. and 9 p.m. (G.M.T) readings both occurred on the 31st, viz., 67° and 64° respectively. It is worthy of note that during this spell of heat, whilst at 2 p.m. each day the relative humidity is about 45 per cent., the 9 a.m. and 9 p.m. readings average about 90 per cent. The amount of humidity does not appear here to be affected by the direction of the wind, as at a sea-coast station.

The accuracy of the daily rainfall record from my Snowdon gauge is substantiated by the amount found in my monthly gauge, kept in another part of the garden, viz. .89 in. This would, therefore, seem to be one of the driest parts of Devon during the present drought, which is peculiar, as this is *normally* a wet district. Height above sea-level *about* 600 ft. Rainfall at Ipplepen (S. Devon) 1.14 in., Manaton (Dartmoor) 1.39 in. D. W. HORNER, F.R.Met.Soc.

*Moretonhampstead, Devon, August 3rd, 1916.*

### HEAVY RAIN ON JULY 23rd.

A VERY severe thunderstorm and great rain occurred on the afternoon of the 23rd, July, 1916. The rain began at 3 p.m., and ended at 4.15 p.m. (1½ hours) during which 1.02 inches fell. This fall was quite local, as there was no rain at all that day one mile to the west, or one mile to the east of this. The storm came from the N.E. and went to the S.W. I thought there would have been a big rainfall at Woodpark, Scariff, on that day. But Mr. Hibbert told me he had no rain at all. There were great floods in all the streams about here, and our mountain roads were much damaged. But the floods only lasted about an hour. The forenoon of that day was very fine and hot, with not a sign of the coming storm. The evening was very fine also. M. BENTLEY, Lieut.-Col.

*Hurdlestown, Broadford, July, 1916.*

## THUNDERSTORM OF JULY 24th, 1916.

THE forenoon was gloriously fine, the temperature reaching 72° in the shade, with a clear sky and a little cirrus cloud. The barometer 600 ft. above sea-level, stood at 29·62 ins. and was inclined to fall slightly. At 1.30 p.m. a small bank of dark cloud was observed to the N. and distant thunder was heard. At 2 p.m. thunder was heard to the S. and rapidly came nearer. Soon afterwards an extensive bank of thunder cloud rapidly overspread the whole sky from the N., and a storm of great intensity set in, which lasted without any interval until 4.30 p.m., lightning being very frequent and dangerously near most of the time. But the feature of the storm was the, for this neighbourhood, unprecedented rainfall. Between 2.20 p.m. and 4.30 p.m. it amounted to 2·91 in., and the entire fall in barely four hours was 3·01 in. The heaviest fall registered here in 24 hours since 1910 has been 1·73 in., on Aug. 1st of that year. Great masses of earth were burst from the high banks of the Hacketstown-Tallow Road, on the steep slope to the W. of the town, and carried in fragments down the decline for many yards. A bridge over a tiny stream which flows at the foot of this slope was swept clean away, leaving a precipitous cut in the highway eight yards deep. There were three head of cattle killed by lightning just outside the town to the E. The storm seemed to travel about N.N.E. and S.S.W. on rather a narrow path. The barometer fell to 29·55 during the storm. Pressure had been almost steady for three days. The wind never rose to more than a fresh breeze from N.W., and before and after the storm, and part of the time during it, the wind was scarcely perceptible.

The storm was confined to a very narrow path travelling N.N.E. to S.S.W. There was absolutely no rain at Rathvilly, 6 miles W. of Hacketstown or Killigan, 3 miles N.W. Here marks of violent rain begin 1½ miles from Hacketstown. There was but little rain in the town land of Rithnagrew, which approaches to 1 mile from Hacketstown to E.N.E. There was none in that of Kilcarney, 3 miles N.E., nor in Clonmore, 3 miles due S. In Fallow, 9 miles S.W. the storm was of phenomenal violence, but nothing to compare to what it was in the immediate neighbourhood of Hacketstown. It extended to the S. of Fallow, being violent at Aghadi, 3 miles beyond. How much further we have not yet information.

C. S. S. ELLISON.

*Hacketstown.*

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## THE THUNDERSTORMS, JUNE 10th.

THIS day was extraordinary for the number of thunderstorms that seemed to pass all round us but never right overhead. These storms developed in the North at 11.24 a.m. old time, and continued, on and off, until evening. No damage seemed to have been done here by the lightning, although a rather dangerous storm passed in the distance from N. to N.E., between 3 and 3.35 p.m., with much forked lightning. One vivid flash was followed by a terrible peal of thunder. As the storm moved away the cloud effects were impressively grand and of an extraordinary coppery hue.—Rainfall was no way remarkable after so much thunder, only .45 in. being recorded.

G. E. DACEY.

*Lewisham, S.E., July 8th, 1916.*

## METEOROLOGICAL NEWS AND NOTES.

A METEOROLOGICAL OFFICE CIRCULAR of four pages has been issued in June and July, about the 20th of the month, giving notices of honours conferred on members of the Meteorological Committee and of the Meteorological Office Staff, details of the effects of the Summer Time Act on the observing stations reporting to the Meteorological Office, lists of official publications, notes and queries, and obituary notices of deceased Observers. The new publication is of real interest, and should prove useful to those to whom it is sent, but no indication appears upon the circular as to how they may be obtained, or whether the issue is to be regular.

THE CLIMATE OF GEORGETOWN, DEMERARA is summarized in *Meteorological Office Circular No. 2* in the following table of two lines of figures, a translation of which into the familiar British units we append in two additional lines :—

*Comparison of Meteorological Records, 1846-56, and 1887-1914.*

|           |    | Pressure.<br>m.s.l.<br>mb. | Temperature. |            |            | Vapour<br>Pressure.<br>mb. | Relative<br>Humidity.<br>% | Annual<br>Rainfall.<br>mm. |
|-----------|----|----------------------------|--------------|------------|------------|----------------------------|----------------------------|----------------------------|
|           |    |                            | Mean.<br>a.  | Max.<br>a. | Min.<br>a. |                            |                            |                            |
| 1846-1856 | .. | 1011.5                     | 299.3        | 302.2      | 296.4      | 28.45                      | 76.2                       | 2434.8                     |
| 1887-1914 | .. | 1012.2                     | 300.1        | 302.5      | 297.1      | 28.35                      | 76.1                       | 2394.0                     |
|           |    | in.                        | F.           | F.         | F.         | in.                        |                            | in.                        |
| 1846-1856 | .. | 29.87                      | 79.3         | 84.6       | 74.1       | 0.84                       | 76.2                       | 95.86                      |
| 1887-1914 | .. | 29.89                      | 80.8         | 85.1       | 75.4       | 0.84                       | 76.1                       | 94.25                      |

THE IRONY OF NAMES was illustrated a few weeks ago at the Field Hospital of the R.A.M.C. at El— in the Egyptian desert when, on a day with a shade temperature of over 311° C. absolute (100°F.) four patients were admitted in succession bearing the names of Winter, Storm, Snow and Frost.

## RAINFALL TABLE FOR JULY, 1916.

| STATION.                       | COUNTY.                    | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|--------------------------------|----------------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                |                            |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1916.<br>in. |
| Camden Square.....             | <i>London</i> .....        | 51 32      | 0 8                  | 111                            | 2'57                           | 1'68         |
| Tenterden.....                 | <i>Kent</i> .....          | 51 4       | *0 41                | 190                            | 2'21                           | 1'11         |
| Arundel (Patching).....        | <i>Sussex</i> .....        | 50 51      | 0 27                 | 130                            | 2'46                           | '77          |
| Fordingbridge (Oaklands)...    | <i>Hampshire</i> .....     | 50 56      | 1 38                 | 135                            | 2'14                           | 1'59         |
| Oxford (Magdalen College)...   | <i>Oxfordshire</i> .....   | 51 45      | 1 15                 | 186                            | 2'43                           | 1'59         |
| Wellingborough(Swanspool)...   | <i>Northampton</i> .....   | 52 18      | 0 41                 | 155                            | 2'54                           | 1'38         |
| Bury St. Edmunds(Westley)...   | <i>Suffolk</i> .....       | 52 15      | *0 40                | 226                            | 2'68                           | 1'93         |
| Geldeston [Beccles].....       | <i>Norfolk</i> .....       | 52 27      | *1 31                | 38                             | 2'37                           | ...          |
| Polapit Tamar [Launceston]...  | <i>Devon</i> .....         | 50 40      | 4 22                 | 315                            | 2'74                           | 1'24         |
| Rousdon [Lyme Regis].....      | ".....                     | 50 41      | 3 0                  | 516                            | 2'68                           | '93          |
| Stroud (Field Place).....      | <i>Gloucestershire</i> ... | 51 44      | 2 13                 | 226                            | 2'75                           | 1'86         |
| Church Stretton (Wolstaston).. | <i>Shropshire</i> .....    | 52 35      | 2 48                 | 800                            | 2'58                           | 1'63         |
| Boston.....                    | <i>Lincolnshire</i> .....  | 52 58      | 0 1                  | 11                             | 2'35                           | 1'67         |
| Worksop (Hodsock Priory)...    | <i>Nottinghamshire</i> ... | 53 22      | 1 5                  | 56                             | 2'35                           | 1'26         |
| Mickleover Manor.....          | <i>Derbyshire</i> .....    | 52 54      | 1 32                 | 280                            | 2'57                           | 2'02         |
| Macclesfield.....              | <i>Cheshire</i> .....      | 53 15      | 2 7                  | 501                            | 3'41                           | ...          |
| Southport (Hesketh Park)..     | <i>Lancashire</i> .....    | 53 39      | 2 59                 | 38                             | 2'92                           | 1'05         |
| Arncliffe Vicarage.....        | <i>Yorkshire, W.R.</i> ... | 54 8       | 2 6                  | 732                            | 4'75                           | 4'95         |
| Goldsborough Hall.....         | ".....                     | 54 0       | 1 25                 | 119                            | 2'61                           | 1'52         |
| Hull (Pearson Park).....       | " <i>E.R.</i> .....        | 53 45      | 0 20                 | 6                              | 2'39                           | 1'65         |
| Newcastle (Town Moor) ...      | <i>Northumberland</i> ...  | 54 59      | 1 38                 | 201                            | 2'90                           | 2'92         |
| Borrowdale (Seathwaite) ...    | <i>Cumberland</i> .....    | 54 30      | 3 10                 | 423                            | 8'91                           | 6'57         |
| Cardiff (Ely).....             | <i>Glamorgan</i> .....     | 51 29      | 3 13                 | 53                             | 3'26                           | 2'43         |
| Haverfordwest.....             | <i>Pembroke</i> .....      | 51 48      | 4 58                 | 90                             | 3'39                           | 1'90         |
| Aberystwyth (Gogerddan)..      | <i>Cardigan</i> .....      | 52 26      | 4 1                  | 83                             | 4'03                           | 1'67         |
| Llandudno.....                 | <i>Carnarvon</i> .....     | 53 20      | 3 50                 | 72                             | 2'52                           | 1'36         |
| Cargen [Dumtries].....         | <i>Kirkcudbright</i> ...   | 55 2       | 3 37                 | 80                             | 3'20                           | 5'18         |
| Marchmont House.....           | <i>Berwick</i> .....       | 55 44      | 2 24                 | 498                            | 3'30                           | 5'81         |
| Girvan (Pinmore).....          | <i>Ayr</i> .....           | 55 10      | 4 49                 | 207                            | 3'73                           | 4'81         |
| Glasgow (Queen's Park) ...     | <i>Renfrew</i> .....       | 55 53      | 4 18                 | 144                            | 2'91                           | 3'37         |
| Islay (Eallabus).....          | <i>Argyll</i> .....        | 55 47      | 6 15                 | 68                             | 3'41                           | 2'24         |
| Mull (Quinish).....            | ".....                     | 56 34      | 6 13                 | 35                             | 4'12                           | 3'11         |
| Balquhiddier (Stronvar).....   | <i>Perth</i> .....         | 56 21      | 4 23                 | 422                            | 4'34                           | 4'48         |
| Dundee (Eastern Necropolis)    | <i>Forfar</i> .....        | 56 28      | 2 57                 | 199                            | 2'84                           | 7'52         |
| Braemar.....                   | <i>Aberdeen</i> .....      | 57 0       | 3 24                 | 1114                           | 2'65                           | 4'58         |
| Aberdeen (Cranford).....       | ".....                     | 57 8       | 2 7                  | 120                            | 3'00                           | 3'34         |
| Gordon Castle.....             | <i>Moray</i> .....         | 57 37      | 3 5                  | 107                            | 3'25                           | 3'24         |
| Drumnadrochit.....             | <i>E. Inverness</i> ...    | 57 20      | 4 29                 | 138                            | 3'37                           | 4'60         |
| Fort William ..                | ".....                     | 56 49      | 5 6                  | 171                            | 4'92                           | 2'91         |
| Loch Torridon (Bendamph)...    | <i>W. Ross</i> .....       | 57 32      | 5 32                 | 20                             | 5'35                           | 3'88         |
| Dunrobin Castle.....           | <i>Sutherland</i> .....    | 57 59      | 3 56                 | 14                             | 2'91                           | 1'94         |
| Killarney (District Asylum)    | <i>Kerry</i> .....         | 52 4       | 9 31                 | 178                            | 3'53                           | 1'92         |
| Waterford (Brook Lodge)...     | <i>Waterford</i> .....     | 52 15      | 7 7                  | 104                            | 3'13                           | 1'16         |
| Nenagh (Castle Lough).....     | <i>Tipperary</i> .....     | 52 54      | 8 24                 | 120                            | 3'02                           | 1'68         |
| Ennistymon House.....          | <i>Clare</i> .....         | 52 57      | 9 18                 | 37                             | 3'57                           | 1'66         |
| Gorey (Courtown House) ..      | <i>Wexford</i> .....       | 52 40      | 6 13                 | 80                             | 2'90                           | 1'00         |
| Abbey Leix (Blandsfort)....    | <i>Queen's County</i> ..   | 52 56      | 7 17                 | 532                            | 2'99                           | 2'32         |
| Dublin(FitzWilliamSquare)      | <i>Dublin</i> .....        | 53 21      | 6 14                 | 54                             | 2'60                           | 2'14         |
| Mullingar (Belvedere).....     | <i>Westmeath</i> .....     | 53 29      | 7 22                 | 367                            | 3'16                           | 4'14         |
| Crossmolina (Enniscoe).....    | <i>Mayo</i> .....          | 54 4       | 9 16                 | 74                             | 3'26                           | 1'82         |
| Cong (The Glebe).....          | ".....                     | 53 33      | 9 16                 | 112                            | 3'72                           | 1'04         |
| Collooney (Markree Obsy.).     | <i>Sligo</i> .....         | 54 11      | 8 27                 | 127                            | 3'36                           | 2'86         |
| Seaforde.....                  | <i>Down</i> .....          | 54 19      | 5 50                 | 180                            | 3'32                           | 3'04         |
| Ballymena (Harryville).....    | <i>Antrim</i> .....        | 54 52      | 6 13                 | 150                            | 3'44                           | 2'43         |
| Oniagh (Edenfel).....          | <i>Tyrone</i> .....        | 54 36      | 7 18                 | 280                            | 3'34                           | 1'97         |

RAINFALL TABLE FOR JULY, 1916—*continued.*

| RAINFALL OF MONTH ( <i>con.</i> ) |          |                   |             |       | RAINFALL FROM JAN. 1. |       |                      |          | Mean Annual 1875-1909. | STATION.          |
|-----------------------------------|----------|-------------------|-------------|-------|-----------------------|-------|----------------------|----------|------------------------|-------------------|
| Diff. from Av. in.                | % of Av. | Max. in 24 hours. | No. of Days | Date. | Aver. 1875-1909.      | 1916. | Diff. from Aver. in. | % of Av. |                        |                   |
|                                   |          | in.               |             |       | in.                   | in.   |                      |          | in.                    |                   |
| — .89                             | 65       | .71               | 7           | 13    | 13.53                 | 16.49 | +2.96                | 122      | 25.11                  | Camden Square     |
| —1.10                             | 50       | .29               | 16          | 10    | 13.65                 | 15.95 | +2.30                | 117      | 27.64                  | Tenterden         |
| —1.69                             | 31       | .39               | 6           | 7     | 14.92                 | 17.85 | +2.93                | 120      | 30.48                  | Patching          |
| — .55                             | 74       | .69               | 6           | 11    | 15.18                 | 16.98 | +1.80                | 112      | 31.06                  | Fordingbridge     |
| — .84                             | 65       | .84               | 6           | 13    | 13.03                 | 15.96 | +2.93                | 122      | 24.58                  | Oxford            |
| —1.16                             | 54       | .33               | 6           | 11    | 13.76                 | 15.32 | +1.56                | 111      | 25.20                  | Swanspool         |
| — .75                             | 72       | .46               | 4           | 13    | 13.44                 | 16.73 | +3.29                | 124      | 25.40                  | Westley           |
| ...                               | ...      | ...               | ...         | ...   | 11.98                 | ...   | ...                  | ...      | 23.73                  | Geldeston         |
| —1.50                             | 45       | .43               | 3           | 10    | 18.62                 | 18.69 | + .07                | 100      | 38.27                  | Polapit Tamar     |
| —1.75                             | 35       | .68               | 6           | 4     | 17.01                 | 15.93 | —1.08                | 94       | 33.54                  | Rousdon           |
| — .89                             | 68       | .54               | 16          | 10    | 15.83                 | 17.13 | +1.30                | 108      | 29.81                  | Stroud            |
| — .95                             | 63       | .36               | 6           | 12    | 16.88                 | 17.90 | +1.02                | 106      | 32.41                  | Wolstaston        |
| — .68                             | 71       | .46               | 3           | 16    | 12.21                 | 16.68 | +4.47                | 137      | 23.35                  | Boston            |
| —1.09                             | 54       | .23               | 7           | 13    | 13.15                 | 14.66 | +1.51                | 111      | 24.46                  | Hodsock Priory    |
| — .55                             | 79       | .63               | 2           | 10    | 14.34                 | 18.78 | +4.44                | 131      | 26.65                  | Mickleover        |
| ...                               | ...      | ...               | ...         | ...   | 18.17                 | ...   | ...                  | ...      | 34.73                  | Macclesfield      |
| —1.87                             | 36       | .27               | 1           | 13    | 15.88                 | 14.34 | —1.54                | 90       | 32.70                  | Southport         |
| + .20                             | 104      | 1.16              | 7           | 19    | 31.97                 | 34.65 | +2.68                | 108      | 61.49                  | Arncliffe         |
| —1.09                             | 58       | .32               | 7           | 12    | 14.54                 | 15.77 | +1.23                | 108      | 27.29                  | Goldsborough Hall |
| — .74                             | 69       | .70               | 12          | 13    | 13.47                 | 16.25 | +2.78                | 120      | 26.42                  | Hull              |
| + .02                             | 101      | .69               | 20          | 18    | 14.45                 | 16.52 | +2.07                | 114      | 27.94                  | Newcastle         |
| —2.34                             | 74       | 1.55              | 1           | 17    | 65.29                 | 72.77 | +7.48                | 111      | 129.48                 | Seathwaite        |
| — .83                             | 75       | 1.05              | 6           | 14    | 20.48                 | 25.77 | +5.29                | 126      | 42.28                  | Cardiff           |
| —1.49                             | 56       | .38               | 6           | 10    | 22.84                 | 19.74 | —3.10                | 86       | 46.81                  | Haverfordwest     |
| —2.36                             | 41       | .52               | 12          | 13    | 22.15                 | 24.70 | +2.55                | 112      | 45.46                  | Gogerdan          |
| —1.16                             | 54       | .40               | 2           | 10    | 14.89                 | 16.89 | +2.00                | 113      | 30.36                  | Llandudno         |
| +1.98                             | 162      | 1.48              | 7           | 20    | 22.26                 | 27.66 | +5.40                | 124      | 43.47                  | Cargen            |
| +2.51                             | 176      | 1.75              | 7           | 13    | 17.68                 | 24.54 | +6.86                | 139      | 33.76                  | Marchmont         |
| +1.08                             | 129      | .70               | 11          | 18    | 24.83                 | 29.13 | +4.30                | 117      | 49.77                  | Girvan            |
| + .46                             | 116      | .68               | 7           | 16    | 18.42                 | ...   | ...                  | ...      | 35.97                  | Glasgow           |
| —1.17                             | 66       | .49               | 11          | 18    | 23.80                 | 29.25 | +5.45                | 123      | 48.79                  | Eallabus          |
| —1.01                             | 76       | .71               | 10          | 19    | 27.67                 | 25.25 | —2.42                | 91       | 56.57                  | Quinish           |
| + .14                             | 103      | 2.23              | 7           | 12    | 37.75                 | 45.42 | +7.67                | 120      | 73.77                  | Stronvar          |
| +4.68                             | 265      | 3.36              | 7           | 18    | 14.86                 | 22.88 | +8.02                | 154      | 28.64                  | Dundee            |
| +1.93                             | 173      | 1.21              | 7           | 15    | 17.80                 | 25.89 | +8.09                | 145      | 34.93                  | Braemar           |
| + .34                             | 111      | .90               | 7           | 17    | 17.02                 | 18.83 | +1.81                | 111      | 32.73                  | Aberdeen          |
| — .01                             | 100      | .47               | 6           | 22    | 15.52                 | 23.32 | +7.80                | 150      | 30.34                  | Gordon Castle     |
| +1.23                             | 136      | 1.80              | 7           | 23    | 19.42                 | 32.40 | +12.98               | 167      | 36.13                  | Drumnadrochit     |
| —2.01                             | 59       | .95               | 7           | 22    | 38.71                 | 42.26 | +3.55                | 109      | 75.80                  | Fort William      |
| —1.47                             | 73       | .75               | 31          | 18    | 42.90                 | 50.05 | +7.15                | 117      | 83.93                  | Bendamp           |
| — .97                             | 67       | .78               | 7           | 12    | 17.19                 | 21.26 | +4.07                | 124      | 31.90                  | Dunrobin Castle   |
| —1.61                             | 54       | .64               | 7           | 13    | 28.40                 | 29.01 | + .61                | 102      | 54.81                  | Killarney         |
| —1.97                             | 37       | .34               | 5           | 9     | 20.53                 | 19.40 | —1.13                | 95       | 39.57                  | Waterford         |
| —1.34                             | 56       | .54               | 3           | 12    | 20.53                 | 22.26 | +1.73                | 108      | 39.43                  | Castle Lough      |
| —1.91                             | 46       | .34               | 1, 11       | 12    | 23.24                 | 24.99 | +1.75                | 108      | 46.52                  | Ennistymon        |
| —1.90                             | 34       | .37               | 6           | 12    | 18.32                 | 18.67 | + .35                | 102      | 34.99                  | Courtown Ho.      |
| — .67                             | 78       | .47               | 24          | 15    | 18.83                 | 21.75 | +2.92                | 115      | 35.92                  | Abbey Leix        |
| — .46                             | 82       | .43               | 1           | 13    | 14.75                 | 19.14 | +4.39                | 130      | 27.68                  | Dublin            |
| + .98                             | 131      | 1.05              | 6           | 14    | 19.17                 | 25.78 | +6.61                | 134      | 36.15                  | Mullingar         |
| —1.44                             | 56       | .63               | 11          | 13    | 26.64                 | 30.74 | +4.10                | 115      | 52.87                  | Enniscoe          |
| —2.68                             | 28       | .29               | 11          | 11    | 25.13                 | 26.35 | +1.22                | 105      | 48.90                  | Cong              |
| — .50                             | 85       | .47               | 1           | 21    | 22.19                 | 27.20 | +5.01                | 123      | 42.71                  | Markree           |
| — .28                             | 92       | .84               | 1           | 14    | 20.74                 | 22.48 | +1.74                | 108      | 38.91                  | Seaforde          |
| —1.01                             | 71       | .49               | 1           | 16    | 21.53                 | 25.72 | +4.19                | 119      | 40.84                  | Ballymena         |
| —1.37                             | 59       | .39               | 3           | 13    | 20.44                 | 23.68 | +3.24                | 116      | 39.38                  | Omagh             |

## SUPPLEMENTARY RAINFALL, JULY, 1916.

| Div.  | STATION.                        | Rain<br>inches. | Div.   | STATION.                      | Rain<br>inches. |
|-------|---------------------------------|-----------------|--------|-------------------------------|-----------------|
| II.   | Warlingham, Redvers Road ..     | 1.54            | XI.    | Lligwy .....                  | 1.77            |
| „     | Ramsgate .....                  | 1.64            | „      | Douglas .....                 | 2.06            |
| „     | Hailsham .....                  | .89             | XII.   | Stoneykirk, Ardwell House...  | 2.53            |
| „     | Totland Bay, Aston House...     | .55             | „      | Carsphairn Shiel .....        | 5.65            |
| „     | Stockbridge, Ashley .....       | 1.43            | „      | Beattock, Kinnelhead .....    | 5.76            |
| „     | Grayshott .....                 | 1.40            | „      | Langholm, Drove Road .....    | 6.05            |
| III.  | Harrow Weald, Hill House...     | 1.74            | XIII.  | Selkirk, The Hangingshaw...   | 5.28            |
| „     | Pitsford, Sedgebrook .....      | 1.72            | „      | North Berwick Reservoir ..... | 4.26            |
| „     | Woburn, Milton Bryant .....     | 1.51            | „      | Edinburgh, Royal Observat'y.  | 5.18            |
| „     | Chatteris, The Priory .....     | 1.75            | XIV.   | Maybole, Knockdon Farm ...    | 3.71            |
| IV.   | Elsenham, Gaunts End .....      | 1.23            | XV.    | Buchlyvie, The Manse .....    | 4.73            |
| „     | Shoeburyness .....              | 1.04            | „      | Ballachulish House .....      | 3.04            |
| „     | Colchester, Hill Ho., Lexden .. | .86             | „      | Oban .....                    | 2.13            |
| „     | Ipswich, Rookwood, Copdock ..   | 1.79            | „      | Campbeltown, Witchburn ..     | 2.43            |
| „     | Aylsham, Rippon Hall .....      | 1.28            | „      | Holy Loch, Ardnadam .....     | 3.13            |
| „     | Swaffham .....                  | .94             | „      | Tiree, Cornaigmore .....      | 2.24            |
| V.    | Bishops Cannings .....          | 1.08            | XVI.   | Dollar Academy .....          | 4.30            |
| „     | Wimborne, St. John's Hill ...   | 1.00            | „      | Glenlyon, Meggernie Castle..  | 5.05            |
| „     | Ashburton, Druid House .....    | 1.06            | „      | Blair Atholl .....            | 6.77            |
| „     | Cullompton .....                | 1.20            | „      | Coupar Angus .....            | 7.22            |
| „     | Lynmouth, Rock House .....      | 1.04            | „      | Montrose, Sunnyside Asylum.   | 6.73            |
| „     | Okehampton, Oaklands .....      | 1.18            | XVII.  | Alford, Lynturk Manse .....   | 3.84            |
| „     | Hartland Abbey .....            | .93             | „      | Fyvie Castle .....            | 2.09            |
| „     | Probus, Lamellyn .....          | ..              | „      | Keith Station .....           | 2.50            |
| „     | North Cadbury Rectory .....     | .97             | XVIII. | Rothiemurchus .....           | 3.11            |
| VI.   | Clifton, Stoke Bishop .....     | 1.67            | „      | Loch Quoich, Loan .....       | 9.05            |
| „     | Ledbury Underdown .....         | 1.75            | „      | Skye, Dunvegan .....          | 2.80            |
| „     | Shifnal, Hatton Grange .....    | 1.92            | „      | Lochmaddy, Bayhead .....      | 1.35            |
| „     | Droitwich .....                 | 1.81            | „      | Fortrose .....                | 4.16            |
| „     | Blockley, Upton Wold .....      | 2.00            | „      | Glencarron Lodge .....        | 4.08            |
| VII.  | Grantham, Saltersford .....     | 1.60            | XIX.   | Altnaharra .....              | 2.38            |
| „     | Market Rasen .....              | .78             | „      | Melvich .....                 | 1.98            |
| „     | Bawtry, Hesley Hall .....       | 1.17            | „      | Loch More, Achfary .....      | 3.77            |
| „     | Derby, Midland Railway .....    | 2.01            | XX.    | Dunmanway, The Rectory ..     | .78             |
| „     | Buxton .....                    | 2.59            | „      | Glanmire, Lota Lodge .....    | 2.09            |
| VIII. | Nantwich, Dorfold Hall .....    | 1.93            | „      | Mitchelstown Castle .....     | 2.57            |
| „     | Chatburn, Middlewood .....      | 2.99            | „      | Darrynane Abbey .....         | .79             |
| „     | Lancaster, Strathspey .....     | 2.27            | „      | Clonmel, Bruce Villa .....    | 1.43            |
| IX.   | Langsett Moor, Up. Midhope ..   | 1.49            | „      | Broadford, Hurdlestown .....  | 2.45            |
| „     | Scarborough, Scalby .....       | 1.96            | XXI.   | Enniscorthy, Ballyhyland...   | 2.56            |
| „     | Ingleby Greenhow .....          | 1.77            | „      | Rothnen, Clonmannon .....     | 1.80            |
| „     | Mickleton .....                 | 3.05            | „      | Ballycumber, Moorock Lodge .. | 3.29            |
| X.    | Bellingham, High Green Manor .. | 3.56            | „      | Balbriggan, Ardgillan .....   | 1.85            |
| „     | Ilderton, Lilburn Cottage ..... | 4.73            | „      | Castle Forbes Gardens .....   | 4.39            |
| „     | Thirlmere, The Bank .....       | 5.34            | XXII.  | Ballynahinch Castle .....     | 2.41            |
| XI.   | Llanfrecfa Grange .....         | 1.93            | „      | Woodlawn .....                | 1.67            |
| „     | Treherbert, Tyn-y-waun .....    | 3.36            | „      | Westport, St. Helens .....    | 2.06            |
| „     | Carmarthen, The Friary .....    | 2.18            | „      | Dugort, Slievemore Hotel ...  | 3.17            |
| „     | Fishguard, Goodwick Station.    | 1.15            | XXIII. | Enniskillen, Portora .....    | 2.05            |
| „     | Crickhowell, Tal-y-maes .....   | 1.00            | „      | Dartrey [Cootehill] .....     | 2.74            |
| „     | New Radnor, Ednol .....         | 1.95            | „      | Warrenpoint, Manor House ..   | 3.33            |
| „     | Birmingham WW., Tyrmynydd ..    | 2.93            | „      | Belfast, Cave Hill Road ..... | 2.66            |
| „     | Lake Vyrnwy .....               | 2.56            | „      | Glenarm Castle .....          | 1.46            |
| „     | Llangynhafal, Plâs Drâw .....   | 1.48            | „      | Londonderry, Creggan Res...   | 3.23            |
| „     | Dolgelly, Bryntirion .....      | 2.50            | „      | Dunfanaghy, Horn Head ...     | 2.29            |
| „     | Bettws-y-Coed, Tyn-y-bryn...    | 2.36            | „      | Killybegs .....               | 2.61            |





# THAMES VALLEY RAINFALL.

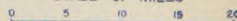
JULY, 1916.



ALTITUDE  
SCALE

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

SCALE OF MILES



## THE WEATHER OF JULY.

THE cold, gloomy conditions characteristic of the whole month of June continued without interruption throughout the first half of July, the low temperature and absence of sunshine being specially marked in eastern districts. After about the 16th warmer weather set in, but it was not until the 19th that the sky cleared in the south, an improvement which was delayed in the north till the 22nd. In one or two restricted areas there was a marked retardation in the setting in of summer conditions notably in the east of England, where the month remained cold and sunless throughout. In the extreme north of Scotland dull weather also persisted, although this was associated during the last ten days with an increase of temperature.

The mean temperature of the month, taking the country as a whole, was half a degree below the average. The only areas where an excess was recorded were the north of Scotland, the south-west of England, and the south of Ireland, where the normal was exceeded by about a third of a degree F. On the other hand in the east and south-east of England temperature fell more than two degrees F. below the normal, and in the Channel and Midlands the mean was a degree under the average.

The highest temperature in shade was 83° at Kilmarnock on the 24th, and a similar reading at Manchester on the 26th. On the 31st the maximum at Camden Square (in a Glaisher stand) was 84°·4. The lowest temperature, 33°, occurred at West Linton on the 6th, when the grass minimum fell to 26°.

The rainfall of the month amounted to three or more times the average in some places in the east of Scotland affected by the storm of the 8th, but less than a third of the average fell in parts of Sussex and Devon, and in Co. Mayo in Ireland. Except in Brecon, Cumberland, and one or two isolated patches in north-western districts, the rainfall in England and Wales was under two inches.

Less than an inch fell in Lincoln, on the east coast, from the Wash to the mouth of the Thames, and on the south coast from Dungeness to Torquay.

In Scotland as much as 9·4 in. fell at Perth, and 9·0 in. at Loan, W. Inverness. More than five inches fell over the counties of Forfar, eastern Perth, Fife, and Midlothian. To the north and north-east of this region the rain fell off rapidly to under two inches. On the extreme west coast the fall was under three inches. In Ireland the rainfall was, in general, under the average. A few stations in Westmeath had more than the normal. The actual fall varied from four inches in Donegal and Longford to less than an inch on the south coast of Cork.

The most notable rain storm of the month occurred in the eastern districts of Scotland on July 7th and 8th, when a shallow depression which appeared off the south of Ireland on the 6th, passed eastward to the North Sea.

The maximum falls reported on the 7th were 3·42 in. at Perth, 3·35 in. at Dundee, 3·17 in. at Edinburgh (City Observatory), and 3·03 in. at Edzell. On the 8th 1·90 in. fell at Perth, 1·30 in. at Dundee, and 1·06 in. at Edzell, the total rainfall for the two days being 5·32 in. at Perth, 4·65 in. at Dundee, and 4·09 in. at Edzell. At a considerable number of other places in the area affected, the rainfall for the two days was just under four inches.

Over the country, as a whole, the general rainfall expressed as a percentage of the average was England and Wales 64 per cent. ; Scotland, 114 per cent. ; Ireland, 64 per cent. ; British Isles, 80 per cent.

Bright sunshine was deficient, the general defect being three-quarters of an hour per day. There was a daily excess of about half an hour in the south west of England, and a deficit exceeding two hours a day in the east of England. The amounts at individual stations were as follows, Weymouth, 257 hours ; Sidmouth, 233 hours ; Southport, 173 hours ; Hodsock Priory, 149 hours ; Camden Square and Bolton, 147 hours ; Copdock, 144 hours ; Swinton House, 141 hours ; Perth, 135 hours ; Markree Observatory, 132 hours ; Hull and Paisley, 106 hours ; Loch More, 90 hours.

In London (Camden Square) the mean temperature was 61°·9 or 1°·6 below the average. Duration of rain, 18·3 hours. Evaporation, 2·23 in.

## Climatological Table for the British Empire, February, 1916.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |        | Average. |      |               |           | Absolute.       |                   | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|--------|----------|------|---------------|-----------|-----------------|-------------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |        | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date.  |          |      |               |           |                 |                   |            |       |                 |
|                                                                  |           |       |          |        |          |      |               | 0-100     |                 |                   | inches     |       |                 |
| London, Camden Square                                            | 53·7      | 13    | 26·6     | 25     | 45·7     | 34·8 | 35·2          | 85        | 92·5            | 25·5              | 3·46       | 21    | 6·8             |
| Malta ... ..                                                     | 66·2      | 25    | 46·3     | 11     | 58·9     | 51·8 | ...           | 89        | 112·0           | ...               | 6·85       | 15    | 3·0             |
| Lagos ... ..                                                     | 90·4      | 9, 13 | 70·1     | 6      | 88·9     | 76·4 | 73·1          | 73        | 146·5           | 65·0              | 1·45       | 2     | 6·9             |
| Cape Town ...                                                    | 95·1      | 20    | 54·5     | 15     | 81·0     | 60·6 | 57·1          | 65        | ...             | ...               | ·40        | 5     | 2·9             |
| Johannesburg ...                                                 | 84·5      | 29    | 50·3     | 10     | 79·1     | 55·9 | 52·9          | 70        | ...             | 50·5              | 3·75       | 10    | 3·1             |
| Mauritius ...                                                    | 87·3      | 13    | 66·2     | 8      | 84·7     | 72·1 | 70·3          | 77        | ...             | 64·8              | 4·16       | 18    | 5·1             |
| Bloemfontein ...                                                 | 93·6      | 16    | 47·4     | 14     | 88·7     | 58·2 | 50·9          | 50        | ...             | ...               | ·58        | 6     | 2·8             |
| Calcutta... ..                                                   | 93·1      | 27    | 49·5     | 10     | 84·6     | 60·4 | 55·9          | 58        | ...             | 36·0              | ·00        | 0     | 1·5             |
| Bombay... ..                                                     | 84·9      | 8     | 59·2     | 7      | 81·4     | 67·9 | 62·3          | 67        | 132·8           | 43·0              | ·00        | 0     | 1·1             |
| Madras ... ..                                                    | 97·3      | 29    | 62·7     | 5      | 88·3     | 69·1 | 67·9          | 74        | 160·2           | 58·7              | ·00        | 0     | 1·5             |
| Colombo, Ceylon                                                  | 89·5      | 17    | 64·1     | 6      | 87·5     | 70·1 | 69·5          | 78        | 159·3           | 55·7              | ·07        | 2     | 4·7             |
| Hongkong ... ..                                                  | 75·1      | 24    | 49·4     | 14     | 62·9     | 56·1 | 54·0          | 80        | ...             | ...               | 1·31       | 6     | 8·2             |
| Sydney ... ..                                                    | 90·7      | 1     | 59·3     | 15, 16 | 79·1     | 65·5 | 61·9          | 72        | 155·2           | 49·9              | 2·67       | 18    | 5·7             |
| Melbourne ...                                                    | 101·2     | 18    | 52·9     | 9      | 76·8     | 58·9 | 55·3          | 65        | 153·1           | 44·1              | 2·02       | 10    | 5·4             |
| Adelaide ...                                                     | 106·8     | 17    | 53·8     | 7      | 86·4     | 62·1 | 51·5          | 41        | 156·9           | 44·9              | ·29        | 2     | 2·7             |
| Perth ... ..                                                     | 102·5     | 25    | 56·0     | 27     | 83·3     | 62·7 | 57·3          | 59        | 162·0           | 47·9              | 1·88       | 7     | 3·3             |
| Coolgardie ...                                                   | 107·0     | 14    | 54·4     | 19     | 92·7     | 62·5 | 50·8          | 36        | 166·4           | 50·8              | ·07        | 2     | 1·6             |
| Hobart, Tasmania                                                 | 93·0      | 15    | 47·1     | 19     | 69·0     | 54·4 | 51·8          | 70        | 147·9           | 35·3              | 2·03       | 10    | 6·9             |
| Wellington ...                                                   | 78·6      | 25    | 46·4     | 29     | 72·6     | 61·2 | 57·8          | 73        | 135·6           | 35·4              | 1·85       | 6     | 7·0             |
| Auckland ... ..                                                  | ...       | ...   | ...      | ...    | 75·7     | 62·7 | ...           | ...       | ...             | ...               | ·51        | 8     | ...             |
| Jamaica, Kingston                                                | 89·2      | 25    | 63·2     | 4      | 84·6     | 67·6 | 65·9          | 75        | ...             | ...               | ·57        | 6     | ...             |
| Grenada ... ..                                                   | 87·0      | 10    | 70·0     | *      | 83·0     | 72·0 | ...           | 74        | 133·0           | ...               | 2·63       | 16    | 1·5             |
| Toronto ... ..                                                   | 43·7      | 17    | —9·3     | 21     | 26·1     | 11·8 | 12·1          | 81        | ...             | ...               | ...        | ...   | ...             |
| Fredericton ...                                                  | 45·0      | 1, 26 | —20·0    | 14, 15 | 24·7     | 3·4  | 8·7           | 82        | ...             | ...               | 2·80       | 12    | 6·2             |
| St. John, N.B.                                                   | 46·2      | 1     | —11·5    | 21     | 26·4     | 10·7 | 12·0          | 72        | ...             | 13·3              | 2·48       | 19    | 6·2             |
| Alberta, Edmonton                                                | ...       | ...   | ...      | ...    | ...      | ...  | ...           | ...       | ...             | ...               | ...        | ...   | ...             |
| Victoria, B.C. ...                                               | 59·0      | 26    | 23·8     | 1      | 44·8     | 35·2 | 36·0          | 85        | 112·0           | 23·0              | 7·03       | 16    | 7·0             |

\* Several.

*Johannesburg.*—Bright sunshine, 273·1 hours.*Mauritius.*—Mean temp. 0°·4, dew point 0°·9 and R 1°·24 in. below averages, mean hourly velocity of wind 1·0 above average.*Bloemfontein.*—A very hot and dry month.

COLOMBO, CEYLON.—Mean temp. 75°·8, or 1°·2 below, dew point 1°·2 above, and R 1·70 in., below, averages. Mean hourly velocity of wind 4·9 miles. T and L on 19th.

HONGKONG.—Mean temp. 59°·6, mean hourly velocity of wind 16·8 miles. Bright sunshine 80·3 hours.

*Melbourne.*—Mean temp. 0°·4 above, and R ·33 in. above, averages.*Adelaide.*—Mean temp. 0°·1 above, and R ·33 in. below, averages.*Perth.*—Rainfall in excess of average.*Coolgardie.*—Temp. 1°·6 above, and R ·75 in. below, averages.*Hobart.*—Temp. 0°·7 below, and R ·60 in. above, averages.*Wellington.*—Mean temp. 4°·6 above, and R 1·58 in. below, averages. Bright sunshine 232·4 hours.

# Symons's Meteorological Magazine.

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## SIR ERNEST SHACKLETON'S FIGHT WITH WINTER.

ANTARCTIC exploration has furnished many examples of the struggle of the human will against the most unfavourable conditions of nature, but there has never been a more obstinate, determined fight, eventually crowned with success, than that which Sir Ernest Shackleton has carried on since his exploring ship the *Endurance* was lost in the Weddell Sea, in November, 1915. It will be remembered that after overcoming extraordinary difficulties in the pack ice, drifting northward through the Weddell Sea, the whole expedition in three small boats landed on Elephant Island, in the South Shetlands, in April 15th, 1916. Winter was already setting in, the date corresponding to October 16th in the Northern Hemisphere, and the stock of provisions was only sufficient to keep the whole party for about six weeks. At any moment the northern edge of the expanding antarctic ice floe might surge beyond the island and block the sea as a means of escape or rescue. The nearest inhabited land lay 600 miles to the north, in the Falkland Islands, 600 miles to the north-west in Tierra del Fuego, and 700 miles to the north-east, in South Georgia. Sir Ernest Shackleton decided that the only chance of saving the party was to get into communication with the outer world, and he determined on the desperate adventure of making the voyage with a small party in the best of the three strained and battered boats, in order to bring down a ship to take off the remainder. The best chance of finding a sufficiently stout sea-going craft to venture amongst the ice floes was at one of the Norwegian whaling stations, on the north-east coast of South Georgia, and the prevailing winds and currents, gave this voyage, though longer, the best chance of success. After strengthening and covering in the boat with such material as was available, Sir Ernest left twenty-two men, in charge of Mr. Frank Wild, on April 24th, and, after a terrible voyage, reached the south-west coast of South Georgia on May 10th. After trying in vain to coast along the island in face of the furious seas, he finally crossed the snow covered mountain ridge—a feat which had never before been attempted—and arrived at the Stromness whaling station on May 20th. Here a small whaling steamer of 80 tons was at once placed at his disposal,



and after seeing to the safety of his companions on the south side of the island, he left on the 23rd, and, three days later, came in sight of Elephant Island; but prompt as everyone had been, the Antarctic winter was first upon the scene, and heavy pack ice, through which the little vessel could not force a way, barred the access to the island. For three days the relief ship worked to and fro along the edge of the ice in heavy weather, hoping to find an opening, but, on the 28th, the hopelessness of the effort became apparent, and the ship turned northward to the Falkland Islands, reaching Port Stanley on May 31st. Wireless messages were then sent, describing the disaster to the expedition and failure of the relief. As had been anticipated, there was no vessel in Port Stanley fit for a winter voyage to the South Shetlands, and the British Government lost no time in inquiring whether any suitable ship could be found in any of the harbours of South America. The Government of Uruguay generously offered the use of a stout, Aberdeen-built, trawler, the *Instituto de Pesca*, and it reflects credit on the energy of all concerned that this little vessel, fully equipped for a long voyage, had covered the 1,000 miles from the River Plate to Port Stanley in time to sail thence on the 17th June. Sir Ernest Shackleton went on board, and on the 20th once more got within 20 miles of Elephant Island, despite bad weather and difficult ice conditions. It was now mid-winter, the days were very short and night very long, fogs and gales were of continual occurrence, and the ice-pack was so dense that every effort to penetrate it failed. It was now nearly two months since the party had landed on the island, and provisions would have been exhausted unless extraordinary precautions had been taken and some local food supplies obtained. Nothing but absolute impossibility of proceeding further would have induced Sir Ernest to return, but the only chance of success seemed to be to get a more powerful vessel, and on June 25th he was back again in Port Stanley. He had now resolved to visit Punta Arenas, the most southerly town of Chili, in the middle of Magellan Straits, and here a small wooden schooner, the *Emma*, provided with auxiliary motor engines, was placed at his disposal, and in her he proceeded to make the third attempt at rescue. It was July 12th before he was able to sail, and to expedite matters the Chilean Government gave the use of the small steamer *Yelcho* to tow the *Emma* through the devious channels of Tierra del Fuego. As was pointed out by Mr. R. C. Mossman the ice around the islands to the north of the Weddell sea is occasionally blown off, even in the middle of winter, so as to leave a clear approach to the land for a short period, and it was on the chance of an incident of this sort that the success of the attempts at rescue depended. No such incident occurred, however, on this occasion. The *Emma* met streams of pack ice 100 miles from the island, and she was too light to work through the ice and was damaged in the attempt to do so. The ice also put the engines

out of use, and for a long time the little vessel was worked to and fro under sail exactly as the ships of the earliest antarctic explorers had been ninety years before. She encountered constant gales and in the low temperature prevailing was covered with ice, so that at last even Sir Ernest was convinced it was useless to persevere, and, turning northward, he reached Port Stanley on August 3rd. Meanwhile the Admiralty at home after consulting the authorities on Antarctic navigation at present in this country had secured the use of Captain Scott's old ship, *Discovery*, from the Hudson Bay Company, had her repaired and fully equipped, and dispatched under the command of Captain Fairweather, who left England on August 10th, and expected to reach Port Stanley about the end of September. Meanwhile, Sir Ernest Shackleton resolved on one more attempt, the Chilian Government, at his request, placed the little *Yelcho* at his disposal, under the command of Captain Pardo. She left Punta Arenas on August 22nd, and after coaling at Picton Island, near Cape Horn, left that port on the 28th. After passing through many icebergs in a dense fog she reached Elephant Island from the north-west, and this time happily found a clear way to the land, the pack ice having been blown off in a furious gale the previous day. At 1 p.m. on August 30th the camp of the crew of the *Endurance* was reached, and by 2 p.m. the whole party was on board the *Yelcho* homeward bound, and were safely landed at Punta Arenas on September 3rd. As had been anticipated, Mr. Wild, whose experience of life in the Antarctic regions is unique, had succeeded in keeping his party alive and in good health, throughout the whole four months, although they were unable to move from the narrow beach on which they were landed, and could only secure penguins late in the season and a few shell fish to help out their scanty stores. Few seals were secured on account of the formation of a high ice foot along the shore, but this formation saved the camp from being swept away during the terrific storms which were experienced throughout the winter.

No praise can be too high for the determination and perseverance of Sir Ernest Shackleton and for his courage, and that of the Uruguayan and Chilian officers and crews who accompanied him on the perilously small craft in those dangerous seas, which have never hitherto been entered voluntarily even by the stoutest vessels in the late winter months. Mr. R. C. Mossman supplies the following notes on the weather conditions against which the relief parties fought so strenuously.

The meteorological results of the Expedition will be of the greatest interest and importance. Although it is too much to hope that any mercurial barometer, or other delicate instrument, could have survived the rough experiences of the retreat to Elephant Island in open boats, after the *Endurance* sunk, we can still look forward to a valuable series of observations even though

only non-instrumental. Elephant Island appears to lie almost directly in the cyclonic track taken by depressions, after rounding Cape Horn on their south-east course to the Weddell Sea, very sharp changes of wind and temperature would be experienced. Some idea of the exceptional climatic conditions is given in Wild's report of his four months' stay on the island. We are told that "the weather continued appalling," and again "we were under a constant pall of fog and snow." Precisely similar conditions apply to the South Orkney station located in the same latitude, some 270 miles to the east. At this place a fine day is uncommon, great variations of temperature are frequent, and the persistent heavy squalls bring tons of snow off the mountains. During Föhn winds the temperature even in winter may rise to from 45° to 50° F., while in calm weather the thermometer may fall 40° below zero. As the explorers were stranded on a narrow beach surrounded by high cliffs, it is doubtful whether they would get any of the scanty sunshine during the brief intervals of clear sky. Whenever the wind blew from a northerly or westerly direction the air would be full of snow drift blown from the adjacent heights. The persistent fog is explained by the position of the island near the outside edge of the pack, and with winds blowing over an ocean of relatively high temperature before reaching the cold land.

Among other phenomena the heavy blizzard in May, which seriously endangered the party, may be referred to. The wind was evidently from the south, and the high seas swept over the narrow beach. Fortunately the temperature fell, nature built up a wall of ice between the relentless seas and the prospective victims, and the situation was saved. An exactly similar experience befell the observers at the South Orkneys in April 1904, when the house was undermined by the waves. The frozen sea spray, however, cemented the stones composing the walls together and allowed of steps being taken to repair the building after the storm.

Only those who are familiar with the difficulties and dangers attending navigation in Polar waters, even in a properly protected ship during summer, when the daylight is continuous, can appreciate the unceasing vigilance and activity demanded from the ship's officers and crews in their mid-winter combat with gales, fog, icebergs and pack ice. Access to Elephant Island was rendered possible by its position, which was in general to the west of, but sometimes within the main ice bearing current, which sweeps out of Weddell Sea in a north-easterly direction. The chances of reaching the island in the absence of a suitably protected vessel were few and far between, and depended upon the psychological moment being seized when the pack, after a succession of heavy gales, had been driven to leeward. We held from the first that an approach to the island from the north-west offered the best prospect of success, and this belief was fully realised in the last successful attempt.

## METEOROLOGICAL OBSERVATIONS AT NOTRE DAME DES PINS, MANCHURIA, for 1915.

By REV. J. DE MOIDREY, S.J

THE following is a summary of the meteorological observations made at Notre Dame des Pins, for 1915, in continuation of those for 1914 given in the July number of this Magazine, pp. 87-88 :—

### I.—Barometric Pressure. *Millimetres.*

### II.—Relative Humidity. *Per cent.*

|          | 8 hr.<br>mm.  | 14 hr.<br>mm. | 20 hr.<br>mm. | Daily<br>Mean (a).<br>mm. | 8 hr.       | 16 hr.      | 20 hr.      |
|----------|---------------|---------------|---------------|---------------------------|-------------|-------------|-------------|
| Jan. ..  | <b>760·69</b> | <b>759·73</b> | <b>760·55</b> | <b>760·32</b>             | 58·5        | 34·5        | 50·6        |
| Feb. ..  | 57·34         | 56·01         | 56·75         | 56·78                     | <i>45·1</i> | 23·3        | 25·1        |
| Mar. ..  | 55·42         | 54·11         | 55·11         | 55·02                     | 46·4        | 20·8        | 39·8        |
| April .. | 52·01         | 50·59         | 51·32         | 51·44                     | 69·6        | 39·3        | 52·1        |
| May ..   | 47·33         | 46·26         | 46·43         | 46·79                     | 58·0        | 45·9        | 55·5        |
| June ..  | 43·96         | 42·93         | 43·07         | 43·42                     | 62·3        | 44·2        | 62·9        |
| July ..  | <i>42·51</i>  | <i>41·83</i>  | <i>41·97</i>  | <i>42·15</i>              | 73·9        | <b>56·7</b> | 72·6        |
| Aug. ..  | 44·33         | 43·15         | 43·63         | 43·58                     | 71·5        | 48·3        | <b>77·1</b> |
| Sept. .. | 50·28         | 48·75         | 49·36         | 49·42                     | 70·8        | 40·0        | 65·0        |
| Oct. ..  | 55·47         | 53·83         | 54·55         | 54·72                     | 71·3        | 41·6        | 64·4        |
| Nov. ..  | 60·12         | 58·23         | 58·91         | 59·26                     | <b>86·2</b> | 45·1        | 66·1        |
| Dec. ..  | 57·00         | 55·57         | 56·13         | 56·35                     | 70·6        | 48·3        | 51·7        |
| Year ..  | 752·20        | 750·92        | 751·48        | 751·60                    | 65·3        | 40·7        | 56·9        |

### III.—Temperature, ° Centigrade.

### *Daily Range.*

|          | Min.        | Max.        | 20 hr.      | Mean (b).   | Min.       | Max.        | Mean.       |
|----------|-------------|-------------|-------------|-------------|------------|-------------|-------------|
| Jan. ..  | —19·0       | —6·0        | —13·4       | —12·8       | 5·0        | 23·0        | 12·9        |
| Feb. ..  | —14·3       | 0·0         | —7·9        | —7·4        | 1·9        | 20·8        | 14·3        |
| March .. | —8·0        | 5·5         | —2·2        | —1·6        | 4·7        | 23·0        | 13·4        |
| April .. | 0·6         | 15·1        | 7·3         | 7·7         | 6·0        | <b>25·5</b> | 14·5        |
| May ..   | 8·3         | 23·0        | 15·5        | 15·6        | 5·1        | 24·0        | 14·7        |
| June ..  | 13·9        | 28·6        | 20·5        | 21·0        | 2·2        | 24·1        | 14·7        |
| July ..  | <b>20·7</b> | <b>31·9</b> | <b>24·7</b> | <b>25·8</b> | 2·3        | <i>18·1</i> | <i>11·2</i> |
| Aug. ..  | 17·9        | 30·9        | 22·7        | 23·8        | 7·0        | 21·9        | 12·9        |
| Sept. .. | 10·2        | 24·9        | 16·3        | 17·2        | <b>3·0</b> | 22·2        | 14·7        |
| Oct. ..  | 3·7         | 17·9        | 8·8         | 10·2        | 4·3        | 23·3        | 14·2        |
| Nov. ..  | —5·7        | 9·8         | 0·5         | 1·5         | 2·7        | 22·4        | <b>15·5</b> |
| Dec. ..  | —11·5       | 3·5         | —6·1        | —4·7        | 4·5        | 24·8        | 15·0        |
| Year ..  | + 1·4       | + 15·4      | + 7·2       | + 8·0       | 4·5        | 22·8        | 14·0        |

(a) Mean of 8 hr., 14 hr., and 20 hr., with a small correction. (b) Mean of Max., Min. & 8 p.m.

The highest reading is in heavy type, the lowest in italic.

#### DRY PERIODS.

| Commenced.  | Lastest. | Commenced.   | Lastest. |
|-------------|----------|--------------|----------|
| 28 January  | 11 days. | 24 September | 11 days. |
| 9 February  | 16 „     | 16 November  | 22 „     |
| 27 February | 29 „     | 9 December   | 11 „     |



III.—*Wind Velocity. Frequency of Wind in Percentages. State of the Sky%*

|       | kms<br>per hr. | N. | N.E. | E. | S.E. | S. | S.W. | W. | N.W. | bright. | cloudy. | overcast. |
|-------|----------------|----|------|----|------|----|------|----|------|---------|---------|-----------|
| Jan.  | 4.2            | 15 | 57   | 0  | 1    | 0  | 9    | 4  | 14   | 72      | 7       | 21        |
| Feb.  | 4.3            | 11 | 31   | 0  | 0    | 0  | 14   | 5  | 40   | 64      | 17      | 19        |
| Mar.  | 5.5            | 17 | 23   | 0  | 0    | 6  | 12   | 9  | 32   | 68      | 13      | 19        |
| April | 5.2            | 11 | 36   | 1  | 0    | 1  | 29   | 5  | 18   | 48      | 24      | 28        |
| May   | 5.4            | 19 | 34   | 0  | 0    | 2  | 31   | 5  | 8    | 45      | 22      | 33        |
| June  | 5.4            | 12 | 24   | 0  | 0    | 5  | 48   | 8  | 3    | 38      | 26      | 36        |
| July  | 4.5            | 1  | 33   | 0  | 2    | 5  | 53   | 5  | 1    | 31      | 26      | 43        |
| Aug.  | 3.5            | 5  | 42   | 0  | 0    | 1  | 42   | 4  | 7    | 55      | 24      | 21        |
| Sept. | 4.3            | 4  | 53   | 0  | 0    | 0  | 30   | 5  | 8    | 69      | 6       | 24        |
| Oct.  | 5.2            | 5  | 62   | 0  | 0    | 1  | 20   | 6  | 6    | 65      | 10      | 26        |
| Nov.  | 5.0            | 9  | 43   | 0  | 0    | 0  | 26   | 1  | 21   | 82      | 3       | 16        |
| Dec.  | 4.0            | 15 | 46   | 0  | 0    | 4  | 10   | 4  | 21   | 79      | 9       | 12        |

IV.—*Number of Days of*

|          | Rain.<br>mm. | Snow. | Rain. | Thunder-<br>storms. | Thunder. | Dew. | Fog. |
|----------|--------------|-------|-------|---------------------|----------|------|------|
| Jan. ..  | 3.5          | 7     | 2     | 0                   | 0        | 0    | 0    |
| Feb. ..  | 8.5          | 3     | 1     | 0                   | 0        | 0    | 1    |
| Mar. ..  | 13.7         | 3     | 0     | 0                   | 0        | 0    | 0    |
| April .. | 15.2         | 3     | 7     | 0                   | 0        | 0    | 1    |
| May ..   | 34.6         | 0     | 10    | 2                   | 0        | 0    | 3    |
| June ..  | 124.3        | 0     | 13    | 4                   | 3        | 1    | 2    |
| July ..  | 337.2        | 0     | 13    | 3                   | 0        | 7    | 0    |
| Aug. ..  | 74.2         | 0     | 6     | 5                   | 0        | 11   | 0    |
| Sept. .. | 43.4         | 0     | 8     | 3                   | 0        | 8    | 0    |
| Oct. ..  | 21.5         | 1     | 7     | 1                   | 0        | 8    | 2    |
| Nov. ..  | 3.1          | 0     | 2     | 0                   | 0        | 0    | 0    |
| Dec. ..  | 0.2          | 1     | 0     | 0                   | 0        | 0    | 0    |
| Year ..  | 679.4        | 18    | 69    | 18                  | 3        | 35   | 9    |

IV.—*Number of Days of*

|          | Hoar<br>Frost. | Dust. | Zodiacal<br>Light. | Rain-<br>bow. | Halo. | Sunshine<br>per day.<br>hrs. mins. |
|----------|----------------|-------|--------------------|---------------|-------|------------------------------------|
| Jan. ..  | 2              | 4     | 0                  | 0             | 1     | 5 39                               |
| Feb. ..  | 0              | 1     | 0                  | 0             | 1     | 6 50                               |
| Mar. ..  | 5              | 5     | 3                  | 0             | 3     | 8 2                                |
| April .. | 4              | 2     | 1                  | 0             | 2     | 7 54                               |
| May ..   | 0              | 1     | 0                  | 1             | 0     | 7 56                               |
| June ..  | 0              | 0     | 0                  | 2             | 0     | 8 4                                |
| July ..  | 0              | 0     | 0                  | 0             | 0     | 6 53                               |
| Aug. ..  | 0              | 0     | 0                  | 3             | 0     | 8 15                               |
| Sept. .. | 0              | 0     | 0                  | 0             | 1     | 8 4                                |
| Oct. ..  | 6              | 0     | 0                  | 0             | 0     | 6 36                               |
| Nov. ..  | 9              | 1     | 0                  | 0             | 1     | 6 42                               |
| Dec. ..  | 2              | 3     | 0                  | 0             | 1     | 5 45                               |
| Year ..  | 28             | 17    | 4                  | 6             | 10    | 7 23                               |

|                    |              |                  |             |
|--------------------|--------------|------------------|-------------|
| First Thunderstorm | 9 May.       | First Snow       | 23 October. |
| Last ..            | 1 October.   | Last ..          | 5 April.    |
| First Dust         | 27 November. | First Hoar Frost | 12 October. |
| Last ..            | 24 May.      | Last ..          | 13 April.   |
| First Dew          | 11 June.     | First Fog        | 26 February |
| Last ..            | 14 October   | Last ..          | 26 October. |

*Erratum.*—Page 87, last column of Barometric Pressure for  
Max. read Daily Mean.

## Correspondence.

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

### HEAVY DAY'S RAIN AT CHESHUNT.

AN account of the unprecedented storm of Thursday, 17th August, may interest your readers.

All the day we had thunder rumbling round us and at 6 p.m. peals and lightning, simultaneously with torrents of rain, broke apparently right over Goff's Oak. Our gutters and rain pipes, which during the twenty-four years I have lived in my house have sufficed to carry off the rain, were flooded, and the water fell in sheets from the gutters. Fortunately every one of our pipes were clear, as I had them cleaned shortly before, but our paths were like brooks, lawns like lakes, and our moat rose over 3 ft. My cellars were flooded, the water coming through foundations of house; never before have they had a drop in them.

The storm lasted without a break till nearly 9 p.m., and there was a slight drizzle up to 11 p.m.

I was astounded to measure 3.51 in. in the morning—my gauge bottle is a large one, it would hold 12 inches at least, and I took the measure myself. Every scrap of grit was washed off our roads, and they looked like water courses. My neighbours, Mr. E. T. Boxal, at Woodgreen Park, and the Earl of Carrick, at Claremont, the first one mile south of us, the other one mile east, were inundated, their stable yards in both cases being higher than the houses the water got in and poured through the ground floor rooms.

I have only been able to hear from one other Observer, Mr. F. B. Debenham, of Cheshunt Park (three miles east-north-east of us) who measured 2.84 on the 17th. But from what I hear the fall in places not far distant was comparatively slight, the Cheshunt Urban District Council gave only 1.22 in. At Cuffley station, one mile distant, they had nothing like our rainfall—the roads there proved it—and at Northaw hardly any rain fell. W. M. CUNINGHAM.

*Goff's Oak House, Cheshunt, 11th September, 1916.*

### SUMMER DROUGHT AT TOTLAND BAY, ISLE OF WIGHT.

AT Totland Bay we have had an absolute drought of 30 days, from July 13th to August 11th, inclusive. This is the longest summer drought I have recorded during my thirty years' residence at Totland Bay. The nearest approach to it was a summer drought of 28 days in 1914.

I have to look back to 1893 to find a longer drought, which was a spring drought of 43 days, terminating on April 28th, 1893.

JOHN DOVER.

*Aston House, Totland Bay, Isle of Wight, 6th September, 1916.*

## THE WAR AND THE WEATHER.

I AM aware that a great deal has been written and said on this subject, but may I bring forward a theory in your valuable pages ?

It is a well-known fact that a volcanic eruption frequently causes a thunderstorm or series of thunderstorms to form over the crater of the volcano. Well, we have what is practically a "volcano" in almost continuous eruption over northern France, and it will be noticed that whenever the "volcano" becomes super-active, as lately, the weather becomes very bad in the war area, and more or less unsettled weather occurs in the south-east of England (including the London district). I venture to think that an inspection of rainfall figures since the war began will show a tendency for the normally dry areas of the E. and S.E. of England to be relatively wetter than the W. or N.W. Of course, there have been exceptions, as in May last, but these exceptions will always be found to coincide with a lull in the artillery operations in the war-zone.

My theory (for what it is worth) is, therefore, this :—That the constant disturbance of the lower strata of the atmosphere in the war-area tends to cause a permanent low pressure system over that district, and this is also responsible for the continuous wind-currents from the N., N.W., or W., over England to which the cool spring and early summer has been due. Here, in Devonshire, although we have had the cool north-westerly winds, and low temperatures (no temperature of 70° having been recorded here in June, nor up to to-day), the rainfall has been comparatively slight (only .79 in. since July 1st), and the ground is parched and vegetation suffering for want of water. Of the amount given above, .57 in. fell on one day (the 6th).

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

*Moretonhampstead, Devon, July 19th, 1916.*

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## HEAVY RAINFALL ON AUGUST 29th.

EARLY on the morning of Tuesday, August 29th, rain began falling and continued practically without intermission until 9 a.m. (summer time) the following day, the total fall for the twenty-four hours, ending 9 a.m., amounting to 2.35 in.

The wind was between north and east, which is almost without exception the driest quarter in this part of the country, therefore such a prolonged and heavy downpour, in itself unusual here, is rendered all the more remarkable.

S. HYL A GREVES.

*Rodney House, Bournemouth, September 3rd, 1916.*

I HAVE seen no mention in the papers of the record fall of rain in this district of Tuesday, the 29th. I registered at 9 on Wednesday, 3.70 in. This is the highest since I have kept a register—between 30 and 40 years. At 6 p.m. Tuesday there was 1.25 in. of rain, which continued until about 3 a.m. In that time 2.45 in. fell. At Minehead 3.60 in. fell.

CHAS. E. J. ESDAILE.

*Cothelestone House, Taunton, September 1st, 1916.*

THE drought mentioned in my letter dated August 3rd, lasted for 31 days (July 12th to August 12th inclusive). After this, rainfall was excessive for the remainder of the month of August, the total at this station being 5.71 in., falling on 14 days. On the 29th there was a very remarkable fall. It commenced at 7 a.m. (G.M.T.) and went on without cessation until midnight, the total fall during that period being 2.48 in. At Manaton (Dartmoor) the fall was 2.41 in., and Ipplepen (Newton Abbot) 2.78 in. in the same period. It is curious that this day's fall was less as we approach Dartmoor, as the month's falls were just the reverse, viz., Ipplepen, 4.79 in., this station, 5.71 in., and Manaton, 6.33 in.

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

*Moretonhampstead, Devon, September 4th, 1916.*

THE above was remarkable, not only for the quantity of rain that fell, but the variation in amount which seemed to increase as we proceed along the coast westward. Here we had .66 in. in Exeter, four miles east of Dawlish (Kenton) the amount was 2.11 in. in the 24 hours. Dawlish and Teignmouth measured over 3 inches, while Torquay reports no less than 3.88 in., which is, I believe, a record for that town.

This downfall was very similar to the one of July 19th, 1914, on the west coast. But although the latter was heavier while it lasted, the totals fell considerably short of the present visitation in the 24 hours.

ARTHUR F. PARBURY.

*Hookway, Crediton, Near Exeter.*

[In addition to the above we have received notices of the following falls exceeding 3 inches on August 29th :—

|                              | ins. |                             | ins. |
|------------------------------|------|-----------------------------|------|
| Suffolk, Rendlesham ... ..   | 3.07 | Devon, Torquay, Cary Green  | 3.58 |
| Dorset, East Lulworth ... .. | 3.11 | „ „ Roby Hall               | 3.39 |
| „ Creech Grange ... ..       | 3.30 | Somerset, Mells Park, Frome | 3.08 |
| „ Tynham House ... ..        | 3.33 | „ Dinder Wells ...          | 3.60 |
| „ Kingston Vicarage ... ..   | 3.44 | „ Wheddon Cross ...         | 3.55 |

ED. S.M.M.]

## THE SHOWERS AND CLOUDS OF AUGUST.

No variety of weather is, perhaps, so thoroughly characteristic of the latter half of August as cool westerly conditions marked during the daytime by heavy showers, sometimes accompanied by thunder of a mild type. These August showers are deliciously refreshing to the full, rich, sombre foliage of waning summer, and never fail to make the grass grow fresh and green again when there has been parching midsummer drought, giving the appearance of a secondary or minor spring, superseded, as it were, upon the major effects of advancing spring.

The rains of August, 1916, were associated throughout with fine sunsets and with cloudscapes of great beauty and purity in the rain-washed atmosphere. Particularly imposing were the cumulo-form piles on Sunday, August 27th, showing vividly black, rocky flanks overlooking deep, gloomy rifts, surmounted on the other side by towering masses of dazzling snow-radiance, the whole cloud systems being in the peculiar foldings of parts amazingly like solid mountain structures. Speaking from the artistic or spiritual standpoint I cannot emphasize too strongly the great asset which we possess in that tendency of the climate of London to furnish, on many days during the summer-half of the year and occasionally during the winter, those magnificent ranges of storm-cloud which should enthrall every beholder with a sublime sense of mystery, power and beauty.

L. C. W. BONACINA.

*Hampstead, N. W., September 1st, 1916.*

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## ATMOSPHERIC CONDITIONS AND HEALTH.

"SCIENCE" for August 11th contains an interesting paper by Professor F. S. Lee, of Columbia University, New York, entitled "Recent progress in our knowledge of the physiological action of atmospheric conditions." His final results, as stated in his own words, are :—By way of general summary it may be said that when an existing external temperature is fairly comfortable to the individual an elevation of it, especially when such elevation is accompanied by an increase of humidity, is deleterious, and the deleterious effects are more pronounced when the air is stagnant. Deleterious effects resulting from such a combination of atmospheric conditions may be in some degree obviated if the air next the skin be put into motion, but a more effective antidote is a reduction in the temperature of the air, and this may be assisted by a reduction in its humidity. All experimentation and observation go to demonstrate that a moderately cool and moderately dry air in motion constitutes the most physiologically helpful aerial envelope of the body. The customary figure of 70° F. (approximately 21°C.) for the atmosphere in which most persons engage in the ordinary

occupations of the living room of a dwelling is too high ; a range from 65° to 68° F. (approximately 18°—20° C.) with not over 50 per cent. relative humidity, is undoubtedly better, but even such temperatures are too high when much physical activity occurs. Depending on activity and on more obscure corporal conditions the same external temperature may feel at one time warm and at another time cold. The degree of comfort that is felt—which should not be allowed too potent an influence in deciding what one's environmental conditions shall be—depends, moreover, largely on the thickness of the clothing and on habit. It is surprising how readily one's habits in this respect may be altered. Uniformity in conditions should be avoided ; too long a continuance of an existing temperature is dulling to the body ; there should be not infrequent and marked changes. Artificial ventilating systems should not necessarily be condemned, but should be operated intelligently and may advantageously be combined with window ventilation.

In these days we hear much of "fresh" air and its merits. We have fresh-air funds, fresh-air schools, and fresh-air babies. All are commendable ; but while giving to our funds, opening our schools, and putting our babies out of doors, let us clearly understand what constitutes fresh air. The freshness of so-called "fresh" air lies, not in more oxygen, less carbon dioxide, less organic matter of respiratory origin, and the hypothetical presence of a hypothetically stimulating ozone, but rather in a low temperature, a low humidity, and motion. So far as fresh air itself is concerned, there seems to be nothing more mysterious about it than this.

To what extent ought fresh air to be used as a therapeutic agent ? Here intelligent experience, and not opinion without experience, is the only guide. That a physician, indeed, should have any article in his creed of therapeutics that is not based on the intelligent experience of somebody is not to be supposed. It cannot be denied that where intelligent experience has been applied to the topic of fresh air as a therapeutic agent the use of fresh air has been almost invariably extended. But no one has a right to maintain, therefore, that it is a panacea. Only when it has been tested in a great variety of pathological conditions—and this can be done with entire safety to the patient—will the therapeutic use and limitations of this physiologically significant agent become known.

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### END OF SUMMER TIME.

OBSERVERS are reminded that Summer Time comes to an end on September 30th, so that from October 1st the clock is set back to Greenwich mean time in Great Britain, and to Dublin mean time in Ireland. Observations will accordingly be made once more at 9 a.m. clock time.

## RAINFALL TABLE FOR AUGUST, 1916.

| STATION.                        | COUNTY.            | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|---------------------------------|--------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                 |                    |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1916.<br>in. |
| Camden Square.....              | London.....        | 51 32      | 0 8                  | 111                            | 2'39                           | 5'57         |
| Tenterden.....                  | Kent.....          | 51 4       | *0 41                | 190                            | 2'42                           | 2'87         |
| Arundel (Patching).....         | Sussex.....        | 50 51      | 0 27                 | 130                            | 2'52                           | 1'87         |
| Fordingbridge (Oaklands)...     | Hampshire.....     | 50 56      | 1 38                 | 135                            | 2'76                           | 5'15         |
| Oxford (Magdalen College)...    | Oxfordshire.....   | 51 45      | 1 15                 | 186                            | 2'44                           | 3'81         |
| Wellingborough(Swanspool)...    | Northampton.....   | 52 18      | 0 41                 | 155                            | 2'36                           | 2'80         |
| Bury St. Edmunds(Westley)...    | Suffolk.....       | 52 15      | *0 40                | 226                            | 2'52                           | 5'12         |
| Geldeston [Beccles].....        | Norfolk.....       | 52 27      | *1 31                | 38                             | 2'22                           | 3'68         |
| Polapit Tamar [Launceston]...   | Devon.....         | 50 40      | 4 22                 | 315                            | 3'17                           | 3'01         |
| Rousdon [Lyme Regis].....       | „.....             | 50 41      | 3 0                  | 516                            | 2'84                           | 4'03         |
| Stroud (Field Place).....       | Gloucestershire..  | 51 44      | 2 13                 | 226                            | 2'90                           | 4'63         |
| Church Stretton (Wolstaston)..  | Shropshire.....    | 52 35      | 2 48                 | 800                            | 3'43                           | 2'73         |
| Boston.....                     | Lincolnshire.....  | 52 58      | 0 1                  | 11                             | 2'39                           | 2'88         |
| Worksop (Hodsock Priory)...     | Nottinghamshire... | 53 22      | 1 5                  | 56                             | 2'55                           | 1'43         |
| Mickleover Manor.....           | Derbyshire.....    | 52 54      | 1 32                 | 280                            | 2'80                           | 2'06         |
| Macclesfield.....               | Cheshire.....      | 53 15      | 2 7                  | 501                            | 3'76                           | ...          |
| Southport (Hesketh Park)...     | Lancashire.....    | 53 39      | 2 59                 | 38                             | 3'73                           | 3'56         |
| Arncliffe Vicarage.....         | Yorkshire, W. R.   | 54 8       | 2 6                  | 732                            | 5'62                           | 5'01         |
| Goldsbrough Hall.....           | „.....             | 54 0       | 1 25                 | 119                            | 2'80                           | 2'04         |
| Hull (Pearson Park).....        | „ E. R.            | 53 45      | 0 20                 | 6                              | 3'05                           | 2'76         |
| Newcastle (Town Moor)...        | Northumberland...  | 54 59      | 1 38                 | 201                            | 3'20                           | 3'21         |
| Borrowdale (Seathwaite)...      | Cumberland.....    | 54 30      | 3 10                 | 423                            | 11'47                          | 7'01         |
| Cardiff (Ely).....              | Glamorgan.....     | 51 29      | 3 13                 | 53                             | 4'54                           | 3'15         |
| Haverfordwest.....              | Pembroke.....      | 51 48      | 4 58                 | 90                             | 4'21                           | 2'57         |
| Aberystwyth (Gogerddan)...      | Cardigan.....      | 52 26      | 4 1                  | 83                             | 4'88                           | 2'21         |
| Llandudno.....                  | Carnarvon.....     | 53 20      | 3 50                 | 72                             | 3'16                           | 2'01         |
| Cargen [Dumfries].....          | Kirkcudbright...   | 55 2       | 3 37                 | 80                             | 4'23                           | 4'03         |
| Marchmont House.....            | Berwick.....       | 55 44      | 2 24                 | 498                            | 3'54                           | 4'25         |
| Girvan (Pinmore).....           | Ayr.....           | 55 10      | 4 49                 | 207                            | 4'54                           | 3'47         |
| Glasgow (Queen's Park)...       | Renfrew.....       | 55 53      | 4 18                 | 144                            | 3'62                           | 3'86         |
| Islay (Eallabus).....           | Argyll.....        | 55 47      | 6 15                 | 68                             | 4'49                           | 3'12         |
| Mull (Quinish).....             | „.....             | 56 34      | 6 13                 | 35                             | 5'00                           | 3'91         |
| Balquhiddie (Stronvar).....     | Perth.....         | 56 21      | 4 23                 | 422                            | 6'22                           | 2'96         |
| Dundee (Eastern Necropolis)...  | Forfar.....        | 56 28      | 2 57                 | 199                            | 3'34                           | 3'94         |
| Braemar.....                    | Aberdeen.....      | 57 0       | 3 24                 | 1114                           | 3'63                           | 3'72         |
| Aberdeen (Cranford).....        | „.....             | 57 8       | 2 7                  | 120                            | 3'07                           | 3'66         |
| Gordon Castle.....              | Moray.....         | 57 37      | 3 5                  | 107                            | 3'29                           | 2'70         |
| Drumnadrochit.....              | E. Inverness.....  | 57 20      | 4 29                 | 138                            | 3'11                           | 1'93         |
| Fort William.....               | „.....             | 56 49      | 5 6                  | 171                            | 6'15                           | 4'23         |
| Loch Torridon (Bendamph)...     | W. Ross.....       | 57 32      | 5 32                 | 20                             | 6'61                           | 3'22         |
| Dunrobin Castle.....            | Sutherland.....    | 57 59      | 3 56                 | 14                             | 2'71                           | 3'03         |
| Killarney (District Asylum)...  | Kerry.....         | 52 4       | 9 31                 | 178                            | 4'57                           | 8'45         |
| Waterford (Brook Lodge)...      | Waterford.....     | 52 15      | 7 7                  | 104                            | 3'73                           | 1'55         |
| Nenagh (Castle Lough).....      | Tipperary.....     | 52 54      | 8 24                 | 120                            | 4'04                           | 3'04         |
| Ennistymon House.....           | Clare.....         | 52 57      | 9 18                 | 37                             | 5'01                           | 3'13         |
| Gorey (Courtown House)...       | Wexford.....       | 52 40      | 6 13                 | 80                             | 3'31                           | 2'14         |
| Abbey Leix (Blandsfort)...      | Queen's County..   | 52 56      | 7 17                 | 532                            | 3'94                           | 3'14         |
| Dublin (Fitz William Square)... | Dublin.....        | 53 21      | 6 14                 | 54                             | 3'08                           | 2'88         |
| Mullingar (Belvedere).....      | Westmeath.....     | 53 29      | 7 22                 | 367                            | 4'00                           | 2'90         |
| Crossmolina (Enniscoe).....     | Mayo.....          | 54 4       | 9 16                 | 74                             | 4'68                           | 4'70         |
| Cong (The Glebe).....           | „.....             | 53 33      | 9 16                 | 112                            | 4'70                           | 3'42         |
| Collooney (Markree Obsy.)...    | Sligo.....         | 54 11      | 8 27                 | 127                            | 4'30                           | 4'70         |
| Seaforde.....                   | Down.....          | 54 19      | 5 50                 | 180                            | 3'64                           | 3'04         |
| Ballymena (Harryville).....     | Antrim.....        | 54 52      | 6 13                 | 150                            | 4'18                           | 2'88         |
| Omagh (Edenfel).....            | Tyrone.....        | 54 36      | 7 18                 | 280                            | 4'22                           | 3'25         |

RAINFALL TABLE FOR AUGUST, 1916—*continued.*

| RAINFALL OF MONTH ( <i>con.</i> ) |          |                   |        |             | RAINFALL FROM JAN. 1. |           |                      |          | Mean Annual 1875-1909. | STATION           |
|-----------------------------------|----------|-------------------|--------|-------------|-----------------------|-----------|----------------------|----------|------------------------|-------------------|
| Diff. from Av. in.                | % of Av. | Max. in 24 hours. |        | No. of Days | Aver. 1875-1909. in.  | 1916. in. | Diff. from Aver. in. | % of Av. |                        |                   |
|                                   |          | in.               | Date.  |             |                       |           |                      |          | in.                    |                   |
| +3.18                             | 233      | 1.35              | 29     | 16          | 15.92                 | 22.06     | +6.14                | 139      | 25.11                  | Camden Square     |
| + .45                             | 119      | 1.32              | 25     | 13          | 16.07                 | 18.82     | +2.75                | 117      | 27.64                  | Tenterden         |
| — .65                             | 74       | .71               | 29     | 13          | 17.44                 | 19.72     | +2.28                | 113      | 30.48                  | Patching          |
| +2.39                             | 187      | 1.55              | 29     | 14          | 17.94                 | 22.13     | +4.19                | 124      | 31.06                  | Fordingbridge     |
| +1.37                             | 156      | 1.26              | 29     | 15          | 15.47                 | 19.77     | +4.30                | 128      | 24.58                  | Oxford            |
| + .44                             | 119      | 1.42              | 29     | 12          | 16.12                 | 18.12     | +2.00                | 113      | 25.20                  | Swanspool         |
| +2.60                             | 203      | 1.21              | 29     | 17          | 15.96                 | 21.85     | +5.89                | 136      | 25.40                  | Westley           |
| +1.46                             | 166      | 1.53              | 29     | 16          | 14.20                 | ...       | ...                  | ...      | 23.73                  | Geldeston         |
| — .16                             | 95       | .70               | 29     | 16          | 21.79                 | 21.70     | — .09                | 100      | 38.27                  | Polapit Tamar     |
| +1.19                             | 142      | 1.72              | 29     | 15          | 19.85                 | 19.96     | + .11                | 101      | 33.54                  | Rousdon           |
| +1.73                             | 160      | 1.52              | 29     | 15          | 18.73                 | 21.76     | +3.03                | 117      | 29.81                  | Stroud            |
| — .70                             | 80       | .54               | 16     | 16          | 20.31                 | 20.63     | + .32                | 101      | 32.41                  | Wolstaston        |
| + .49                             | 121      | 1.05              | 29     | 15          | 14.60                 | 19.56     | +4.96                | 134      | 23.35                  | Boston            |
| —1.12                             | 56       | .37               | 29     | 13          | 15.70                 | 16.09     | + .39                | 103      | 24.46                  | Hodsock Priory    |
| — .74                             | 74       | .52               | 29     | 12          | 17.14                 | 20.84     | +3.70                | 122      | 26.65                  | Mickleover        |
| ...                               | ...      | ...               | ...    | ...         | 21.93                 | ...       | ...                  | ...      | 34.73                  | Macclesfield      |
| — .17                             | 95       | .87               | 14     | 12          | 19.61                 | 17.90     | —1.71                | 91       | 32.70                  | Southport         |
| — .61                             | 89       | 1.42              | 15     | 13          | 37.59                 | 39.66     | +2.07                | 106      | 61.49                  | Arneliffe         |
| — .76                             | 73       | .39               | 13     | 13          | 17.34                 | 17.81     | + .47                | 103      | 27.29                  | Goldsborough Hall |
| — .29                             | 90       | .52               | 20     | 16          | 16.52                 | 19.01     | +2.49                | 115      | 26.42                  | Hull              |
| + .01                             | 100      | .61               | 27     | 17          | 17.65                 | 19.73     | +2.08                | 112      | 27.94                  | Newcastle         |
| —4.46                             | 61       | 1.50              | 31     | 14          | 76.76                 | 79.78     | +3.02                | 104      | 129.48                 | Seathwaite        |
| —1.39                             | 69       | .91               | 25     | 16          | 25.02                 | 28.92     | +3.90                | 116      | 42.28                  | Cardiff           |
| —1.64                             | 61       | .50               | 23, 24 | 10          | 27.05                 | 22.31     | —4.74                | 83       | 46.81                  | Haverfordwest     |
| —2.67                             | 42       | .34               | 13     | 15          | 27.03                 | 26.91     | — .12                | 100      | 45.46                  | Gogerdan          |
| —1.15                             | 64       | .98               | 15     | 10          | 18.05                 | 18.90     | + .85                | 105      | 30.36                  | Llandudno         |
| — .20                             | 95       | 1.58              | 25     | 16          | 26.49                 | 31.69     | +5.20                | 120      | 43.47                  | Cargen            |
| + .71                             | 120      | .75               | 25     | 14          | 21.22                 | 28.79     | +7.57                | 136      | 33.76                  | Marchmont         |
| —1.07                             | 76       | 1.25              | 26     | 14          | 29.37                 | 32.60     | +3.23                | 111      | 49.77                  | Girvan            |
| + .24                             | 107      | 1.61              | 25     | 13          | 22.04                 | 29.01     | +6.97                | 132      | 35.97                  | Glasgow           |
| —1.37                             | 69       | .64               | 25     | 18          | 28.29                 | 32.37     | +4.08                | 115      | 48.79                  | Eallabus          |
| —1.09                             | 78       | .88               | 25     | 20          | 32.67                 | 29.16     | —3.51                | 89       | 56.57                  | Quinish           |
| —3.26                             | 48       | 1.25              | 24     | 7           | 43.97                 | 48.38     | +4.41                | 110      | 73.77                  | Stronvar          |
| + .60                             | 118      | 2.14              | 25     | 13          | 18.20                 | 26.82     | +8.62                | 148      | 28.64                  | Dundee            |
| + .09                             | 103      | .86               | 25     | 12          | 21.43                 | 29.61     | +8.18                | 138      | 34.93                  | Braemar           |
| + .59                             | 119      | 2.22              | 25     | 14          | 20.09                 | 22.49     | +2.40                | 112      | 32.73                  | Aberdeen          |
| — .59                             | 82       | .77               | 25     | 14          | 18.81                 | 26.02     | +7.21                | 138      | 30.34                  | Gordon Castle     |
| —1.18                             | 62       | .57               | 25     | 16          | 22.53                 | 34.33     | +11.80               | 152      | 36.13                  | Drumnadrochit     |
| —1.92                             | 69       | .98               | 13     | 16          | 44.86                 | 46.49     | +1.63                | 104      | 75.80                  | Fort William      |
| —3.39                             | 49       | .52               | 31     | 14          | 49.51                 | 53.27     | +3.76                | 108      | 83.93                  | Bendamp           |
| + .32                             | 112      | 1.19              | 29     | 13          | 19.90                 | 24.29     | +4.39                | 121      | 31.90                  | Dunrobin Castle   |
| +3.88                             | 185      | 2.14              | 23     | 18          | 32.97                 | 37.46     | +4.49                | 114      | 54.81                  | Killarney         |
| —2.18                             | 42       | .43               | 24     | 10          | 24.26                 | 20.95     | —3.31                | 87       | 39.57                  | Waterford         |
| —1.00                             | 75       | .85               | 24     | 16          | 24.57                 | 25.30     | + .73                | 103      | 39.43                  | Castle Lough      |
| —1.88                             | 62       | .86               | 22     | 15          | 28.25                 | 28.12     | — .13                | 100      | 46.52                  | Ennistymon        |
| —1.17                             | 65       | .57               | 24     | 14          | 21.63                 | 20.81     | — .82                | 96       | 34.99                  | Courtown Ho.      |
| — .80                             | 80       | .63               | 27     | 16          | 22.77                 | 24.89     | +2.12                | 109      | 35.92                  | Abbey Leix        |
| — .20                             | 94       | .60               | 27     | 16          | 17.83                 | 22.02     | +4.19                | 124      | 27.68                  | Dublin            |
| —1.10                             | 72       | .50               | 16, 23 | 14          | 23.17                 | 28.68     | +5.51                | 124      | 36.15                  | Mullingar         |
| + .02                             | 100      | .85               | 14     | 21          | 31.32                 | 35.44     | +4.12                | 113      | 52.87                  | Enniscoe          |
| —1.28                             | 73       | .97               | 22     | 17          | 29.83                 | 29.77     | — .06                | 100      | 48.90                  | Cong              |
| + .40                             | 109      | 1.48              | 14     | 20          | 26.49                 | 31.90     | +5.41                | 120      | 42.71                  | Markree           |
| — .60                             | 84       | 1.45              | 15     | 15          | 24.38                 | 25.52     | +1.14                | 105      | 38.91                  | Seaforde          |
| —1.30                             | 69       | .53               | 13     | 21          | 25.71                 | 28.60     | +2.89                | 111      | 40.84                  | Ballymena         |
| — .97                             | 77       | .48               | 12     | 15          | 24.66                 | 26.93     | +2.27                | 109      | 39.38                  | Omagh             |



## SUPPLEMENTARY RAINFALL, AUGUST, 1916.

| Div.  | STATION.                     | Rain<br>inches. | Div.   | STATION.                      | Rain<br>inches. |
|-------|------------------------------|-----------------|--------|-------------------------------|-----------------|
| II.   | Warlingham, Redvers Road ..  | 3.39            | XI.    | Lligwy .....                  | 1.91            |
| „     | Ramsgate .....               | 2.54            | „      | Douglas, Isle of Man .....    | 3.69            |
| „     | Hailsham .....               | 1.45            | XII.   | Stoneykirk, Ardwell House...  | 2.61            |
| „     | Totland Bay, Aston House...  | 2.18            | „      | Carsphairn, Shiel .....       | 4.16            |
| „     | Stockbridge, Ashley .....    | 3.82            | „      | Beattock, Kinnelhead .....    | 5.00            |
| „     | Grayshott .....              | 3.81            | „      | Langholm, Drove Road .....    | 4.24            |
| III.  | Harrow Weald, Hill House...  | 5.59            | XIII.  | Selkirk, The Hangingshaw..    | 4.00            |
| „     | Pitsford, Sedgebrook.. ..    | 3.08            | „      | North Berwick Reservoir....   | 3.62            |
| „     | Woburn, Milton Bryant.....   | 2.76            | „      | Edinburgh, Royal Observatry.  | 4.05            |
| „     | Chatteris, The Priory.....   | 2.60            | XIV.   | Maybole, Knockdon Farm ...    | 3.73            |
| IV.   | Elsenham, Gaunts End .....   | 3.70            | XV.    | Buchlyvie, The Manse.....     | 3.66            |
| „     | Shoeburyness .....           | 2.00            | „      | Ballachulish House .....      | 5.37            |
| „     | Colchester, Hill Ho., Lexden | 4.28            | „      | Oban.....                     | 4.68            |
| „     | Ipswich, Rookwood, Copdock   | 6.50            | „      | Campbeltown, Witchburn ..     | 3.25            |
| „     | Aylsham, Rippon Hall .....   | 3.16            | „      | Holy Loch, Ardnadam .....     | 5.80            |
| „     | Swaffham .....               | 2.19            | „      | Tiree, Cornaigmore .....      | ...             |
| V.    | Bishops Cannings .....       | 5.53            | XVI.   | Dollar Academy .....          | 3.01            |
| „     | Wimborne, St. John's Hill... | 4.37            | „      | Glenlyon, Meggernie Castle..  | 3.06            |
| „     | Ashburton, Druid House.. ..  | 5.80            | „      | Blair Atholl .....            | 3.00            |
| „     | Cullompton .....             | 5.68            | „      | Coupar Angus .....            | 3.58            |
| „     | Lynmouth, Rock House .....   | 3.73            | „      | Montrose, Sunnyside Asylum.   | 3.64            |
| „     | Okehampton, Oaklands.. ..    | 5.09            | XVII.  | Alford, Lynturk Manse .....   | 3.51            |
| „     | Hartland Abbey.....          | 2.10            | „      | Fyvie Castle .....            | 2.99            |
| „     | Probus, Lamellyn.....        | ...             | „      | Keith Station .....           | 2.43            |
| „     | North Cadbury Rectory.....   | 6.13            | XVIII. | Rothiemurchus .....           | 3.56            |
| VI.   | Clifton, Stoke Bishop .....  | 4.80            | „      | Loch Quoich, Loan .....       | 5.85            |
| „     | Ledbury, Underdown .....     | 3.92            | „      | Skye, Dunvegan .....          | 2.39            |
| „     | Shifnal, Hatton Grange.....  | 2.43            | „      | Lochmaddy, Bayhead .....      | 2.18            |
| „     | Droitwich .....              | 2.46            | „      | Fortrose .....                | 2.48            |
| „     | Blockley, Upton Wold.....    | 4.02            | „      | Glencarron Lodge .....        | 2.87            |
| VII.  | Grantham, Saltersford.....   | 3.32            | XIX.   | Altnaharra .....              | 1.83            |
| „     | Market Rasen .....           | 3.21            | „      | Melvich .....                 | 1.45            |
| „     | Bawtry, Hesley Hall .....    | 1.61            | „      | Loch More, Achfary .....      | 3.50            |
| „     | Derby, Midland Railway.....  | 2.65            | XX.    | Dunmanway, The Rectory ..     | 6.64            |
| „     | Buxton .....                 | 3.03            | „      | Glanmire, Lota Lodge.....     | 3.37            |
| VIII. | Nantwich, Dorfold Hall ..... | 3.50            | „      | Mitchelstown Castle.....      | 3.54            |
| „     | Chatburn, Middlewood .....   | 3.75            | „      | Darrynane Abbey.....          | 4.42            |
| „     | Lancaster, Strathspey .....  | 4.22            | „      | Clonmel, Bruce Villa .....    | 1.90            |
| IX.   | Langsett Moor, Up. Midhope   | 1.89            | „      | Broadford, Hurdlestown.....   | 3.31            |
| „     | Scarborough, Scalby .....    | 3.81            | XXI.   | Enniscorthy, Ballyhyland...   | 2.42            |
| „     | Ingleby Greenhow .....       | 2.41            | „      | Rothnen, Clonmannon .....     | 1.93            |
| „     | Mickleton .....              | 2.50            | „      | Ballycumber, Moorock Lodge    | 4.63            |
| X.    | Bellingham, High Green Manor | 4.39            | „      | Balbriggan, Ardgillan .....   | 1.89            |
| „     | Ilderton, Lilburn Cottage .. | 4.00            | „      | Castle Forbes Gardens.....    | 3.91            |
| „     | Thirlmere, The Bank .....    | 3.39            | XXII.  | Ballynahinch Castle.....      | 4.58            |
| XI.   | Llanfrechfa Grange .....     | 3.61            | „      | Woodlawn .....                | 3.50            |
| „     | Treherbert, Tyn-y-waun ..... | 6.08            | „      | Westport, St. Helens ...      | 2.81            |
| „     | Carmarthen, The Friary ..... | 5.68            | „      | Dugort, Slievemore Hotel ...  | 3.08            |
| „     | Fishguard, Goodwick Station. | 1.89            | XXIII. | Enniskillen, Portora .....    | ...             |
| „     | Crickhowell, Tal-y-maes..... | 3.50            | „      | Dartrey [Cootehill] .....     | 4.61            |
| „     | New Radnor, Ednol .....      | 2.60            | „      | Warrenpoint, Manor House ..   | 3.24            |
| „     | Birmingham WW., Tyrmynydd    | 4.53            | „      | Belfast, Cave Hill Road ..... | 2.12            |
| „     | Lake Vyrnwy .....            | 3.44            | „      | Glenarm Castle .....          | 1.91            |
| „     | Llangynhafal, Plâs Drâw..... | 1.56            | „      | Londonderry, Creggan Res...   | 2.53            |
| „     | Dolgelly, Bryntirion.....    | 4.77            | „      | Dunfanaghy, Horn Head ...     | 3.35            |
| „     | Bettws-y-Coed, Tyn-y-bryn... | 2.93            | „      | Killybegs .....               | 4.90            |



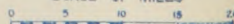
# THAMES VALLEY RAINFALL — AUGUST 1916.



ALTITUDE  
SCALE

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

SCALE OF MILES



## THE WEATHER OF AUGUST.

THE characteristics of the weather of August were a mean temperature in excess of the average, a normal amount of sunshine and a rainfall on the whole under the average but showing sharp local variations. The fine sunny dry weather which characterised the second half of July continued until about the 12th when a wide spread drought of three weeks duration terminated. Thereafter although the temperature continued above the normal, sunshine was deficient and the weather generally rainy and unsettled, with heavy rainstorms in the east of Scotland on the 25th and over the south-west of England on the 29th. During the first ten days of the month the United Kingdom was under the influence of an anticyclone which on some occasions embraced the whole country. On the 11th a low-pressure system appeared off the coast of Ireland, and during the remainder of the month cyclonic conditions prevailed except for a short time round about the 20th when a high-pressure area lay over the southern districts.

Mean temperature was  $2^{\circ}$  above the average, the excess ranging from  $3^{\circ}\cdot5$  in the south of Ireland and  $3^{\circ}$  in the west of Scotland to about a degree in the east and north of Scotland where the last ten days of the month were distinctly cool. The highest temperatures in England were recorded on the 1st when  $87^{\circ}$  was recorded at Shrewsbury and  $85^{\circ}$  at Camden Square. On the 5th high temperatures were general, the shade maximum rising to  $84^{\circ}$  at Cullompton and Killarney, and to  $82^{\circ}$  at York and Crieff. After the 13th when a reading of  $82^{\circ}$  was noted at Tottenham the thermometer failed to exceed  $75^{\circ}$  in any part of the country. The lowest temperatures were recorded at the close of the month when West Linton in Scotland had a shade minimum of  $33^{\circ}$  and Wick  $37^{\circ}$ .

Rainfall in the Thames Valley was extremely irregular and ranged from two and a half inches in the county of North Bucks and Bedford and over the Thames estuary, to seven inches at Basingstoke and Goff's Oak. Some of these remarkable figures are referred to in our correspondence. The amounts of rainfall varied from 13·5 in. near Killarney and over 10 in. in Snowdonia to about an inch over a small area to the north of the Cromarty Firth. For the fourth month in succession a narrow coastal strip extending from Folkestone to the Isle of Wight had in general less than two inches. Speaking broadly, the rainfall was in general under the average on the coasts, the only marked exception being in South Devon, where the heavy rainfall of the 29th caused an excess. Over the country as a whole, the general rainfall expressed as a percentage of the average was England and Wales 99 per cent. ; Scotland, 82 per cent. ; Ireland, 86 per cent. ; British Isles 90 per cent. Sunshine agreed closely with the normal in all districts, the pronounced excess during the first ten days being balanced by the general deficiency noted during the last three weeks. More than six hours a day on the average was recorded over the south of England and less than four hours in the north of Scotland. The amounts at individual stations were as follows :—Weymouth, 217 hours ; Totland Bay, 212 hours ; Haversford-west, 198 hours ; Southport, 195 hours ; Sidmouth, 191 hours ; Copdock, 170 hours ; Paisley, 159 hours ; Loch More, 155 hours ; Camden Square, 146 hours ; Perth, 145 hours ; Swinton House (Berwickshire), 143 hours ; Bolton, 102 hours.

In London (Camden Square) the mean temperature was  $63^{\circ}\cdot9$  or  $1^{\circ}\cdot6$  above the average. Duration of rain 41·0 hours, Evaporation 2·34 in.

## Climatological Table for the British Empire, March, 1916.

| STATIONS.<br><br>(Those in <i>italics</i> 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. |          |      |               |           |                 |                   |            |       |        |
|                                                                         | 56°       | 19    | 27°      | 9     | 46°      | 34°  | 36°           | 88        | 95°             | 21°               | inches     |       |        |
| London, Camden Square                                                   | 56°       | 19    | 27°      | 9     | 46°      | 34°  | 36°           | 88        | 95°             | 21°               | 4·67       | 22    | 8·5    |
| Malta ... ..                                                            | 67·5      | 14    | 50·8     | 3     | 63·5     | 55·0 | ...           | 81        | 134°            | ...               | ·60        | 1     | 1·8    |
| Lagos ... ..                                                            | 92·2      | 1, 2  | 71·2     | 15    | 89·7     | 78·0 | 75·5          | 75        | 154°            | 69·5              | 3·73       | 7     | 6·9    |
| Cape Town ...                                                           | 90·4      | 29    | 43·6     | 24    | 76·5     | 58·0 | 55·0          | 68        | ...             | ...               | ·52        | 4     | 3·7    |
| Johannesburg ...                                                        | 82·2      | 1     | 42·8     | 25    | 72·4     | 54·6 | 52·6          | 79        | ...             | 43·5              | 4·87       | 13    | 5·2    |
| Mauritius ...                                                           | 87·6      | 1     | 65·3     | 6     | 84·9     | 71·3 | 70·7          | 80        | ...             | 60·1              | 7·06       | 16    | 4·5    |
| Bloemfontein .                                                          | 92·5      | 1     | 47·3     | 24    | 80·3     | 55·5 | 51·8          | 60        | ...             | ...               | 2·47       | 9     | 4·1    |
| Calcutta... ..                                                          | 102·9     | 17*   | 58·2     | 2     | 95·8     | 70·1 | 64·0          | 58        | ...             | 46·0              | ·00        | 0     | 1·6    |
| Bombay... ..                                                            | 94·1      | 2     | 69·3     | 1     | 87·7     | 74·9 | 71·2          | 73        | 137·7           | 51·1              | ·00        | 0     | 1·3    |
| Madras ... ..                                                           | 96·1      | 30    | 65·9     | 8†    | 90·0     | 70·7 | 70·7          | 76        | 159·6           | 62·4              | ·00        | 0     | 0·9    |
| Colombo, Ceylon                                                         | 90·1      | 23    | 68·5     | 1     | 88·4     | 73·6 | 72·3          | 79        | 160·5           | 62·8              | 4·47       | 16    | 4·9    |
| Hongkong ... ..                                                         | 79·1      | 31    | 48·0     | 1     | 63·4     | 57·3 | 54·1          | 79        | ...             | ...               | ·55        | 9     | 9·5    |
| Sydney ... ..                                                           | 88·5      | 4     | 54·9     | 30    | 74·9     | 62·4 | 59·2          | 72        | 144·9           | 46·9              | 2·46       | 12    | 5·1    |
| Melbourne ...                                                           | 91·2      | 21    | 46·9     | 6, 29 | 73·3     | 52·6 | 50·0          | 62        | 142·0           | 36·1              | 1·07       | 4     | 3·6    |
| Adelaide ... ..                                                         | 100·7     | 25    | 50·5     | 28    | 81·1     | 57·0 | 49·6          | 47        | 150·3           | 39·0              | ·48        | 1     | 3·0    |
| Perth ... ..                                                            | 94·4      | 27    | 50·0     | 31    | 79·6     | 59·9 | 55·8          | 65        | 153·6           | 41·2              | ·33        | 6     | 2·4    |
| Coolgardie ...                                                          | 100·6     | 2     | 51·0     | 27    | 87·6     | 60·7 | 51·4          | 42        | 161·4           | 48·0              | ·54        | 5     | 2·7    |
| Hobart, Tasmania                                                        | 76·9      | 31    | 43·1     | 6     | 67·6     | 52·0 | 47·7          | 63        | 140·7           | 33·5              | ·39        | 8     | 6·3    |
| Wellington ...                                                          | 80·4      | 15    | 47·8     | 26    | 72·5     | 59·4 | 57·4          | 74        | 119·0           | 37·4              | 1·42       | 7     | 7·0    |
| Auckland ... ..                                                         | ...       | ...   | ...      | ...   | ...      | ...  | ...           | ...       | ...             | ...               | ...        | ...   | ...    |
| Jamaica, Kingston                                                       | 88·7      | 24    | 65·4     | 4     | 86·1     | 68·3 | 65·3          | 70        | ...             | ...               | ·79        | 2     | ...    |
| Grenada ... ..                                                          | 89·0      | 27    | 69·0     | 5     | 84·0     | 72·0 | ...           | 72        | 136·0           | ...               | 2·74       | 14    | 2·0    |
| Toronto ... ..                                                          | 57·4      | 29    | —2·4     | 18    | 33·0     | 17·7 | 18·3          | 79        | ...             | ...               | ...        | ...   | ...    |
| Fredericton ...                                                         | 60·3      | 30    | —17·0    | 22    | 31·1     | 9·9  | 13·8          | 75        | ...             | ...               | 2·05       | 10    | 4·9    |
| St. John, N.B.                                                          | 52·8      | 30    | 2·5      | 21    | 30·9     | 15·4 | 18·4          | 70        | 125·6           | 0·2               | 2·29       | 10    | 5·1    |
| Alberta, Edmonton                                                       | ...       | ...   | ...      | ...   | ...      | ...  | ...           | ...       | ...             | ...               | ...        | ...   | ...    |
| Victoria, B.C. ...                                                      | 58·3      | 10    | 30·8     | 5     | 47·3     | 37·8 | 37·7          | 82        | 120·0           | 24·3              | 5·37       | 19    | 7·7    |

\* and 18. † 9 and 10.

*Johannesburg*.—Bright sunshine, 224·7 hours.*Mauritius*.—Mean temp. normal, dew point 0°·2 below, and R 2·31 in. below, averages.

COLOMBO, CEYLON.—Mean temp. 81°·0, or 0°·6 below, dew point 0°·5 below, and R ·65 in. below, averages. Mean hourly velocity of wind 4·3 miles. T and L on eight days.

HONGKONG.—Mean temp. 60°·2, mean hourly velocity of wind 17·4 miles. Bright sunshine 49·5 hours.

*Melbourne*.—Mean temp. 1°·6 below, and R 1·12 in. below, averages.*Adelaide*.—Mean temp. 0°·7 below, and R ·57 in. below, averages.*Coolgardie*.—Temp. 2°·6 above, and R slightly above, averages.*Hobart*.—Temp. 0°·4 above, and R 1·27 in. below, averages.*Wellington*.—Mean temp. 5°·5 above, and R 1·92 in. below, averages. Bright sunshine 186·5 hours. T and L on 3 days, fog on the 9th.

# Symons's Meteorological Magazine.

No. 609.

OCTOBER, 1916.

VOL. LI.

## THE CLIMATE OF SAMOA.

MR. D. C. BATES, Director of the Meteorological Office, Wellington, New Zealand, sends us the following summary of the mean meteorological conditions of Apia, in Samoa, extracted from the first annual report of the medical officer of the Military Forces in possession of Samoa and based upon "several years'" observations, presumably official figures, recorded for the German Government. Samoa it will be remembered was the first of the German colonies captured immediately after the outbreak of the war, and was taken by troops sent from New Zealand. Features of the climate are the almost uniform temperature throughout the year, the mean of February, the warmest month, being only 2°·1 F. higher than of June, the coldest month, and the sharp division of the year into six "dry" months with less than 8 inches of rain each, and six wet months with more than 11½ inches. The total rainfall for the year comes out at 124·4 in.

In the annual report, 1916, the medical officer states, "The meteorological returns for the year show a long period of dry weather followed by a heavy rainfall," and gives the monthly means for previous years as follows:—

|               | Temperature<br>F. | Rainfall<br>inches | Humidity<br>per cent. | Sunshine<br>hours per month |
|---------------|-------------------|--------------------|-----------------------|-----------------------------|
| January ...   | 79·0              | 19·20              | 85                    | 156                         |
| February ...  | 79·3              | 18·80              | 85                    | 188                         |
| March ...     | 79·1              | 14·90              | 82                    | 145                         |
| April ...     | 79·0              | 11·80              | 86                    | 156                         |
| May ...       | 78·4              | 5·90               | 83                    | 197                         |
| June ...      | 77·2              | 5·70               | 82                    | 173                         |
| July ...      | 77·3              | 3·10               | 82                    | 140                         |
| August...     | 77·5              | 3·90               | 80                    | 144                         |
| September ... | 77·7              | 6·30               | 81                    | 176                         |
| October ...   | 78·8              | 7·70               | 82                    | 230                         |
| November ...  | 78·8              | 11·80              | 83                    | 170                         |
| December ...  | 79·3              | 15·30              | 83                    | 157                         |
| Total ...     |                   | 124·4              |                       |                             |



**Professor Henrik Mohn.**

Bergen, 15th May, 1835—Kristiania, 15th September, 1916.

THE rugged, kindly face of Professor Mohn was always one of the most welcome and unfailing land-marks of the international gatherings of meteorologists, oceanographers, and geographers, and many friends outside Norway, as well as in his native land, will mourn his loss. A good linguist, like most Scandinavians, he never felt or caused the awkwardness of a foreigner, and his British, French and German friends were thus enabled to appreciate the goodness of his great and simple character as readily as his own northern kinsfolk.

When the Norwegian Meteorological Institute was founded in 1866 Mohn was appointed the first Director, and he filled this post for forty-eight years, retiring in 1913. He was indefatigable in his efforts to improve the Norwegian meteorological service, and succeeded not only in bringing it into a high state of efficiency, but also in establishing a record amongst the government meteorological services of the world by full and prompt publication. His annual volumes on the Rainfall of Norway were, we believe, the only publications of the kind that were ready by the June or July of the year following that with which they dealt, and, so far as we are aware, the only annual records of the rainfall of a country to appear regularly at an earlier date than *British Rainfall*.

Mohn wrote many memoirs on the climate of Norway, and, in conjunction with Professor Hildebrandsson, he published, in 1891, an important paper on Storms in the Scandinavian peninsula. As was natural in a maritime country like Norway his attention was early directed to oceanography and the conditions of the polar regions. He took a large share in working up the results of the fine Norwegian Sea Expedition of 1876-78, the earliest results of the stimulus given by H.M.S. *Challenger*, and discussed the meteorological observations made by Dr. Nansen on his first crossing of Greenland in 1888, and those of the great trans-polar drift of the *Fram* in 1893-96. His last work was a discussion of the meteorology of the Antarctic regions as shown in the results of Captain Amundsen's expedition to the South Pole in 1912.

Of a more general character was his well-known "Principles of Meteorology" (1887), which was translated into French, Russian, Polish, Spanish and Italian, but, characteristically enough, not into English. Dr. Mohn was Professor of Meteorology in the University of Kristiania. He received an honorary degree from the Swedish University of Upsala in 1877, and, amongst many other foreign honours, he was elected an honorary member of the Royal Meteorological Society in 1874.

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**Edward Mawley.**

1842—Berkhamsted, 15th September, 1916.

THE death, after a very short illness, of Mr. Edward Mawley, terminates a life of quiet usefulness in horticulture and meteorology, and removes a man who was the friend of all who knew him. For nearly half a century he was an enthusiast in gardening, and retiring early from his profession as an architect he practically devoted his whole life to the absorbing interests of the growth and improvement of flowers. Roses and dahlias were his chief delight, and he took a leading part in the development of the National Rose Society, of which he was an original member. He became Secretary of that Society when its membership was only a few hundred, and when, after 37 years, he became President, the members numbered more than 6,000. Mr. Mawley was no narrow-minded devotee of the sport of rose-growing. He treated the subject in a scientific manner and pursued many investigations, which, starting from the flower-garden, led him far into several branches of science where his work had enduring value. Of these one was the study of phenology—the dates of the various annual life stages of plants, and the migrations of animals—and Fellows of the Royal Meteorological Society will long remember the annual reports he read on this subject from 1889 to 1910.

Mr. Mawley was elected a Fellow of the Royal Meteorological Society in 1876, and served continuously on the Council from 1881 to 1908. He was President in 1896-98, when he gave two addresses of great value. The first was on Shade Temperature, giving the results of a lengthy series of experiments with different patterns of thermometer screen, which resulted in the adoption of the Royal Meteorological Society's modification of the Stevenson screen. The second was on Weather Influence on Farm and Garden Crops, and may be said to have intertwined the two main branches of his life-work. After retiring from the presidency he acted as Secretary at the meetings of the Society from 1898 to 1901, and throughout the whole time his influence was always exercised in extending the usefulness of the Society and increasing its dignity.

Mr. Mawley commenced his meteorological observations at Richmond, Surrey, in 1870, and in 1873 he went to Addiscombe, near Croydon, where his meteorological observations were greatly extended. In 1883, he moved to Berkhamsted, where he soon created one of the finest private meteorological stations in the country. Besides the ordinary instruments of a second order station he had a series of self-recording instruments for wind, rain, sunshine, pressure and temperature, and, in addition to these, he had a pair of percolation gauges. He supplied full monthly abstracts of his observations to the press and to various scientific societies and publications. For more than forty years he was a friend and supporter of the British Rainfall Organization, and lost no opportunity of promoting rainfall observing amongst his innumerable horticultural friends.



## DIRECTIONS FOR SNOWFALL STUDY TO BEGIN IN NOVEMBER 1916.

BY L. C. W. BONACINA.

IN pursuance of the suggestions embodied in my articles in this Magazine for April, 1916, and February, 1915, I draw up a few rules for such Rainfall Observers as are willing in their periodical returns to the British Rainfall Organization to furnish data respecting the occurrence and depth of snow in the irrespective localities. Those who are willing to contribute thus to the study of British snowfall should be ready to commence recording on November 1st, which, as previously pointed out, is the best date—in as much as few Novembers pass without heavy local snowfalls, especially in the uplands. It is clear that January 1st does not commence a new meteorological year, whilst to begin the study on December 1st would also be illogical, since the latter part of November is, from the general climatic point of view one with December. I may conveniently give the directions under the headings of occurrence and depth of snow.

**Occurrence of Snow.**—The occurrence of snow, whether heavy or slight, should be entered to the date in every case, and, in the ordinary way, careful Observers of the weather are not likely to fail to notice a real snowfall, however light. But difficulty may sometimes arise in connection with the question of all that is to be included under the term snow, since this form of precipitation may approximate to rain on the one hand or to hail on the other. Wet flaky sleet, being a mixture of rain and snow, should, of course, be counted as an occurrence of snow, but it is not so easy to decide whether soft winter hail, commonly called graupel, should be regarded as snow. In the majority of instances graupel is suggestive of snowy types of weather, and I suggest that graupel should be entered as snow in every case when the maximum temperature of the day is below 40° F.

A further reason for including soft hail with snow is this : that frozen pellets are very variable in appearance, hardness, and texture, and sometimes appear to be nothing else than flakes of snow stuck together. Under this heading I wish to caution Observers against mistaking very fine snow for very fine rain. In cold weather it occasionally happens that precipitation has to be very carefully inspected in order to see whether it is composed of fine drops of water or of fine crystals.

**Depth of Snow.**—When Observers read their rain gauge, say at 9 a.m., they should record the depth of undrifted snow which has fallen during the preceding 24 hours. A little judgment and exercise of common sense should enable the Observer to choose some spot

for measuring the snow that will give a fair approximation to the general depth of undrifted snow in the locality. In order not to tax the Observer unduly at odd times of the day, the depth of snow, even if heavy, which has melted soon after falling, or which has not lasted till the regular observing hour, need not be entered. In such cases the snow need only be entered under the occurrence column.

### Correspondence.

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

#### THUNDERSTORM AT IPPLEPEN, S. DEVON.

THE Rev. R. D. Cook, B.A., Vicar of Ipplepen, has sent me a description of the recent thunderstorm, some notes on which may interest your readers. He says:—

"We had a very heavy thunderstorm here on the night of September 28th-29th. It lasted practically twelve hours, but there was little thunder until almost the end; then it was intense. At 5.50 a.m. (G.M.T.) on the 29th, the brick work of the chimney-stack of two cottages—just across the road from the post office—was struck and demolished, the lightning going down the chimney into the kitchen and scattering its contents. The next door house (the cottages being in a terrace) was treated in the same way, the kitchen cupboard door being wrenched off, and the china, etc., smashed. The ridge of the roof between the two houses was torn off and the ridge tiles driven right and left—one piece being found at least 400 feet away, and another about 200 feet in the opposite direction, having been carried right over intervening houses. About half a mile distant three ancient fir trees were struck and scored from top to bottom. Denbury Manor ( $1\frac{1}{2}$  miles to the northward) was very badly damaged, a large hole being made in the roof of the nursery, and the room practically wrecked. A little nearer Newton Abbot, *i.e.*, at Ogdwell, a sheep was killed, and a large hole made in the ground. The rainfall at 9 a.m. (G.M.T.) on the 29th was .62 in.'

D. W. HORNER.

*October 1st, 1916.*

#### IRISH AND GREENWICH TIME.

In your magazine for September, page 123, there is a slip under the heading, "End of Summer Time." From October 1st Greenwich Mean Time will apply to Ireland as well as to Great Britain, in accordance with the "Irish Time Act, 1916."

JOHN W. MOORE, M.D.

*40, Fitzwilliam Square West, Dublin, Sept. 20th, 1916.*

## NOTES ON "BRITISH RAINFALL, 1915."

*Summer Time.* I see in the 1915 yearly volume, p. 9, that you fear Summer Time may cause inaccuracies in some reports. I think it has made mine a little *more accurate*, as I was rarely able to visit my rain gauge exactly at 9 o'clock Greenwich Time.

*Definition of a Rain Day.* I cordially agree with the proposal [p. 18] to make 1 mm. or .04 in., limit value. The difficulty of measuring very small rainfalls is shown by the wild discrepancies in the number of rain-days at neighbouring stations. Moreover, the rainfalls below 1 mm. have no practical importance, at least not in a district of mines, moors, and wet, like this; perhaps Essex strawberry-growers may regard them differently. This is a goitre district and I drink rain-water to avoid goitre, so the condition of my rain-barrel is of practical interest to me, and I know that showers of less than 1 mm. bring nothing into the barrel, the moss-patched flag roof absorbs them.

*Millimeters.* As an ardent matriculist I am, of course, extremely pleased to see that I am no longer the only unofficial person sending you records in mm. I see at least one other in my own county, and three or four elsewhere. I lately received a Japanese paper in which the rain was given in millimeters. As there seems no chance that the world's records can ever become mutually intelligible in any other way, I hope the other British Observers will gradually come round.

*Ore-veins and Rainfalls.* Your remarks, on p. 75, to the effect that the Dalcross downpour, the Norwich downpour, etc., occurred where the track of a cyclone made a sharp angle, suggest a curious analogy with mining. Metallic veins are always richest where crossed by another vein. Perhaps light on the origin of rain may throw light on the origin of ore, or *vice versa*, though I cannot yet form any distinct theory.

C. HARPUR.

*Nenthead, Alston, Cumberland, 6th October, 1916.*

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 HEAVY RAINS IN SCOTLAND.

A rainstorm which is described in *The Times* of October 13th as being locally of unprecedented severity swept over the Lochaber district during the night of October 11th-12th. At Fort William 4.5 in. of rain fell in the 12 hours ending 9 a.m. on the 12th. Fort William was entirely isolated so far as railway communication was concerned owing to the numerous "wash-outs" that had taken place on the West Highland, the Mallarg and other railways. Glen Nevis was converted into a lake, and some houses were inundated.

## REMARKABLE COLD IN THE ARGENTINE.

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

It will be remembered that the month of June in the British Isles was of an exceptionally bleak character (see this magazine June and July, 1916, pp. 67 and 88). From records given in a new monthly bulletin issued by Mr. Rector, Director of the Cordoba branch of the Argentine Meteorological Office, it is seen that the cold of the past winter months was unprecedented in the middle latitudes of the Argentine Republic. We have been able to supplement the information given in the above bulletin from manuscript data in our possession dealing with the monthly temperature in Cordoba since 1873 when the record began. The mean temperature of June, 1916, in Cordoba was  $42^{\circ}\cdot6$  F., being  $7^{\circ}\cdot4$  below the normal and  $1^{\circ}\cdot2$  below that of June, 1875, which was previously the coldest month on record. The cold was unequally partitioned between day and night, the mean maxima being only  $3^{\circ}\cdot1$  below the normal, while the mean minima were as much as  $11^{\circ}\cdot0$  below the normal. Mr. Rector remarks : " On the average there are 8 days in June in which the temperature falls to  $32^{\circ}\cdot0$  F. or lower. The greatest number hitherto recorded in June was 17, in 1915, but this year there were 26. The frosts have been general in all the province being most pronounced in the vicinity of this capital and to the north-east." The lowest shade temperature in June, 1916, was  $16^{\circ}\cdot7$ , the previous record being  $17^{\circ}\cdot2$ . The remarkable cold continued throughout July, the mean temperature of which was  $45^{\circ}\cdot9$ , or  $5^{\circ}\cdot2$  below the average, and  $0^{\circ}\cdot2$  below the previous coldest (1885). A high barometer, clear skies, and light winds were associated with the great cold. On August 30th  $\cdot 12$  in. of rain fell, " the first precipitation registered since May 29th, or ninety-two consecutive days without rain. Only on three occasions since 1873 has there been a longer absolute drought." The combined cold and drought played great havoc with plants which endure uninjured any ordinary winters. Similar exceptional conditions were experienced in Buenos Aires, where there were " sixty-five consecutive nights in which the thermometer\* fell from  $2^{\circ}$  to  $9^{\circ}$  C. below the freezing point."

As was to be expected the remarkably cold winter and high pressure in the Argentine has been preceded, associated and followed by equally remarkable phenomena in other parts of the world. Thus early in May there were unusual floods in Cape Colony associated with much loss of life and live stock. At the close of that month an unprecedented cold snap occurred in Melbourne (see this Magazine, p. 101). June was remarkable for great cold in Britain and for heat in the eastern Mediterranean and Egypt. In

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\* I have reason to believe that this refers to an exposed thermometer.

R.C.M.

New Zealand the month was most unusual, the mean June temperature, taking Auckland, Wellington, Dunedin and Hokitika as representative of the country, being  $3^{\circ}5$  in excess of the normal. At Wellington and Dunedin all records for previous June months were broken back to the commencement of the series in 1867, and at Auckland, which has a longer record, June, 1916, was the mildest since 1861, and the wettest since 1889, while the small rainfall at Wellington was a record for the month. In Australia and Tasmania temperature conditions were not abnormal, except at Perth, W.A., where June was  $2^{\circ}7$  above the normal, and at Melbourne, where pressure was  $\cdot 20$  in. under the average. In South Africa the Cape Town temperature was under the June normal by  $2^{\circ}0$ , but at Johannesburg  $2^{\circ}7$  above the normal. To deal with other phenomena it may be noted that the July rainfall at Hobart, Tasmania, was the greatest since 1878, the last occasion in which the recent very high Nile Flood was exceeded. Finally we may note the practical failure of the north-east Trade Winds, for some months past, and the remarkable flood rains that set in over Victoria on the evening of September 21st, lasting several days, which, Mr. Hunt describes, "as the most widespread, heavy and continuous downfall that has ever occurred in Victoria."

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### REPORT ON ATMOSPHERIC POLLUTION.

THE first report of the committee of investigation on atmospheric pollution appointed at the International Exhibition and Conference, London, 1912, appears in full in the *Lancet* of February 26th, 1916, the period dealt with embracing the results obtained for the year ending March, 1915. The report extends to forty pages. The committee appointed by the conference of delegates with Sir Napier Shaw as Chairman has held several meetings, in the course of which it has drawn up specifications of a standard collector or "pollution gauge" and of an appropriate method of analysing the products.

The Committee met for the first time on June 21st, 1912, and since that time has held twelve meetings.

On the recommendation of a Sub-Committee, consisting of the Hon. Secretary, Mr. J. G. Clark, and Mr. Bailie Smith, it has approved the specification of a standard gauge for collecting the atmospheric impurity which falls on an exposed surface together with that which comes down with the rainfall. It has arranged for the manufacture of the gauge and has been successful in securing the co-operation of the authorities of nineteen cities and towns by whom gauges have been installed and provision made for the analysis of the collected products.

The Committee's interpretation of the term "pollution" relates to such matter solid, liquid, or gaseous, as reaches the surface of

the earth or falls upon the buildings, etc., either by its own gravity or with the assistance of falling rain.

The atmosphere, as we know it from everyday experience, contains suspended solid matter which cannot be regarded as a normal part of its constitution. Its significance from the physiological point of view is realised when we remember that an adult human being inhales about 400 cubic feet of air per day. No doubt a large proportion of this suspended matter is arrested in the filtering mechanism of the respiratory organs, but investigation has shown that suspended matter of a gritty nature will sometimes bring about bronchial inflammation.

Much of the solid pollution consists of combustible sooty matter, and those who have had occasion to handle shrubs, trees, and other plants in or near towns, are familiar with the sooty stains that are left on the hands. This constituent is the source of much trouble in towns, where it gives a distasteful murky appearance to works of art, delicate fabrics, buildings, etc. Mural paintings are frequently found seriously obscured by a deposit which has its origin in the pollution suspended in the air.

The large proportion of free carbon in the suspended matter clearly explains the dirtying effects that are too obvious in our towns and cities; but, in addition, there are sulphates present, the effect of which on building stones is notorious. The sulphur takes the form of calcium sulphate, ammonium sulphate, and a very minute quantity of free sulphur, the latter probably having its origin in the oxidation of sulphuretted hydrogen evolved from the imperfect combustion of raw coal.

Although the sulphur oxides and the ammonia are described here as forming *gaseous* pollution, they are usually found in the combined state as ammonium sulphate, which is normally a soluble solid. The sulphur, however, seems to lose none of its destructive effect on buildings by this union; in fact, experiments which have been made for the Committee indicate that the sulphur oxides in union with the ammonia are even more destructive than when they are free. This seems to arise partly from the fact that the basic substances of certain building stones have a natural tendency to displace ammonia from its salts and unite themselves with the acid component; and partly from the fact that the soluble solid ammonium sulphate, in the presence of moisture, has a much greater penetrating and continuous effect upon building stones than would be the case with the gaseous sulphur oxides.

Stones which are largely composed of carbonates of lime and magnesia suffer seriously in this way. A reaction takes place between the ammonium sulphate and the carbonates of lime and magnesia, the latter being converted into sulphates, with the formation of ammonium carbonate. The formation of those substances causes the stone to disintegrate, the process of destruction being hastened

by the action of rain. The vapours to which the attention of the Committee has been given were the tarry hydrocarbons. This tarry matter attaches itself to the carbon particles and gives them very great adhesive power, so that when they have deposited on and attached themselves to building stones, plants, etc., they cannot be readily washed away by rain, as would be the case if the tar were not there.

The gaseous pollutions kept in mind by the Committee were the sulphur oxides and ammonia. Coal contains on the average about 1 per cent. of its weight of sulphur (say, 20 to 30 lb. for each ton of coal). Under conditions of perfect combustion this sulphur would be evolved as either di-oxide or tri-oxide of sulphur, or both, but, as has been shown, if the combustion is not perfect, sulphuretted hydrogen appears—in fact, it is probably always safe to assume that when visible smoke is evolved from coal sulphuretted hydrogen accompanies it.

The Committee recognises that during recent years many thousands of smoke-producing coal fires have been supplanted by gas cooking and heating stoves, and, still more recently, the electric stove has been introduced. The products of combustion from a gas fire consist mainly of carbonic acid and water vapour, together with a minute quantity of sulphur oxides. As regards heating capacity, a coal fire consuming 21 lb. of coal per day would be about equal to a gas fire consuming 200 cubic feet of gas per day, but whereas the coal would evolve about 1,500 grains of sulphur in various forms, as well as the tar, carbon, etc., already alluded to, the gas would contribute only 50 to 60 grains of sulphur in the form of sulphur oxides.

The first duty of the Committee was to consider the method of investigation to be adopted.

The various methods available for the measurement of atmospheric pollution are referred to in detail, but, in the present instance, it will be sufficient to merely mention them.

1. A measured volume of air may be filtered through cotton or asbestos wool and the weight of the deposit ascertained.

2. All rain and deposit matter falling on a gauge vessel of known catchment area may be collected, the water evaporated or filtered, and the residue weighed and analysed.

3. *Aitken's Dust Counter*.—This is an ingenious instrument devised by Dr. John Aitken, F.R.S., and is intended for counting the number of dust particles in the air, but no attempt is made to ascertain their composition.

4. Glass plates may be exposed to the air for a known length of time, then washed in water and their opacity measured.

5. A jet of air of standard size and velocity may be caused to strike a glass plate or a white paper placed at a fixed distance from the nozzle, and the opacity of the plate or discolouration of the paper measured after a definite time.

6. A measured volume of air may be drawn through filter paper and the degree of discolouration produced on the paper compared with a calibrated scale. Or the air may be drawn through the paper until a predetermined degree of discolouration has been produced the volume required being measured.

7. An optical method might be used by which the opacity of a column of air of a given length to a standard light is measured. This might be arranged to give quantitative results by preparing a scale of opacity from measurements taken with air containing known amounts of suspended matter, but the results would probably not be of great accuracy.

8. The rain might be caught and its opacity, after a thorough shaking, compared with a standard scale made by adding definite proportions of soot to distilled water.

9. Boxes having a collecting surface of known area may be exposed for a definite time, their contents collected and analysed.

The results which are considered in the Report now under notice, are all obtained by the use of Method No. 2 above described. This may therefore be now considered in greater detail. The standard form of deposit gauge was the subject of very careful consideration by the Committee; provision had to be made to prevent contamination by bird-droppings and by matter from the gauge itself, also to prevent the access of dead leaves and other large wind-blown particles. It was necessary at the same time to obtain a fair and representative sample of the matter deposited in the neighbourhood. Great care had to be exercised that the gauges were not set up in such positions as to give fallacious results.

The question of the treatment of the water and solid impurities caught by the gauge was gone into most carefully. A Sub-Committee of skilled chemists was appointed to draft a standard method of analysis; this was printed and sent to each co-operating authority, and the analyses were carried out in most cases by the public analyst. The results were sent to the Committee monthly on a special form of report.

The choice of "metric tons per square kilometre" as the unit for final comparison of figures was made by the Committee after careful consideration; it was influenced partly by the hope that the results would be of international as well as local interest.

The standard gauge, consists of a galvanised iron stand, supporting a circular enamelled iron gauge vessel of 4 square feet superficial area. Projecting above the gauge vessel is a wire screen open at the top, intended to prevent birds from settling on the edge of the vessel. The gauge vessel is conical at the bottom and communicates, by means of a glass tube and rubber connection, with a group of three or more bottles connected together; designed to hold one month's rainfall. The rain and deposited matter falling on the gauge are collected in the bottles, and removed once a month for analysis.

*(To be continued.)*



## RAINFALL TABLE FOR SEPTEMBER, 1916.

| STATION.                        | COUNTY.              | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|---------------------------------|----------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                 |                      |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1916.<br>in. |
| Camden Square.....              | London.....          | 51 32      | 0 8                  | 111                            | 2'00                           | 1'48         |
| Tenterden.....                  | Kent.....            | 51 4       | *0 41                | 190                            | 2'25                           | 2'89         |
| Arundel (Patching).....         | Sussex.....          | 50 51      | 0 27                 | 130                            | 2'58                           | 2'12         |
| Fordingbridge (Oaklands)...     | Hampshire.....       | 50 56      | 1 38                 | 135                            | 2'39                           | 2'81         |
| Oxford (Magdalen College)...    | Oxfordshire.....     | 51 45      | 1 15                 | 186                            | 1'98                           | 73           |
| Wellingborough (Swanspool)...   | Northampton.....     | 52 18      | 0 41                 | 155                            | 2'13                           | 53           |
| Bury St. Edmunds (Westley)...   | Suffolk.....         | 52 15      | *0 40                | 226                            | 2'18                           | 2'11         |
| Geldeston [Beccles].....        | Norfolk.....         | 52 27      | *1 31                | 38                             | 2'13                           | 1'50         |
| Polapit Tamar [Launceston]...   | Devon.....           | 50 40      | 4 22                 | 315                            | 3'11                           | 2'55         |
| Rousdon [Lyme Regis].....       | ".....               | 50 41      | 3 0                  | 516                            | 2'69                           | 2'23         |
| Stroud (Field Place).....       | Gloucestershire..... | 51 44      | 2 13                 | 226                            | 2'39                           | 1'06         |
| Church Stretton (Woistaston)... | Shropshire.....      | 52 35      | 2 48                 | 800                            | 2'40                           | 1'18         |
| Boston.....                     | Lincolnshire.....    | 52 58      | 0 1                  | 11                             | 2'07                           | 1'29         |
| Worksop (Hodsock Priory)...     | Nottinghamshire..... | 53 22      | 1 5                  | 56                             | 1'84                           | 1'33         |
| Mickleover Manor.....           | Derbyshire.....      | 52 54      | 1 32                 | 280                            | 2'11                           | 94           |
| Macclesfield.....               | Cheshire.....        | 53 15      | 2 7                  | 501                            | 2'92                           | ...          |
| Southport (Hesketh Park)...     | Lancashire.....      | 53 39      | 2 59                 | 38                             | 3'09                           | 2'56         |
| Arnelife Vicarage.....          | Yorkshire, W.R.....  | 54 8       | 2 6                  | 732                            | 4'55                           | 4'16         |
| Goldsborough Hall.....          | ".....               | 54 0       | 1 25                 | 119                            | 2'17                           | 1'99         |
| Hull (Pearson Park).....        | E.R.....             | 53 45      | 0 20                 | 6                              | 2'05                           | 1'23         |
| Newcastle (Town Moor)...        | Northumberland.....  | 54 59      | 1 38                 | 201                            | 2'00                           | 1'43         |
| Borrowdale (Seathwaite)...      | Cumberland.....      | 54 30      | 3 10                 | 423                            | 1'28                           | 7'86         |
| Cardiff (Ely).....              | Glamorgan.....       | 51 29      | 3 13                 | 53                             | 3'61                           | 3'16         |
| Haverfordwest.....              | Pembroke.....        | 51 48      | 4 58                 | 90                             | 3'91                           | 2'80         |
| Aberystwyth (Gogerddan)...      | Cardigan.....        | 52 26      | 4 1                  | 83                             | 3'89                           | 3'98         |
| Llandudno.....                  | Carnarvon.....       | 53 20      | 3 50                 | 72                             | 2'50                           | 2'78         |
| Cargen [Dumfries].....          | Kirkcudbright.....   | 55 2       | 3 37                 | 80                             | 3'34                           | 3'83         |
| Marchmont House.....            | Berwick.....         | 55 44      | 2 24                 | 498                            | 2'67                           | 2'70         |
| Girvan (Pinmore).....           | Ayr.....             | 55 10      | 4 49                 | 207                            | 4'30                           | 1'92         |
| Glasgow (Queen's Park)...       | Renfrew.....         | 55 53      | 4 18                 | 144                            | 2'99                           | 79           |
| Islay (Eallabus).....           | Argyll.....          | 55 47      | 6 15                 | 68                             | 4'49                           | 3'02         |
| Mull (Quinish).....             | ".....               | 56 34      | 6 13                 | 35                             | 5'20                           | 3'25         |
| Balquhiddy (Stronvar).....      | Perth.....           | 56 21      | 4 23                 | 422                            | 5'81                           | 1'31         |
| Dundee (Eastern Necropolis)...  | Forfar.....          | 56 28      | 2 57                 | 199                            | 2'34                           | 1'70         |
| Braemar.....                    | Aberdeen.....        | 57 0       | 3 24                 | 1114                           | 2'73                           | 1'76         |
| Aberdeen (Cranford).....        | ".....               | 57 8       | 2 7                  | 120                            | 2'69                           | 1'79         |
| Gordon Castle.....              | Moray.....           | 57 37      | 3 5                  | 107                            | 2'58                           | 1'10         |
| Drumnadrochit.....              | E. Inverness.....    | 57 20      | 4 29                 | 138                            | 2'94                           | 1'33         |
| Fort William.....               | ".....               | 56 49      | 5 6                  | 171                            | 6'66                           | 2'53         |
| Loch Torridon (Bendamph)...     | W. Ross.....         | 57 32      | 5 32                 | 20                             | 7'28                           | 5'17         |
| Dunrobin Castle.....            | Sutherland.....      | 57 59      | 3 56                 | 14                             | 2'51                           | 1'51         |
| Killarney (District Asylum)...  | Kerry.....           | 52 4       | 9 31                 | 178                            | 3'79                           | 2'41         |
| Waterford (Brook Lodge)...      | Waterford.....       | 52 15      | 7 7                  | 104                            | 3'19                           | 1'68         |
| Nenagh (Castle Lough).....      | Tipperary.....       | 52 54      | 8 24                 | 120                            | 3'16                           | 1'63         |
| Ennistymon House.....           | Clare.....           | 52 57      | 9 18                 | 37                             | 4'22                           | 3'69         |
| Gorey (Courtown House).....     | Wexford.....         | 52 40      | 6 13                 | 80                             | 2'78                           | 2'67         |
| Abbey Leix (Blandsfort).....    | Queen's County.....  | 52 56      | 7 17                 | 532                            | 2'93                           | 1'80         |
| Dublin (Fitz William Square)... | Dublin.....          | 53 21      | 6 14                 | 54                             | 2'06                           | 2'14         |
| Mullingar (Belvedere).....      | Westmeath.....       | 53 29      | 7 22                 | 307                            | 3'02                           | 1'90         |
| Crossmolina (Enniscoe).....     | Mayo.....            | 54 4       | 9 16                 | 74                             | 4'42                           | 2'83         |
| Cong (The Glebe).....           | ".....               | 53 33      | 9 16                 | 112                            | 4'05                           | 2'79         |
| Collooney (Markree Obsy.)...    | Sligo.....           | 54 11      | 8 27                 | 127                            | 3'65                           | 2'55         |
| Seaforde.....                   | Down.....            | 54 19      | 5 50                 | 180                            | 3'25                           | 1'13         |
| Ballymena (Harryville).....     | Antrim.....          | 54 52      | 6 13                 | 150                            | 3'43                           | 1'62         |
| Omagh (Edenfel).....            | Tyrone.....          | 54 36      | 7 18                 | 280                            | 3'39                           | 1'24         |

RAINFALL TABLE FOR SEPTEMBER, 1916—*continued.*

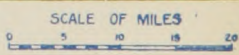
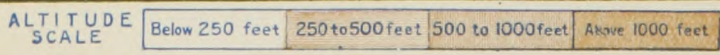
| RAINFALL OF MONTH (con.) |          |                   |             |                  | RAINFALL FROM JAN. 1. |                      |          |     | Mean Annual 1875-1909. | STATION           |
|--------------------------|----------|-------------------|-------------|------------------|-----------------------|----------------------|----------|-----|------------------------|-------------------|
| Diff. from Av. in.       | % of Av. | Max. in 24 hours. | No. of Days | Aver. 1875-1909. | 1916.                 | Diff. from Aver. in. | % of Av. | in. |                        |                   |
| — .52                    | 74       | .28               | 17          | 13               | 17.92                 | 23.54                | +5.62    | 131 | 25.11                  | Camden Square     |
| —1.36                    | 40       | .34               | 17          | 10               | 18.32                 | 19.71                | +1.39    | 107 | 27.64                  | Tenterden         |
| — .46                    | 82       | .36               | 26          | 13               | 20.02                 | 21.84                | +1.82    | 109 | 30.48                  | Patching          |
| + .42                    | 109      | .83               | 1           | 10               | 20.33                 | 24.94                | +4.61    | 122 | 31.06                  | Fordingbridge     |
| —1.25                    | 37       | .32               | 17          | 13               | 17.45                 | 20.50                | +3.05    | 117 | 24.58                  | Oxford            |
| —1.60                    | 25       | .19               | 17          | 7                | 18.25                 | 18.65                | + .40    | 102 | 25.20                  | Swanspool         |
| — .07                    | 97       | .54               | 4           | 14               | 18.14                 | 23.96                | +5.82    | 132 | 25.40                  | Westley           |
| — .63                    | 70       | .44               | 19          | 16               | 16.33                 | ...                  | ...      | ... | 23.73                  | Geldeston         |
| — .56                    | 82       | .55               | 28          | 15               | 24.90                 | 24.25                | — .65    | 97  | 38.27                  | Polapit Tamar     |
| — .46                    | 83       | .56               | 26          | 11               | 22.54                 | 22.19                | — .35    | 98  | 33.54                  | Rousdon           |
| —1.33                    | 44       | .24               | 28          | 10               | 21.12                 | 22.82                | +1.70    | 108 | 29.81                  | Stroud            |
| —1.22                    | 49       | .35               | 17          | 8                | 22.71                 | 21.81                | — .90    | 96  | 32.41                  | Wolstaston        |
| — .78                    | 62       | .56               | 3           | 14               | 16.67                 | 20.85                | +4.18    | 125 | 23.35                  | Boston            |
| — .51                    | 72       | .35               | 3           | 11               | 17.54                 | 17.42                | — .12    | 99  | 24.46                  | Hodsock Priory    |
| —1.17                    | 45       | .42               | 3           | 11               | 19.25                 | 21.78                | +2.53    | 113 | 26.65                  | Mickleover        |
| ...                      | ...      | ...               | ...         | ...              | 24.85                 | ...                  | ...      | ... | 34.73                  | Macclesfield      |
| — .53                    | 83       | .77               | 17          | 12               | 22.70                 | 20.46                | —2.24    | 90  | 32.70                  | Southport         |
| — .39                    | 91       | 2.32              | 3           | 8                | 42.14                 | 43.82                | +1.68    | 104 | 61.49                  | Arnccliffe        |
| — .18                    | 92       | 1.15              | 3           | 11               | 19.51                 | 19.80                | + .29    | 101 | 27.29                  | Goldsborough Hall |
| — .82                    | 61       | .50               | 3           | 11               | 18.57                 | 20.24                | +1.67    | 109 | 26.42                  | Hull              |
| — .57                    | 72       | 1.01              | 3           | 8                | 19.65                 | 21.16                | +1.51    | 108 | 27.94                  | Newcastle         |
| —3.42                    | 69       | 3.97              | 17          | 9                | 88.04                 | 87.64                | — .40    | 96  | 129.48                 | Seathwaite        |
| — .45                    | 88       | 1.28              | 26          | 12               | 28.63                 | 32.08                | +3.45    | 112 | 42.28                  | Cardiff           |
| —1.11                    | 71       | .76               | 17          | 12               | 30.96                 | 25.11                | —5.85    | 81  | 46.81                  | Haverfordwest     |
| + .09                    | 102      | 1.71              | 17          | 11               | 30.92                 | 30.89                | — .03    | 100 | 45.46                  | Gogerddan         |
| + .28                    | 111      | .82               | 2           | 12               | 20.55                 | 21.68                | +1.13    | 115 | 30.36                  | Llandudno         |
| + .49                    | 114      | 1.01              | 3           | 12               | 29.83                 | 35.52                | +5.69    | 119 | 43.47                  | Cargen            |
| + .03                    | 101      | 1.14              | 3           | 15               | 23.89                 | 31.49                | +7.60    | 132 | 33.76                  | Marchmont         |
| —2.38                    | 45       | .59               | 18          | 17               | 33.67                 | 34.52                | + .85    | 103 | 49.77                  | Girvan            |
| —2.20                    | 26       | .26               | 17          | 14               | 25.03                 | 29.80                | +4.77    | 119 | 35.97                  | Glasgow           |
| —1.47                    | 67       | .81               | 17          | 20               | 32.78                 | 35.39                | +2.61    | 108 | 48.79                  | Eallabus          |
| —1.95                    | 63       | .81               | 16          | 15               | 37.87                 | 32.41                | —5.46    | 84  | 56.57                  | Quinish           |
| —4.50                    | 23       | 1.00              | 17          | 3                | 49.78                 | 49.69                | — .09    | 100 | 73.77                  | Stronvar          |
| — .64                    | 76       | .87               | 3           | 10               | 20.54                 | 28.52                | +7.98    | 139 | 28.64                  | Dundee            |
| — .97                    | 64       | 1.14              | 18          | 9                | 24.16                 | 31.37                | +7.21    | 130 | 34.93                  | Braemar           |
| — .90                    | 66       | .56               | 3           | 11               | 22.78                 | 24.28                | +1.50    | 107 | 32.73                  | Aberdeen          |
| —1.48                    | 43       | .32               | 18          | 13               | 21.39                 | 27.12                | +5.73    | 127 | 30.34                  | Gordon Castle     |
| —1.61                    | 45       | .46               | 18          | 11               | 25.47                 | 35.66                | +10.19   | 140 | 36.13                  | Drumnadrochit     |
| —4.13                    | 38       | .88               | 17          | 15               | 51.52                 | 49.02                | —2.50    | 95  | 75.80                  | Fort William      |
| —2.11                    | 71       | 1.53              | 18          | 15               | 56.79                 | 58.44                | +1.65    | 103 | 83.93                  | Bendamp           |
| —1.00                    | 60       | .80               | 18          | 11               | 22.41                 | 25.80                | +3.39    | 115 | 31.90                  | Dunrobin Castle   |
| —1.38                    | 63       | .47               | 25          | 20               | 36.76                 | 39.87                | +3.11    | 109 | 54.81                  | Killarney         |
| —1.51                    | 52       | .39               | 26          | 10               | 27.45                 | 22.63                | —4.82    | 82  | 39.57                  | Waterford         |
| —1.53                    | 51       | .45               | 17          | 10               | 27.73                 | 26.93                | — .80    | 97  | 39.43                  | Castle Lough      |
| — .53                    | 87       | .85               | 17          | 18               | 32.47                 | 31.81                | — .66    | 98  | 46.52                  | Ennistymon        |
| — .11                    | 98       | 1.14              | 27          | 8                | 24.41                 | 23.48                | — .93    | 96  | 34.99                  | Courtown Ho.      |
| —1.13                    | 63       | .94               | 27          | 12               | 25.70                 | 24.69                | + .99    | 104 | 35.92                  | Abbey Leix        |
| + .08                    | 104      | .58               | 2           | 14               | 19.89                 | 24.16                | +4.27    | 121 | 27.68                  | Dublin            |
| —1.12                    | 63       | .75               | 17          | 6                | 26.19                 | 30.58                | +4.39    | 117 | 36.15                  | Mullingar.        |
| —1.59                    | 54       | .79               | 27          | 20               | 35.74                 | 38.27                | +2.53    | 107 | 52.87                  | Ennisceoe         |
| —1.26                    | 69       | 1.59              | 27          | 15               | 33.88                 | 32.56                | —1.32    | 96  | 48.90                  | Cong              |
| —1.10                    | 70       | .54               | 17          | 20               | 30.14                 | 34.45                | +4.31    | 114 | 42.71                  | Markree           |
| —2.12                    | 35       | .46               | 17          | 11               | 27.63                 | 26.65                | — .98    | 98  | 38.91                  | Seaforde          |
| —1.81                    | 47       | .42               | 16          | 10               | 29.14                 | 30.22                | +1.08    | 103 | 40.84                  | Ballymena         |
| —2.15                    | 36       | .60               | 17          | 14               | 28.05                 | 28.17                | + .12    | 100 | 39.38                  | Omagh             |

## SUPPLEMENTARY RAINFALL, SEPTEMBER, 1916.

| Div.  | STATION.                        | Rain<br>inches. | Div.   | STATION.                       | Rain<br>inches. |
|-------|---------------------------------|-----------------|--------|--------------------------------|-----------------|
| II.   | Warlingham, Redvers Road ..     | 1·61            | XI.    | Lligwy .....                   | 2·56            |
| „     | Ramsgate .....                  | 1·29            | „      | Douglas, Isle of Man .....     | 2·47            |
| „     | Hailsham .....                  | 1·57            | XII.   | Stoneykirk, Ardwell House ..   | 1·76            |
| „     | Totland Bay, Aston House ..     | 1·94            | „      | Carsphairn, Shiel .....        | 3·08            |
| „     | Stockbridge, Ashley .....       | 2·09            | „      | Beattock, Kinnelhead .....     | 3·52            |
| „     | Grayshott .....                 | 2·74            | „      | Langholm, Drove Road .....     | 2·55            |
| III.  | Harrow Weald, Hill House ..     | 1·49            | XIII.  | Selkirk, The Hangingshaw ..    | 2·19            |
| „     | Pitsford, Sedgebrook .....      | ·86             | „      | North Berwick Reservoir .....  | 1·02            |
| „     | Woburn, Milton Bryant .....     | ·85             | „      | Edinburgh, Royal Observat'y.   | 1·47            |
| „     | Chatteris, The Priory .....     | 1·72            | XIV.   | Maybole, Knockdon Farm ..      | 1·40            |
| IV.   | Elsenhams, Gaunts End .....     | 1·42            | XV.    | Buchlyvie, The Manse .....     | 1·10            |
| „     | Shoeburyness .....              | ·82             | „      | Ballachulish House .....       | 2·27            |
| „     | Colchester, Hill Ho., Lexden .. | 1·05            | „      | Oban .....                     | 2·30            |
| „     | Ipswich, Rookwood, Copdock ..   | 1·16            | „      | Campbeltown, Witchburn ..      | 2·25            |
| „     | Aylsham, Rippon Hall .....      | 1·64            | „      | Holy Loch, Ardnadam .....      | 3·01            |
| „     | Swaffham .....                  | 1·21            | „      | Tiree, Cornaigmore .....       | ...             |
| V.    | Bishops Cannings .....          | 1·41            | XVI.   | Dollar Academy .....           | 1·83            |
| „     | Wimborne, St. John's Hill ..    | 2·81            | „      | Glenlyon, Meggernie Castle ..  | 1·35            |
| „     | Ashburton, Druid House .....    | 3·27            | „      | Blair Atholl .....             | 1·23            |
| „     | Cullompton .....                | 2·97            | „      | Coupar Angus .....             | 1·37            |
| „     | Lynmouth, Rock House .....      | 2·35            | „      | Montrose, Sunnyside Asylum.    | 1·08            |
| „     | Okehampton, Oaklands .....      | 2·83            | XVII.  | Alford, Lynturk Manse .....    | 1·30            |
| „     | Hartland Abbey .....            | 2·64            | „      | Fyvie Castle .....             | 1·52            |
| „     | St. Austell, Trevarna .....     | 2·38            | „      | Keith Station .....            | 1·81            |
| VI.   | North Cadbury Rectory .....     | 3·66            | XVIII. | Rothiemurchus .....            | 1·24            |
| „     | Clifton, Stoke Bishop .....     | 1·61            | „      | Loch Quoich, Loan .....        | 10·10           |
| „     | Ledbury, Underdown .....        | ·97             | „      | Skye, Dunvegan .....           | 3·59            |
| „     | Shifnal, Hatton Grange .....    | 1·22            | „      | Lochmaddy, Bayhead .....       | 2·30            |
| „     | Droitwich .....                 | 1·14            | „      | Fortrose .....                 | ·99             |
| VII.  | Blockley, Upton Wold .....      | 1·98            | „      | Glencarron Lodge .....         | 3·94            |
| „     | Grantham, Saltersford .....     | 1·35            | XIX.   | Altnaharra .....               | 2·37            |
| „     | Market Rasen .....              | 1·37            | „      | Melvich .....                  | 1·79            |
| „     | Bawtry, Hesley Hall .....       | 2·07            | „      | Loch More, Achfary .....       | 5·05            |
| „     | Derby, Midland Railway .....    | ·92             | XX.    | Dunmanway, The Rectory ..      | 1·35            |
| VIII. | Buxton .....                    | 2·92            | „      | Glanmire, Lota Lodge .....     | 1·07            |
| „     | Nantwich, Dorfold Hall .....    | 2·25            | „      | Mitchelstown Castle .....      | 2·36            |
| „     | Chatburn, Middlewood .....      | 2·83            | „      | Darrynane Abbey .....          | 1·88            |
| IX.   | Lancaster, Strathspey .....     | 2·88            | „      | Clonmel, Bruce Villa .....     | 2·47            |
| „     | Langsett Moor, Up. Midhope ..   | 1·64            | „      | Broadford, Hurdlestown .....   | 2·39            |
| „     | Scarborough, Scalby .....       | 1·51            | XXI.   | Enniscorthy, Ballyhyland ..    | 2·58            |
| „     | Ingleby Greenhow .....          | 1·88            | „      | Rothnen, Clonmannon .....      | 2·30            |
| X.    | Mickleton .....                 | 2·30            | „      | Ballycumber, Moorock Lodge ..  | 1·79            |
| „     | Bellingham, High Green Manor .. | 2·16            | „      | Balbriggan, Ardgillan .....    | 1·83            |
| „     | Ilderton, Lilburn Cottage ..... | 1·52            | „      | Castle Forbes Gardens .....    | 2·01            |
| XI.   | Thirlmere, The Bank .....       | 2·65            | XXII.  | Ballynahinch Castle .....      | 4·00            |
| „     | Llanfrechfa Grange .....        | 1·53            | „      | Woodlawn .....                 | 2·92            |
| „     | Treherbert, Tyn-y-waun .....    | 4·94            | „      | Westport, St. Helens .....     | 3·49            |
| „     | Carmarthen, The Friary .....    | 3·04            | „      | Dugort, Slievemore Hotel ..... | 4·11            |
| „     | Fishguard, Goodwick Station ..  | 2·33            | XXIII. | Enniskillen, Portora .....     | 1·26            |
| „     | Crickhowell, Tal-y-maes .....   | 3·50            | „      | Dartrey [Cootehill] .....      | 1·65            |
| „     | New Radnor, Ednol .....         | 1·45            | „      | Warrenpoint, Manor House ..    | 1·05            |
| „     | Birmingham WW., Tyrmynydd ..    | 3·46            | „      | Belfast, Cave Hill Road .....  | 1·35            |
| „     | Lake Vyrnwy .....               | 4·21            | „      | Glenarm Castle .....           | 1·49            |
| „     | Llangynhafal, Plás Drâw .....   | 4·04            | „      | Londonderry, Creggan Res. ...  | 2·26            |
| „     | Dolgelly, Bryntirion .....      | 7·16            | „      | Dunfanaghy, Horn Head .....    | 2·20            |
| „     | Bettws-y-Coed, Tyn-y-bryn ..... | 3·83            | „      | Killybegs .....                | 4·10            |



# THAMES VALLEY RAINFALL — SEPTEMBER, 1916.





## WEATHER OF SEPTEMBER.

THE characteristic features of the weather of September were a deficiency of sunshine and of rainfall with a relatively small number of rainy days.

The mean temperature of the month, taking the country as a whole, was in close agreement with the normal. In the north and east temperature was slightly below the average, but in the south and west the average was exceeded, the excess being most pronounced in Ireland, where it was less than 2°.

The month opened with a low pressure system to the north-west accompanied by strong southerly winds and rain in the west. On the 3rd a well mark cyclonic area lay over the Irish Sea, which, moving eastward, caused heavy rain to the north of its centre as much as 2.32 in. at Arncliffe on the 3rd. On the morning of the 7th temperature fell to 35° at Balmoral, the winds in Scotland being light from the east or calm. The approach of an anti-cyclone from the west on the 6th was accompanied by warmer weather, and on the 7th temperature rose to 77° at Killarney, and 75° at Bettws-y-Coed on the 8th. From the 14th to the 16th rather fresh northerly and north-westerly winds, associated with the advance of a high-pressure area from the Atlantic, caused cold weather throughout the whole country. Temperature in shade fell to 32° at West Linton on the 16th, and minima below 40° were widely recorded. From the 14th to the 25th maxima of 70° or above were uncommon, and on the 21st frost in shade was experienced as far south as Marlborough, with readings as low as 28° at West Linton and 29° at Balmoral. The rainfall of the month was in general under the average, although the areas with less than half the average were in no district of wide extent. In Northampton the precipitation fell to about a quarter of the average at some places. More than the average fell in one or two widely separated regions, but even in Wales and the south of Scotland, where an excess was fairly common, the departure from the average was unimportant. The actual amount in Great Britain varied from more than ten inches in the normally rainy areas in South Wales, the Lake District, and at Inverness, to less than an inch over the Thames Estuary, South Kent, the south Midlands and the estuary of the Forth. A narrow fringe on the eastern coastal areas extending from Wick to Dover, had in general, less than 1.5 in. In Ireland the only region with more than 4 in. was a small area in Connemara, where the maximum was 7.5 ins. The least rainfall under 1 inch was to the south of Lough Neagh and to the east and south-east of Belfast.

In the Thames Valley the maximum fall—slightly more than 2.5 ins.—occurred on the Hampshire heights. More than 2 ins. fell on the Cotswolds, and less than an inch in the Thames Estuary. Over the country as a whole the general rainfall expressed as a percentage of the average was:—England and Wales, 77 per cent.; Scotland, 58 per cent.; Ireland, 64 per cent. British Isles, 66 per cent, the driest month of the present year.

Sunshine was deficient everywhere and in no part of the month was there any prolonged spell of fine sunny weather. The actual amounts recorded varied from five hours a day in the Channel Islands and four hours in the north-east, and south-east England to about two and a half hours in the north of Scotland. The general deficiency over the country as a whole was about one hour a day, the amount varying from a third of an hour in the east of Scotland to an hour and a half in the south of Ireland. The amounts at individual stations were as follows:—Worthing, 156 hours, Weymouth, 141 hours, Swinton, (Berwick) 121 hours, Southport, 118 hours, Haverfordwest, 114 hours, Paisley, 113 hours, Copdock, 108 hours, Camden Square, 95 hours, Bolton, 86 hours, Hull, 83 hours, Loch More, 67 hours. In London (Camden Square) the mean temperature was 56°·7 or 1°·0 below the average. Duration of rain 28·0 hours, Evaporation 1·24 in.

## Climatological Table for the British Empire, April, 1916.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |            |       |                 |
|                                                                  | °         |       | °        |       | °        | °    | °             | 0-100     | °               | °                 | inches     |       |                 |
| London, Camden Square                                            | 77·3      | 27    | 32·8     | 1     | 59·8     | 39·8 | 40·5          | 49        | 123·2           | 23·5              | 1·31       | 15    | 4·3             |
| Malta ... ..                                                     | 77·0      | 21    | 48·0     | 17    | 67·1     | 55·8 | ...           | 80        | 130·0           | ...               | 1·37       | 6     | 2·0             |
| Lagos ... ..                                                     | 91·2      | 5     | 72·2     | 11    | 88·8     | 76·5 | 74·4          | 73        | 156·2           | 69·5              | 5·46       | 11    | 7·4             |
| Cape Town ... ..                                                 | 94·1      | 3     | 47·9     | 28    | 74·2     | 56·1 | 54·5          | 72        | ...             | ...               | ·99        | 5     | 4·2             |
| Johannesburg ... ..                                              | 77·3      | 26    | 42·0     | 23    | 71·2     | 50·6 | 44·1          | 66        | ...             | 37·8              | ·43        | 4     | 3·2             |
| Mauritius ... ..                                                 | 85·7      | 6     | 62·6     | 22    | 82·3     | 69·1 | 69·3          | 82        | ...             | 56·1              | 5·57       | 17    | 5·3             |
| Bloemfontein ... ..                                              | 81·9      | 20    | 34·2     | 25    | 74·7     | 48·7 | 46·1          | 62        | ..              | ...               | 2·09       | 6     | 3·3             |
| Calcutta ... ..                                                  | 105·4     | 30    | 70·3     | 13    | 97·4     | 77·0 | 72·6          | 67        | ...             | 66·6              | 1·80       | 3     | 2·5             |
| Bombay ... ..                                                    | 92·6      | 6     | 75·6     | 1     | 89·9     | 77·9 | 73·7          | 72        | 133·6           | 57·7              | ·04        | 1     | 2·0             |
| Madras ... ..                                                    | 101·2     | 24    | 74·7     | 3     | 94·1     | 78·1 | 74·6          | 75        | 161·6           | 72·0              | ·02        | 1     | 2·2             |
| Colombo, Ceylon ... ..                                           | 91·0      | 10    | 69·8     | 16    | 89·0     | 75·9 | 74·8          | 82        | 158·8           | 68·0              | 11·17      | 22    | 6·5             |
| Hongkong ... ..                                                  | 85·8      | 30    | 56·8     | 5     | 75·3     | 67·1 | 66·0          | 83        | ...             | ...               | 4·30       | 8     | 7·4             |
| Sydney ... ..                                                    | ...       | ...   | ...      | ...   | ...      | ...  | ...           | ...       | ...             | ...               | ...        | ...   | ...             |
| Melbourne ... ..                                                 | 80·0      | 19    | 40·3     | 30    | 66·0     | 50·9 | 46·6          | 63        | 131·4           | 31·4              | 2·06       | 18    | 5·8             |
| Adelaide ... ..                                                  | 82·5      | 10    | 43·5     | 26    | 68·4     | 52·7 | 49·1          | 65        | 136·0           | 34·9              | 1·51       | 15    | 5·7             |
| Perth ... ..                                                     | 94·0      | 8     | 49·0     | 23    | 76·0     | 56·0 | 49·5          | 54        | 157·0           | 37·0              | ·43        | 4     | 3·9             |
| Coolgardie ... ..                                                | 86·4      | 8     | 39·6     | 26    | 75·3     | 50·0 | 42·0          | 42        | 144·0           | 33·0              | ·03        | 1     | 2·6             |
| Hobart, Tasmania ... ..                                          | 77·8      | 1     | 39·2     | 28    | 61·6     | 46·6 | 43·2          | 65        | 127·3           | 31·9              | 4·37       | 21    | 5·5             |
| Wellington ... ..                                                | 70·2      | 7     | 40·2     | 9     | 64·9     | 53·5 | 55·0          | 77        | 101·6           | 30·0              | 3·69       | 12    | 6·5             |
| Auckland ... ..                                                  | ...       | ...   | ...      | ...   | ...      | ...  | ...           | ...       | ...             | ...               | ...        | ...   | ...             |
| Jamaica, Kingston ... ..                                         | 90·3      | 10    | 68·1     | 9     | 86·7     | 71·2 | 69·2          | 74        | ...             | ...               | 2·99       | 12    | ...             |
| Grenada ... ..                                                   | 88·0      | 3     | 70·0     | 12    | 86·0     | 74·0 | ...           | 71        | 136·0           | ...               | 1·83       | 13    | 2·5             |
| Toronto ... ..                                                   | 68·6      | 30    | 25·3     | 7     | 51·9     | 36·9 | 35·5          | 76        | 123·0           | 26·0              | 3·24       | 18    | 5·6             |
| Fredericton ... ..                                               | 66·0      | 17    | 18·0     | 4     | 52·0     | 31·0 | 31·1          | 66        | ...             | ...               | 1·76       | 6     | 4·7             |
| St. John, N.B. ... ..                                            | 59·2      | 20    | 24·0     | 4     | 48·6     | 33·0 | 31·0          | 68        | 136·3           | 18·7              | 2·48       | 9     | 6·2             |
| Victoria, B.C. ... ..                                            | 62·7      | 2     | 37·2     | 22    | 54·4     | 37·2 | 41·0          | 77        | 129·2           | 29·0              | 1·12       | 15    | 6·1             |

*Johannesburg*.—Bright sunshine, 269·5 hours.

*Mauritius*.—Mean temp. 1°·1 dew point 0°·9, and R 1·11 in. above averages.

COLOMBO, CEYLON.—Mean temp. 82°·5, or 0°·2 below, dew point same as average and R 3·43 in. above averages. Mean hourly velocity of wind 4·5 miles. T and L on twelve days.

HONGKONG.—Mean temp. 70°·6, mean hourly velocity of wind 11·1 miles. Bright sunshine 145·0 hours.

*Melbourne*.—Mean temp 1°·2 below, and R ·24 in. below, averages.

*Adelaide*.—Mean temp. 3°·4 below, and R ·35 in. below, averages. a cool month mean max. lowest on record.

*Perth*.—Rainfall 1·20 in. below, average

*Coolgardie*.—Temp. 2°·8 below, and R normal.

*Hobart*.—Temp. 1°·0 below, and R slightly below, averages.

*Wellington*.—Mean temp. 2°·4 above, and R ·33 in. below, averages. Bright sunshine 160·2 hours. T L and H on 8th. Frost on 4 days and fog on 1 day.

# Symons's Meteorological Magazine.

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## Professor Cleveland Abbe.

New York, 3rd December, 1838—October, 1916.

WE learn with much regret of the death of the veteran American Meteorologist, Professor Cleveland Abbe, who was more widely acquainted with the meteorologists of the world than any of his contemporaries and a frequent visitor to this country. Professor Abbe was proud of his purely English ancestry, and among the many honours which he received we believe that none afforded him greater gratification than the Symons Medal of the Royal Meteorological Society, awarded him in 1912, which appealed to him in a special degree because of his life-long friendship with the late Mr. Symons. Abbe was educated at the Universities of Michigan (Ann Arbor), and Harvard. After four years in the U.S. Coast and Geodetic Survey he completed his special astronomical and meteorological training in Russia at the famous Paulkova Observatory, near Petrograd, in 1864-66. In 1868 he was appointed Director of Cincinnati Observatory and in the succeeding year organized the weather service of that institution, from which followed, in 1871, the U.S. Government Weather Bureau. When this Bureau was founded Abbe was appointed Professor of Meteorology, and it was in this capacity that he exercised an influence on the progress of meteorology greater than perhaps any other man of his time. He was meteorologist to the U.S. Scientific Expedition to the west coast of Africa, 1889-90. In 1891 he attended the International Meteorological Congress held in Munich, as U.S. delegate, and in a similar capacity was present at the Kelvin Jubilee in 1896. His contributions to astronomical and meteorological literature although forming but a small part of his activities, were very numerous. Among his more important works may be mentioned a series of papers in two volumes on the Mechanics of the Earth's Atmosphere published in 1891 and 1908, his Treatise on Meteorological Apparatus and Methods, issued in 1888, the article "Meteorology" in the last two editions of the Encyclopaedia Britannica, and a memoir on the Physical Basis of Long Range Forecasts. He also initiated the preparation (1881-95) of the General Bibliography of Meteorology,



and founded the Abbe Meteorological Library of the John Hopkin's University, Baltimore. He was associate editor of the American "Meteorological Journal," 1891-94, and of the "Beiträge zur Physik der freien Atmosphäre," 1905, but his greatest literary monument is the "Monthly Weather Review" of the U.S. Weather Bureau.

He founded this important journal in 1893, and edited it until June, 1909, when the "Review" was re-organized by other hands, and for a time lost the literary and scientific character which, under Professor Abbe's fostering care had raised it to the highest position amongst the meteorological journals of the world. It was not long, however, before the Review resorted to its old traditions and in 1914, despite the burden of 76 years, Professor Abbe resumed the responsibilities of editorship. There is a peculiar fitness in his last years being devoted to the maintenance of the great publication with which his name was linked during the brilliant period of the development of American meteorology.

Professor Abbe, for fully a quarter of a century, was professor of Meteorology in George Washington University, Washington, resigning this appointment in 1910.

The friendship between the editor of this Magazine and Professor Abbe began in Edinburgh, in 1884, and for more than 30 years it grew through correspondence and intercourse at International scientific gatherings in many lands, so that his death removes not only an honoured colleague, but a friend who never grudged help and counsel.

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## METEOROLOGY OF THE SOUTH ORKNEYS IN 1915.

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

THROUGH the courtesy of Mr. George O. Wiggin, Director of the Argentine Meteorological Office, we have been favoured with an abstract of the meteorological observations made at Laurie Island, South Orkneys, during 1915. As Sir Ernest Shackleton's Expedition was in the Weddell Sea to the south of the South Orkneys during the whole year, it is obvious that results of considerable value will emerge from the discussion of the two series of data. Meanwhile it is of interest to draw attention to some of the more prominent features of the year's work. The year 1915 was remarkably cold at the South Orkneys, the mean temperature ( $20^{\circ}\cdot6$ ) being the lowest on record during the thirteen years covered by the observations, and  $3^{\circ}\cdot4$ , below the average. August was unusually cold with a mean of  $-0^{\circ}\cdot4$  or  $16^{\circ}\cdot4$  below the average (a record), while the four months May to August were  $9^{\circ}$  colder than the average. Only in October and November were the monthly mean temperatures in excess of the average. Even in February, the

warmest month, the average temperature in 1915 was only  $31^{\circ}3$ . Although 1915 was so inclement at the South Orkneys the exceptional conditions did not extend into lower latitudes in the South Atlantic, as at both the Falkland Islands and Punta Arenas, in Magellan Strait, the mean annual temperatures were just the average. It is of interest to note that in May and August barometric pressure was higher in the South Orkneys than at the Falkland Islands, while this inversion of the normal conditions also took place between Punta Arenas and the South Orkneys in the months of May, July and August. In May barometric pressure was  $\cdot08$  in. above the normal at Laurie Island, but  $\cdot29$  in. below the normal at Punta Arenas, the departures in July and August being equally pronounced. It is of interest to compare the very abnormal conditions at the South Orkneys with those obtaining at other places in the Southern Hemisphere. Dealing with the temperature data given in the climatological table which appears monthly in this magazine, supplemented by other promptly published records, it was found that in 1915 the mean annual temperature was just the normal at Johannesburg, Auckland, Hobart and Adelaide. At Cape Town, Dunedin (New Zealand), Sydney and Perth (West Australia), the mean temperature was a degree in excess of the average, while at St. Helena (a Meteorological Office station) the year was a very warm one in marked contrast to the South Orkneys, the mean temperature being  $1^{\circ}7$  above the average, and July was the only month with a mean under the average. Speaking generally the year 1915 in the southern hemisphere had a relatively high temperature in middle latitudes, the only marked exception, judging from the data at our disposal, being at Hokitika, on the west coast of New Zealand where the temperature was  $1^{\circ}4$  under the normal.

Dealing with other climatic elements at the South Orkneys, cloud amount, rainfall, and relative humidity were all below the average, and sunshine and barometric pressure were above the average. The air was also unusually calm, the mean annual wind velocity being the lowest yet noted, January and each month from August to December establishing a record for low wind velocity. The annexed table gives, as far as our space permits, a translation from metric to the old familiar British units of some of the more important data at the South Orkneys last year along with the monthly departure from the average of pressure and temperature. The former is at  $32^{\circ}$  sea level and gravity.

With regard to other elements the mean relative humidity was 89, being 1 per cent. below the average. Bright sunshine amounted to 575 hours, with a maximum 79 hours in November and a minimum of 8 hours in June. The highest barometric pressure,  $30\cdot19$  in, occurred on May 26th, and again on June 3rd, and the lowest  $28\cdot12$  in., on July 22nd. The mean daily range of temperature varied from  $16^{\circ}9$  in July to  $4^{\circ}0$  in February.

*Laurie Island, South Orkneys, 1915.*

Lat. 60° 44' S. Long., 44° 39' W. Height, 20 ft.

|          | Barometric Pressure. |                            |       | Temperature in Shade. |               |              | Precipitation.<br>in. | Cloud<br>0-10. | Wind vel.<br>mi. per hr. |
|----------|----------------------|----------------------------|-------|-----------------------|---------------|--------------|-----------------------|----------------|--------------------------|
|          | Mean.<br>in.         | Diff. from<br>Aver.<br>in. | Mean. | Diff. from<br>Aver.   | High-<br>est. | Low-<br>est. |                       |                |                          |
| Jan ..   | 29.15                | —0.13                      | 30.9  | —1.1                  | 41.0          | 21.6         | .76                   | 9.8            | 5.5                      |
| Feb.     | .16                  | —0.08                      | 31.3  | —1.4                  | 39.0          | 23.4         | 1.02                  | 9.5            | 8.9                      |
| Mar. ..  | .38                  | +0.15                      | 30.9  | —0.2                  | 45.3          | 18.0         | 1.30                  | 8.6            | 13.0                     |
| April .. | .10                  | —0.15                      | 23.7  | —2.7                  | 38.1          | 2.3          | 1.57                  | 9.2            | 11.7                     |
| May ..   | .37                  | +0.08                      | 12.0  | —8.1                  | 32.9          | —21.6        | .99                   | 7.6            | 8.5                      |
| June ..  | .30                  | —0.10                      | 7.9   | —6.5                  | 32.0          | —25.4        | 1.56                  | 7.4            | 9.3                      |
| July ..  | .42                  | +0.05                      | 6.3   | —4.8                  | 32.4          | —20.6        | .80                   | 6.2            | 10.7                     |
| Aug. ..  | .45                  | +0.06                      | —0.4  | —16.4                 | 33.4          | —23.4        | .95                   | 6.5            | 7.1                      |
| Sept. .. | .47                  | +0.16                      | 20.8  | —0.3                  | 33.1          | —10.5        | 1.34                  | 8.9            | 8.0                      |
| Oct. ..  | .52                  | +0.23                      | 25.9  | +1.3                  | 38.7          | —4.0         | .60                   | 8.9            | 8.5                      |
| Nov. ..  | .27                  | +0.09                      | 28.6  | +0.8                  | 36.9          | 16.2         | .54                   | 8.6            | 6.7                      |
| Dec. ..  | .31                  | —0.06                      | 29.5  | —1.1                  | 37.0          | 19.9         | .44                   | 8.8            | 5.8                      |
| Year ..  | 29.33                | +0.3                       | 20.6  | —3.4                  | 45.3          | —25.4        | 11.87                 | 8.4            | 8.6                      |
| Average  | 29.30                | ..                         | 24.0  | ..                    | 46.4          | —28.8        | 17.52                 | 8.5            | 12.3                     |

## THE PERMANENT SNOW BEDS OF THE BEN NEVIS GROUP.

By REV. R. P. DANSEY.

IN March, 1905, an article by the present writer appeared in the *Meteorological Magazine* on this subject, and in May, 1906, one in the *Geographical Journal* by Mr. V. H. Gatty. As I had not been in Scotland for ten years, and then in June, I resolved to pay a visit to the snow beds in the second half of last September, when they might be expected to be at nearly their minimum. From Crianlarich Ben More and Ben Lui were ascended, but there was no trace of snow in any of their corries, though two large drifts could be seen on the Cairngorms, quite 60 miles distant, on their Western slopes; this was surprising, as the few permanent snow beds on these mountains are all on the N.E. side; possible they were not old beds but the result of a summer snowstorm; although so distant they were just discernible to the unaided eye. On Ben Nevis there were about a dozen patches of old snow on September 20th, none was large with the exception of the bed in the Observatory Gully described by the writer and Mr. Gatty ten years ago; this bed though long was narrow, but owing to bad weather it was the only one I was able actually to reach, and then in such a storm of wind, mist, hail and snow, that progression in the teeth of the gale was only possible by sheltering the face with the hands, so that a full inspection was hope-

less. Only the bottom end was reached, where the depth was about 4 feet, and a tunnel ran right through the bed where it crossed the main gully at right angles to the general line of its bed ; temperature was  $33^{\circ}$  ; fresh snow was lying, and there was no sign of thawing on or under the bed. No doubt the bed was very much deeper than this in the main gully to my left. On another day I secured a photograph of this bed from the top of the cliffs, some 800 feet above the bottom of the bed, which shows well its attenuated character. During my nearly three weeks' stay there were only two days when the heights above 4000 feet were *partially* clear for about an hour or so, this photograph was taken in one of these precious minutes.

Ten years ago I was struck with the enormous masses of snow under Aonach Mor and Aonach Beag in June. These mountains form a ridge running parallel to Ben Nevis, about 5 miles N.E. of it. Aonach Mor has a broad flat summit especially favourable to drifting, and it was my conviction then that Aonach Mor might harbour snow beds equal to or larger than any on Ben Nevis. In my first visit to ascertain this I was foiled by mist and rain, but not before two large snow beds appeared now and again through the clouds from the corrie below. A few days after, though the tops were still in cloud, I traversed the whole summit ridge of Aonach Mor to Aonach Beag and when just about to turn back from the top the clouds dispersed for an hour—the second clearance only during my stay at Fort William—and revealed three snow beds, two of which were certainly larger than any on Ben Nevis, with the possible exception of the bed previously described, which is larger but much narrower. One of these beds—the smallest and seemingly shallowest—was under the N.W. side of the N.E. ridge of Aonach Beag (4,060 feet) ; the other two were under the cliffs of Aonach Mor (4,000 feet). These two were rectangular in shape and in depth might have been anything between 8 and 20 feet, as a deep “*bergschrund*” was visible against the cliff at their upper end. Three photographs were secured looking down at them from about 500 feet above. I should say that these are both permanent snow beds, but that the Aonach Beag one may possibly sometimes disappear. Several other small patches of old snow were also in evidence. On the day of my visit there was a drift of new snow from 1—3 feet deep all along the cliff edge, though with the warmth of the first half of October, and the heavy rains in Scotland, this probably soon melted. It was extremely unfortunate that owing to the bad weather it was impossible in the time at my disposal to get to these beds, but I hope to have another and more successful visit to them next autumn.

[With reference to Mr. Dansey's suggestion that the snow he saw on the western side of the Cairngorms in September might have

been the result of a summer snowstorm, we are able to state that this was not the case. During the month of July large and persistent beds of snow on the western side of the Cairngorms were visible from the Spey Valley, and residents in the neighbourhood assured us that they had not been absent since the great snowstorms of March. Later information up to the middle of August satisfies us that the snow remained unmelted up to that time and was beginning to increase in area by early autumn falls.—ED., *S.M.M.*]

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## REPORT ON ATMOSPHERIC POLLUTION.

*(Continued from page 139).*

Elaborate instructions were given for analysis of rain water and solids deposited in the gauge.

Thirty-eight gauges were set up in various parts of the country, of which ten were in Manchester and six in the County of London.

The results obtained are set out in detail in a series of tables and the exact position of the gauges is shown in Ordnance maps of one inch to the mile.

The total solids are lowest at Malvern, with 2.05 tons per square kilometre per month, Bowdon has 5.69 tons, and Birmingham S.W. 6.04 tons. Twenty-two stations get between 5 and 15 tons per square kilometre per month and fourteen between 15 and 25 tons.

Sulphuric acid is generally in the same proportion as the total solids; the agreement is quite striking. The exceptions are Bolton, London (Victoria Park), Manchester (Whitefield), comparatively richer in acid, Newcastle-upon-Tyne, Oldham, Sheffield (Attercliffe), and Paisley comparatively poorer, but there is only the difference of one class in any case. Chlorine is rather more irregular; the classification agrees with that for sulphuric acid in twenty-eight cases. The chlorine is relatively conspicuous by its presence at the Meteorological Office, Sheffield (Attercliffe) and Meersbrook Park), Greenock, and Paisley, specially so at Sheffield (Attercliffe) and relatively in defect at Birmingham Central, London (Southwark Park, Victoria Park, and Golden Lane), Manchester (Ancoats), and Coatbridge.

*Ammonia.*—The results for ammonia are very similar to those for tar. The Liverpool result is much influenced by a very large figure for a single month.

The following summary shows the deposit per acre per month arranged in classes. Class A has less than 5 tons of solids per square kilometre per month; Class B from 5 to 15 tons; Class C from 15 to 25 tons and Class D from 25 or more tons.

*Deposit per Acre per Month.*

|                                                          | Tar.      | Carbonaceous other than tar. | Ash.    | Loss of ignition. | Ash.    | Total solids. | Sulphuric Acid. | Chlorine | Ammonia  |
|----------------------------------------------------------|-----------|------------------------------|---------|-------------------|---------|---------------|-----------------|----------|----------|
|                                                          | lb.       | lb.                          | lb.     | lb.               | lb.     | lb.           | lb.             | lb.      | lb.      |
| CLASS A<br>(The Malvern type)                            | 0.23      | 4.5                          | 9       | 3.4               | 6.8     | 23            | 4.5             | 1.4      | 0.23     |
| CLASS B<br>(The Ravenscourt Park or Cheadle type) ...    | 0.9       | 18                           | 36      | 13.5              | 27      | 90            | 18              | 5.4      | 0.9      |
| CLASS C<br>(The Liverpool or Embankment Gardens type)... | 1.8       | 36                           | 72      | 27                | 54      | 180           | 36              | 10.8     | 1.8      |
| CLASS D<br>(The Oldham type)                             | Over 2.25 | Over 45                      | Over 90 | Over 34           | Over 68 | Over 225      | Over 45         | Over 14  | Over 2.3 |

The average atmosphere may be expected to deposit upon a square kilometre in any one winter month 15 tons of solid matter, which may be regarded as made up of 0.15 ton of tarry matter, 8 tons of carbonaceous matter other than tar, 6 tons of insoluble inorganic dust, besides soluble salts, which include 3 tons of sulphuric acid, a ton of chlorine, and 0.3 ton of ammonia. Taking 250 acres to the square kilometre, 1 ton per square kilometre works out at rather less than a hundredweight to  $12\frac{1}{2}$  acres, or 9 lb. per acre. Hence, on the average, the atmospheres of the several classes represent deposit per acre in a month as shown in the table of deposit per acre given above.

By the use of the method indicated above we can gain an insight into the relation between the various elements of atmospheric pollution and the season of the year. It may be expected beforehand that there should be a relation, because the production of pollution by domestic fires is one of the most noteworthy characteristics of the colder seasons; the question which is put here, therefore, is for which of the elements the variation is most conspicuous. Another point is suggested by the fact that the closing months of 1914 were extremely rainy, and the exaggerated rainfall of December is certainly associated, as a rule, with large amounts of pollution collected. This is in itself surprising, because with frequent rainfall the roads and roofs are kept well washed. The only explanation seems to be that the December pollution came down locally with the rain instead of being dispersed over a wider area; but this conclusion can only apply to those gauges which are near sources of pollution, such as Embankment Gardens, to take a special instance. With a properly distributed series of gauges for the country as a whole we ought to find an improvement of the

atmosphere in country localities in consequence of the "washing" of the air in the neighbourhood of centres of production of pollution.

A seasonal variation with a maximum in winter and a minimum in summer is clearly disclosed in the summary for total solids.

Spring is the most productive of grit, summer and winter are equal in this respect, and autumn is least.

Carbonaceous matter other than tar (smuts and fragments of plants) shows no discrimination between the seasons: the slight preponderance of spring over summer may be regarded as fortuitous.

Ammonia is the only one which shows itself as a summer product.

The effect of the exceptionally wet month of December or July is a noticeable feature perhaps in tar, and certainly in the soluble compounds, loss on ignition, and soluble ash. It also appears quite clearly in total solid, and as it is not specially noteworthy in insoluble ash or smut the principal effect of the rain must be looked for in the dissolved constituents. The rain apparently takes out the dissolved constituents without much effect upon the insoluble ones. It may be that the effect which the rain would have in bringing down mineral dust is compensated by the absence of solid constituents of that nature in rainy weather, while the supply of dissolved or soluble constituents is undiminished.

The effect of the rainy month is clearly shown in the tables for sulphuric acid and chlorine, but less so with ammonia. How far the marked preponderance of the various products in winter is due to the fact that the particular winter under review was a rainy one is an open question.

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## Correspondence.

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

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### PECULIAR LIGHTNING.

DURING a sudden squall, about 2 a.m., on the 31st, after a normal distant lightning flash, a second followed in the west or north-west while I was at a south window. But instead of a flash this was more like a deluge of light, hardly varying in intensity during the three seconds or more that it lasted, lighting up a house some thirty yards distant with a curiously even glow. The following evening brought further distant lightning and another sharp squall about 10 o'clock. These seem to have been characteristic of the recent stormy weather, for besides the serious case at Chesterfield I have

heard of another doing much damage in the Dedham district in Essex.

My cousin, Joseph Clark, of Street, Somerset, writing on Sunday's storm records that on Sunday morning the 5th inst., "The wind dropped at about 1 a.m. but came on again at 2 a.m. At 4.20 there came the longest flash of lightning I ever remember, thoroughly alarming me. I got out of bed quickly and went to the window, for I really thought that the house or farmyard was on fire. I heard no thunder." The latter fact may have been due to the storm as here, where also the wind would have drowned any but a heavy peal.

J. E. CLARK.

*Purley, Surrey.*

### REMARKABLE HAILSTONES.

ABOUT 1.20 p.m. to-day a short but most remarkable hailstorm took place here. It followed very frequent thunder, the centre of the storm passing some distance to the west, the wind being about S.S.E. The hailstones were roughly circular, the larger ones being about  $\frac{3}{4}$  of an inch in diameter, and in great numbers. The outer surface was granulated, and in general appearance as if a number of small hailstones had been frozen together. I had no opportunity to examine them minutely till nearly half an hour later; even then the granulated appearance was quite noticeable, much like figure 25 on page 143 of Scott's *Elementary Meteorology*. I cut several through the centre, and there was in most instances a darker core or centre, varying from about an eighth to a quarter of an inch in diameter, with lines radiating from this centre to the outer surface.

What I should like to know is how the hail stones exhibited the central dark core, suggesting pressure, and at the same time the undoubted granulated surface, suggesting that the whole was built up of a large number of small stones frozen together.

C. E. B. DEACON.

*Alderwasley Parsonage, Wirksworth, October 27th, 1916.*

### ABNORMAL TEMPERATURES.

OCTOBER this year boasts of a higher mean temperature than May or June, as follows :—

|      |      |    | May. | June. | October. |
|------|------|----|------|-------|----------|
| Mean | Max. | .. | 59°3 | 60°5  | 58°2     |
| „    | Min. | .. | 45°6 | 45°2  | 49°0     |
| Mean | ..   | .. | 52°4 | 52°8  | 53°6     |



It will be noted that the October nights were nearly  $4^{\circ}$  warmer than June. During the first ten days of October the mean temperature was  $59^{\circ}\cdot6$ , while for June 1-10th it was only  $49^{\circ}\cdot4$ .

During a period of 33 years I have no instance of this kind to compare with the above. ARTHUR F. PARBURY.

*Crediton, Exeter, November 1st, 1916.*

### SUMMER TIME.

THE Summer Time scheme was brought forward with a view of economizing the resources of the country, and so assisting us to win the war. The object in view, no doubt, meets with general approval ; it is the means used to attain it which has caused considerable dissatisfaction.

It is clear that considerable economy in coal must be effected by getting up and going to bed an hour earlier during the summer months, but it is not clear that this can only be brought about by altering the clocks. The Rev. H. A. Boys has suggested that the time tables might be altered for the summer months ; if this were done, and if the Banks and Government offices took similar action, it is probable that other business establishments would fall into line. This would avoid the necessity for changing the clocks and the consequent confusion in meteorological returns : there would still, however, remain the inconvenience mentioned in your article of June, viz., that an Observer may not be able to adhere to the old time and catch a train on the new time table.

But this inconvenience seems a trivial matter when compared with even the lowest estimate of the probable saving. In these times we have all to put up with inconvenience and extra work, and the ultimate question which should settle all such points surely is, " Will it help to win the war ? "

LAWRENCE GIBBS, F.R.Met.Soc.

*Wirksworth, Derbyshire.*

### METEOROLOGICAL NEWS AND NOTES.

WEATHER PROPHECIES for long periods still continue. A.B.M., writing in the *Glasgow Herald* of October 27th, predicts a mild winter on the basis of the Greenwich temperatures, while Mr. Hugh Clements, in the daily press at the beginning of this month, forecasts an exceptionally cold winter. The only alternative forecast is that the temperature of the coming winter will be exactly the average, and there seems no doubt that whatever the event may prove the supporters of one or other of these remarkable forecasts will be gratified.

A NEW MONTHLY WEATHER REVIEW, commencing with January, 1916, is promised shortly by the Argentine Meteorological Office. Since 1909 this office has published useful monthly maps of the principal meteorological elements including one showing the excess or deficiency of the month's rainfall over the Republic. It will be a great advantage to have this valuable material under one cover along with the statistical data on which the maps are based.

Mr. J. J. Hicks, the head of the well known firm of instrument makers, died on October 25th in his 79th year. He leaves a reputation for high-class work, which makes his name worthy of memory.

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### REVIEW.

*Results of Meteorological Observations in the five years, 1911-15, also of Underground Temperatures in the twelve years, 1898-1910, made at the Radcliffe Observatory, Oxford, under the Direction of Arthur A. Rambaut, M.A., F.R.S. Radcliffe Observer. Size, 10 x 6. Oxford, 1916. Pp. 215. Plates.*

SOME changes have been made in the arrangement of the volume as compared with first issues of the same series. A special grant received in 1911 enabled the arrears of printing to be overtaken, and the results of the observations to be printed off year by year. In the volume under notice the five annual parts dealing with the period 1911-1915 have been bound together. It was found impossible, owing to the depletion of the staff on account of the war to continue the evaluation from the photographic records of the hourly tabulations of pressure and temperature. A considerable portion of the volume is taken up with the daily observations of underground temperature, five platinum resistance thermometers being employed. The daily results for all five thermometers for the whole period of twelve years, 1899-1910, are brought together, the results being shown graphically on three plates for depths ranging from  $6\frac{1}{2}$  inch to 10 feet. At depths of  $6\frac{1}{2}$  inch and  $1\frac{1}{2}$  feet the mean monthly temperature is highest in July, at  $3\frac{1}{2}$  feet and 5 feet  $8\frac{1}{2}$  inch the maximum is retarded until August, and at 10 feet occurs a month later. The minimum occurs in February at all depths except the deepest, where it is a month later. All the curves agree in showing a general falling off in the mean annual temperature amounting to about  $2^{\circ}$  in the twelve years for which observations are available. A useful appendix gives the monthly and annual values of the various elements of climate, mostly since 1890, in continuation of those previously published. Tables giving monthly values of bright sunshine and mean wind velocity since 1881 appear for the first time. The old familiar units are adhered to throughout, which facilitates the comparison with previous volumes of the series.

## RAINFALL TABLE FOR OCTOBER, 1916.

| STATION.                        | COUNTY.              | Lat.<br>N. | Long.<br>W.<br>[*E.] | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|---------------------------------|----------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
|                                 |                      |            |                      |                                | Aver.<br>1875—<br>1909.<br>in. | 1916.<br>in. |
| Camden Square.....              | London.....          | 51 32      | 0 8                  | 111                            | 2.72                           | 3.25         |
| Tenterden.....                  | Kent.....            | 51 4       | *0 41                | 190                            | 3.48                           | 4.91         |
| Arundel (Patching).....         | Sussex.....          | 50 51      | 0 27                 | 130                            | 4.01                           | 6.24         |
| Fordingbridge (Oaklands)...     | Hampshire.....       | 50 56      | 1 38                 | 135                            | 3.97                           | 5.82         |
| Oxford (Magdalen College)...    | Oxfordshire.....     | 51 45      | 1 15                 | 186                            | 2.82                           | 3.46         |
| Wellingborough (Swanspool)...   | Northampton.....     | 52 18      | 0 41                 | 155                            | 2.60                           | 2.03         |
| Bury St. Edmunds (Westley)...   | Suffolk.....         | 52 15      | *0 40                | 226                            | 2.72                           | 2.85         |
| Geldeston [Beccles].....        | Norfolk.....         | 52 27      | *1 31                | 38                             | 2.84                           | 2.46         |
| Polapit Tamar [Launceston]...   | Devon.....           | 50 40      | 4 22                 | 315                            | 4.84                           | 6.35         |
| Rousdon [Lyme Regis].....       | „.....               | 50 41      | 3 0                  | 516                            | 3.81                           | 6.63         |
| Stroud (Field Place).....       | Gloucestershire..... | 51 44      | 2 13                 | 226                            | 3.21                           | 5.47         |
| Church Stretton (Wolstaston)... | Shropshire.....      | 52 35      | 2 48                 | 800                            | 3.77                           | 5.45         |
| Boston.....                     | Lincolnshire.....    | 52 58      | 0 1                  | 11                             | 2.75                           | 1.99         |
| Worksop (Hodsock Priory)...     | Nottinghamshire..... | 53 22      | 1 5                  | 56                             | 2.77                           | 1.72         |
| Mickleover Manor.....           | Derbyshire.....      | 52 54      | 1 32                 | 280                            | 2.81                           | 3.38         |
| Macclesfield.....               | Cheshire.....        | 53 15      | 2 7                  | 501                            | 3.53                           | ...          |
| Southport (Hesketh Park)...     | Lancashire.....      | 53 39      | 2 59                 | 38                             | 3.74                           | 5.81         |
| Arneliffe Vicarage.....         | Yorkshire, W.R.....  | 54 8       | 2 6                  | 732                            | 6.48                           | 13.48        |
| Goldsbrough Hall.....           | „.....               | 54 0       | 1 25                 | 119                            | 3.16                           | 4.24         |
| Hull (Pearson Park).....        | „ E.R.....           | 53 45      | 0 20                 | 6                              | 3.19                           | 2.84         |
| Newcastle (Town Moor)...        | Northumberland.....  | 54 59      | 1 38                 | 201                            | 3.20                           | 2.74         |
| Borrowdale (Seathwaite)...      | Cumberland.....      | 54 30      | 3 10                 | 423                            | 12.71                          | 23.01        |
| Cardiff (Ely).....              | Glamorgan.....       | 51 29      | 3 13                 | 53                             | 4.87                           | 8.98         |
| Haverfordwest.....              | Pembroke.....        | 51 48      | 4 58                 | 90                             | 5.51                           | 9.39         |
| Aberystwyth (Gogerddan)...      | Cardigan.....        | 52 26      | 4 1                  | 83                             | 5.38                           | 8.43         |
| Llandudno.....                  | Carnarvon.....       | 53 20      | 3 50                 | 72                             | 3.78                           | 4.13         |
| Cargen [Dumfries].....          | Kirkcudbright.....   | 55 2       | 3 37                 | 80                             | 4.45                           | 8.14         |
| Marchmont House.....            | Berwick.....         | 55 44      | 2 24                 | 498                            | 3.83                           | 4.25         |
| Girvan (Pinmore).....           | Ayr.....             | 55 10      | 4 49                 | 207                            | 5.38                           | 6.97         |
| Glasgow (Queen's Park)...       | Renfrew.....         | 55 53      | 4 18                 | 144                            | 3.36                           | 6.39         |
| Islay (Eallabus).....           | Argyll.....          | 55 47      | 6 15                 | 68                             | 4.95                           | 7.19         |
| Mull (Quinish).....             | „.....               | 56 34      | 6 13                 | 35                             | 5.87                           | 7.87         |
| Balquhider (Stronvar).....      | Perth.....           | 56 21      | 4 23                 | 422                            | 7.29                           | 12.46        |
| Dundee (Eastern Necropolis)...  | Forfar.....          | 56 28      | 2 57                 | 199                            | 2.81                           | 4.53         |
| Braemar.....                    | Aberdeen.....        | 57 0       | 3 24                 | 1114                           | 3.88                           | 6.63         |
| Aberdeen (Cranford).....        | „.....               | 57 8       | 2 7                  | 120                            | 3.23                           | 4.13         |
| Gordon Castle.....              | Moray.....           | 57 37      | 3 5                  | 107                            | 3.38                           | 3.86         |
| Drumnadrochit.....              | E. Inverness.....    | 57 20      | 4 29                 | 138                            | 3.49                           | 6.06         |
| Fort William.....               | „.....               | 56 49      | 5 6                  | 171                            | 7.32                           | 16.20        |
| Loch Torridon (Bendamph)...     | W. Ross.....         | 57 32      | 5 32                 | 20                             | 8.38                           | 9.39         |
| Dunrobin Castle.....            | Sutherland.....      | 57 59      | 3 56                 | 14                             | 3.15                           | 4.17         |
| Killarney (District Asylum)...  | Kerry.....           | 52 4       | 9 31                 | 178                            | 5.59                           | 13.60        |
| Waterford (Brook Lodge)...      | Waterford.....       | 52 15      | 7 7                  | 104                            | 4.00                           | 7.89         |
| Nenagh (Castle Lough).....      | Tipperary.....       | 52 54      | 8 24                 | 120                            | 3.48                           | 7.51         |
| Ennistymon House.....           | Clare.....           | 52 57      | 9 18                 | 37                             | 4.40                           | 9.97         |
| Gorey (Courtown House)...       | Wexford.....         | 52 40      | 6 13                 | 80                             | 3.75                           | 7.40         |
| Abbey Leix (Blandsfort)...      | Queen's County.....  | 52 56      | 7 17                 | 532                            | 3.53                           | 5.40         |
| Dublin (Fitz William Square)... | Dublin.....          | 53 21      | 6 14                 | 54                             | 2.88                           | 5.95         |
| Mullingar (Belvedere).....      | Westmeath.....       | 53 29      | 7 22                 | 367                            | 3.19                           | 7.58         |
| Crossmolina (Enniscoe).....     | Mayo.....            | 54 4       | 9 16                 | 74                             | 5.27                           | 10.65        |
| Cong (The Glebe).....           | „.....               | 53 33      | 9 16                 | 112                            | 4.60                           | 11.42        |
| Collooney (Markree Obsy.)...    | Sligo.....           | 54 11      | 8 27                 | 127                            | 4.21                           | 8.56         |
| Seaforde.....                   | Down.....            | 54 19      | 5 50                 | 180                            | 3.65                           | 7.39         |
| Ballymena (Harryville).....     | Antrim.....          | 54 52      | 6 13                 | 150                            | 3.78                           | 6.35         |
| Omagh (Edenfel).....            | Tyrone.....          | 54 36      | 7 18                 | 280                            | 3.76                           | 7.54         |

RAINFALL TABLE FOR OCTOBER, 1916—*continued.*

| RAINFALL OF MONTH (con.) |          |                                |             | RAINFALL FROM JAN. 1.   |              |                      |          | Mean Annual 1875-1909. | STATION.          |
|--------------------------|----------|--------------------------------|-------------|-------------------------|--------------|----------------------|----------|------------------------|-------------------|
| Diff. from Av. in.       | % of Av. | Max. in 24 hours.<br>in. Date. | No. of Days | Aver. 1875-1909.<br>in. | 1916.<br>in. | Diff. from Aver. in. | % of Av. |                        |                   |
| + .53                    | 119      | .64 17                         | 23          | 20.64                   | 26.79        | +6.15                | 130      | 25.11                  | Camden Square     |
| +1.43                    | 141      | .86 17                         | 22          | 21.80                   | 24.62        | +2.82                | 113      | 27.64                  | Tenterden         |
| +2.23                    | 156      | 1.00 17                        | 23          | 24.03                   | 28.08        | +4.05                | 117      | 30.48                  | Patching          |
| +1.85                    | 147      | .78 30                         | 23          | 24.30                   | 30.76        | +6.46                | 127      | 31.06                  | Fordingbridge     |
| + .64                    | 123      | .67 2                          | 24          | 20.27                   | 23.96        | +3.69                | 118      | 24.58                  | Oxford            |
| - .57                    | 78       | .40 2                          | 18          | 20.85                   | 20.68        | - .17                | 99       | 25.20                  | Swanspool         |
| + .13                    | 105      | .48 27                         | 20          | 20.86                   | 26.81        | +5.95                | 128      | 25.40                  | Westley           |
| - .38                    | 87       | .39 24                         | 22          | 19.17                   | ...          | ...                  | ...      | 23.73                  | Geldeston         |
| +1.51                    | 131      | .81 27                         | 25          | 29.74                   | 30.60        | + .86                | 103      | 38.27                  | Polapit Tamar     |
| +2.82                    | 174      | 1.03 30                        | 25          | 26.35                   | 28.82        | +2.47                | 109      | 33.54                  | Rousdon           |
| +2.26                    | 170      | .85 2                          | 26          | 24.33                   | 28.29        | +3.96                | 116      | 29.81                  | Stroud            |
| +1.68                    | 145      | 1.25 27                        | 26          | 26.48                   | 27.26        | + .78                | 103      | 32.41                  | Wolstaston        |
| - .76                    | 72       | .36 3                          | 19          | 19.42                   | 22.84        | +3.42                | 118      | 23.35                  | Boston            |
| -1.05                    | 62       | .35 29                         | 19          | 20.31                   | 19.14        | -1.17                | 94       | 24.46                  | Hodsock Priory    |
| + .57                    | 120      | .51 2                          | 23          | 22.06                   | 25.16        | +3.10                | 114      | 26.65                  | Mickleover        |
| ...                      | ...      | ...                            | ...         | 28.38                   | ...          | ...                  | ...      | 34.73                  | Macclesfield      |
| +2.07                    | 155      | 1.72 13                        | 24          | 26.44                   | 26.27        | - .17                | 99       | 32.70                  | Southport         |
| +7.00                    | 208      | 1.63 5                         | 26          | 48.62                   | 57.30        | +8.68                | 118      | 61.49                  | Arnccliffe        |
| +1.08                    | 134      | .67 13                         | 25          | 22.67                   | 24.04        | +1.37                | 106      | 27.29                  | Goldsborough Hall |
| - .35                    | 89       | .70 13                         | 22          | 21.76                   | 23.08        | +1.32                | 106      | 26.42                  | Hull              |
| - .46                    | 86       | .68 4                          | 22          | 22.85                   | 23.90        | +1.05                | 104      | 27.94                  | Newcastle         |
| +10.30                   | 181      | 3.15 4                         | 23          | 100.75                  | 110.65       | +9.90                | 110      | 129.48                 | Seathwaite        |
| +4.11                    | 185      | 1.55 2                         | 28          | 33.50                   | 41.06        | +7.56                | 122      | 42.28                  | Cardiff           |
| +3.88                    | 171      | 1.42 2                         | 25          | 36.47                   | 34.50        | -1.97                | 95       | 46.81                  | Haverfordwest     |
| +3.05                    | 157      | 1.75 27                        | 25          | 36.30                   | 39.32        | +3.02                | 108      | 45.46                  | Gogerddan         |
| + .35                    | 109      | .83 2                          | 24          | 24.33                   | 25.81        | +1.48                | 106      | 30.36                  | Llandudno         |
| +3.69                    | 183      | 1.17 5                         | 25          | 34.28                   | 43.66        | +9.38                | 127      | 43.47                  | Cargen            |
| + .42                    | 111      | .61 13                         | 24          | 27.72                   | 35.74        | +8.02                | 129      | 33.76                  | Marchmont         |
| +1.59                    | 130      | .68 14                         | 25          | 39.05                   | 41.49        | +2.44                | 106      | 49.77                  | Girvan            |
| +3.03                    | 190      | .92 5                          | 24          | 28.39                   | 36.19        | +7.80                | 127      | 35.97                  | Glasgow           |
| +2.24                    | 145      | .88 4                          | 28          | 37.73                   | 42.58        | +4.85                | 113      | 48.79                  | Eallabus          |
| +2.00                    | 134      | 1.11 11                        | 26          | 43.74                   | 40.28        | -3.46                | 92       | 56.57                  | Quinish           |
| +5.17                    | 171      | 3.20 14                        | 25          | 57.07                   | 62.15        | +5.08                | 109      | 73.77                  | Stronvar          |
| +1.72                    | 161      | .69 29                         | 23          | 23.35                   | 33.05        | +9.70                | 142      | 28.64                  | Dundee            |
| +2.75                    | 171      | .95 14                         | 22          | 28.04                   | 38.00        | +9.96                | 136      | 34.93                  | Braemar           |
| + .90                    | 128      | .75 5                          | 20          | 26.01                   | 28.41        | +2.40                | 109      | 32.73                  | Aberdeen          |
| + .48                    | 114      | .82 6                          | 20          | 24.77                   | 30.98        | +6.21                | 125      | 30.34                  | Gordon Castle     |
| +2.57                    | 174      | 1.76 14                        | 20          | 28.96                   | 41.72        | +12.76               | 144      | 36.13                  | Drumnadrochit     |
| +8.88                    | 221      | 4.50 11                        | 25          | 58.84                   | 65.22        | +6.38                | 111      | 75.80                  | Fort William      |
| +1.01                    | 112      | 2.14 14                        | 22          | 65.17                   | 67.83        | +2.66                | 104      | 83.93                  | Bendamph          |
| +1.02                    | 132      | .93 11                         | 17          | 25.56                   | 29.97        | +4.41                | 117      | 31.90                  | Dunrobin Castle   |
| +8.01                    | 243      | 5.35 21                        | 28          | 42.35                   | 53.47        | +11.12               | 126      | 54.81                  | Killarney         |
| +3.89                    | 197      | 1.62 1                         | 22          | 31.45                   | 30.52        | - .93                | 100      | 39.57                  | Waterford         |
| +4.03                    | 216      | 1.27 5                         | 29          | 31.21                   | 34.44        | +3.23                | 110      | 39.43                  | Castle Lough      |
| +5.57                    | 227      | 1.52 5                         | 30          | 36.87                   | 41.78        | +4.91                | 113      | 46.52                  | Ennistymon        |
| +3.65                    | 197      | 1.01 29                        | 25          | 28.16                   | 30.88        | +2.72                | 109      | 34.99                  | Courtown Ho.      |
| +1.87                    | 153      | .51 26                         | 26          | 29.23                   | 32.09        | +2.86                | 110      | 35.92                  | Abbey Leix        |
| +3.07                    | 207      | .79 2                          | 24          | 22.77                   | 30.11        | +7.34                | 132      | 27.68                  | Dublin            |
| +4.39                    | 138      | 1.00 14                        | 30          | 29.38                   | 38.16        | +8.78                | 130      | 36.15                  | Mullingar         |
| +5.38                    | 202      | 1.14 5                         | 30          | 41.01                   | 48.92        | +7.91                | 119      | 52.87                  | Enniscoe          |
| +6.82                    | 148      | 1.46 1                         | 30          | 38.48                   | 43.98        | +5.50                | 114      | 48.90                  | Cong              |
| +4.35                    | 203      | .84 6                          | 31          | 34.35                   | 43.01        | +8.66                | 125      | 42.71                  | Markree           |
| +3.74                    | 205      | 1.29 2                         | 27          | 31.28                   | 34.04        | +2.76                | 109      | 38.91                  | Seaforde          |
| +2.57                    | 168      | .80 4                          | 29          | 32.92                   | 36.57        | +3.65                | 111      | 40.84                  | Ballymena         |
| +3.78                    | 201      | 1.27 4                         | 30          | 31.81                   | 35.71        | +3.90                | 112      | 39.38                  | Omagh             |

## SUPPLEMENTARY RAINFALL, OCTOBER, 1916.

| Div.  | STATION.                      | Rain<br>inches. | Div.   | STATION.                      | Rain<br>inches. |
|-------|-------------------------------|-----------------|--------|-------------------------------|-----------------|
| II.   | Warlingham, Redvers Road .    | 5.79            | XI.    | Lligwy .....                  | 4.92            |
| „     | Ramsgate .....                | 4.05            | „      | Douglas, Isle of Man .....    | 8.39            |
| „     | Hailsham .....                | 6.47            | XII.   | Stoneykirk, Ardwell House...  | 6.93            |
| „     | Totland Bay, Aston House...   | 4.30            | „      | Carsphain, Shiel .....        | 12.25           |
| „     | Stockbridge, Ashley.. .....   | 6.30            | „      | Beattock, Kinnelhead .....    | 11.14           |
| „     | Grayshott .....               | 6.66            | „      | Langholm, Drove Road .....    | 8.93            |
| III.  | Harrow Weald, Hill House...   | 3.42            | XIII.  | Selkirk, The Hangingshaw..    | 5.31            |
| „     | Pitsford, Sedgebrook.....     | 2.42            | „      | North Berwick Reservoir.....  | 3.82            |
| „     | Woburn, Milton Bryant.....    | 3.25            | „      | Edinburgh, Royal Observatv.   | 4.54            |
| „     | Chatteris, The Priory.....    | 1.71            | XIV.   | Maybole, Knockdon Farm ...    | 5.66            |
| IV.   | Elsenham, Gaunts End .....    | 3.04            | XV.    | Buchlyvie, The Manse .....    | 10.39           |
| „     | Shoeburyness .....            | 2.06            | „      | Ballachulish House .....      | 15.28           |
| „     | Colchester, Hill Ho., Lexden  | 2.23            | „      | Oban .....                    | 9.08            |
| „     | Ipswich, Rookwood, Copdock    | 2.21            | „      | Campbeltown, Witchburn ..     | 6.58            |
| „     | Aylsham, Rippon Hall .....    | 2.60            | „      | Holy Loch, Ardnadam.....      | 10.90           |
| „     | Swaffham .....                | 2.68            | „      | Tiree, Cornaigmore .....      | 6.76            |
| V.    | Bishops Cannings .....        | 5.74            | XVI.   | Dollar Academy .....          | 7.31            |
| „     | Wimborne, St. John's Hill ... | 5.75            | „      | Glenlyon, Meggernie Castle..  | 10.81           |
| „     | Ashburton, Druid House.....   | 9.63            | „      | Blair Atholl .....            | 6.84            |
| „     | Cullompton .....              | 6.56            | „      | Coupar Angus .....            | 5.13            |
| „     | Lynmouth, Rock House .....    | 7.60            | „      | Montrose, Sunnyside Asylum.   | 4.08            |
| „     | Okehampton, Oaklands.....     | 8.10            | XVII.  | Alford, Lynturk Manse .....   | 5.90            |
| „     | Hartland Abbey .....          | 6.32            | „      | Fyvie Castle .....            | 6.15            |
| „     | St. Austell, Trevarna .....   | 8.36            | „      | Keith Station ..              | 4.74            |
| VI.   | North Cadbury Rectory.....    | 6.22            | XVIII. | Rothiemurchus .....           | 6.61            |
| „     | Clifton, Stoke Bishop .....   | 7.36            | „      | Loch Quoich, Loan .....       | 28.50           |
| „     | Ledbury, Underdown.....       | 3.86            | „      | Skye, Dunvegan .....          | 8.15            |
| „     | Shifnal, Hatton Grange.....   | 3.95            | „      | Lochmaddy, Bayhead .....      | 4.83            |
| „     | Droitwich.....                | 3.46            | „      | Fortrose.....                 | 5.39            |
| VII.  | Blockley, Upton Wold.....     | 4.68            | „      | Glencarron Lodge .....        | 14.67           |
| „     | Grantham, Saltersford.....    | 1.76            | XIX.   | Altnaharra .....              | 6.38            |
| „     | Market Rasen .....            | 2.07            | „      | Melvich .....                 | 4.00            |
| „     | Bawtry, Hesley Hall .....     | 1.53            | „      | Loch More, Achfary .....      | 9.77            |
| „     | Derby, Midland Railway.....   | 2.82            | XX.    | Dunmanway, The Rectory ..     | 13.42           |
| VIII. | Buxton .....                  | 6.35            | „      | Glanmire, Lota Lodge.....     | 9.54            |
| „     | Nantwich, Dorfold Hall .....  | 3.65            | „      | Mitchelstown Castle .....     | 6.49            |
| „     | Chatburn, Middlewood .....    | 10.19           | „      | Darrynane Abbey.....          | ...             |
| IX.   | Lancaster, Strathspey .....   | 7.35            | „      | Clonmel, Bruce Villa .....    | 6.51            |
| „     | Langsett Moor, Up. Midhope    | 5.50            | „      | Broadford, Hurdlestown.....   | 8.61            |
| „     | Scarborough, Scalby .....     | 3.67            | XXI.   | Enniscorthy, Ballyhyland...   | 9.22            |
| „     | Ingleby Greenhow .....        | 3.98            | „      | Rathnew, Clonmannon .....     | 5.62            |
| X.    | Mickleton .....               | 8.70            | „      | Ballycumber, Moorrock Lodge   | 6.45            |
| „     | Bellingham, High Green Manor  | 5.82            | „      | Balbriggan, Ardgillan .....   | 7.33            |
| „     | Ilderton, Lilburn Cottage ... | 3.58            | „      | Castle Forbes Gardens.....    | 6.61            |
| „     | Keswick, The Bank.....        | 13.28           | XXII.  | Ballynahinch Castle.....      | 14.61           |
| XI.   | Llanfrecfa Grange .....       | 10.50           | „      | Woodlawn .....                | 7.49            |
| „     | Treherbert, Tyn-y-waun .....  | 19.80           | „      | Westport, St. Helens ...      | 10.10           |
| „     | Carmarthen, The Friary .....  | 10.62           | „      | Dugort, Slievemore Hotel ...  | 9.11            |
| „     | Fishguard, Goodwick Station.  | 7.05            | XXIII. | Enniskillen, Portora.....     | 5.98            |
| „     | Crickhowell, Tal-y-maes.....  | 8.50            | „      | Dartrey [Cootehill] .....     | 7.66            |
| „     | New Radnor, Ednol .....       | 6.40            | „      | Warrenpoint, Manor House ..   | 7.11            |
| „     | Birmingham WW., Tyrmynydd     | 11.71           | „      | Belfast, Cave Hill Road ..... | 7.78            |
| „     | Lake Vyrnwy .....             | 12.88           | „      | Glenarm Castle .....          | 6.10            |
| „     | Llangynhafal, Plás Drâw.....  | 5.15            | „      | Londonderry, Creggan Res...   | 6.53            |
| „     | Dolgelly, Bryntirion.....     | 10.43           | „      | Dunfanaghy, Horn Head ...     | 7.16            |
| „     | Bettws-y-Coed, Tyn-y-bryn...  | 11.88           | „      | Killybegs .....               | 10.36           |





# THAMES VALLEY RAINFALL — OCTOBER, 1916.



ALTITUDE SCALE

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

SCALE OF MILES



## WEATHER OF OCTOBER.

THE outstanding features of the weather of October were the heavy rainfall, falling on a large number of days, and the persistence of unsettled stormy conditions, with hardly a break during the whole month. Heavy gales were of frequent occurrence, the most widespread occurring from the 9th to the 15th and about the close of the month.

The mean temperature of the month was above the average in all parts of the country, a result largely due to the unusual mildness characteristic of the first half of the month, as during the second half the mean temperature, except in Ireland, was below the average. Taking the whole country the mean temperature excess as compared with the average was  $2^{\circ}3$ , being most pronounced in Ireland where it amounted to  $3^{\circ}5$ , and least marked in the east of Scotland, where the average was very slightly exceeded. The month opened with rather cool weather, but, on the 4th, the temperature in the shade as far north as Gordon Castle rose to  $70^{\circ}$ , while, on the 6th, readings of  $71^{\circ}$  were recorded at Hawarden Bridge and Llandudno. A conspicuous feature of the first half of the month was the very high mean minimum temperature which in some parts of the south of England averaged from  $55^{\circ}$  to  $57^{\circ}$  over the whole period, the nights being relatively much milder than the days. After the middle of the month the temperature fell, the lowest readings being recorded either on the 17th or 21st. On the former date shade readings of  $18^{\circ}$  were recorded at Balmoral and West Linton, and at most of the Scotch stations the temperature fell well below freezing point.

Over England, except in the north-east, the lowest temperatures were recorded on the 21st, the minimum being  $24^{\circ}$  at Shrewsbury.

Ireland resembled Scotland in having the lowest temperatures just after the middle of the month, but no readings below  $32^{\circ}$  were recorded.

Another cold snap occurred about the 27th, when the temperature fell to  $22^{\circ}$  at West Linton. The month closed with a strong gale from the S.W., and at Southport on the evening of the 30th the wind rose to 81 miles per hour.

The rainfall of this month was almost everywhere largely above the average, and in some places more than double the average fell. The driest area, where less than 2 inches fell, embraced a considerable region E. and W. of a line drawn from Doncaster to Cambridge. In the wet regions of the west an average daily rainfall of from  $\frac{1}{2}$  to  $\frac{3}{4}$  of an inch was noted. In some parts of Ireland rain fell on every day of the month. The most noticeable rainstorms occurred on the 11th and 22nd. On the former date 4.50 inches fell in 11 hours at Fort William, and at Killarney on the 22nd 5.35 in. In the week ending the 14th 11.75 in. fell at Fort William and 8.50 in. at Ballachulish. In the Thames Valley map the least rainfall, under 2 inches, was in the vicinity of Cambridge, and less than  $2\frac{1}{2}$  inches fell in the estuary of the Thames. Over 7 inches fell in parts of Hampshire and Gloucester. Over the country, as a whole, the general rainfall expressed as a percentage of the average was:—England and Wales, 143 per cent; Scotland, 153 per cent.; Ireland, 209 per cent.; British Isles 162 per cent.

Sunshine, as in September, was everywhere deficient, especially in western districts. The percentage of the total possible recorded varied from 28 in the Channel Islands and 27 in the Midland Counties to 15 over Ireland and 17 in the west of Scotland. The general deficiency over the country as a whole was about 1 hour a day, the amount varying from  $\frac{1}{5}$  of an hour in Scotland East and the Midland Counties to over  $1\frac{1}{2}$  hours in Ireland. The amounts at individual stations were as follows:—Sidmouth, 92 hours; Weymouth, 99 hours; Totland Bay, 92 hours; Hodsock Priory, 81 hours; Southport, 78 hours; Perth, 72 hours; Swinton (Berwick) 71 hours; Haverfordwest, 64 hours; Hull, 61 hours; Camden Square, 80 hours; Bolton and Paisley, 52 hours; Loch More, 49 hours. In London (Camden Square) the mean temperature was  $53^{\circ}1$  or  $3^{\circ}0$  above the average. Duration of rain 55.2 hours. Evaporation, .76 in.



## Climatological Table for the British Empire, May, 1916.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |            |       |                 |
|                                                                  | °         |       | °        |       | °        | °    | °             | 0-100     | °               | °                 | inches     |       |                 |
| London, Camden Square                                            | 84·8      | 21    | 36·6     | 9     | 67·6     | 47·4 | 47·1          | 57        | 129·8           | 33·0              | 1·88       | 13    | 5·5             |
| Malta ... ..                                                     | 80·2      | 9     | 58·8     | 16    | 71·9     | 61·6 | ...           | 82        | 135·0           | ...               | ·08        | 1     | 2·1             |
| Lagos ... ..                                                     | 90·4      | 15    | 70·1     | 17    | 88·1     | 75·9 | 74·1          | 73        | 152·0           | 69·2              | 6·96       | 16    | 7·3             |
| Cape Town ... ..                                                 | 81·9      | 24    | 39·7     | 30    | 66·0     | 49·5 | 49·5          | 74        | ...             | ...               | 2·93       | 15    | 5·2             |
| Johannesburg ... ..                                              | 71·8      | 18    | 28·0     | 23    | 62·9     | 42·5 | 31·8          | 56        | ...             | 26·3              | ·58        | 3     | 2·1             |
| Mauritius ... ..                                                 | 81·3      | 10    | 63·7     | 13    | 78·1     | 68·5 | 66·4          | 81        | ...             | 55·9              | 7·49       | 20    | 6·6             |
| Bloemfontein .. ..                                               | 75·3      | 18    | 24·5     | 9     | 64·6     | 34·2 | 31·4          | 58        | ...             | ...               | ·04        | 2     | 1·9             |
| Calcutta... ..                                                   | 104·6     | 2     | 69·5     | 9     | 97·9     | 80·0 | 74·2          | 67        | ...             | 64·3              | 3·86       | 2     | 2·7             |
| Bombay... ..                                                     | 93·5      | 27    | 77·5     | 6     | 91·3     | 81·0 | 77·0          | 75        | 139·0           | 71·9              | ·07        | 2     | 4·0             |
| Madras ... ..                                                    | 103·4     | 4     | 74·7     | 31    | 96·8     | 80·7 | 75·5          | 72        | 155·6           | 74·7              | ·84        | 3     | 2·4             |
| Colombo, Ceylon ... ..                                           | 89·3      | 2     | 69·2     | 19    | 86·9     | 75·0 | 75·0          | 85        | 158·0           | 68·0              | 30·99      | 23    | 8·2             |
| Hongkong ... ..                                                  | 90·5      | 28    | 70·0     | 3     | 82·9     | 74·5 | 72·6          | 83        | ...             | ...               | 12·94      | 14    | 6·7             |
| Sydney ... ..                                                    | ...       | ...   | ...      | ...   | ...      | ...  | ...           | ...       | ...             | ...               | ...        | ...   | ...             |
| Melbourne ... ..                                                 | 75·1      | 10    | 29·9     | 29    | 62·3     | 45·5 | 42·1          | 62        | 121·3           | 21·1              | ·96        | 7     | 5·5             |
| Adelaide ... ..                                                  | 81·6      | 10    | 41·4     | 24    | 67·5     | 50·3 | 47·0          | 64        | 125·0           | 30·1              | 1·19       | 7     | 5·5             |
| Perth ... ..                                                     | 84·4      | 4     | 40·2     | 13    | 68·8     | 53·4 | 52·0          | 74        | 137·2           | 29·2              | 4·80       | 17    | 6·0             |
| Coolgardie ... ..                                                | 87·4      | 7     | 37·8     | 13    | 71·8     | 47·9 | 48·5          | 48        | 137·2           | 29·8              | 2·05       | 3     | 2·8             |
| Hobart, Tasmania .. ..                                           | 71·6      | 2     | 32·0     | 27    | 57·0     | 44·1 | 39·8          | 63        | 124·0           | 25·1              | ·23        | 13    | 5·7             |
| Wellington ... ..                                                | 67·8      | 16    | 38·4     | 18    | 60·2     | 49·5 | 49·0          | 80        | 93·8            | 26·0              | 3·58       | 17    | 6·7             |
| Auckland ... ..                                                  | ...       | ...   | ...      | ...   | ...      | ...  | ...           | ...       | ...             | ...               | ...        | ...   | ...             |
| Jamaica, Kingston .. ..                                          | 91·2      | 20    | 70·1     | 6     | 86·5     | 72·4 | 71·8          | 79        | ...             | ...               | 11·92      | 11    | ...             |
| Grenada ... ..                                                   | 88·0      | 4*    | 72·0     | 30    | 86·0     | 75·0 | ...           | 73        | 135·0           | ...               | 3·52       | 12    | 2·5             |
| Toronto ... ..                                                   | 81·4      | 24    | 35·7     | 19    | 63·8     | 44·8 | 43·7          | 73        | 138·5           | 32·0              | 5·58       | 14    | 5·4             |
| Fredericton ... ..                                               | 76·5      | 28    | 30·0     | 5     | 63·2     | 39·8 | 41·6          | 66        | ...             | ...               | 3·31       | 13    | 5·6             |
| St. John, N.B. ... ..                                            | 63·8      | 27    | 34·0     | 1     | 55·3     | 40·5 | 38·5          | 70        | 125·2           | 31·2              | 1·81       | 15    | 6·6             |
| Victoria, B.C. ... ..                                            | 67·3      | 24    | 36·1     | 7     | 57·4     | 43·9 | 42·0          | 76        | 140·0           | 28·8              | ·89        | 9     | 5·4             |

\* And 16, 24, 28.

*Johannesburg.*—Bright sunshine, 287·1 hours.*Mauritius.*—Mean temp. 0°·5, dew point 1°·6, and R 4·46 in. above averages.*Bloemfontein.*—A cold month.

COLOMBO, CEYLON.—Mean temp. 81°·0, or 1°·7 below, dew point 0°·8 below, and R 17·67 in., above averages. Mean hourly velocity of wind 4·7 miles. TSS on ten days.

HONGKONG.—Mean temp. 78°·1, mean hourly velocity of wind 12·2 miles. Bright sunshine 194·2 hours.

*Melbourne.*—Mean temp. 0°·1 below, and R 1·20 in. below, averages. Early portion of the month warm and latter extremely cold and unexampled in the history of the State.*Adelaide.*—Mean temp. 1°·2 above, and R 1·51 in. below averages.*Coolgardie.*—Temp. 2°·1 above.*Hobart.*—Mean temp. normal and R ·65 in. below average.*Wellington.*—Mean temp. 2°·1 above, and R 1·22 in. below averages. Bright sunshine 131·6 hours.

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## GREAT RAINFALL AT KILLARNEY

THE rainfall of 5·35 in. recorded at the District Asylum, Killarney, on October 21st, was published without comment in our Table of the Rainfall of October in last month's magazine. This did not imply that the occurrence was an every-day matter to be expected in a wet country like Ireland. It is the practice of the Editors of "British Rainfall" to make very searching enquiries regarding every phenomenon reported to them that borders on the incredible or even approaches the distinction of being very rare. It necessarily happens that "record" falls of rain in a given time are those regarding which a sceptical attitude is the wisest until they have been established by corroborative evidence. Causes of error are numerous, though big falls are rare. It often happens that a decimal point gets astray in copying and ·53 may inadvertently be put down by the copyist as 5·3 and on going over the report he may complete the figure by making it 5·30. But 5·35 could not find its way into a note-book in this way. Remembering, however, that the ordinary rain-measuring glass contains just ·50 in. one can imagine an Observer surprised by a well filled rain gauge to count the number of full glasses—one, two, three, four, five; then measure a residue of ·35 and innocently write down the 5·35 as total. Hence we always examine neighbouring records before accepting a big fall. Now if several Observers in the neighbourhood had observed quantities of about 2·85 in. for the day in question we should feel it necessary to look for evidence that the mistake of reading glass-fuls as inches did not take place. Killarney was an extremely important rainfall station for the mere fact that no other rain gauges were known to exist within a good many miles of it, and although the nearest Observers recorded between 2 and 3 inches they were so far away that they did not necessarily suggest that the Killarney Observer had made this mistake. Still the facts made investigation more imperative. Many rain gauges cannot hold so much as five inches and if an Observer with a small gauge tells us that it was not over-

flowing when he measured over five inches, his own statement would correct his own record. Again a big fall of rain must produce marked effects in the way of floods or damage to property, and we have before now discovered a slip of the pen of  $\cdot 90$  for  $\cdot 09$  by the Observer remembering that the day on which he made the record was a fine day with only a slight shower. (We have also found that an illiterate Observer was in the habit of writing hundredths, as, for example,  $\cdot 9$ , while the clerk who copied his results to send in added a zero to keep the list in order with two figures to the right of the decimal point, but knowing more of decimals than the ways of primitively-minded men he made the figure  $\cdot 90$  instead of  $\cdot 09$ . This, however, is a digression).

The possibility of an error induced us to write to Dr. Griffin, of Killarney, for particulars as to his remarkable reading, and to our great satisfaction his reply absolutely confirmed the correctness of the record. It runs as follows :—

“ In reply to yours of the 9th inst., I beg to say that as far as I can ascertain there is no doubt whatever about the amount of rainfall recorded here on the morning of the 22nd of October. The Observer, Mr. Galvin, is a very careful man, and he was assisted on that occasion by the Deputy Head Attendant as they both suspected that the rainfall would be extraordinary on that morning. The amount recorded here was only a few points more than that registered by an electrical engineer, Mr. McDonnell, at Flesk Mills, two miles distant from here. The body of the gauge holds 9.45 in. and inside this body we keep a bottle into which the funnel fits which we find convenient for measuring the ordinary rainfall. This bottle holds 2.10 inches, and we very rarely have a rainfall on any one day greater than this. The last date on which this amount was exceeded was on the morning of the 23rd August, 1916, and the body of the gauge was emptied on that occasion so that no residue was left.

“ The rain was of a tropical kind, came down vertically, and there was no wind. It rained continuously for 24 hours, and the oldest inhabitants never remember such a continuous and heavy rainfall. There was not much damage done in this immediate neighbourhood as it is well drained by the Rivers Flesk and Dinagh, but several bridges were swept away between Killarney and Killorglin, and also near Caragh Lake. The River Main overflowed its banks, and cattle were swept away and drowned. I am also informed that considerable damage was done in Glencar district—bridges and cattle, turf and potatoes were swept away. As far as I am aware no one tampered with the gauge.”

E. W. GRIFFIN.

This letter shows first that the gauge was of ample size, that the Observer was so alert to avoid mistakes that he took an assistant

with him to check the observations, and best of all that another rainfall station of which we had not previously heard existed in the neighbourhood, only two miles away. It is one of the chief advantages of extraordinary rains that they serve to bring new Observers to light. We lost no time in communicating with Mr. McDonnell, and he replied as follows :—

“ I am in receipt of your letter of the 21st inst. *re* rainfall records.

“ I am taking observations of rainfall daily as our generating station at Flesk Mills is driven by water power.

“ If my records are of interest I shall be very glad to send you copies at any time and enclose herewith monthly records from 10th March, 1914 to December, 1915, together with rough tracing showing location of my gauge in relation to Killarney railway station.

“ I, personally, take the reading each morning between 9 a.m. and 9.30 a.m., and enter same on Station Log Sheets, so that I have the daily record since 10th March, 1914.

“ My records are so extremely high that I had a doubt as to their accuracy, but on the occasions on which I have compared notes with Dr. Griffin our readings have been very close.

“ With reference to the heavy rainfall of October. My log sheets show 5.02 in. on the 21st, *i.e.*, rainfall, 9.30 a.m. 21st to 9.30 a.m. 22nd.

“ This rain came from north-west to west, and did not affect the river more than usual. We had a rise of 54 inches at our observation point. Since then we registered 3.24 in. on 16th November from south-west to south, and observed a rise of no less than 13 feet in the river. A heavier flood has not been witnessed by any person with whom I was able to get into communication.”

D. E. McDONNELL.

As a matter of fact although Ireland has a higher general rainfall than England the variations are less, and very heavy falls appear much more rare. How far this is due to the smaller number of rainfall stations in Ireland it is not easy to say; but the fact is remarkable that until the Killarney fall of October 21st, falls of 5 inches or over had only twice been recorded in one day, and in both cases at the very exceptional station of Glen-na-Smoel on the mountain border between Cos. Dublin and Wicklow; confirmation of these falls was it must be allowed, much less complete than in the Killarney case. The greatest fall in one day hitherto reported from Co. Kerry was 4.28 in., at Derreen, Kenmare, on October 18th, 1882.



**Alexander Ivanovitch Voeikof..**

Moscow, 1842—1916.

THIS year has seen the removal of many of the ancient landmarks of Meteorology, men to whose labours we owe the great advances of the science in the later half of the nineteenth century in all parts of the world, and we have now to record the loss of the great Russian climatologist Voeikof, which took place last January in in his seventy-fifth year.

After his earlier education in Russia he studied at Göttingen, where he took the degree of Doctor of Philosophy in 1865. He travelled widely, gaining first hand knowledge of the climates of the world. He took the degree of Doctor in Physical Geography at Moscow in 1880, and settled down at the University of Petrograd as lecturer in Physical Geography in 1884, becoming an Ordinary Professor of that subject two years later. He had been an Honorary Member of the Royal Meteorological Society since 1879.

Voeikof was a voluminous writer; his principal works were two important books dealing respectively with Climatology and Meteorology. The former, under the title of "The Climates of the Earth," was published in Russian in 1884, and in a German translation in 1887; the latter, in Russian only, appeared in 1904 under the simple title of "Meteorology."

In his extensive travels Voeikof made friends in all countries of the world, and left a store of pleasant memories.

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**THE WETTEST MONTH ON RECORD
IN MELBOURNE.**

THE rainfall at Melbourne during September, 1916, 7.93 in., constitutes a record for any month during 61 years, the previous highest being 7.61 in., in October, 1869. Continuous steady rain for 63 hours without ceasing and for 9 days almost continuous rain; the latter six had periods of fine weather. All the rivers in Victoria were flooded and were over the banks; many cattle were lost, and a few cases of death by drowning, mostly of children, have been recorded. At Balook, in South Gippsland, the total rainfall for the month was 22.25 in. The following are the daily falls of rain.

			<i>Melbourne.</i>	<i>Balook.</i>
September	21	..	.01	
	22	..	.83	.08
	23	..	2.31	1.69
	24	..	1.97	1.26
	25	..	.24	.19
	26	..	.59	5.32
	27	..	.91	7.23
	28	..	.06	2.08
	29	..	.08	1.13
	30	..	.20—Total 7.20.	.82—19.80

ROYAL METEOROLOGICAL SOCIETY.

THE first Ordinary Meeting of the 1916-17 Session was held at 70, Victoria Street, S.W., on November 15th, Major H. G. Lyons, F.R.S., President, in the Chair.

Mr. C. E. P. Brooks, M.Sc., read a paper entitled, "A Meteorologist in China," dealing with the work of the late Captain L. H. Tamplin, who for some years maintained a very fully equipped meteorological station at Wu-hu, and later at Chinkiang, on the Yangtse river. The situation of these two stations is west of the great Chinese meteorological and magnetic observatory at Zi-ka-wei and not far distant from the Lu-kia-pang Observatory, the records from which were published in a recent number of this magazine. For the last eighteen months Captain Tamplin's records were made at Amoy, near Hong-kong. The whole series covered the period from 1902 to 1915 with one or two short breaks, and included records of pressure, temperature, precipitation, and wind direction. By means of a series of wind roses Mr. Brooks was able to bring out in a very clear manner the characteristic climatic features at various seasons. These are of the typical monsoonal type with a great preponderance of south-easterly wind in summer and a complete absence of rainfall with west wind in winter.

The President, Captain Wilson-Barker, Sir Napier Shaw, Mr. J. E. Clark and Mr. Carle Salter took part in the discussion in which Captain Tamplin's meteorological work was very highly spoken of.

A paper, by Lieut. A. E. M. Geddes, on the Storm of November 11th-13th, 1915, was read by Mr. R. G. K. Lempfert in the absence of the author. For the purpose of this investigation synoptic charts were prepared for intervals of two hours throughout the three days, enabling the track of the depression and the weather associated with its passage to be discussed in great detail. The storm exhibited many points of similarity with that of November 11th-13th, 1901, studied by Sir Napier Shaw and Mr. Lempfert, and described in their memoir "The Life History of Surface Air Currents" (M.O. No. 174). The depression of November, 1915, moved at a speed of approximately 30 miles per hour from a point near Valencia, through Falmouth, and eastward along the English Channel, through the Straits of Dover to Denmark. The lowest recorded pressure was at Scilly, where the barometer fell to 958.3 mb. (28.30 in.) at 6 p.m. on the 12th. The temperature sequence appears to have been normal, and the most unusual feature of the storm was the remarkably heavy rainfall which occurred principally in a broad belt stretching from the west of Ireland to East Anglia. The largest falls recorded exceeded 5 inches during the 3 days. The storm was remarkable for the wide area in front of the centre in which rain was falling at a given moment.

The trajectories of some of the surface winds during the storm

were worked out showing that two distinct supplies of air came respectively from the south or south-west and from the north. Trajectories were also traced out for the geostrophic winds, at a height of, say, 2,000 feet, showing an influx of air at that altitude from the south-west, and an easterly flow on the northern side of the path. The conclusions lent support to the hypothesis of rain formation put forward in the "Life History of Surface Air Currents," namely, that the warm southerly winds are forced to ascend by being lifted upon dense masses of air from more northerly quarters, and supply the rain, which may fall through a northerly or easterly surface wind.

Mr. Carle Salter exhibited a large-scale map of the rainfall of November 11th-12th, 1915, prepared from several thousand observations for *British Rainfall* and called attention to the details of rainfall distribution in relation to the cyclone track, some of which did not appear to be adequately explained by the hypothesis put forward. He considered it advisable to investigate the pressure distribution in greater detail. Sir Napier Shaw gave a further explanation of the reasoning by which he had been led to abandon the purely convectional theory of rain formation in cyclonic systems in favour of that described above and supported by the paper.

After the ordinary meeting a short general meeting of the Society was held in the course of which proposals were put forward and adopted to suspend the by-laws in order to enable the period of office of the Presidents and Vice-Presidents to be extended beyond the prescribed period of two years. Col. Mellish, in moving the principal amendment said that it was the wish of the Council to ask Major Lyons to accept nomination as president for a third year

Correspondence.

To the Editor of Symons's Meteorological Magazine.

AN UNUSUAL FOG BOW.

THERE was visible here to-day for about 4 hours opposite to the sun, and upon a film of thin lofty cirrus spread over a sky far more blue than not, a bright bow, having the appearance of a solar halo which had by mistake got into the position of a rainbow.

Prismatic colouring was faintly visible, and the bow was brightest where the cloud film was thickest, but there hardly could have been a sky less suggestive of rain. It was at its best at 12.30 p.m., and at 2 p.m. I looked several times to see whether there were any signs of a solar halo on the precisely similar sky in the west and south-west, but could detect none.

I do not remember ever to have seen such a bow before.

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

North Cadbury Rectory, Somerset, November 28th.

WHAT I presume to have been a brilliant fog bow or arch spanned the northern sky on Tuesday, November 28th, 11.50 a.m. to 0.55 p.m. (65 minutes). There was no rain within some hours of the event and, at the time, the southern region of the firmament was involved in fog through which the sun struggled with a sickly light. The prismatic colours were slightly displayed in the bow at times though it greatly varied both in tone and tint and for short intervals it presented a colourless luminosity which suggested the aspect of "the ghost of a rainbow" as one of the spectators remarked.

The bow was projected upon pale blue sky slightly interspersed with very thin films of whitish vapour. Denser clouds began to gather over the sun at 0.53 p.m., and the object quickly disappeared. It may have been visible for a considerable time before I first detected it and it will be interesting to learn whether it was observed elsewhere and for how long?

From letters, in the local press, relating to the phenomenon it seems that it was seen as early as 10.55 a.m. from Bristol, and that it remained plainly visible from Kelston, near Bath, until between 3 and 3.15 p.m. The majority of the observers describe it as presenting a nearly colourless aspect; the inner margin of the bow appeared, however, generally bluish, while the outer fringe exhibited an orange tint, the hues were feebly manifested.

W. F. DENNING.

Bristol, November 28th, 1916.

THE COMING WINTER.

THE statement (p. 154) that I predict a mild winter for Greenwich is not quite accurate. What I tried to show was that, given a certain antecedent condition (a matter still in doubt, perhaps), there would be reason to expect that winter would have a preponderance of warm months. Failing this condition, there is nothing to be said.

Facetious criticism (if the term applies), is sometimes appropriate and amusing: but a reasoned estimate of the future in the light of the past is not necessarily disposed of in that way, and it may fairly claim better treatment. Meet argument with argument, and let us see how things pan out. The problem of long-range forecasting presses increasingly for solution; and it would be unscientific to dismiss it as insoluble. I venture to predict (at pretty long range) that some of the rising generation will see a Meteorological Office including forecasts of months, seasons, etc., as part of its regular duties.

A.B.M.

Bridge of Allan, 23rd November, 1916.

[We regret that the correspondent who sent the material for the note complained of is seriously ill and cannot therefore be asked to furnish the newspaper notice on which the remark was based. We much regret that the opinions of A. B. M. were referred to as a forecast, since he explains that they were not so meant.—
EDITOR, *S.M.M.*]

WINTER THUNDERSTORMS.

I SHOULD be much obliged if any of your readers would kindly send me reports of thunder or lightning observed between January 1st 1917, and March 31st, 1917. The reports should be sent as soon as possible by letter or post-card, addressed to Captain C. Cave, R.E., Meteorological Office, South Farnborough, Hants.

The points on which information is desired are the following :—

- (1.) Time when storm was nearest or overhead.
- (2.) Direction of storm, when first observed, and time.
- (3.) Direction when last observed, and time.
- (4.) Note if there was change of wind during the storm, and if there was a drop of temperature.
- (5.) Any other information as to heavy rain, hail, or snow, or any remarkable feature.
- (6.) If an Observer has accurate time, a list of the times of occurrence of flashes would be useful.

Information on these points would be of use, but, as many observers might not have time or opportunity to observe them all, I should be grateful for information on even one point ; No. 1 is the most important.

I wish to take this opportunity of thanking those of your readers who sent information in the first three months of 1916. I had nearly one thousand reports from all sources and was unable to reply to each one. I wish to assure Observers that every report sent in was of use.

More reports from the North of Scotland would be particularly useful.

C. CAVE.

Meteorological Office, South Farnborough, Hants.

PERMANENT SNOW BEDS IN SCOTLAND.

I WELCOME Mr. Dansey's investigations on this subject not only as a particular aspect of the general study of British snowfall, the importance of which I have lately drawn attention to, but also in their general climatic bearing. As the highest ground in the Highlands obviously cannot fall very far short of the snow-line, it was

only to be expected that small beds of permanent snow should exist here and there, and the facts which Mr. Dansey has brought to line in recent years show how broad statements in geographical text-books to the effect that there are no permanent snows in Britain must only be accepted in a general sense. As a curt generalization it is, perhaps, truer to say that there are no permanent snows than that there are. Just below the definite snow-line in mountain regions there comes a belt where snow is liable to lie permanently in isolated patches where local conditions favour accumulation, and it is just within this outlier region that the Scottish Highlands seem to come.

Similarly in travelling sometimes in winter from a part of England where snow is not lying to where it lies deep one first of all traverses an intermediate zone beginning with a few small encrustations of snow here and there which increase in frequency and size as the uniform snow cover is approached.

L. C. W. BONACINA.

November 26th, 1916.

REMARKABLE SHOWERS.

BETWEEN 5 and 6 p.m. on November 7th we had here two brief but extremely heavy showers, the one following the other after an interval of a few minutes, which produced effects such as I had never before seen, although heavy rains are not rare in the district. The wind was westerly, and the path of the deluge appears in each case to have been very narrow from north to south; I saw the second shower approaching and was struck by its appearance—a long narrow belt of dense black cloud, of low altitude, each end of which was sharply defined, coming from about W.S.W.; its length from N. to S. could not have been more than 45° , and its greatest thickness I judged as 10° ; there was not much cloud above it, and below it the sky was comparatively bright. The rain speedily followed, and as soon as the downpour had (abruptly) ceased, I went out and found the roads everywhere flooded, with water spurting into them through the hedges (even from newly-ploughed land) in a way I had never seen before. On fairly level ground there was a strong current on both sides of the road, but where there was a moderately steep gradient the word “roaring” could fairly have been applied to the noise made by the rushing torrent. Unfortunately it was too dark to make measurements, but the disintegrated state of the roads amply testifies to the violence of the floods, which, I may add, began to abate very quickly. Next morning I found 1.49 in. of rain in my gauge, and I estimate that at least five-sixths of that amount must have fallen in those two showers, whose total duration was less than a quarter of an hour.

R. H. CURTIS.

14th November, 1916.

REVIEW.

Eleventh Annual Report of the Meteorological Committee to the Lords Commissioners of His Majesty's Treasury, for the year ended March 31st, 1916. London, H.M. Stationery Office. Size, $9\frac{1}{2} \times 6$. Pp. 16. Price 1d.

By a drastic process of elimination the eleventh annual report of the Meteorological Committee is reduced in size to a pamphlet of 16 pages, of which only 5 are devoted to letterpress. The work of the year was mainly concerned with further organization on a war basis, involving among other activities the issue of four weather reports daily for the hours of 1 a.m., 7 a.m., 1 p.m. and 6 p.m., G.M.T. A separate unit of the Royal Engineers has been created for meteorological work at the front, the service in France being under the command of Major E. Gold, R.E., D.S.O., and that in the Eastern Mediterranean under Capt. E. M. Wedderburn. In connection with these services great assistance has been received from Major H. G. Lyons, R.E., who has been in charge of that department of the Office since May, 1915.

Attention has also been given to the co-ordination of meteorological observations in connection with aeronautics, and Major G. T. Taylor, R.F.C., late Schuster Reader in Meteorology, has been appointed Professor of Meteorology to the Royal Flying Corps.

The special publications of the Office during the year include Sir Napier Shaw's "The Weather Map," and we are interested to note that the preparation of a Handbook or Text Book of Meteorology is in progress. But for the official reports the publications have been restricted to the requirements of the Naval and Military services. The completion is announced of the first issue of the Réseau Mondial, dealing with the Meteorology of the globe, an account of which was given in a lecture before the Royal Meteorological Society by Sir Napier Shaw in March, 1916. (See this Magazine, April, 1916, p. 42). Unfortunately the issue of this work has been delayed through the destruction by fire of the printed-off copies of the letterpress.

Mention is made of a special investigation carried out by Capt. C. J. P. Cave, R.E., in charge of the South Farnborough branch of the Office, into the occurrence of thunderstorms with a view to anticipating their arrival in threatened localities. We are glad to hear from Capt. Cave that he has received great assistance in this work from reports sent in from a large number of readers of this magazine and Observers of the British Rainfall Organization.

METEOROLOGICAL NEWS AND NOTES.

THE LATE MR. GEORGE SEARLE, of Edith Road, West Kensington; who was a rainfall Observer for more than thirty years, has left a legacy of £200 to the British Rainfall Organization, which, however, is not payable until the end of the war. The bequest, when received, will go to the Endowment Fund of the Organization, the proceeds of which are available for supplementing the income derived from subscriptions to the publications, a source which has necessarily suffered somewhat during the last two years.

METEOROLOGICAL OBSERVATIONS ON ELEPHANT ISLAND in the South Shetlands were, we are glad to learn, kept up by the scientific staff of Sir Ernest Shackleton's expedition in the *Endurance* during the whole period of their stay on the island.

DECEMBER AS THE FIRST WINTER MONTH is not only a convenience to meteorologists, but an ancient belief in England. The daily press recently called attention to the fact that on December 1st, following a medieval custom, the Town Crier of Colchester ushered in "Winter" by walking through the town ringing his bell and declaiming the lines :—

Cold December hath come in,
Poor people's backs are clothed thin,
The trees are bare, the birds are mute,
A pot and toast would very well suit.

MR. J. GLASSPOOLE, assistant computer in the office of the British Rainfall Organization, attested under the Derby Scheme, and, when called up for military service a few months ago, was allowed exemption to enable him to take the examinations at the University of London for which he had been preparing. He has now passed for the degree of B.Sc. in Mathematics and Chemistry, and has been appointed as assistant chemist in a Government establishment engaged on war work.

RAINFALL OBSERVING IN THE EGYPTIAN DESERT apparently offers some attractions to the hard-worked members of the R.A.M.C. now stationed somewhere thereabouts. One of these writes to us :—"I should think about the easiest job in this part of the world would be that of Rainfall Observer. For ten months of the year he could sleep in peace, waken up in November, get the rain gauge out, set it up in a suitable place, and then lie down again keeping one eye open in case the rain *should* come on. And then in the middle of January he would demobilize the gauge, measure the minute fraction of an inch of water, send in his report, and curl up for another long sleep."

RAINFALL TABLE FOR NOVEMBER, 1916.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875— 1909. in.	1916. in.
Camden Square.....	London.....	51 32	0 8	111	2'34	4'67
Tenterden.....	Kent.....	51 4	*0 41	190	3'07	4'87
Arundel (Patching).....	Sussex.....	50 51	0 27	130	3'54	4'77
Fordingbridge (Oaklands)...	Hampshire.....	50 56	1 38	135	3'41	5'20
Oxford (Magdalen College)...	Oxfordshire.....	51 45	1 15	186	2'25	2'94
Wellingborough (Swanspool)...	Northampton.....	52 18	0 41	155	2'22	3'33
Bury St. Edmunds (Westley)...	Suffolk.....	52 15	*0 40	226	2'40	3'25
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	2'49	3'12
Polapit Tamar [Launceston]...	Devon.....	50 40	4 22	315	4'07	6'44
Rousdon [Lyme Regis].....	„.....	50 41	3 0	516	3'51	4'36
Stroud (Field Place).....	Gloucestershire.....	51 44	2 13	226	2'77	2'86
Church Stretton (Wolstaston)...	Shropshire.....	52 35	2 48	800	2'94	2'76
Boston.....	Lincolnshire.....	52 58	0 1	11	2'05	3'21
Worksop (Hodsock Priory)...	Nottinghamshire.....	53 22	1 5	56	1'98	3'16
Mickleover Manor.....	Derbyshire.....	52 54	1 32	280	2'21	3'21
Macclesfield.....	Cheshire.....	53 15	2 7	501	3'00	...
Southport (Hesketh Park)...	Lancashire.....	53 39	2 59	38	3'16	2'63
Arnellcliffe Vicarage.....	Yorkshire, W.R.....	54 8	2 6	732	6'12	6'38
Goldsborough Hall.....	„.....	54 0	1 25	119	2'33	2'64
Hull (Pearson Park).....	„ E.R.....	53 45	0 20	6	2'34	2'68
Newcastle (Town Moor)...	Northumberland.....	54 59	1 38	201	2'63	3'38
Borrowdale (Seathwaite)...	Cumberland.....	54 30	3 10	423	13'59	20'71
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	4'08	3'18
Haverfordwest.....	Pembroke.....	51 48	4 58	90	5'16	4'52
Aberystwyth (Gogerddan)...	Cardigan.....	52 26	4 1	83	4'50	3'00
Llandudno.....	Carnarvon.....	53 20	3 50	72	3'19	2'58
Cargen [Dumfries].....	Kirkcudbright.....	55 2	3 37	80	4'35	5'13
Marchmont House.....	Berwick.....	55 44	2 24	498	3'21	5'37
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	5'24	4'86
Glasgow (Queen's Park)...	Renfrew.....	55 53	4 18	144	3'63	3'19
Islay (Eallabus).....	Argyll.....	55 47	6 15	68	5'33	6'42
Mull (Quinish).....	„.....	56 34	6 13	35	6'24	8'63
Balquhider (Stronvar).....	Perth.....	56 21	4 23	422	7'87	...
Dundee (Eastern Necropolis)...	Forfar.....	56 28	2 57	199	2'62	3'86
Braemar.....	Aberdeen.....	57 0	3 24	1114	3'76	6'08
Aberdeen (Cranford).....	„.....	57 8	2 7	120	3'29	3'64
Gordon Castle.....	Moray.....	57 37	3 5	107	2'85	2'85
Drumnadrochit.....	E. Inverness.....	57 20	4 29	138	3'41	3'61
Fort William.....	„.....	56 49	5 6	171	7'55	11'79
Loch Torridon (Bendamph)...	W. Ross.....	57 32	5 32	20	8'90	10'98
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	3'25	2'37
Killarney (District Asylum)...	Kerry.....	52 4	9 31	178	5'54	11'20
Waterford (Brook Lodge)...	Waterford.....	52 15	7 7	104	3'80	6'15
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	3'88	5'09
Ennistymon House.....	Clare.....	52 57	9 18	37	4'62	7'48
Gorey (Courtown House)...	Wexford.....	52 40	6 13	80	3'41	3'88
Abbey Leix (Blandsfort)...	Queen's County.....	52 56	7 17	532	3'28	5'42
Dublin (Fitz William Square)...	Dublin.....	53 21	6 14	54	2'64	5'77
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	3'38	4'69
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 16	74	5'75	7'64
Cong (The Glebe).....	„.....	53 33	9 16	112	5'00	6'83
Collooney (Markree Obsy.)...	Sligo.....	54 11	8 27	127	4'02	7'48
Seaford.....	Down.....	54 19	5 50	180	3'86	4'20
Ballymena (Harryville).....	Antrim.....	54 52	6 13	150	3'95	4'12
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	3'66	4'34

RAINFALL TABLE FOR NOVEMBER, 1916—continued.

RAINFALL OF MONTH (con.)					RAINFALL FROM JAN. 1.				Mean Annual 1875-1909.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.	No. of Days	Date.	Aver. 1875-1909. in.	1916. in.	Diff. from Aver. in.	% of Av.		
+2.33	200	.87	7	12	22.98	31.46	+8.48	137	25.11	Camden Square
+1.80	159	1.08	19	17	24.87	29.49	+4.62	119	27.64	Tenterden
+1.23	135	.73	5	14	27.57	32.85	+5.28	119	30.48	Patching
+1.79	153	.93	6	23	27.71	35.96	+8.25	130	31.06	Fordingbridge
+ .69	131	.77	18	14	22.52	26.90	+4.38	119	24.58	Oxford
+1.11	150	.84	18	16	23.07	24.01	+ .94	104	25.20	Swanspool
+ .85	135	.59	19	16	23.26	30.06	+6.80	129	25.40	Westley
+ .63	125	.70	18	22	21.66	24.51	+2.85	113	23.73	Geldeston
+2.37	158	.83	4	22	33.81	37.04	+3.23	110	38.27	Polapit Tamar
+ .85	124	.85	7	18	29.86	33.18	+3.32	111	33.54	Rousdon
+ .09	103	.61	7	17	27.10	31.15	+4.05	115	29.81	Stroud
- .18	94	.41	25	17	29.42	30.02	+ .60	102	32.41	Wolstaston
+1.16	157	.87	18	16	21.47	26.05	+4.58	121	23.35	Boston
+1.18	159	1.17	18	14	22.29	22.30	+ .01	100	24.46	Hodsock Priory
+1.00	145	.96	18	15	24.27	28.37	+4.10	117	26.65	Mickleover
...	...	...	...	...	31.38	...	...	...	34.73	Macclesfield
- .53	83	.33	6	18	29.60	28.90	- .70	98	32.70	Southport
+ .26	104	1.00	18	21	54.74	63.68	+8.94	116	61.49	Arncliffe
+ .31	113	.71	18	18	25.00	26.68	+1.68	107	27.29	Goldsborough Hall
+ .34	115	.92	18	19	24.10	25.76	+1.66	107	26.42	Hull
+ .75	128	1.27	18	17	25.48	27.28	+1.80	107	27.94	Newcastle
+7.12	153	4.88	26	14	114.34	131.36	+17.02	115	129.48	Seathwaite
- .90	78	.68	6	23	37.58	44.24	+6.66	118	42.28	Cardiff
- .64	88	.77	6	22	41.63	39.02	-2.61	94	46.81	Haverfordwest
-1.50	67	.53	7	21	40.80	42.32	+1.52	104	45.46	Gogerrddan
- .61	81	.40	25	17	27.52	28.39	+ .87	103	30.36	Llandudno
+ .78	118	1.03	3	20	38.63	48.79	+10.16	126	43.47	Cargen
+2.16	167	1.21	18	22	30.93	41.11	+10.18	133	33.76	Marchmont
- .38	93	.95	3	21	44.29	45.55	+1.26	103	49.77	Girvan
- .44	88	.70	24	20	32.02	39.38	+7.36	123	35.97	Glasgow
+1.09	120	.75	24	27	43.06	49.00	+5.94	114	48.79	Eallabus
+2.39	138	1.08	3	26	49.98	48.91	-1.07	98	56.57	Quinish
...	...	...	...	...	64.94	...	...	...	73.77	Stronvar
+1.24	147	.89	19	18	25.97	36.91	+10.94	142	28.64	Dundee
+2.32	162	1.18	3	18	31.80	44.08	+12.28	139	34.93	Braemar
+ .35	111	.78	4	18	29.30	32.05	+2.75	109	32.73	Aberdeen
.00	100	.41	28	19	27.62	33.83	+6.21	122	30.34	Gordon Castle
+ .20	106	.93	24	20	32.37	45.33	+12.96	140	36.13	Drumadrochit
+4.24	156	1.61	10	26	66.39	77.01	+10.62	116	75.80	Fort William
+2.08	123	1.47	23	23	74.07	78.81	+4.74	106	83.93	Bendamph
- .88	77	.30	20	18	28.81	32.34	+3.53	112	31.90	Dunrobin Castle
+5.66	202	3.52	16	27	47.89	64.67	+16.78	135	54.81	Killarney
+2.35	162	1.30	4	20	35.25	36.67	+1.42	104	39.57	Waterford
+1.21	131	.98	3	21	35.09	39.53	+4.44	113	39.43	Castle Lough
+2.86	162	1.79	16	26	41.49	49.26	+7.77	119	46.52	Ennistymon
+ .47	114	.76	6	21	31.57	34.76	+3.19	110	34.99	Courtown Ho.
+2.14	165	.92	17	20	32.51	37.51	+5.00	115	35.92	Abbey Leix
+3.13	219	1.56	17	19	25.41	35.88	+10.47	141	27.68	Dublin
+1.31	139	.70	18	25	32.76	42.85	+10.09	131	36.15	Mullingar
+1.89	133	1.43	16	28	46.76	56.56	+9.80	121	52.87	Enniscoe
+1.83	137	1.18	16	27	43.48	50.81	+7.33	117	48.90	Cong
+3.46	186	1.25	17	28	38.37	50.49	+12.12	132	42.71	Markree
+ .34	109	.72	4, 18	19	35.14	38.24	+3.10	109	38.91	Seaforde
+ .17	104	.64	25	23	36.87	40.69	+3.82	110	40.84	Ballymena
+ .68	119	.62	3	26	35.47	40.05	+4.58	113	39.38	Omagh

SUPPLEMENTARY RAINFALL, NOVEMBER, 1916.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	6.94	XI.	Lligwy	3.65
„	Ramsgate	3.54	„	Douglas, Isle of Man .....	...
„	Hailsham	5.26	XII.	Stoneykirk, Ardwell House...	3.19
„	Totland Bay, Aston House...	3.25	„	Carsphairn, Shiel	7.95
„	Stockbridge, Ashley..	5.18	„	Beattock, Kinnelhead	6.05
„	Grayshott	6.23	„	Langholm, Drove Road	6.12
III.	Harrow Weald, Hill House...	4.14	XIII.	Selkirk, The Hangingshaw..	5.05
„	Pitsford, Sedgebrook.....	3.29	„	North Berwick Reservoir...	3.63
„	Woburn, Milton Bryant.....	3.42	„	Edinburgh, Royal Observatory.	3.17
„	Chatteris, The Priory.....	2.10	XIV.	Maybole, Knockdon Farm...	4.20
IV.	Elsenham, Gaunts End	3.96	XV.	Buchlyvie, The Manse.....	...
„	Shoeburyness	3.47	„	Ballachulish House	13.01
„	Colchester, Hill Ho., Lexden	3.78	„	Oban	7.23
„	Ipswich, Rookwood, Copdock	4.21	„	Campbeltown, Witchburn ..	5.14
„	Aylsham, Rippon Hall	3.11	„	Holy Loch, Ardnadam.....	8.59
„	Swaffham	2.99	„	Tiree, Cornaigmore	5.00
V.	Bishops Cannings	3.68	XVI.	Dollar Academy	5.48
„	Wimborne, St. John's Hill...	5.48	„	Glenlyon, Meggernie Castle..	11.51
„	Ashburton, Druid House....	8.54	„	Blair Atholl	5.68
„	Cullompton	5.32	„	Coupar Angus	4.03
„	Lynmouth, Rock House	3.75	„	Montrose, Sunnyside Asylum.	...
„	Okehampton, Oaklands....	7.06	XVII.	Alford, Lynturk Manse	4.61
„	Hartland Abbey.....	5.00	„	Fyvie Castle	3.98
„	St. Austell, Trevarna	8.37	„	Keith Station	3.70
VI.	North Cadbury Rectory.....	5.10	XVIII.	Rothiemurchus	4.33
„	Clifton, Stoke Bishop	2.81	„	Loch Quoich, Loan	21.95
„	Ledbury, Underdown.....	2.80	„	Skye, Dunvegan	9.67
„	Shifnal, Hatton Grange.....	1.72	„	Lochmaddy, Bayhead	2.42
„	Droitwich	2.44	„	Fortrose	1.93
VII.	Blockley, Upton Wold.....	3.76	„	Glencarron Lodge	8.77
„	Grantham, Saltersford.....	3.55	XIX.	Altnaharra	5.65
„	Market Rasen	2.71	„	Melvich	4.68
„	Bawtry, Hesley Hall	2.76	„	Loch More, Achfary	12.32
„	Derby, Midland Railway.....	2.94	XX.	Dunmanway, The Rectory ..	12.60
VIII.	Buxton	4.07	„	Glanmire, Lota Lodge.....	7.80
„	Nantwich, Dorfold Hall	2.51	„	Mitchelstown Castle.....	7.66
„	Chatburn, Middlewood	3.43	„	Darrynane Abbey.....	...
IX.	Lancaster, Strathspey	3.83	„	Clonmel, Bruce Villa	7.09
„	Langsett Moor, Up. Midhope	5.27	„	Broadford, Hurdlestown.....	5.84
„	Scarborough, Scalby	3.37	XXI.	Enniscorthy, Ballyhyland...	5.41
„	Ingleby Greenhow	4.47	„	Rathnew, Clonmannon	5.35
X.	Mickleton	4.70	„	Ballycumber, Moorock Lodge	3.37
„	Bellingham, High Green Manor	7.02	„	Balbriggan, Ardgillan	5.04
„	Ilderton, Lilburn Cottage ..	4.60	„	Castle Forbes Gardens.....	4.63
„	Keswick, The Bank.....	9.21	XXII.	Ballynahinch Castle.....	10.03
XI.	Llanfrecŷfa Grange	4.16	„	Woodlawn	4.21
„	Treherbert, Tyn-y-waun	10.28	„	Westport, St. Helens	8.40
„	Carmarthen, The Friary	5.10	„	Dugort, Slievemore Hotel ..	10.06
„	Fishguard, Goodwick Station.	4.00	XXIII.	Enniskillen, Portora.....	3.92
„	Crickhowell, Tal-y-maes.....	4.50	„	Dartrey [Cootehill]	4.15
„	New Radnor, Ednol	4.31	„	Warrenpoint, Manor House ..	4.01
„	Birmingham WW., Tyrmynydd	5.60	„	Belfast, Cave Hill Road	3.74
„	Lake Vyrnwy	6.06	„	Glenarm Castle	4.34
„	Llangynhafal, Plas Drŷw.....	3.41	„	Londonderry, Creggan Res...	5.02
„	Dolgelly, Bryntirion.....	5.58	„	Dunfanaghy, Horn Head ...	5.46
„	Bettws-y-Coed, Tyn-y-bryn...	5.31	„	Killybegs	7.56

THAMES VALLEY RAINFALL. — NOVEMBER, 1916.



ALTITUDE
SCALE

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

SCALE OF MILES

0 5 10 15 20

WEATHER OF NOVEMBER.

UNTIL the closing week the weather of November was exceedingly wet and stormy, and in the first fortnight, when equatorial winds predominated, it was also very mild. The worst gales of the month occurred respectively between the 3rd and 5th, and between the 17th and 19th. Shortly after mid-day on the 3rd increasing winds from S. and S.E. set in on all our northern coasts, and in the course of the next two days the entire kingdom was involved in a storm of considerable severity. The greatest violence was experienced on the 5th and over the southern half of the kingdom, where most of the anemometers recorded wind velocity of considerably over 60 miles an hour. At Brighton the extreme force, in gusts, was 74 miles per hour, at Dover 78 miles, and at Plymouth 81 miles. On the west coast the gale resulted in the loss, by collision on the 4th, of the steamer *Connemara*, off Greenore.

The mild weather reached its maximum intensity between the 10th and 13th, when shade temperatures slightly above 60° were recorded at many stations in nearly all parts of the kingdom. At Carrick-on-Suir the thermometer on the 10th reached 64°, and on the following day it rose to 63° at Geldeston, and as far north as Gordon Castle.

The second important storm of the month, that of the 17th to 19th, came from the E. or S.E. and was attended by weather of an essentially wintry character. The violence of the wind was not as great as in the earlier instance, but there were several records of gusts varying between 55 and 60 miles per hour. Round the north and north-east coasts of Great Britain, where the on-shore wind raised a tremendous sea, an extreme wind velocity of 65 miles per hour was recorded at Dyce, and 67 miles at Aberdeen. At the mouth of the Channel, the velocity in gusts reached 69 miles per hour at Scilly and at Pendennis Castle, Falmouth. The weather at the time was bitterly cold and on the 18th and 19th snow or sleet fell in nearly all districts. Some rather sharp night frosts occurred between the 19th and 22nd, but the lowest temperatures recorded in the screen were not more than 5° or 6° below freezing point. A thunderstorm passed over Bognor and Brighton on the 21st.

A brief recurrence of mild stormy weather took place between the 22nd and 25th, but in the closing days of the month the atmosphere became much quieter and temperature fell decidedly. On the coldest night, that of the 27th-28th, the screened thermometer fell to about 10° below the freezing point at a number of places in eastern, central and southern England; while on the surface of the grass the minima were as low as 11° at Hampstead, 13° at Wisley, and 15° at Marlborough and Tunbridge Wells.

Aurora was seen at Aberdeen on the 1st, 2nd, 17th and 25th, at Crieff on the 21st, at Edinburgh on the 25th, and at many northern stations on the 29th. A brisk air motion served to keep the atmosphere as a rule fairly clear, but on the evening of the 13th a thick fog settled over London, and traffic in the streets became at once difficult and dangerous.

The total rainfall was in excess of the average practically everywhere and was more than 50 per cent. above the average in the south of England, the east Midlands, and the greater part of Ireland. In London the fall was exactly double the average, the total at Camden Square being the greatest recorded in November since observations commenced in 1858. The rainfall exceeded 6 inches in the west and south of Ireland, over the West Highlands, and the southern uplands of Scotland. The six-inch areas in England and Wales were not abnormally extensive, but the appearance of 6-inch splashes in Surrey and Sussex is an unusual occurrence in November.

The general rainfall expressed as a percentage of the average was :—England and Wales, 124 per cent.; Scotland, 124 per cent.; Ireland, 148 per cent.; British Isles, 131 per cent. At Camden Square the duration of sunshine was 49.4 hours, the duration of rainfall 82.2 hours, and the total evaporation from a free water surface was, .34 in.

Climatological Table for the British Empire, June, 1916.

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	73·6	22	40·3	17	65·0	47·9	46·9	75	125·8	39·1	2·19	16	8·0
Malta	96·4	27	63·3	8	78·1	70·3	...	72	145·0	...	·06	1	0·8
Lagos	88·4	8	70·2	9	84·7	74·3	73·2	82	156·2	69·0	18·84	22	8·6
Cape Town	66·8	25	33·3	5	59·9	47·5	48·1	82	...	...	4·14	14	5·1
Johannesburg	69·5	12	37·8	6	62·8	43·4	27·7	47	...	30·0	·00	0	0·6
Mauritius	78·8	2	58·8	23	75·4	64·2	62·2	79	...	50·5	1·79	18	4·9
Bloemfontein	72·8	14	21·9	19	63·7	30·2	26·6	58	..	...	·00	0	1·5
Calcutta... ..	95·2	1	74·3	29	88·9	78·7	74·5	85	...	72·5	16·99	17	9·1
Bombay... ..	89·9	6	76·2	21	87·1	79·4	77·9	84	130·2	69·8	23·55	29	8·7
Madras	104·5	7	74·6	1	99·8	80·5	70·0	61	165·9	74·5	3·41	11	6·7
Colombo, Ceylon	87·2	1	72·4	13*	85·0	76·6	74·3	84	153·0	69·9	7·97	21	8·2
Hongkong	89·1	30	71·5	8	83·4	76·5	74·8	86	...	...	32·18	25	8·9
Sydney ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Melbourne	66·6	1	32·5	16	56·2	43·9	42·1	73	107·7	24·6	1·62	19	6·4
Adelaide	64·8	5	39·5	18	58·5	46·9	47·5	83	120·8	30·1	8·58	24	6·6
Perth	68·0	1	38·0	20	62·3	55·5	47·4	74	126·4	31·1	7·67	18	6·0
Coolgardie	67·8	1	36·0	20†	59·4	44·0	41·0	64	129·0	28·0	1·27	9	4·6
Hobart, Tasmania	61·4	13	31·3	16	52·5	40·3	38·7	72	109·0	24·0	2·56	22	6·2
Wellington	62·0	1	35·4	27	57·6	48·0	45·7	78	86·8	27·0	1·33	10	6·4
Auckland ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Jamaica, Kingston	94·1	22	71·3	2	89·4	73·5	71·6	75	...	...	1·53	7	...
Grenada	88·0	14*	71·0	17‡	85·0	74·0	...	77	135·0	...	7·13	20	...
Toronto	78·0	13	39·8	1	69·1	51·2	53·6	82	141·4	35·9	4·29	18	6·1
Fredericton	81·2	27	39·0	2	69·7	50·1	53·5	77	...	...	6·31	12	6·1
St. John, N.B.	74·0	7	40·3	16	63·1	48·8	50·3	80	136·2	39·0	5·23	16	6·8
Victoria, B.C.	80·8	16	43·3	6	64·2	48·5	47·0	74	139·0	24·0	·52	8	4·6

* 20. † 22. ‡ 30.

MALTA.—Exceptionally hot, with prevalence of east winds.

LAGOS.—On the 25th, 6·14 in. of R fell.

Johannesburg.—Bright sunshine, 295·5 hours.

COLOMBO CEYLON.—Mean temp. 80°·8, or 0°·9 below, dew point 0°·5 below, and R ·21 in. below, averages. Mean hourly velocity of wind 6·9 miles.

HONGKONG.—Mean temp. 79°·6, mean hourly velocity of wind 15·1 miles. Bright sunshine 125·3 hours.

Melbourne.—Mean temp. 0°·4 below, and R ·47 in. below, averages.

Adelaide.—Mean temp. 0°·7 below, and R 5·54 in. above, averages. The wettest month on record in the whole of the 77 years' record.

Coolgardie.—Temperature 0°·9 below the average. R about normal.

Wellington.—Mean temp. 3°·4 above, and R 3·75 in., below averages. Bright sunshine 122·3 hours.

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VOL. LI.

THE RAINFALL OF 1916.

WE are happy to be able to report that there is no falling off in the number of rainfall returns received during the first ten days of January as compared with last year. More than 3,000 out of the expected total of 5,500 records have already come in to the office at Camden Square. The large Rainfall Table on pp. 184-5 presents a summary of the year as well as of the month of December, and a glance at the column showing the relation to the average tells us that the year has been an unusually wet one. Only a few stations in the north and centre of England, in the south-west of Wales, and in the extreme fringe of the Outer Hebrides, failed to record an average fall, and it is many years since so small an area of the British Isles could be called "dry" when compared with the average. The deficiency of rainfall was nowhere so much as 10 per cent., whereas in the wetter parts of the country many stations showed excesses of more than 40 per cent. The wettest part was undoubtedly the east and centre of Scotland, but large tracts in the south of England were also very wet indeed; and the uniformity of the high rainfall over the length and breadth of Ireland is perhaps the most remarkable feature of the distribution, the general excess being 14 per cent.

Considering the general rainfall of the other large divisions of the country, we find that Wales, with an excess of only 5 per cent., was nearly normal. The North of England had an excess of 9 per cent., the South of England as much as 16 per cent., and Scotland 17 per cent. The rainfall of the British Isles as a whole was 13 per cent. in excess of the average. This shows that 1916 was wetter than any year since 1912, while Scotland and Ireland were wetter than in any year since 1903, the wettest in our annals. London lay in the wettest part of England, and the total fall, 34·01 inches, has only once been exceeded appreciably. This was in 1903, when 38·10 in. fell; but in 1878 there was practical equality with 1916, the fall then being 34·08 in.

William Ellis, F.R.S.

Greenwich, 20th February, 1828—Blackheath, 11th December, 1916.

THE fateful year, 1916, has claimed yet another veteran of Meteorological science in the person of Mr. William Ellis, the successor of Glaisher as head of the Meteorological department of the Royal Observatory, Greenwich, and for a generation he was as Referee the arbiter on doubtful papers submitted to the Royal Meteorological Society. The son of an assistant at the Royal Observatory Mr. Ellis was himself in its service all his working life, and on retirement in 1893, he lived so near that it is recorded that he attended 75 consecutive annual visitations, the last of them last June.

Mr. Ellis was President of the Royal Meteorological Society in 1886-87, and to the end he took a keen interest in the work of the Society, continuing to attend the meetings long after his failing eyesight made the journey from Blackheath to Westminster and back a very serious danger. He was a frequent contributor to our pages and readers will remember with what zest he threw himself into the denunciation of all attempts to revive the old views of the influence of the Moon's phases on the Weather. He opposed these the more strongly because it is mainly to his researches that the influence of the Sun on magnetic phenomena was established, and he had satisfied himself that nothing about the Moon warranted any belief in it as a weather guide. His exhaustive volume on the fifty years' Temperature Observations at Greenwich fitly marked the close of his official career, but he continued to take the keenest interest in meteorological and astronomical matters to the end. His two vigorous letters on the limits of the seasons in our last volume are sufficient to show how alert his mental faculties remained far into his eighty-seventh year. In all his comments and controversies his strong common sense was always conspicuous.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday the 20th December, at the Society's Rooms, 70, Victoria Street; Major H. G. Lyons, D.Sc., F.R.S., President, in the Chair.

Mr. Carle Salter, Assistant Director of the British Rainfall Organization, read a paper on the Measurement of Rainfall Duration. Save for an article by Mr. Baldwin Latham in 1880, practically no attention appeared to have been paid to this subject till 1903, when Dr. H. R. Mill commenced collecting records for the British Isles the number of which has grown till in *British Rainfall, 1915*, as many as forty-eight records were published. An examination of these records revealed certain inconsistencies which were probably

due to personal and instrumental causes. Two short series of observations made simultaneously with the Halliwell Recorder and the Hyetograph, two of the most widely used patterns of self-recording rain gauge, showed a difference of about 10 per cent. between their respective indications. A rough comparison of all the available records suggested that the Casella Recorder gave generally the largest values and the Beckley the smallest. These differences appeared to be due principally to the varying degrees of sensitiveness of the instruments to very light rain, and the suggestion had been made that if rain of very low intensity were omitted from the records a closer approximation to homogeneity would be attained. An analysis of the "Halliwell" and "Hyetograph" records referred to, by the elimination of all rain at a less rate than .01 in. in 3 hours (or 0.1 mm. per hour) showed, however, that the original differences were not greatly reduced.

An animated discussion followed in which the President, Mr. W. B. Tripp, Mr. Baldwin Latham, Col. H. Mellish, Dr. C. Chree, Dr. H. R. Mill, Mr. F. J. W. Whipple, Mr. W. W. Bryant, Prof. H. H. Turner and Mr. Mark Zambra took part and Mr. Salter replied.

Prof. H. H. Turner, F.R.S., read a paper entitled "Discontinuities in Meteorological Phenomena, Third Note." In two previous papers it had been suggested that meteorological history is divided into definite chapters of average length $6\frac{1}{2}$ years, the separating dates being assigned according to a regular law. Further that if these chapters are numbered consecutively those with even numbers differ in certain essential respects from those with odd numbers. Some particular illustrations of these points had already been given, the elements studied being rainfall and temperature at different stations. The present paper gave the systematic analysis of 55 years' monthly rainfalls at twenty-eight European stations. The division into alternating chapters was clearly brought out; and it was apparently possible to assign the separating dates from this material within a month. This precision was made possible by the existence of a five-monthly periodicity, for which some evidence was given in a former communication, but which was clearly established by the mass of evidence here submitted. The division into chapters had been connected in a former paper with the movements of the earth's axis. In the present paper some earthquake statistics were presented which appeared to be favourable to this view.

Dr. H. R. Mill congratulated Prof. Turner on his successful treatment of the irregular alternating spells of excessive and deficient rainfall, the existence and capricious limits of which were shown in the coloured maps in *British Rainfall* for the last ten years.

Sir Napier Shaw said that it would indeed be a great thing for meteorology if it could be shown that the poles wagged the weather; but the problem would not be so much simplified if it should transpire that it was the weather that wagged the poles.

Correspondence.

*To the Editor of Symons's Meteorological Magazine.*THE RAINFALL OF HAVANA AND ENGLAND,
SOUTH-WEST.

FOR the past two years space has been kindly allowed for a short note to indicate the probable rainfall in the south-west of England for the three months January to March. This indication is based on a correlation between the rainfall at Havana for the wet season, May to October, and that in England, south-west, for the January to March following, the co-efficient being $\cdot 54$ and the probable error $\cdot 08$.

In 1914 the Havana rainfall was 71 per cent. of the average, while that experienced later in England, south-west, was 129 per cent. In 1915, the figures were respectively 82 and 126 per cent; This year the Havana rainfall has again been slight, only amounting to 74 per cent. of the fifty years' average, and suggests that there will be an abundant rainfall in the south-west districts of England and Wales for the three months, January to March, 1917.

Since 1911 the seasonal rainfall at Havana during May to October, with one exception, has been well below the average, while that subsequently falling in England, south-west, in January to March, has been in excess. The figures are of sufficient interest to be given in detail :

	Havana.	Eng. S.W.		Havana.	Eng. S.W.		Havana.	Eng. S.W.
1911	66	146	1913	87	138	1915	82	129
1912	108	139	1914	71	129	1916	74	...

A. HAMPTON BROWN.

December 27th, 1916.

A STAGNANT DECEMBER—COLD AND FOGGY.

THE month of December in every recent year beginning with 1910 has been (with the exception of that of 1913, which, at the close, was gloriously fine and frosty) characterized by weather of the open Atlantic type—rough, wet, and warm, providing many days and nights of dark muggy winter warmth during which the very breath of the ocean could be felt even in the interior of the country in the great broad sweeps of the moisture-laden south-westerly gale. In December, 1916, however, we reverted to another type of mid-winter weather marked by dry stagnant conditions favourable to gloomy fog-frosts in inland cities. But, except locally, as, for instance, in the south of Ireland, the cold of December, 1916, was not very severe for the season, and in London the month could

not compare in intensity of cold with the famous 1890, nor was there so sharp a spell as occurred at the end of 1908.

From the Midlands in the middle of the month came the usual winter tale of snowed-up railways, but nothing exceptional in the way of snowfall seems to have occurred.

To the above general remarks I may add a few special notes which came under my personal observation. During the night of the 14th-15th of December the northern suburbs of London had a snowfall, which, considering its local character, was rather heavy and slow to disappear. It was really quite an experience of geographical interest to travel on the morning of the 15th from the high ground of Hampstead Heath under two or three inches of snow, to Hyde Park, only four or five miles distant, where it required very sharp eyes to trace a pinch of snow "salt" here and there—raising the question to what extent Hampstead's local snowfall was due to its miniature mountain climate and what to a pure meteorological accident.

During the days around Christmas the Dartmoor plateau was sufficiently under snow to cause the lean hollows in the flanks of the great barren ridges to be outlined with an almost ghastly glare very different from the grandeur and beauty exhibited under a heavy fall of snow such as the Devonshire moors are only a little less familiar with than the north-country fells. On the morning of the 27th there was something like 15° of frost at Chagford, near Moreton-hampstead, Devon, and all window panes were thickly "ferned." The evening express from Exeter arrived at Paddington in a first-class London fog, only half an hour late, thanks apparently to the G.W.R.'s excellent device of engine-cab electric signalling, and it was interesting to observe the engine and train thickly coated with ice and rime in consequence of rushing nearly 200 miles through a freezing night fog. Like most heavy hoar frosts, however, this proved the forerunner of a warm rain-type of weather and not of a cold snow-type which in this country has quite a different set of signs.

L. C. W. BONACINA.

30th December, 1916.

METEOROLOGICAL OBSERVATIONS AT LU-KIA-PANG.

ERRATA.

THROUGH a copyist's error in the statistics for 1915 which appear on p. 53 in your Magazine for May, 1916, the daily mean barometer readings for the months are incorrectly set forth. They should be as follows (the figures 10 are omitted before the monthly values):—

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR
26·72	21·48	21·48	15·99	09·77	05·98	03·64	02·99	12·06	16·77	24·96	24·39	15·52

J. DE MOIDREY, S.J.

Zi-Ka-Wei, Nov. 12th, 1916.

REVIEWS.

The Weather Map. An introduction to modern meteorology, by SIR NAPIER SHAW, F.R.S., Director of the Meteorological Office. Published by the Authority of the Meteorological Committee. London . . . Stationery Office, 1916. Size, 6 × 5. Pp. 94, plates. Price 4d.

WERE it not for the formal blue paper covers this little book, with its quaint form, miniature size, and well-designed illustrations, would merit the designation of "dainty" and we could hardly imagine a prettier or more welcome Christmas present to any lover of Nature than a nicely bound copy. Sir Napier Shaw writes with a pleasant style far removed from the usual formal diction to which the printers to the Stationery Office are accustomed. It appears from the first line that the book appeals to persons engaged in war-like operations, a fact which serves to remind those who are not that the whole strength of the Meteorological Office has been turned for the last two years to the service of the Navy and Army. Yet the little book appeals no less to the student of the weather who has to content himself with inglorious routine at home, and to school teachers above all. A master of his subject like Sir Napier Shaw naturally lays stress on the fact which the junior meteorological official is apt to forget, namely, that modern meteorology depends on the organized work of the army of humble Observers as well as on the highly specialized labours of the officials at headquarters. It is plain that the better-informed the Observer is as to the purpose and the utility of his observations the more useful will his data be to the specialist who utilizes them for drawing general conclusions, and detailed forecasts. To all Observers this book is invaluable, and we recommend everyone who reads this notice to send five penny stamps to the Meteorological Office, South Kensington, London, S.W., and secure a copy without delay. It is unquestionably the best fourpenceworth ever published by the Office. One difficulty which may conceivably present itself to some readers will shortly be overcome by the publication of a glossary of the technical terms employed, although these are for the most part quite clearly explained as they occur. The little book requires no criticism, and indeed the excellence of its intentions would disarm a critic were he inclined to be captious. We may note, however, that on p. 16 the action of growing plants on carbonic acid is incompletely stated as of course it is only green plants which act, and that only under the stimulus of sunlight. On p. 23 there is a very exceptional occurrence, a sentence which is not quite clear. It reads: "With the ubiquity of pressure comes the idea of its distribution and for this purpose we regard the pressure as uniform." It would scarcely be easy to draw an isobaric map if the pressure were uniform over the whole area dealt with.

Statistical climatic summaries for six stations in different parts of the world, on a somewhat novel plan, and fifteen isopleth diagrams associating seasonal and diurnal variations at the four observatories of the Meteorological Office complete the delightful compendium.

The Rain Children, a fairy-tale in Physics. By T. H. ORPEN, M.A.
With seven illustrations by C. E. Brock, R. I., London, Society for Promoting Christian Knowledge. Size $8\frac{1}{2} \times 6$. Pp. viii. & 112. Price 2s. 6d.

To write a successful fairy-tale of science is one of the most difficult feats in literature, and Mr. Orpen has been remarkably successful. We speak only of the scientific part or kernel dealing with the Rain Children story, leaving to others the fairytale of History which forms the husk of the nut and relates to Thales of Miletus, as a pagan philosopher and as a Christian missionary.

There are ten short chapters each representing an experience of a little girl with the fairy rain children and the titles are, Aunt Heat, Aunt Cold, Colonel Lightning, The Hammer Pond, the Battle of the Aunts, Snow-drill, To the Everlasting Hills, the Power of Steam, the River of Ice, and the Tunnel makers. The idea is that the Rain Children or rain drops, whose father is the Sun, and their mother the Sea, do all the work of the world under the directions of two Aunts who hate each other and never meet, Aunt Heat the sister of the Sun, and Aunt Cold, the sister of the Sea. Colonel Lightning, always followed by Sergeant Thunder, dashes across the story very effectively and the Rain Children are very delicately and cleverly handled. An obvious criticism that Heat and Cold are not both entities is anticipated by a scornful remark of Aunt Heat that Aunt Cold is after all "only a negative term," but the point is not elaborated. It would be the worst of bad taste to force a fairy-tale too far, and Mr. Orpen has been very happy in avoiding forced similes and even in refraining from exhausting the legitimate latitude of his subject. We hope that he will add more chapters to a later edition and suggest as themes, among others, Big Brother Wind who helps the Rain Children up to the mountain tops, Grandfather Gravity, who guides them home to their mother, the Fog Fiends, who attack the rain children from chimney pots and drag them into mischief, and The Transformation Scene, where chemical forces might come into play. The book should arouse a real interest in Nature on the part of children, and leave practically nothing to unlearn.

RAINFALL TABLE FOR DECEMBER, 1916.

STATION.	COUNTY.	Lat. N.	Long. W. [°E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875— 1909. in.	1916. in.
Camden Square.....	London.....	51 32	0 8	111	2'13	2'55
Tenterden.....	Kent.....	51 4	*0 41	190	2'77	4'19
Arundel (Patching).....	Sussex.....	50 51	0 27	130	2'91	5'12
Fordingbridge (Oaklands)...	Hampshire.....	50 56	1 38	135	3'35	4'33
Oxford (Magdalen College)...	Oxfordshire.....	51 45	1 15	186	2'06	2'73
Wellingborough(Swanspool)...	Northampton.....	52 18	0 41	155	2'13	2'57
Bury St. Edmunds(Westley)...	Suffolk.....	52 15	*0 40	226	2'14	2'89
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	2'07	3'18
Polapit Tamar [Launceston]...	Devon.....	50 40	4 22	315	4'46	4'88
Rousdon [Lyme Regis].....	".....	50 41	3 0	516	3'68	4'76
Stroud (Field Place).....	Gloucestershire..	51 44	2 13	226	2'71	3'63
Church Stretton (Wolstaston)...	Shropshire.....	52 35	2 48	800	2'99	2'05
Boston.....	Lincolnshire.....	52 58	0 1	11	1'88	3'00
Worksop (Hodsock Priory)...	Nottinghamshire...	53 22	1 5	56	2'17	2'16
Mickleover Manor.....	Derbyshire.....	52 54	1 32	280	2'38	2'54
Macclesfield.....	Cheshire.....	53 15	2 7	501	3'35	...
Southport (Hesketh Park)...	Lancashire.....	53 39	2 59	38	3'10	2'52
Arncliffe Vicarage.....	Yorkshire, W.R....	54 8	2 6	732	6'75	4'09
Goldsborough Hall.....	".....	54 0	1 25	119	2'29	1'96
Hull (Pearson Park).....	" E.R.	53 45	0 20	0	2'32	2'72
Newcastle (Town Moor) ...	Northumberland...	54 59	1 38	201	2'46	4'12
Borrowdale (Seathwaite) ...	Cumberland.....	54 30	3 10	423	15'14	...
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	4'70	3'79
Haverfordwest.....	Pembroke.....	51 48	4 58	90	5'18	4'34
Aberystwyth (Gogerddan)...	Cardigan.....	52 26	4 1	83	4'66	4'62
Llandudno.....	Carmarvon.....	53 20	3 50	72	2'84	1'68
Cargen [Duntries].....	Kirkcudbright...	55 2	3 37	80	4'84	5'01
Marchmont House.....	Berwick.....	55 44	2 24	498	2'83	3'91
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	5'48	6'09
Glasgow (Queen's Park) ...	Renfrew.....	55 53	4 18	144	3'95	4'60
Islay (Eallabus).....	Argyll.....	55 47	6 15	68	5'73	5'42
Mull (Quinish).....	".....	56 34	6 13	35	6'59	6'64
Balquhiddie (Stronvar).....	Perth.....	56 21	4 23	422	8'83	...
Dundee (Eastern Necropolis)...	Forfar.....	56 28	2 57	199	2'67	3'81
Braemar.....	Aberdeen.....	57 0	3 24	1114	3'13	3'74
Aberdeen (Cranford).....	".....	57 8	2 7	120	3'43	4'16
Gordon Castle.....	Moray.....	57 37	3 5	107	2'72	2'01
Drumnadrochit.....	E. Inverness ...	57 20	4 29	138	3'76	3'88
Fort William ..	".....	56 49	5 6	171	9'41	6'12
Loch Torridon (Bendamph)...	W. Ross.....	57 32	5 32	20	9'86	9'59
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	3'09	2'77
Killarney (District Asylum)...	Kerry.....	52 4	9 31	178	6'92	4'88
Waterford (Brook Lodge)...	Waterford.....	52 15	7 7	104	4'32	3'21
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	4'34	4'11
Ennistymon House.....	Clare.....	52 57	9 18	37	5'03	5'05
Gorey (Courtown House) ..	Wexford.....	52 40	6 13	80	3'42	2'98
Abbey Leix (Blandsfort)....	Queen's County..	52 56	7 17	532	3'41	4'30
Dublin (FitzWilliam Square)...	Dublin.....	53 21	6 14	54	2'27	2'72
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	307	3'39	3'44
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 16	74	6'11	5'94
Cong (The Glebe).....	".....	53 33	9 16	112	5'42	5'39
Collooney (Markree Obsy.)...	Sligo.....	54 11	8 27	127	4'34	4'81
Seaforde.....	Down.....	54 19	5 50	180	3'77	2'96
Ballymena (Harryville).....	Antrim.....	54 52	0 13	150	3'97	3'59
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	3'91	3'26

RAINFALL TABLE FOR DECEMBER, 1916—continued.

RAINFALL OF MONTH (con.)					RAINFALL FROM JAN. 1.				Mean Annual 1875-1909.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Date.	No. of Days	Aver. 1875-1909. in.	1916. in.	Diff. from Aver. in.	% of Av.		
+ .42	120	.43	22	15	25.11	34.01	+8.90	135	25.11	Camden Square
+1.42	151	.70	22	21	27.64	33.68	+6.04	122	27.64	Tenterden
+2.21	176	.64	20, 22	16	30.48	37.97	+7.49	125	30.48	Patching
+ .98	129	1.41	20	18	31.06	40.29	+9.23	130	31.06	Fordingbridge
+ .67	133	.73	20	13	24.58	29.63	+5.05	121	24.58	Oxford
+ .44	121	.58	21	15	25.20	26.58	+1.38	105	25.20	Swanspool
+ .75	135	.44	22	19	25.40	32.95	+7.55	130	25.40	Westley
+1.11	154	.43	21	23	23.73	27.69	+3.96	117	23.73	Geldeston
+ .42	109	1.19	9	20	38.27	41.92	+3.65	110	38.27	Polapit Tamar
+1.08	129	1.61	20	15	33.54	37.94	+4.40	113	33.54	Rousdon
+ .92	134	.62	21, 22	14	29.81	34.78	+4.97	117	29.81	Stroud
- .94	69	.38	22	17	32.41	32.07	- .34	99	32.41	Wolstaston
+1.12	160	.61	21	20	23.35	29.05	+5.70	124	23.35	Boston
- .01	100	.30	21, 22	20	24.46	24.46	.00	100	24.46	Hodsock Priory
+ .16	107	.48	23	14	26.65	31.02	+4.37	116	26.65	Mickleover
...	...	...	...	...	34.73	...	...	...	34.73	Macclesfield
- .58	81	.52	28	19	32.70	31.42	-1.28	96	32.70	Southport
-2.66	61	.70	30	12	61.49	67.77	+6.28	110	61.49	Arncliffe
- .33	86	.29	23	15	27.29	28.64	+1.35	105	27.29	Goldsborough Hall
+ .40	117	.42	21	25	26.42	28.48	+2.06	108	26.42	Hull
+1.66	168	.72	9	17	27.94	31.40	+3.46	112	27.94	Newcastle
...	...	...	...	...	129.48	...	...	...	129.48	Seathwaite
- .91	81	.65	22	19	42.28	48.03	+5.75	114	42.28	Cardiff
- .84	84	1.06	9	21	46.81	43.34	-3.47	93	46.81	Haverfordwest
- .04	99	1.09	28	18	45.46	46.94	+1.48	103	45.46	Gogerddan
-1.16	59	.36	28	20	30.36	30.06	- .30	99	30.36	Llandudno
+ .17	104	1.02	28	24	43.47	53.80	+10.33	124	43.47	Cargen
+1.08	138	.92	9	17	33.76	45.00	+11.24	133	33.76	Marchmont
+ .61	111	.75	15	23	49.77	51.64	+1.87	104	49.77	Girvan
+ .65	116	.61	20	21	35.97	43.98	+8.01	122	35.97	Glasgow
- .31	95	1.11	20	26	48.79	51.36	+2.57	105	48.79	Eallabus
+ .05	101	.63	20	24	56.57	55.55	-1.02	98	56.57	Quinish
...	...	...	...	...	73.77	...	...	...	73.77	Stronvar
+1.14	143	1.39	9	23	28.64	40.72	+12.08	142	28.64	Dundee
+ .61	119	1.40	9	17	34.93	47.82	+12.89	137	34.93	Braemar
+ .73	121	.83	9	25	32.73	36.21	+3.48	111	32.73	Aberdeen
- .71	74	.43	9	19	30.34	35.84	+5.50	118	30.34	Gordon Castle
+ .12	103	.90	27	25	36.13	49.19	+13.06	136	36.13	Drumnadrochit
-3.29	65	.82	28, 29	24	75.80	83.13	+7.33	110	75.80	Fort William
- .27	97	1.16	15	26	83.93	88.40	+4.47	105	83.93	Bendampf
- .32	90	.49	9	17	31.90	35.01	+3.11	110	31.90	Dunrobin Castle
-2.04	71	.84	14	27	54.81	69.55	+14.74	127	54.81	Killarney
-1.11	74	.64	8	14	39.57	39.88	+ .31	101	39.57	Waterford
- .23	95	1.10	28	20	39.43	43.64	+4.21	111	39.43	Castle Lough
+ .02	100	.62	8	24	46.52	54.31	+7.79	117	46.52	Ennistymon
+ .44	87	.60	8	15	34.99	37.74	+2.75	108	34.99	Courtown Ho.
+ .89	126	1.50	9	24	35.92	41.81	+5.89	116	35.92	Abbey Leix
+ .45	120	.49	12	24	27.68	38.60	+10.92	139	27.68	Dublin
+ .05	101	1.00	9	18	36.15	46.29	+10.14	128	36.15	Mullingar
- .17	97	.72	8	28	52.87	62.50	+9.63	118	52.87	Enniscpe
- .03	99	.90	28	25	48.90	56.20	+7.30	115	48.90	Cong
+ .47	111	1.02	8	23	42.71	55.30	+12.59	130	42.71	Markree
- .81	79	.84	20	21	38.91	41.20	+2.29	106	38.91	Seaforde
- .38	90	.71	9	26	40.84	44.28	+3.44	108	40.84	Ballymena
- .65	83	.52	9	19	39.38	43.31	+3.93	110	39.38	Omagh

SUPPLEMENTARY RAINFALL, DECEMBER, 1916.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road .	3.85	XI.	Lligwy	3.22
„	Ramsgate	2.79	„	Douglas, Isle of Man .....	...
„	Hailsham	5.21	XII.	Stoneykirk, Ardwell House...	3.20
„	Totland Bay, Aston House...	4.22	„	Carsphain, Shiel	7.86
„	Stockbridge, Ashley	4.35	„	Beattock, Kinnelhead	6.02
„	Grayshott	4.11	„	Langholm, Drove Road	4.52
III.	Harrow Weald, Hill House...	2.81	XIII.	Selkirk, The Hangingshaw..	3.30
„	Pitsford, Sedgebrook	2.63	„	North Berwick Reservoir...	2.60
„	Woburn, Milton Bryant.	2.77	„	Edinburgh, Royal Observat.	2.92
„	Chatteris, The Priory	2.71	XIV.	Mayhole, Knockdon Farm ...	5.19
IV.	Elsenham, Gaunts End	2.93	XV.	Buchlyvie, The Mause .....	...
„	Shoeburyness	1.99	„	Ballachulish House	5.09
„	Colchester, Hill Ho., Lexden	2.53	„	Oban	5.38
„	Ipswich, Rookwood, Copdock	3.03	„	Campbeltown, Witchburn ..	6.00
„	Aylsham, Rippon Hall	3.44	„	Holy Loch, Ardnadam	7.66
„	Swaffham	3.03	„	Tiree, Cornaigmore	5.28
V.	Bishops Cannings	3.71	XVI.	Dollar Academy	4.23
„	Wimborne, St. John's Hill ...	4.63	„	Glenlyon, Meggernie Castle..	6.94
„	Ashburton, Druid House	4.98	„	Blair Atholl	3.82
„	Cullompton	4.06	„	Coupar Angus	3.48
„	Lynmouth, Rock House	3.54	„	Montrose, Sunnyside Asylum.	3.37
„	Okehampton, Oaklands	4.98	XVII.	Alford, Lynturk Manse	3.76
„	Hartland Abbey	4.80	„	Fyvie Castle	3.91
„	St. Austell, Trevarna	4.98	„	Keith Station	3.10
„	North Cadbury Rectory.	3.84	XVIII.	Rothiemurchus	2.76
VI.	Clifton, Stoke Bishop	4.26	„	Loch Quoich, Loan	11.20
„	Ledbury, Underdown	2.10	„	Skye, Dunvegan	6.92
„	Shifnal, Hatton Grange	2.72	„	Lochmaddy, Bayhead	4.86
„	Droitwich	2.34	„	Fortrose	2.29
„	Blockley, Upton Wold	3.74	„	Glencarron Lodge	7.35
VII.	Grantham, Saltersford	2.74	XIX.	Altnaharra .....	...
„	Market Rasen	2.41	„	Melvich	4.02
„	Bawtry, Hesley Hall	2.21	„	Loch More, Achfary	7.15
„	Derby, Midland Railway	2.37	XX.	Dunmanway, The Rectory ..	4.79
„	Buxton	3.90	„	Glanmire, Lota Lodge	2.71
VIII.	Nantwich, Dorfold Hall	2.36	„	Mitchelstown Castle	3.10
„	Chatburn, Middlewood .....	...	„	Darrynane Abbey .....	...
„	Lancaster, Strathspey	3.08	„	Clonmel, Bruce Villa	2.71
IX.	Langsett Moor, Up. Midhope	3.72	„	Broadford, Hurdlestown	4.29
„	Scarborough, Scalby	4.47	XXI.	Enniscorthy, Ballyhyland...	3.89
„	Ingleby Greenhow	3.11	„	Rathnew, Clonmannon	3.32
„	Mickleton	3.20	„	Ballycumber, Moorrock Lodge	2.74
X.	Bellingham, High Green Manor	3.95	„	Balbriggan, Ardgillan	3.01
„	Ilderton, Lilburn Cottage ...	3.36	„	Castle Forbes Gardens	3.26
„	Keswick, The Bank	5.22	XXII.	Ballynahinch Castle	7.44
XI.	Llanfrecfa Grange	3.20	„	Woodlawn	2.51
„	Treherbert, Tyn-y-waun	7.92	„	Westport, St. Helens ...	5.01
„	Carmarthen, The Friary	4.09	„	Dugort, Slievemore Hotel ...	8.59
„	Fishguard, Goodwick Station.	4.03	XXIII.	Enniskillen, Portora	3.32
„	Crickhowell, Tal-y-maes	3.00	„	Dartrey [Cootehill]	3.02
„	New Radnor, Ednol	2.38	„	Warrenpoint, Manor House ..	3.48
„	Birmingham WW., Tyrmynydd	3.77	„	Belfast, Cave Hill Road	2.26
„	Lake Vyrnwy	4.32	„	Glenarm Castle	5.44
„	Llangynhafal, Plas Draw	1.79	„	Londonderry, Creggan Res...	3.39
„	Dolgelly, Bryntirion	4.31	„	Dunfanaghy, Horn Head ...	4.92
„	Bettws-y-Coed, Tyn-y-bryn...	3.94	„	Killybegs	5.53

THAMES VALLEY RAINFALL. — DECEMBER, 1916.



ALTITUDE SCALE

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

SCALE OF MILES

0 5 10 15 20

THE WEATHER OF DECEMBER.

THE weather of December, although finer and drier in the western than in the eastern half of the United Kingdom, was for the most part cold, cheerless, and often very misty or foggy. With the exception of a few days at the commencement and end of the month the thermometer was almost invariably below its normal December level. Over the country as a whole shade maxima as high as 40° were in fact very rare, and between the 14th and 18th, and again on the 27th, there were a large number of places in which the thermometer failed to get as high as freezing point all day. Frost was recorded in the screen on many successive nights, and was often severe, the lowest temperatures occurring, as a rule, between the 17th and 20th of the month. On the last mentioned date the screened thermometer fell to 11° at West Linton (in Peeblesshire), 12° at Balmoral, 13° at Alnwick Castle, and 16° at Harrogate. On the surface of the grass frost was experienced in several places on more than 20 occasions, and at Benson (Oxon.) on as many as 25 occasions. The sharpest ground frosts appear to have occurred on the night of the 19th, 20th, when the exposed thermometer sank to 3° at Worksop, 8° at Harrogate, and 10° at Balmoral, Raunds, Malvern and Marlborough. After the 27th, when a brisk current of air swept in from the south-westward a rapid rise of temperature occurred, the morning readings at some of the English stations on the 29th being as much as 23° or 24° higher than those of the previous day. The highest temperatures of the month occurred very generally between the 27th and 29th, when the thermometer rose to 55° and upwards in most of the English and Irish districts and reached 59° at Shaftesbury and at Birr Castle (Kings Co.). The warmth came, however, far too late to have any material effect upon the mean temperature of the month, which was everywhere below the normal, and over central and southern England considerably below it.

Heavy falls of rain were experienced locally in several parts of Great Britain on the 8th and 9th and in the south-west of England on the 20th, and snow or sleet occurred in most districts about the middle of the month, but seldom lay on the ground for any considerable time.

The total rainfall was slightly in excess of the average over the greater part of England and southern Scotland, but rather less in the west and north of Scotland and most of Ireland. The general values for the countries expressed as a percentage of the average were:—England and Wales 112, Scotland 99, Ireland 93, British Isles 102.

The thickest and most widespread fogs occurred respectively on the 16th and on the 26th and 27th. On each occasion a very large part of England was affected, and much delay and interruption to traffic was occasioned. The unusually dense fog which accumulated over the London district on the evening of the 27th was responsible for a large number of street accidents, several of which proved fatal. The frequency of this very undesirable element may be gauged by the fact that at Kew Observatory morning fogs were reported on as many as 8 days, afternoon fogs on 6 days, and evening fogs on 7 days. For the 5 years ended 1915 the average number of morning and evening fogs at this locality in December was only 1, and of afternoon fogs less than 1.

In the matter of bright sunshine the western half of the country fared much better than the eastern and central districts. In the south-west of England and the north of Ireland the mean daily duration was more than half an hour in excess of the average. Over the eastern, central and southern parts of England there was a general deficiency, and in the eastern and midland counties the mean daily duration (less than an hour) was considerably less than half the amount recorded in the south-west.

An unusually fine lunar halo was observed at Aberdeen on the 7th, and thunderstorms occurred at Falmouth on the 10th, and at Dublin on the 12th.

In London (Camden Square) the mean temperature of the month was $37^{\circ}\cdot4$ or $2^{\circ}\cdot3$ below the average. Duration of rainfall $54\cdot0$ hours. Evaporation nil.

Climatological Table for the British Empire, July, 1916.

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	84·4	31	47·0	15	72·1	53·0	54·0	78	133·2	45·7	1·68	13	7·1
Malta	96·4	12	70·2	19	86·2	76·4	...	89	146·0	...	·00	0	0·4
Lagos	86·2	1	70·0	3, 11	82·5	73·0	72·1	82	150·2	67·0	7·59	20	8·3
Cape Town	73·1	5	35·8	12	61·8	46·5	48·1	82	...	...	3·25	13	5·7
Johannesburg	69·6	14	32·5	9	62·4	42·2	30·2	53	...	30·2	·00	0	0·8
Mauritius	76·3	23	54·5	27	73·2	58·8	55·9	71	...	48·2	·74	14	5·1
Bloemfontein	70·5	19	20·4	24	64·4	32·5	28·9	58	..	...	·23	1	1·3
Calcutta... ..	93·1	23	75·0	13	89·6	79·0	77·5	83	...	73·6	7·60	7	8·5
Bombay... ..	88·7	2	75·4	14	85·0	78·8	77·4	87	133·8	73·2	25·10	25	8·9
Madras	99·4	1	73·1	4, 5	92·8	77·6	74·6	77	157·0	73·2	3·66	11	6·1
Colombo, Ceylon	89·1	14	70·2	18	85·0	75·5	74·0	85	159·0	69·4	13·54	25	8·0
Hongkong	92·1	24	73·5	9	88·0	78·2	75·5	79	...	...	8·30	13	4·8
Sydney	66·5	8	43·0	17	59·8	47·7	44·3	76	109·5	32·8	3·26	18	...
Melbourne	62·3	25	35·9	13	56·3	42·6	41·5	72	112·3	26·8	1·54	16	6·3
Adelaide	65·3	24	8·6	2	59·0	46·1	45·0	75	121·0	28·9	3·30	17	5·6
Perth ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Coolgardie	70·8	23	53·0	4*	57·7	41·1	38·7	61	125·0	27·0	1·07	12	6·0
Hobart, Tasmania ..	58·7	27	34·1	15	52·3	40·1	39·2	75	116·2	25·0	4·53	21	6·5
Wellington	62·0	1	33·4	29	53·9	44·3	45·1	86	108·8	24·0	6·42	17	7·6
Auckland ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Jamaica, Kingston ..	92·5	20	69·3	24	88·1	73·1	73·1	78	...	...	3·94	12	...
Grenada	89·0	7	71·0	11	85·0	75·0	...	76	135·0	...	10·23	19	2·5
Toronto	100·2	30	53·7	1	86·6	65·5	64·5	71	147·0	42·6	·36	4	3·5
Fredericton	93·2	20	43·0	10	78·0	55·7	60·4	78	...	...	5·06	11	5·4
St. John, N.B.	77·3	22	48·4	8	65·9	48·4	54·0	86	136·7	44·0	5·60	14	6·9
Victoria, B.C.	79·8	30	45·1	26	64·4	50·8	50·0	78	139·0	36·2	1·23	...	...

* 10, 19.

Johannesburg.—Bright sunshine, 313·8 hours.

COLOMBO, CEYLON.—Mean temp. 80°·3, or 0°·6 below. dew point 0°·2 below, and R 6·40 in. above, averages. Mean hourly velocity of wind 5·8 miles.

HONGKONG.—Mean temp. 82°·7, mean hourly velocity of wind 7·2 miles. Bright sunshine 277·1 hours.

Melbourne.—Mean temp. 0°·9 above, and R ·30 in. below, averages.

Adelaide.—Mean temp. 1°·0 above, and R ·68 in. above, averages.

Coolgardie.—Temperature 1°·6 below the average. R normal.

Hobart.—R 2·45 in. above average.

Wellington.—Mean temp. 1°·6 above, and R ·54 in., above, averages. Bright sunshine 75·3 hours.