

SYMONS'S  
MONTHLY  
METEOROLOGICAL  
MAGAZINE.

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VOLUME THE NINETEENTH.

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1884.

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LONDON:  
EDWARD STANFORD, CHARING CROSS, S.W.,  
AND ALL BOOKSELLERS.



# INDEX.

|  | PAGE         |   | PAGE             |
|--|--------------|---|------------------|
| Absence of Dew beneath a Cloudless Nocturnal Sky .....   | 85           | English Earthquake, The Great ...   | 49               |
| Air Bubbles, Formation of, in Water by Drops of Rain .....   | 109          | Errata in <i>Meteorological Magazine</i> , 1883.....  | 48               |
| American Meteorological Journal, The.....  | 43 184       | Eruption, The Krakatoa .....  | 10               |
| Atmospheric Disturbance, Dec. 10th-16th, 1883, The, and its effects upon the Barometer and Underground Water at Maghull, Liverpool ..... | 4            | Extraordinary Phenomenon on the Dee .....   | 21               |
| August, 1884, The Thunderstorms of .....   | 135, 149 186 | Forecasting Weather, Spectroscopic Formation of Air Bubbles in Water by Drops of Rain ..... | 109              |
| Barometer, A Natural .....   | 26           | Forth Bridge, Wind Pressure at..  | 16 26            |
| Barometric Disturbances and Storms, Jan. 20th to 26th .....  | 1            | Frost, White, followed by Gales ...   | 41               |
| British Empire, The Climate of the, during 1883 .....  | 142          | Gale of October 13th, 1881, Heavy Rain during the .....                                     | 141              |
| Brocken Spectre, in Scotland, The Bubbles, Formation of in Water by Drops of Rain .....  | 180 109      | Gales, White Frosts followed by... ..   | 41               |
| Carbon, A Cloud of .....   | 80           | Glows, Sun .....  | 36               |
| Cause and Effect, Curious Case of... ..  | 187          | Great English Earthquake, The ...   | 49               |
| Ceylon, The Distribution of Rain in, during the Decade 1871-1880 .....   | 171          | Greenwich, Visitation Day at .....  | 74               |
| Climate of Manitoba, The .....   | 80           | Guyot, Professor Arnold, "In Memoriam" .....  | 17               |
| Climate of the British Empire during 1883 .....  | 143          | Health Exhibition, The International, and Meteorology, 4, 115, 125 .....                    | 133              |
| Climatological Tables for the British Empire, 11, 27, 28, 44, 78, 79, 94, 128, 144, 175, 176 .....                                       | 188          | Heavy Indian Rainfall, A, and its Results.....  | 76, 96 123       |
| Cloudless Nocturnal Sky, Absence of Dew beneath a .....  | 85           | Heavy Rain during the Gale of October 13th, 1881 .....                                      | 141              |
| Cloud of Carbon, A .....   | 80           | Heavy Rain in the North-West of Scotland .....  | 167              |
| Clouston, The Rev. Charles, LL.D., L.R.C.S. Edin., "In Memoriam" .....   | 165          | High Level Station, Another ...   | 164 187          |
| Colonel Ward on the Sunsets... ..  | 9, 22 43     | Hoffmeyer, Capt., N.H.C., "In Memoriam" .....   | 17               |
| Curious Case of Cause and Effect.. ..  | 187          | Hydrology .....   | 93               |
| Dee, An Extraordinary Phenomenon on the .....  | 21           | Hydrology and Hydro-Geology.....  | 84               |
| Dew, Absence of, Beneath a Cloudless Nocturnal Sky .....   | 85           | Hygrometry .....  | 89               |
| Distribution of Rain in Ceylon, The, during the Decade 1871-80.....  | 171          | Indian Rainfall, A Heavy, and its Results .....   | 76, 96 123       |
| Drops of Rain, Formation of Air Bubbles in Water by .....  | 109          | "In Memoriam"—<br>Clouston, The Rev. Charles, LL.D., L.R.C.S. Edin. ....                    | 165              |
| Dust, Another Source of Volcanic Earthquake, The Great English ...   | 49           | Guyot, Prof. Arnold .....   | 17               |
| Earthquake, The Java .....   | 10           | Hoffmeyer, Capt. N.H.C. ....  | 17               |
| Easter at the Sorbonne .....   | 69           | International Health Exhibition and Meteorology .....                                       | 4, 115, 125 133  |
| Ely, A Tornado at .....  | 160          | January, 1884, in the United States .....   | 33 63            |
|  |              | January 20th-26th, 1884, Barometric Disturbances and Storms .....                           | 1                |
|  |              | Japan, The Rainfall of.....   | 123              |
|  |              | Japanese Weather Maps.....  | 187              |
|  |              | Java Earthquake and Sunsets ... ..  | 9, 10, 18, 22 36 |

|  | PAGE             |
|--|------------------|
| Journal, The American Meteorological.....  | 43 184           |
| July, 1884, The Thunderstorms of<br>95, 101  | 117              |
| Krakatoa and the Sunsets.....  | 9, 10, 18, 22 36 |
| “Magdeburg News,” The Meteorological Observatory of the .....  | 169              |
| Maghull, Liverpool, Effects of Atmospheric Disturbance of December 10th-16th, 1883, upon Barometer and Underground Water, at ..... | 4                |
| Manitoba, The Climate of .....   | 80               |
| Meteorological Journal, The American .....   | 43 184           |
| <i>Meteorological Magazine</i> 1883, Errata in.....  | 48               |
| Meteorological Notes on the Months, 14, 31, 47, 67, 83, 99, 114, 131, 147, 163, 179  | 191              |
| Meteorological Observatory of the “Magdeburg News,” The .....  | 169              |
| Meteorological Society, The Royal, 6, 24, 39, 73, 87, 115, 125, 174  | 183              |
| Meteorology and the International Health Exhibition ...  | 4, 115 125 133   |
| Mild Winter, The, of 1883-84...3, 26, 38   | 77               |
| Mountain Station in South Australia, The New .....   | 164 187          |
| Natural Barometer, A.....  | 26               |
| New Time, The.....   | 181              |
| Nocturnal Sky, Absence of Dew beneath a Cloudless .....  | 85               |
| Observatory, The Meteorological, of the “Magdeburg News” .....   | 169              |
| October 13th, 1881, Heavy Rain during the Gale of .....  | 141              |
| Phenomenon, An Extraordinary, on the Dee .....   | 21               |
| Pink Semicircle opposite the Sun... ..   | 9                |
| Prognostics, Popular .....   | 185              |
| Rain, A Remarkable .....   | 93               |
| Rain Drops, Formation of Air Bubbles in Water by .....   | 109              |
| Rainfall and Temperature, Monthly 13, 30, 46, 66, 82, 98, 113, 130, 146, 162, 178..  | 190              |
| Rainfall at the Wettest known Station .....  | 21               |
| Rainfall at Uppingham, The .....   | 40               |
| Rainfall of Japan, The .....   | 123              |
| Rainfall, A Heavy Indian, and its Results .....  | 76, 96 123       |
| Rain, Heavy, during the Gale of October 13th, 1881 .....   | 141              |
| Rain, Heavy, in the North-West of Scotland .....   | 167              |

|   | PAGE             |
|---|------------------|
| Rain, The Distribution of, in Ceylon, during the Decade 1871-80.....  | 171              |
| Remarkable Rain.....  | 93               |
| REVIEWS :—  |                  |
| Transit Tables for 1884 .....   | 8                |
| Manual of the Transit Instruments as used for obtaining Correct Time.....   | 8                |
| A Manual of Practical Hygiene... ..   | 9                |
| Royal Meteorological Society The, 6, 24, 39, 73, 87, 115, 125, 174  | 183              |
| Scotland, Heavy Rain in the North-West of .....   | 167              |
| Scotland, The Brocken Spectre in... ..  | 180              |
| Semicircle, Pink, opposite the Sun September, 1884, The Thunderstorms of .....  | 9 153            |
| Sky, Absence of Dew beneath a Cloudless Nocturnal .....   | 85               |
| Sorbonne, Easter at the .....   | 69               |
| Source of Volcanic Dust, Another... ..  | 18               |
| South Australia, The New Mountain Station in .....  | 164 187          |
| Spectre, The Brocken, in Scotland .....   | 180              |
| Spectroscopic Weather Forecasting Station, Another High Level... ..   | 164 187          |
| Station, Rainfall at the Wettest known .....  | 21               |
| Storms and Barometric Disturbances, Jan. 20th to 26th .....   | 1                |
| Sun, Pink Semicircle opposite the... ..   | 9                |
| Sunsets and Krakatoa... ..  | 9, 10, 18, 22 36 |
| Sunsets, Colonel Ward on the... ..  | 9, 22 43         |
| Sun Glows .....   | 36               |
| Supplementary Table ..12, 29, 45, 65, 81, 97, 112, 129, 145, 161, 177   | 189              |
| Thunderstorms of 1884..... 95, 101, 117, 135, 149   | 186              |
| Time, The New.....  | 181              |
| Tornado at Ely. A .....   | 160              |
| Underground Water and the Barometer at Maghull, Liverpool, the Effects of Atmospheric Disturbance, December 10th-16th, 1883, upon ..... | 4                |
| United States, Jan., 1884, in the .....   | 33 63            |
| Uppingham, The Rainfall at .....  | 40               |
| Visitation Day at Greenwich.....  | 74               |
| Volcanic Dust, Another Source of .....  | 18               |
| Volcanic Eruption at Krakatoa.....  | 10               |
| Water, Formation of Air Bubbles in, by Drops of Rain .....  | 109              |
| Weather Forecasting, Spectroscopic .....  | 40               |
| Weather Maps, Japanese .....  | 187              |
| Wettest Known Station, Rainfall at the .....  | 21               |
| White Frost followed by Gales.....  | 41               |
| Wind Pressure at Forth Bridge... ..   | 16 26            |
| Winter of 1883-84, The .. 3, 26, 38   | 77               |

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THE STORMS & BAROMETRIC DISTURBANCES JANUARY  
20TH—26TH.

WE have often expressed our strong objection to duplicate work. There is little doubt that as the most striking phenomena during the above period occurred in Scotland, we shall in due time receive an exhaustive report from the Scottish Meteorological Society. In the interim a short article, presumably by Mr. Buchan, has appeared in *Nature*, and Mr. Marriott is preparing an outline of the phenomena for the meeting of the Royal Meteorological Society on February 20th. We have therefore transferred to him the communications which we have received upon the subject; and also many of the references to the storm of the 26th which would otherwise have appeared in the "Remarks on the Month."

But it would scarcely be right to issue this number without a few words as to the unusual phenomena.

I. At Stornoway, Isle of Lewis, off the N.W. of Scotland, on January 20th, at 6 p.m. the barometer was 30·17 in., by 10 p.m. it had fallen to 29·21 in., a fall of 0·96 in. in four hours; it is said to be, and probably is, the greatest fall in so short a time yet recorded in the British Isles.

II. During the passage of this storm across the Orkneys, the anemometer at Sandwick Manse indicated a rate of 88 miles an hour, which is said to be "the highest speed at which wind has been known to travel in Great Britain."

III. During the afternoon, evening and night of 26th there was a great decrease of barometric pressure. In London it fell to 28·529 in. at 7·30 p.m., a point only passed four times during the last 26 years—but this was as nothing compared with the depression further north—where it went more than an inch lower. The lowest return which we have yet personally received was one from the Rev. Dr. Beverley of Aberdeen, whose standard barometer with a Kew certificate gave 27·381 inches as the sea level pressure at 11·30 p.m. This is thoroughly supported by a reading made at the same time at the Forest of Glen Tana, by Mr. Cunliffe Brooks, M.P., which works out

27·39 in. *Nature*, however, quotes a reading still lower, but as it does not state whether it was reduced to sea level we can only give it as it is given, "Ochertyre, near Crieff, 27·332 in. at 9·45 p.m."

There is (we consider) no doubt that this is the lowest sea level pressure ever recorded in the British Isles. It is extremely rare for it to be less than 28 inches. In London there is one such case on record, *viz.* December 25th, 1821, reported as 27·93 in. In the North of Scotland, owing to the normal path of storm centres traversing that country, pressures vary more, and are as a rule lower—about 0·20 in. so that the equivalent of the London absolute minimum of 27·93 would be for North of Scotland about 27·73 in. *Nature* tells us that at Gordon Castle between 1767 and 1827 the min. was 28·01 in.; that at Culloden House between 1841 and 1884 the min. was 27·98 in.; and that during the great storm of January 7th 1839 the pressure fell to 27·81 at Inchkeith, to 27·72 at Peterhead, and to 27·70 at Aberdeen. But neither the writer in *Nature* nor any one else seems to have remembered a more recent and more remarkable depression than any of these—*viz.* that of December 31st, 1865. The sea level pressure at 24 Scotch lighthouses is given in *Meteorological Magazine*, Vol. I. p. 16, and from it we find that the pressure at the Butt of Lewis fell to 27·69 in. and at Monach to 27·92 (27·63 is reported from Hoy Low light, but is not supported by the Cantickhead return and therefore we print it in parenthesis, though it is quite possible that the Hoy man watched for the minimum, and that the Cantickhead man did not). It is evident that the recent minimum is at least a quarter of an inch below the lowest of these, and hence we are doubtless justified in believing that it is without precedent since the invention of barometers.

IV. There is one other feature which we believe to be also rare, though perhaps not without precedent—*viz.*, the rapid rise from the lowest point, which occurred in some of the Southern parts of England. All practised observers know that during violent storms the mercury in a barometer "pumps" with nearly every gust of wind, indeed even the hand of a good aneroid will be found to move up and down through ·02 or ·03, but there was something more than the mere rise from a very low point reached during pumping.

The facts for four stations are

| County.      | Station.                  | Increase.<br>in. | Time. |         | Duration.<br>h. m. minutes. | Rate per<br>hour. |
|--------------|---------------------------|------------------|-------|---------|-----------------------------|-------------------|
|              |                           |                  | h. m. | h. m.   |                             |                   |
| Devon.....   | Torquay (Babbacombe)...   | 0·030            | 5 18  | to 5 22 | 4                           | 0·45              |
| Middlesex.   | Isleworth (Spring Grove). | 0·050            | 7 24  | to 7 31 | 7                           | 0·43              |
| "            | Camden Square .....       | 0·061            | 7 33  | to 7 41 | 8                           | 0·46              |
| Essex' ..... | Harlow (Toppesfield)..    | 0·05 or 0·06     | ...   | —       | 5 to 7                      | 0·55              |

There is, we think, little doubt as to the cause of this sudden rise, but as Mr. Marriott's attention has been drawn to it and as he has additional details we leave the matter in his hands.

MILD WINTER.

To the Editor of the Meteorological Magazine.

SIR,—I enclose list of plants in blossom. They are all *out-of-door*, garden plants. Although some are of course mere spurts and survivals, most are really fresh blossoms. The frost here on November 15th, 4ft. above ground, 20°·4; grass, 18°·1 (much more severe than in London), cut off almost all then in blossom, and up to that time we had all the tender plants in full bloom, otherwise we should have had a much longer list.—Truly yours,

H. SOUTHALL.

The Graig, Ross, January 12th, 1884.

List of Plants in Blossom in the neighbourhood of Ross, Herefordshire, December 31st, 1883, to January 12th, 1884.

|   |  |
|---|--|
| Alyssum saxatile (Golden tuft).             | Lamium maculatum (variegated dead nettle). |
| Anemone coronaria.                          | Laurestinus.                               |
| Anthemis tinctoria.                         | Limnanthes Douglasii.                      |
| Arabis albida ("Snow on the mountains").    | Linaria cymbalaria (ivy-leaved toad flax). |
| Aubrietia grandiflora.                      | Lithospermum prostratum.                   |
| Auricula.                                   | Lychnis dioica.                            |
| Bellis perennis flora-plena (double-daisy). | Mathiola flore-pleno (double stock).       |
| Berberis aquifolium.                        | Megasea crassifolia.                       |
| „ Darwinii.                                 | Menziesia polifolia-bicolor.               |
| „ ?   | Myosotis dissitiflora.                     |
| Brassica.                                   | Nemophila insignis.                        |
| Calendula arvensis.                         | Omphalodes verna.                          |
| „ officinalis (marigold).                   | Penstemon ( <i>bud</i> ).                  |
| Chrysanthemum.                              | Polyanthus.                                |
| Corchorus japonica.                         | Potentilla alba.                           |
| Corydalis lutea (Fumitory).                 | „ opaca.                                   |
| Crocus.                                     | Primula vulgaris.                          |
| Cyclamen coum.                              | „ veris (cowslip).                         |
| Daphne mezereum.                            | „ (double lilac).                          |
| „ Fioniana.                                 | Pyrethrum parthenium (feverfew).           |
| Dianthus barbatus (Sweet William).          | Pyrus japonica.                            |
| „ ? (common pink).                          | Pear.                                      |
| Doronicum clusii.                           | Reseda lutea (mignonette).                 |
| Eranthis hyemalis (winter aconite).         | Rhododendron atrovirens                    |
| Erica vagans.                               | „ ?  |
| „ ciliaris.                                 | Rose ( <i>bud</i> ).                       |
| „ carnea.                                   | Symphytum caucasicum.                      |
| „ mediterranea.                             | Tritoma uvaria (flame-flower).             |
| Erigeron bellidifolius.                     | Tussilago fragrans (fragrant coltsfoot).   |
| Erysimum pulchellum.                        | Ulex europæus (furze).                     |
| Fragaria vesca (strawberry).                | Veronica rupestris.                        |
| Galanthus nivalis (snowdrop).               | „ taurica.                                 |
| Garya elliptica.                            | „ ?  |
| Helleborus niger (Christmas rose).          | Vinca major (periwinkle).                  |
| „ fetidus (bear's foot).                    | „ minor.                                   |
| Hepatica cærulea.                           | Viola odorata.                             |
| „ rubra.                                    | „ (Russian).                               |
| Hesper s albiflora (single rocket).         | „ tricolor (garden pansy).                 |
| Jasminum nudiflorum (winter jasmine).       | Virginian stock.                           |

## METEOROLOGY AND THE INTERNATIONAL HEALTH EXHIBITION.

THE important influences which both climate and weather exert upon health render it obvious that an International Health Exhibition would be incomplete without a Meteorological Section. We are glad to be able to state that there seems reason to hope for an efficient representation of those branches of Meteorology which bear upon Public Health.

The Committee nominated to supervise the arrangements consists of—

W. B. Bryan, Esq., M.I.C.E.,  
F.R.Met.Soc.  
Prof. De Chaumont, M.D., F.R.S.  
J. Evans, Esq., D.C.L., F.R.S.  
Capt. Douglas Galton, C.B., F.R.S.

Thos. Hawksley, P.P.I.C.E., F.R.S.  
R. H. Scott, F.R.S., P.R.Met.Soc.  
G. J. Symons, F.R.S., Sec.R.Met.Soc.  
J. W. Tripe, M.D., Sec.R.Met.Soc.

The Committee believe that the Royal Meteorological Society will arrange for the establishment in the grounds of a complete climatological station, properly fenced in, but to which a limited number of the public could from time to time be admitted, and it is intended that the instruments should be recorded regularly and the results exhibited on diagrams.

As regards general exhibits, the Committee invite authors of Papers upon the relations between health and disease, rainfall, percolation, evaporation, and flow from ground, and other subjects embraced by the Exhibition, inviting them to exhibit diagrams, models and apparatus illustrative of their researches.

This list of specified subjects indicates the broad views which the Committee entertain, and we submit the invitation to our readers, requesting their attention to it, and merely adding, in conclusion, that all communications should be addressed—

The Secretary,  
International Health Exhibition,  
(Meteorological Sub-Committee). South Kensington.

### THE ATMOSPHERIC DISTURBANCE, DECEMBER 10<sup>TH</sup>-16<sup>TH</sup>, AND ITS EFFECTS UPON THE BAROMETER AND THE UNDERGROUND WATER AT MAGHULL, LIVERPOOL.

BY ISAAC ROBERTS, F.G.S., F.R.A.S.

A GALE of great severity, occurred here between the 10th and 16th of this month, causing considerable injury to property. Chimney stacks were blown down and trees were uprooted.

The annexed diagram shows the effects of the atmospheric disturbance upon the barometer and upon the underground water in the Triassic rocks of this district. Referring to the diagram it will be seen that at ten o'clock on Monday morning, the 10th, the barometer stood at 29·82 inches, and the level of the underground water at the same time was 22·80 inches above my zero mark.

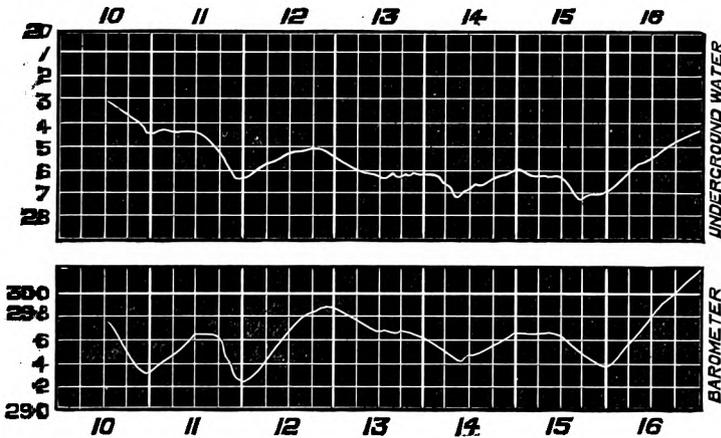
At 11 o'clock at night the water had risen to 24.42 inches, and at midnight the barometer had fallen to 29.30 inches. Between that time and noon of the 11th, the barometer had risen to 29.62 inches, and the water had fallen 0.11 of an inch. The barometer remained steadily at 29.62 inches for 5 hours, but during that interval the water was rapidly rising—it rose 0.73 of an inch during the time, and continued to rise rapidly till half-past 10 o'clock at night on the 11th. The rise of the water between noon and ten o'clock, was 2.20 inches and the barometer had fallen 0.40 of an inch in 5 hours. It was during the night of the 11th (at 1h. 30m. a.m. on 12th) that the force of the gale blew down chimney-stacks and uprooted trees.

The wind continued high during the four following days, and the undulations of the two curves drawn on the diagram, show the periods of varying disturbance.

At four o'clock on the 15th, the water touched the highest point, namely, 27.12 inches, but the barometer did not fall so low as shown on the 11th.

It will be observed in correlating the oscillations shown by the two curves, that the underground water, besides having greater amplitude, is more sensitive to changes of pressure than the barometer, notwithstanding the effects of friction and capillary action, to which the water is subject in the pores of the rock.

*Maghull, 27th, December, 1883.*



[The diagram sent was a tracing from the instruments on a scale far too large for reproduction. In reducing it we have made several alterations respecting which a few remarks may be useful. The level of underground water rises as atmospheric pressure decreases, therefore a comparison of the curves is facilitated by making them read in opposite directions, so that the run of the curves may be similar. We have therefore reversed the underground water scale so that the parallelism of the two curves becomes self-evident.

Moreover, it is essential that the amplitude of the two scales be nearly the same. The specific gravity of Mercury being  $13\frac{1}{2}$ , one would on first thoughts expect that the scale for the water should be rather less than  $\frac{1}{12}$  th of that for the barometer—but upon trying that scale, it was found to be much too small—possibly because friction plays an important part in underground water fluctuation. At any rate we found that a scale of  $\frac{1}{5}$ th was about the best—and that is what we have adopted.

There remain some irregularities as to time, and as to quantity, which are possibly due to the influence of rainfall on subterranean water level, and others for which we cannot at present account—for example it is not obvious why the maximum water level should have been at 4 p.m. on 15th, and the corresponding barometric minimum 6 hours *later*.—ED.]

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### ROYAL METEOROLOGICAL SOCIETY.

THE Annual General Meeting of this Society was held on January 16th. Mr. J. K. Laughton, F.R.A.S., President, in the Chair.

The Secretary read the Report of the Council, which showed that the past few months mark a very important epoch in the history of the Society. In October the Council received the intimation that Her Majesty had been graciously pleased to grant the Society permission to assume the prefix "Royal." In December the Fellows made certain alterations in the by-laws by which the annual subscription has been increased. The Report also showed that the Society is doing much practical work, not only by holding meetings and publishing the papers read at the same, but also by the establishment of a large number of observing stations, which are regularly inspected, so that the results obtained from them may be strictly uniform and comparable. The number of Fellows is 549, and of Honorary Members 19—thus making a total of 568.

The President then delivered his Address, in which he referred to the experiments made by Mr. Saxon Snell, Mr. Bertram and Mr. Hele Shaw with the object of determining the coefficients of Biram's anemometers; as yet these can scarcely be considered quite satisfactory; for though made with the utmost care, they give results differing from each other by nearly 25 per cent. and from the known truth in opposite directions.

The reduction of barometric readings to sea-level is another problem of great interest and importance, the solution of which is far from perfect, and as applied to the converse determination of altitudes has been pronounced by Mr. Gilbert of the U.S. Geological Survey to be beset with difficulties "so numerous and so baffling, that there is no reason to hope that they will ever be fully overcome." In many cases, too, the reduction, even if correct, implies an accumulation of air in places where no air exists: and isobars so drawn, traversing mighty mountain ranges such as the Rocky Mountains or

the Himalayas, or elevated plateaus, such as those of Central or Eastern Asia, convey an impression which may easily lead to serious mistakes.

The great achievement of the year is unquestionably the gathering in of the observations taken, by international agreement, at nine Arctic stations, in which amidst circumstances of more or less discomfort, parties continued observing through a full period of twelve months. With one station established by the United States on the shores of Lady Franklin Bay, it has been found impossible to communicate : this was established in the summer of 1881, and no trustworthy news has since been received. Preliminary reports have been published from the English station at Fort Rae, on the northern shores of the Great Slave Lake ; from the German station in Cumberland Sound ; from the Austrian at Jan Mayen, and from some of the others ; but the principal interest attaches not to the observations taken separately—but to the collation and comparison of the whole, which may be expected to lead the way towards the solution of problems of the greatest importance to Meteorology. In the present day one science is so mixed up with a number of others, and so involved in them, that it is impossible to separate them, or to define the exact limits of each. Many of the problems of Meteorology belong equally to Geography, or at times even to experimental physics, and an address which speaks of the progress of Meteorology is perhaps apt to appear in some degree discursive. Hence it is that the true student of Nature, whilst limiting his detailed work to one particular direction, must consider her kingdom as a grand and comprehensive whole one and indivisible.

The following gentlemen were elected the officers and council for the ensuing year :—

*President.*—Robert Henry Scott, M.A., F.R.S., F.G.S.

*Vice-Presidents.*—Hon. Ralph Abercromby, Edmund Douglas Archibald, M.A. ; John Knox Laughton, M.A., F.R.A.S., F.R.G.S. ; William Marcet, M.D., F.R.S., F.C.S.

*Treasurer.*—Henry Perigal, F.R.A.S.

*Trustees.*—Hon. Francis Albert Rollo Russell, M.A. ; Stephen William Silver, F.R.G.S.

*Secretaries.*—George James Symons, F.R.S. ; John William Tripe, M.D., M.R.C.P.ED.

*Foreign Secretary.*—George Mathews Whipple, B.Sc., F.R.A.S.

*Council.*—William Morris Beaufort, F.R.A.S., F.R.G.S. ; George Chatterton, M.A., M.Inst.C.E. ; John Sandford Dyason, F.R.G.S. ; William Ellis, F.R.A.S. ; Charles Harding ; Richard Inwards, F.R.A.S. ; Baldwin Latham, M.Inst.C.E., F.G.S. ; Robert John Lecky, F.R.A.S. ; Edward Mawley, F.R.H.S. ; Cuthbert E. Peek, M.A., F.R.G.S. ; Capt. Henry Toynbee, F.R.A.S. ; Charles Theodore Williams, M.A., M.D., F.R.C.P.

## REVIEWS.

*Transit Tables for 1884.* By LATIMER CLARK, M.I.C.E. London : E. and F. N. Spon. Crown 8vo.

*Manual of the Transit Instrument as used for obtaining Correct Time.* By LATIMER CLARK, M.I.C.E. London, 1884. E. and F. N. Spon 40 + 16 pages crown 8vo.

THOSE of our readers who remember the persistency with which we have pleaded for greater care being bestowed by meteorologists in the obtaining and keeping of their clocks and watches at "True Time," will understand the pleasure with which we have watched Mr. Latimer Clark's efforts towards popularizing the Transit instrument.

The second of the above works is so low in price and gives so clear a summary of Mr. Clark's efforts, that instead of occupying space with extracts from it, we think it better to advise our readers to get a copy, for even if they do not decide upon purchasing a Transit instrument, they will certainly get a good shilling's worth of instruction.

As regards the Transit tables, we have only one (and it is a very small) complaint to make. We think that the table should give the time of passage of semi-diameter of Sun for each day. It is often impossible to observe more than one limb, and then this datum is indispensable ; it would only need a very narrow column, and space could easily be made for it. On all these grounds we rely upon the author adding it in his next annual tables. It is true that the information is (incompletely) given in his other books, but it ought to be handy in an adjoining column.

Mr. Latimer Clark has not limited his efforts to teaching persons how to observe, and reducing the difficulty of calculations to a minimum, but he has brought his well-known mechanical skill to bear upon the construction of cheap and hardy instruments, and brought out patterns which have met the approval of such men as Col. Tupman and Mr. Lecky, to which it is needless to add our own opinion. But, in conclusion, we should like to suggest for Mr. Latimer Clark's consideration, that we desire to see an instrument which would be less accurate than are his, and, of course, which should be obtainable at a proportionally less price. Mr. Lecky says that with Mr. Clark's smaller Transit Instrument, a fair night's work ought to fix the time to a fifth of a second. Now none but those possessed of exceptionally good chronometers or regulators can *keep* such time when they have got it.

Mr. Lecky evidently was speaking of the average of a number of observations, and the precision would increase with the number. While we have no objection to such precision, we think that it would be reasonable to say that all ordinary meteorological requirements will be met by an instrument whereby a single observation

should always be true to 15 seconds, which probably implies that its delicacy should be about one-tenth that of those now submitted.

If observers will keep their clocks and watches right to a second, by all means let them do so ; no one would rejoice at such a state of things more than we should. But rather than that they should continue to let them be anywhere "within five minutes," let us try to place before them something which shall give them Time, true within a quarter of a minute, as easily as possible, and at a price which cannot be made an excuse for not providing it.

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*A Manual of Practical Hygiene*, by E. A. PARKES, M.D., F.R.S., edited by F. S. B. FRANÇOIS DE CHAUMONT, M.D., F.R.S. Sixth Edition. J. and A. Churchill, London, 1883. 8vo., xix—731 pp.

WE can readily imagine that a meteorologist running along a shelf of new books to see if there was anything that would suit him, would pass this handsome volume. But he would make a grave mistake. The book is a sort of encyclopædia, crammed with all that two clever men can put into it. The original author, Dr. Parkes, may be regarded as the founder of Hygiene as a science, and has had the rare distinction of a temple being built in his honour—the Parkes Museum (in Margaret Street, Oxford Street, W.) Of the present editor, Dr. De Chaumont, we must not say much, since happily he bids fair to go on benefiting his country for years to come, but he is certainly a worthy successor to Dr. Parkes in the Professorship of Military Hygiene at Netley.

Thus far, however, we have not given evidence in support of our assertion, that the book is one of considerable interest for meteorologists. Chapter XIV. is devoted to "Climate," and occupies 14 pages. Chapter XV. is entitled, "Description of the Meteorological Instruments, and a few notes on Meteorology." This occupies 21 pages, and is extremely good. But besides these chapters and others on Air and on Water, the calculation of averages, the drawing of diagrams, air meters, wells, ventilation, the climate of foreign stations, meteoric and volcanic dust, and a host of other subjects, are discussed at various length in this excellent work, not the least important feature in which is an index of about 3,000 entries.

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### PINK SEMI-CIRCLE OPPOSITE THE SUN.

*To the Editor of the Meteorological Magazine.*

SIR,—Mr. Backhouse inquires whether the pink semi-circle opposite the sun is of frequent occurrence. I can say nothing as to sunrise, as, being in the town, I have no opportunity of observing, but at sunset they have frequently been seen, notably so on the evenings of the 10th and 11th of this month, when it was unusually brilliant, and with the rising full moon on its southern edge, and Venus shining brightly in the red orange sun-set, the sky presented a glorious sight. The phenomenon has accompanied sunsets of a

deep orange red and green colour, with a fiery red after-glow for an hour or more after the sun itself had set, but I have never observed it with an ordinary red sunset.

Leaving to others, better able to form an opinion, to say whether Krakatoa or aqueous vapour, is responsible for these unusual sunsets, I will merely observe that they were remarked before Krakatoa was heard of, and that those most brilliant, and leaving an after-glow have been followed by rain or snowstorm of some days duration, so much snow not having been known here within memory, whether in the plain country or in the mountains. The sunsets of the 10th and 11th were followed from midnight of the 11th by almost incessant snow till the morning of the 16th, turning to sleet all that day, with very dark overcast days till the night of the 18th. There was but one break in the clouds during that time, viz., on the afternoon of the 13th, when there was another green and orange sunset with lurid red after-glow.—Truly yours,

M. F. WARD, F.R.A.S.

*Munich, Jan. 29th, 1884.*

[Can Col. Ward oblige us with copies of any printed notices of unusual sunsets, afterglows, &c., published before August 26th?—Ed.]

## THE KRAKATOA ERUPTION.

*To the Editor of the Meteorological Magazine.*

SIR,—The Council of the Royal Society has appointed a committee for the purpose of collecting the various accounts of the volcanic eruption at Krakatoa, and attendant phenomena, in such form as shall best provide for their preservation and promote their usefulness.

The Committee invite the communication of authenticated facts respecting the fall of pumice and of dust, the position and extent of floating pumice, the date of exceptional quantities of pumice reaching various shores, observations of unusual disturbances of barometric pressure and of sea level, the presence of sulphurous vapours, the distances at which the explosions were heard, and exceptional effects of light and colour in the atmosphere.

The Committee will be glad to receive also copies of published papers, articles, and letters bearing upon the subject. Correspondents are requested to be very particular in giving the date, exact time (stating whether Greenwich or local), and position whence all recorded facts were observed. The greatest practicable precision in all these respects is essential.

All communications are to be addressed to

Your obedient servant,

G. J. SYMONS.

*Chairman Krakatoa Committee.*

*Royal Society, Burlington House, W.,  
February 12th, 1884.*

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1883.

| STATIONS.<br><br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain. | Aver. |        |
|--|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|-------------|-------|--------|
|  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. |             |       |        |
|  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                | inches      | Days. | Cloud. |
| England, London .....  | 85·6      | 29    | 41·3     | 17    | 71·4     | 50·4 | 49·1       | 70        | 125·5        | 36·8           | 1·35        | 12    | 5·7    |
| <i>Cape of Good Hope</i> ...   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...    |
| <i>Mauritius</i> .....   | 79·4      | 7     | 59·4     | 11    | 75·8     | 65·2 | 61·2       | 71        | ...          | ...            | 1·97        | 13    | 4·3    |
| Calcutta .....   | 98·7      | 1     | 73·2     | 5     | 90·8     | 77·7 | 78·0       | 80        | 161·9        | 71·4           | 10·20       | 20    | 8·0    |
| Madras .....   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...    |
| Bombay .....   | 92·3      | 1     | 73·7     | 7     | 87·0     | 78·1 | 77·4       | 84        | 149·4        | 71·1           | 13·65       | 25    | 8·9    |
| Ceylon, Colombo .....  | 87·8      | 2     | 72·8     | 9     | 85·4     | 76·7 | 73·1       | 77        | 148·0        | ...            | 11·71       | 20    | 8·0    |
| <i>Melbourne</i> .....   | 65·2      | 15*   | 37·3     | 10    | 60·1     | 47·9 | 45·4       | 75        | 117·4        | 31·0           | 1·96        | 11    | 7·3    |
| <i>Adelaide</i> .....  | 65·5      | 13    | 44·5     | 28    | 61·6     | 49·4 | 47·5       | 75        | 127·4        | 36·4           | 2·77        | 16    | 6·2    |
| <i>Wellington</i> .....  | 63·0      | 25    | 33·5     | 13    | 56·3     | 43·9 | ...        | ...       | 112·0        | 30·0           | 1·60        | 8     | ...    |
| <i>Auckland</i> .....  | 62·5      | 22    | 40·0     | 13    | 58·9     | 48·3 | 45·7       | 74        | 130·0        | 35·0           | 3·30        | 15    | 6·1    |
| <i>Falkland Isles</i> .....  | 44·9      | 10    | 11·8     | 19    | 40·7     | 32·2 | 35·0       | 95        | 87·6         | 13·6           | 1·73        | 23    | 7·9    |
| Jamaica, Kingston .....  | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...    |
| Barbados .....   | 83·0      | 27†   | 70·0     | 7,8   | 81·0     | 72·0 | 73·6       | 86        | 147·0        | 69·0           | 8·43        | 19    | 6·5    |
| Toronto .....  | 78·9      | 24    | 39·2     | 1     | 71·2     | 52·5 | 56·0       | 77        | 142·0        | 32·4           | 4·96        | 14    | 6·5    |
| New Brunswick,<br>Fredericton .....                                  | 87·7      | 27    | 40·0     | 2     | 75·2     | 51·1 | 54·0       | 74        | ...          | ...            | 3·01        | 17    | 6·2    |
| Manitoba, Winnipeg ...   | 94·2      | 27    | 28·0     | 2     | 73·8     | 48·5 | 53·2       | 52        | ...          | ...            | 3·91        | 10    | 5·2    |
| British Columbia, Yale   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...    |

\* And 16. † And 29.

REMARKS, JUNE, 1883.

*Mauritius*.—Rainfall .09 in. below the average; mean pressure 30·126 in.; mean hourly velocity of wind 10·8 miles, extremes 29·8 miles and 2·3 miles; prevailing direction S. E.; strong trade wind from 24th to end of month. C. MELDRUM, F.R.S.

CEYLON.—TSS on four days, and L four other days. J. H. SYMONS.

*Melbourne*.—Mean temp. 4° above the average; temp. of dewpoint and amount of cloud also above the average; humidity, pressure, and rainfall all very slightly below it; prevailing direction of wind N., strong breezes occurring on 9 days; violent gusts from N. on the morning of 22nd; heavy dew on 10th and 11th; heavy T and H storm on 23rd; auroral light seen on 27th. R. L. J. ELLERY, F.R.S.

*Adelaide*.—Mean pressure 30·136 in., being slightly above the average of 26 years; mean temp. (55·5) 1°·9 above the average, and the highest since 1871; mean daily range (12°·2) 1°·6 below the average, and the total range, 21°·0 was the least monthly range on record; amount of cloud below the average; rainfall 17 in. above it. Although the rainfall at Adelaide was only 2·77 in., yet over the agricultural districts generally it was very heavy; on 21st and 22nd the R was steady and heavy, especially in the Mt. Lofty ranges, where at places upwards of 3 in. fell in 24 hours, and the country was everywhere flooded. C. TODD.

*Wellington*.—Up to the 10th fine with moderate winds, chiefly from S. E.; on night of 10th wind changed to S. W., with H, L, and slight B; a S. W. gale blew on night of 13th, with R and H; from 15th to 23rd generally fine, with frequent strong N. W. wind; heavy B on night of 24th, then fine until 30th. R. B. GORE.

*Auckland*.—Mean pressure slightly below the average; temp. about the average; rainfall much below it. T. F. CHEESEMAN.

BARBADOS.—Mean temp. (75·8) (1°·5) below the average of 25 years; prevailing direction of wind N. E.; mean hourly velocity, 15·4 miles, extremes 19·8 miles and 8·9 miles; rainfall 33 per cent., and evaporation 19 per cent., above the average; nine days were overcast; L on 1st, T on 21st. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL,  
JANUARY, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | 2·60        | XI.    | Carno, Tybrith .....     | 8·20        |
| „     | Margate, Birchington...   | 1·64        | „      | Corwen, Rhug .....       | 4·20        |
| „     | Littlehampton .....       | 3·12        | „      | Port Madoc .....         | ...         |
| „     | Hailsham .....            | ...         | „      | I. of Man, Douglas ..... | 6·85        |
| „     | I. of W., St. Lawrence.   | 3·45        | XII.   | Stoneykirk, Ardwell Ho.  | 5·76        |
| „     | Alton, Ashdell .....      | 4·49        | „      | Melrose, Abbey Gate...   | 5·52        |
| III.  | Winslow, Addington ...    | 2·50        | XIII.  | N. Esk Res. [Penicuik]   | 4·95        |
| „     | Oxford, Magdalen Col...   | 2·30        | XIV.   | Ayr, Cassillis House ... | 7·44        |
| „     | Northampton .....         | 2·22        | „      | Glasgow, Queen's Park.   | 5·55        |
| „     | Cambridge, Beech Ho...    | 1·35        | XV.    | Islay, Gruinart School.. | 5·85        |
| IV.   | Southend .....            | 1·73        | XVI.   | St Andrews, Newton Bk    | 3·78        |
| „     | Harlow, Sheering ...      | 2·03        | „      | Balquhider, Stronvar..   | 12·73       |
| „     | Diss .....                | 1·58        | „      | Dunkeld, Inver Braan..   | 6·51        |
| „     | Swaffham .....            | 1·92        | „      | Dalnaspidal H.R.S. ...   | 9·45        |
| „     | Hindringham .....         | 2·18        | XVII.  | Keith H.R.S. ....        | 3·20        |
| V.    | Salisbury, Alderbury ...  | 3·54        | „      | Forres H.R.S. ....       | 3·36        |
| „     | Warminster .....          | 3·77        | XVIII. | Strome Ferry H.R.S. ...  | 10·17       |
| „     | Calne, Compton Bassett    | 3·34        | „      | Lochbroom .....          | 11·08       |
| „     | Ashburton, Holne Vic..    | 9·72        | „      | Tain, Springfield .....  | 4·05        |
| „     | Holsworthy, Clawton...    | 4·24        | „      | Loch Shiel, Glenaladale  | 18·91       |
| „     | Lynmouth, Glenthorne.     | 6·65        | „      | Invergarry .....         | 14·32       |
| „     | Probus, Lamellyn .....    | 4·15        | XIX.   | Lairg H.R.S. ....        | ...         |
| „     | Wincanton, Stowell Rec.   | 3·45        | „      | Forsinard H.R.S. ....    | 4·53        |
| „     | Taunton, Fullands .....   | 3·26        | „      | Watten H.R.S. ....       | 3·65        |
| VI.   | Bristol, Clifton .....    | 4·82        | XX.    | Dunmanway, Coolkelure    | 10·59       |
| „     | Ross .....                | 3·28        | „      | Ferroy, Gas Works ...    | 3·40        |
| „     | Wem, Sansaw Hall .....    | 2·86        | „      | Tralee, Castlemorris ... | 4·43        |
| „     | Cheadle, The Heath Ho.    | 2·98        | „      | Tipperary, Henry Street  | 4·95        |
| „     | Worcester, Diglis Lock    | 3·02        | „      | Newcastle West .....     | 5·32        |
| „     | Coventry, Coundon .....   | 3·26        | „      | Miltown Malbay .....     | 4·70        |
| VII.  | Melton, Coston .....      | 2·27        | „      | Corofin .....            | 5·75        |
| „     | Ketton Hall [Stamford]    | 1·93        | XXI.   | Carlow, Browne's Hill..  | 4·16        |
| „     | Horncastle, Bucknall ...  | 2·20        | „      | Navan, Balrath .....     | 3·37        |
| „     | Mansfield, St. John's St. | 3·51        | „      | Mullingar, Belvedere ... | 4·54        |
| VIII. | Macclesfield, The Park.   | 4·03        | „      | Athlone, Twyford .....   | 7·46        |
| „     | Walton-on-the-Hill .....  | 3·59        | XXII.  | Galway, Queen's Col ...  | 5·41        |
| „     | Lancaster, South Road.    | 5·46        | „      | Clifden, Kylemore .....  | ...         |
| „     | Broughton-in-Furness ..   | 8·19        | „      | Crossmolina, Enniscoe..  | 7·85        |
| IX.   | Wakefield, Stanley Vic.   | 2·81        | „      | Carrick-on-Shannon ...   | 4·08        |
| „     | Ripon, Mickley .....      | 4·71        | XXIII. | Dowra .....              | ...         |
| „     | Scarborough .....         | 2·99        | „      | Rockcorry .....          | 5·08        |
| „     | East Layton [Darlington]  | 4·31        | „      | Warrenpoint .....        | 5·15        |
| „     | Middleton, Mickleton ..   | 7·33        | „      | Newtownards .....        | 5·14        |
| X.    | Haltwhistle, Unthank..    | 6·98        | „      | Belfast, New Barnsley .  | 6·15        |
| „     | Shap, Copy Hill .....     | 9·68        | „      | Cushendun .....          | 7·24        |
| XI.   | Llanfrechfa Grange ...    | 6·65        | „      | Bushmills .....          | 5·17        |
| „     | Llandovery .....          | 8·38        | „      | Stewartstown .....       | 6·02        |
| „     | Solva .....               | 3·12        | „      | Donegal, Revelin Ho. ... | ...         |
| „     | Castle Malgwyn .....      | 5·08        | „      | Buncrana .....           | 5·55        |
| „     | Rhayader, Nantgwillt..    | 9·41        | „      | Carndonagh .....         | 5·01        |

JANUARY, 1884.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL.   |                                |                            |                 |                                 | TEMPERATURE. |                 |      |                 | No. of Nights below 32°<br>In shade On grass |     |
|----------|---|-------------|--------------------------------|----------------------------|-----------------|---------------------------------|--------------|-----------------|------|-----------------|--|-----|
|          |   | Total Fall. | Difference from average 1870-9 | Greatest Fall in 24 hours. |                 | Days on which .01 or more fell. | Max.         |                 | Min. |                 |  |     |
|          |   |             |                                | Dpth                       | Date.           |                                 | Deg.         | Date            | Deg. | Date            |  |     |
| I.       | London (Camden Square) ...  | 2.30        | — .05                          | .55                        | 26              | 16                              | 55.6         | 29              | 32.2 | 1               | 0  | 8   |
| II.      | Maidstone (Hunton Court)...   | 2.33        | — .24                          | .70                        | 25              | 17                              | ...          | ...             | ...  | ...             | ...  | ... |
| III.     | Strathfield Turgiss .....   | 2.83        | + .28                          | .80                        | 26              | 19                              | 56.3         | 30              | 30.2 | 1               | 1  | 13  |
| IV.      | Hitchin .....   | 2.14        | — .08                          | .62                        | 26              | 16                              | 52.0         | 23 <sup>b</sup> | 29.0 | 28              | 6  | ... |
| V.       | Banbury .....   | 2.75        | + .37                          | .55                        | 26              | 19                              | 54.0         | 23 <sup>c</sup> | 29.5 | 23              | 5  | ... |
| VI.      | Bury St. Edmunds (Culford)  | 1.84        | — .00                          | .47                        | 26              | 17                              | 58.0         | 23              | 29.0 | 1               | 7  | ... |
| VII.     | Norwich (Cossey).....   | 1.37        | — .33                          | .23                        | 26              | 14                              | 56.0         | 30              | 31.0 | 19              | 1  | 8   |
| VIII.    | Weymouth(LangtonHerring)  | 3.31        | ...                            | .63                        | 26              | 19                              | 52.0         | 29 <sup>b</sup> | 32.0 | 1, 27           | 2  | ... |
| IX.      | Barnstaple.....   | 4.63        | + .37                          | .75                        | 25              | 19                              | 56.0         | 5               | 35.0 | 1, 2            | 0  | ... |
| X.       | Bodmin .....  | 5.07        | — 1.44                         | .75                        | 26              | 23                              | 53.0         | 4 <sup>d</sup>  | 33.0 | 27              | 0  | 4   |
| XI.      | Cirencester .....   | 3.79        | + .41                          | .55                        | 23              | 19                              | ...          | ...             | ...  | ...             | ...  | ... |
| XII.     | ChurchStretton(Woolstaston)   | 3.20        | — .23                          | .53                        | 26              | 18                              | 52.0         | 29              | 29.0 | 2               | 6  | 6   |
| XIII.    | Tenbury (Orleton) .....   | 3.28        | + .29                          | .66                        | 26              | 17                              | 55.8         | 22              | 30.0 | 29              | 2  | 6   |
| XIV.     | Leicester .....   | 2.14        | ...                            | .30                        | 23              | 19                              | 54.2         | 24              | 30.6 | 27              | 1  | 2   |
| XV.      | Boston .....  | 1.90        | + .18                          | .34                        | 3               | 10                              | 54.0         | 23              | 33.0 | 26              | 0  | ... |
| XVI.     | Grimsby (Killingholme).....   | 2.76        | + 1.00                         | .64                        | 23              | 19                              | 53.0         | 22 <sup>e</sup> | 32.0 | 28              | 0  | ... |
| XVII.    | Hesley Hall [Tickhill].....   | 2.90        | ...                            | .48                        | 23              | 18                              | 55.0         | ...             | 32.0 | 2               | 4  | ... |
| XVIII.   | Manchester (Ardwick).....   | 4.43        | + 1.19                         | .62                        | 25              | 20                              | 52.0         | ...             | 31.0 | 28              | 5  | ... |
| XIX.     | Wetherby (Ribston Hall) ..  | 3.42        | + 1.20                         | .74                        | 3               | 12                              | ...          | ...             | ...  | ...             | ...  | ... |
| XX.      | Skipton (Arncliffe) .....   | 11.57       | + 4.64                         | 2.55                       | 22              | 27                              | 51.0         | 9, 22           | 33.0 | 2               | 0  | ... |
| XXI.     | North Shields .....   | 2.93        | + 1.09                         | .57                        | 3               | 19                              | 55.5         | 9               | 29.0 | 29              | 8  | 9   |
| XXII.    | Borrowdale (Seathwaite).....  | 22.51       | + 3.76                         | 4.07                       | 22              | 29                              | ...          | ...             | ...  | ...             | ...  | ... |
| XXIII.   | Cardiff (Ely) .....   | 6.35        | + 1.64                         | 1.06                       | 31              | 20                              | ...          | ...             | ...  | ...             | ...  | ... |
| XXIV.    | Haverfordwest .....   | 5.76        | — .51                          | 1.00                       | 2               | 26                              | 53.5         | 23              | 31.9 | 26              | 1  | 2   |
| XXV.     | Plinlimmon (Cwmsymlog)...   | 6.88        | ...                            | 1.62                       | 22              | 23                              | ...          | ...             | ...  | ...             | ...  | ... |
| XXVI.    | Llandudno.....  | 4.52        | + 1.56                         | .88                        | 22              | 19                              | 54.0         | 5               | 32.2 | 2               | 0  | ... |
| XXVII.   | Cargen [Dumfries] .....   | 8.41        | + 2.30                         | 1.21                       | 26              | 23                              | 51.8         | 9               | 26.6 | 3               | 4  | ... |
| XXVIII.  | Hawick .....  | 6.05        | + 2.83                         | .71                        | 23              | 22                              | ...          | ...             | ...  | ...             | ...  | ... |
| XXIX.    | Douglas Castle (Newmains)   | 8.72        | + 3.28                         | 1.15                       | 29              | 22                              | ...          | ...             | ...  | ...             | ...  | ... |
| XXX.     | Lochgilphhead (Kilmory).....  | 10.40       | + 2.53                         | 1.69                       | 26              | 28                              | ...          | ...             | ...  | ...             | ...  | ... |
| XXXI.    | Oban (Craigvarren) .....  | 7.56        | ...                            | .99                        | 24              | 29                              | 52.0         | 19              | 29.7 | 26              | 3  | ... |
| XXXII.   | Mull (Quinish).....   | 7.51        | ...                            | .71                        | 22              | 26                              | ...          | ...             | ...  | ...             | ...  | ... |
| XXXIII.  | Loch Leven Sluces .....   | 5.60        | + 1.78                         | .90                        | 5, 25           | 17                              | ...          | ...             | ...  | ...             | ...  | ... |
| XXXIV.   | Arbroath .....  | 3.06        | + .61                          | .55                        | 4               | 16                              | 50.0         | 9               | 26.0 | 3, 26           | 7  | ... |
| XXXV.    | Braemar .....   | 4.80        | + 2.02                         | .97                        | 4               | 22                              | 50.0         | 21 <sup>f</sup> | 14.3 | 3               | 14   | 27  |
| XXXVI.   | Aberdeen .....  | 3.02        | ...                            | .87                        | 23              | 17                              | 55.0         | 15              | 25.0 | 26              | 11   | ... |
| XXXVII.  | Skye (Sligachan) .....  | 16.37       | ...                            | 3.00                       | 20 <sup>a</sup> | 26                              | ...          | ...             | ...  | ...             | ...  | ... |
| XXXVIII. | Culloden .....  | 3.74        | + 1.97                         | ...                        | ...             | ...                             | 52.0         | 5               | 26.0 | 1               | 10   | 21  |
| XXXIX.   | Dunrobin .....  | 4.73        | ...                            | .84                        | 23              | 23                              | 56.0         | 21              | 25.5 | 26              | 5  | ... |
| XL.      | Orkney (Sandwick) .....   | ...         | ...                            | ...                        | ...             | ...                             | ...          | ...             | ...  | ...             | ...  | ... |
| XLI.     | Cork (Blackrock) .....  | 6.85        | + .83                          | 1.08                       | 2               | 19                              | 56.0         | 29              | 30.0 | 26              | 1  | ... |
| XLII.    | Dromore Castle .....  | 9.15        | ...                            | 1.44                       | 22              | 23                              | 57.0         | 22              | 32.0 | 25 <sup>g</sup> | 3  | ... |
| XLIII.   | Waterford (Brook Lodge) ...   | 5.11        | ...                            | .78                        | 2               | 20                              | 55.0         | 22              | 29.0 | 27              | 3  | 6   |
| XLIV.    | Killaloe .....  | 6.07        | ...                            | .82                        | 25              | 25                              | 54.0         | var.            | 30.0 | 27              | 2  | ... |
| XLV.     | Portarlington .....   | 3.30        | + .24                          | .62                        | 22              | 21                              | 55.0         | 22              | 32.0 | 27              | 2  | ... |
| XLVI.    | Dublin (FitzWilliam Square)   | 2.36        | + .10                          | .38                        | 22              | 18                              | 55.8         | 29              | 31.2 | 27              | 4  | 6   |
| XLVII.   | Ballinasloe .....   | 5.40        | + 1.04                         | .95                        | 22              | 29                              | 51.0         | 4               | 26.0 | 27              | 4  | ... |
| XLVIII.  | Waringstown .....   | 4.65        | + 1.24                         | .75                        | 22              | 24                              | 55.0         | 9, 22           | 28.0 | 25              | 6  | 12  |
| XLIX.    | Londonderry (Creggan Res.)  | 6.31        | ...                            | .74                        | 3               | 27                              | ...          | ...             | ...  | ...             | ...  | ... |
| L.       | Omagh (Edenfel) .....   | 5.70        | + 1.93                         | .76                        | 22              | 27                              | 59.0         | 14              | 23.0 | 25              | 13   | ... |

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

a And 24. b And 30. c And 24. d And 23, 29. e And 23. f And 22. g And 26, 27.

## METEOROLOGICAL NOTES ON JANUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The weather was very rough towards the close of the month, and the temp. rather lower than it had been in the earlier part; heavy gales occurred from S.W. on 20th and 26th, during which much R fell; some serious damage was done by the force of the wind, some firs nearly 90 ft high being snapped off about 8 ft. from the ground; TSS of great violence, accompanied by H, occurred on the 25th and 26th.

HITCHIN.—Terrific gale on 26th; bar. reading 28·32 in.

BANBURY.—A remarkable month, mean temp.  $43^{\circ}\cdot 5$ , about  $8^{\circ}$  above the average; the first week was rather wet, the second and third weeks were very fine with high barometric pressure; the rest of the month was stormy, especially from 25th to 28th, the bar. on 26th falling to 28·423 in. (cor. and red.) at 6.30 p.m., with tremendous wind, doing much mischief; S on 1st and 27th; H on 1st, 11th and 25th; high wind on 11 days, fog on four days.

CULFORD.—The month was remarkable for high winds, but was very mild and open; very stormy with L on 26th.

COSSEY.—Gale on 26th, with R, H and L.

LANGTON HERRING.—A very mild month, the temp. falling to  $32^{\circ}$  on only two occasions; the first 10 days were unsettled, R falling each day, succeeded by 10 very fine dry days, with remarkably steady pressure and the air perfectly calm; a violent storm was experienced on 26th and 27th, with T and L; mean temp. of the month  $44^{\circ}\cdot 0$ ,  $4^{\circ}\cdot 5$  above the average of 12 years.

BODMIN.—Very heavy gales occurred on the 23rd, 25th, 26th and 27th, but little damage was sustained in this neighbourhood; mean temp.  $45^{\circ}\cdot 9$ ; L on 26th and 27th.

WOOLSTASTON.—A slight fall of S on the 1st was followed by three weeks of beautiful mild and open weather; a series of gales commencing on the 22nd culminated in one of extreme violence on 26th; the bar. at its lowest at 5.30 p.m. on that day, after which it slowly rose; mean temp. of the month  $42^{\circ}\cdot 1$ .

ORLETON.—The temp. was very high and steady during the whole of the month, the mean being  $6^{\circ}\cdot 5$  above the average of 23 years; light falls of R occurred on six out of the first seven days, which were generally cloudy and damp; after this R fell on only one day till the 22nd, and the weather was generally cloudy and dry, and the bar. very high and steady. The remainder of the month was very stormy and rainy; bar. lowest at 6 p.m. on 26th, accompanied by a great storm of wind and R which flooded the river Teme on the following morning.

LEICESTER.—Another very mild month and very dry from 9th to 21st; on 24th, and 26th, the wind was very high, and the the bar. on the latter day fell to 28·427 in. (corrected) flashes of L were seen on the evenings of 15th, 26th, and 27th.

BOSTON.—Very heavy gales from 20th to 27th; on 26th the force of the wind amounted to a mild hurricane; a small fall of S on 27th.

GRIMSBY, KILLINGHOLME.—A very mild month, winds light in the early part but very high on several occasions in the latter part; gale on 23rd, great gale on 26th with T and L.

HESLEY HALL [TICKHILL].—Mild weather prevailed throughout the month generally, but from the 22nd to the end south-westerly gales with much R brought colder weather, and caused great damage to trees.

ARNcliffe.—A very wild rainy month, the fall of 2·55 in. on 22nd is most unusual.

NORTH SHIELDS.—Very stormy on 26th with L; at 10 p.m. the bar. stood at 27·90 in. and continued to fall till it reached 27·63 in., it then rose, and at

2 a.m. on 27th stood at 28·00 in. It seems that there was a more violent gale in January 1839, but during 44 years the bar. never fell so low.

SEATHWAITE.—Falls of R exceeding one inch in 24 hours occurred on 11 days during the month, and on the three days 21—23, 7·41 in. fell causing a great flood; gales also did much damage; on 23rd about 5 p.m. it blew with such force that walking was quite a difficulty, and another terrific gale blew on the 26th.

#### WALES.

HAVERFORDWEST.—This January was characterized by entire absence of frost, great gloom and damp and remarkable calmness of the atmosphere with very high bar. (30·705 in. cor. on 15th) until the memorably stormy period which began on the night of 21st; it was exceedingly wild all day on 23rd; ominously calm on 24th; very stormy all day with E, L and R and tempest at night on 25th, culminating in the great storm of Saturday the 26th. Pressure at 9 a.m. on 26th, 28·958 in. (cor.) noon 28·731 in., 5 p.m. 28·418 in. the lowest point observed, and at 11 p.m., 28·634 in. R and gloom prevailed to the end of the month.

LLANDUDNO.—The month was exceptionally mild and equable as regards temp., the mean being more than 4° above the average and the range both diurnal and monthly markedly below it; the R, however, was excessive. There was a terrific gale of wind from S.W., on the afternoon of the 26th, at its worst about 3·30 p.m.; the dome of the Grand Pavilion which was just completed sustained serious damage.

#### SCOTLAND.

CARGEN.—A very stormy, wet, dull month, mean temp. (42°·6) nearly 1°·5 above the average; rainfall more than one-third above the average, and sunshine not much more than half the usual amount; a very heavy gale was experienced on the 23rd, and did considerable damage; it lasted from four to five hours; the gale of 26th was one of extreme violence, and lasted 14 hours, and was most disastrous in its effects; from reports from the district it appears to have caused more destruction than the storm of 11th—12th Dec., 1883; on one large estate in the district it is estimated that upwards of 1,000,000 trees have been blown down by these storms, the bar. on 26th fell to the exceedingly low point of 27·660 in. which is ·480 in. below the lowest point recorded during the previous 24 years.

HAWICK.—Very stormy weather on 3rd, 21st, 26th, 27th and 29th, much L on the nights of 20th and 29th; mild from 5th up to 20th; the storm of the 26th was the most severe we have had since the Tay Bridge disaster.

OBAN, CRAIGVARREN.—Rainfall unusually large, and on no less than 19 days there were heavy gales; the temp. was on the whole high, but the range was considerable; on the 26th a terrific gale occurred from S.W., the tide rose two feet above ordinary springs, and the bar. at 9 p.m. stood at 27·39 in.

BRAEMAR.—An usually fine month up to the 22nd; primroses in flower, and rose bushes and honeysuckle budding; on 26th at 9 p.m. the bar. read 26·350 in. (1,114 ft. above sea level), the lowest reading by an inch recorded during 27 years.

ABERDEEN.—Rainfall somewhat above the average; fair seasonable weather prevailed during the greater portion of the month till the 23rd, when a heavy rainfall occurred, succeeded by violent gales on 26th and 27th; at midnight on 26th, the bar reached the lowest point ever recorded here—viz., 27·40 in. (cor. and red.)

SLIGACHAN.—The first three days of the month were very fine; the rest of the month was very stormy; terrible gales from S.W. veering to N.W. blew on the nights of 19th and 21st, and a heavy fall of S occurred on 26th, with high wind from N.W., veering to S.W.; it was the wildest day I ever experi-

enced, a great number of sheep were lost throughout the island buried in the snowdrift.

CULLODEN.—The first and second weeks were very fine, from the 6th to 20th particularly so; the 26th and 27th will be long remembered, a storm of S with tremendous drifts visiting the north, and indeed Scotland generally; the bar. fell to a point lower than any observed during many years, the lowest reading being at 11 p.m. on 26th, 27·386 in.

#### IRELAND.

BLACKROCK.—Temp. generally high in the first part of the month, but it changed colder about the 21st, followed by storms on 23rd and on 26th, with violent R (·735 in., nearly all in one hour) and T; part of the dome of the observatory was blown off and carried many yards away; the bar. fell to 28·53 in. at noon on the 26th.

WATERFORD.—Rainfall one inch above the average; the early part of the month was very mild, primroses in bloom and woodbine in leaf; from the 21st to the end of the month was very wild and wet; S fell on three days; H on 1st and 23rd, and L was seen on 21st and 25th.

KILLALOE.—Very mild open weather prevailed, with average rainfall, until the 17th, after which date it blew heavily at intervals, rising to a very severe gale on the 26th, followed by a fall of S; some T and L on days preceding the storm.

DUBLIN, FITZWILLIAM SQUARE.—A singularly open frostless month, with scarcely any easterly wind, but a great excess of cloud; a protracted mild, quiet, and dull period was succeeded on the 22nd by a series of strong westerly gales and frequent heavy rainfalls, the atmospheric disturbances culminating on the 26th in a storm of exceptional violence; at 2.15 p.m. the bar. stood at 28·150 in. The mean temp. (45°·2) was slightly over 4° in excess of the average, and the rainfall and rainy days were both also above the average; H occurred on 1st and 30th; S or sleet on 25th, 26th, and 27th; L was seen on the nights of 20th and 25th.

BALLINASLOE.—Generally very wet, with unusually high temp., there being only four days frost in the month; violent gales on 22nd and 26th.

WARINGSTOWN.—The beginning of the month was wet, followed by a fortnight of fine dry weather, on the breaking up of which we experienced two of the most severe gales I have witnessed; that of the 26th was awful, and the damage done equals that of January 6th-7th, 1839; the bar. fell to 27·556 in., much the lowest point touched since I have kept a record.

LONDONDERRY, CREGGAN RES.—The month was very stormy; especially severe westerly gales blowing on the 23rd and 26th.

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#### WIND PRESSURE AT THE FORTH BRIDGE.

During the storm of the 12th of last month (December, 1883), which seems to have been general in its violence all over the country, the pressures of wind recorded on the boards erected by Mr. Baker were—on the small board, about 1·5 ft. square, 38·5 lbs. per square foot; on the large board, having an area of 300 square feet, the pressure recorded was 21·5 lbs. per foot. At Wexford, at the same time, the maximum pressure recorded on a board about 2 ft. square was 28 lbs.—*The Engineer*, Jan. 4, 1884. Vol. lviii. p. 12.

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**En Memoriam.**

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**PROF. ARNOLD GUYOT,**

BORN SEPT. 28TH, 1807.  
DIED FEB. 8TH, 1884.

**CAPT. N. H. C. HOFFMEYER,**

BORN JUNE 3RD, 1836.  
DIED FEB. 16TH, 1884.

EMINENT Meteorologists not unfrequently depart in couples. It was so with Charles St. Claire De Ville and Jelinek, and now, within little more than a week we have lost in Guyot the author of *Earth and Man*, a work which as an introduction to Physical Geography is almost unequalled, and whence hundreds of thousands of his fellow-men have imbibed correct views of the world they inhabit; and also the compiler of *Tables Meteorological and Physical*, a work with which scarcely any working meteorologist can dispense.

Captain Hoffmeyer will long be remembered for work in a very different department of meteorology, notably for his great and self-denying labours in giving us daily charts of Atlantic weather. Scientific facts once honestly ascertained and printed and distributed over the world, can scarcely be lost while the world itself remains, hence the truth of Lord Derby's remark that the victories of science are not for one time or one place, but for all times and all places, and hence it is that long after our friend's remains have returned to their original state, his *Cartes synoptiques* will continue available, and future generations will honour his industry, though they will know nothing of the agreeable personal character so sadly missed by his many friends.

## ANOTHER SOURCE OF VOLCANIC DUST.

WE have in previous issues referred to the excellent weekly, published at Cambridge, Massachusetts, entitled *Science*. The number for February 15th, just received, contains a very important and interesting paper by Mr. G. Davidson, communicated by Prof. Hilgard, Superintendent of the United States Coast and Geodetic Survey.

The record is so similar to that of the Krakatoa eruption that but for the facts bearing the indisputable *imprimatur* of Prof. Hilgard, and that some accounts have already been published by the United States Signal Service, one would almost suspect some colouring, or even a hoax. From its origin, however, it is certain that it is absolutely true.

The account, as given in *Science*, is illustrated by a large map of Alaska and the adjacent regions, and also by a view of the island concerned; this we have reproduced, but we do not give the map, partly because of the cost, partly because it would delay this article, and partly because any good map of the extreme north-west of America will show Cook's Inlet, in lon.  $152^{\circ}$  W. and lat.  $60^{\circ}$  N. and Augustin Island lies in the mouth of the inlet.

The narrative is not very compactly written, and our first intention was to recast it in a systematic form, but of course retaining the very expressions used by Mr. Davidson. We have, however, eventually decided on reprinting it *verb. et lit.*, and, having regard to its importance, we suspend our ordinary custom of using small type for reprints, and give it all the prominence of an original communication:—

“NOTES ON THE VOLCANIC ERUPTION OF MOUNT ST. AUGUSTIN,  
ALASKA, OCT. 6, 1883.

“ON the western side of the entrance to Cook's Inlet (forty-five miles wide) lies Cape Douglas; and to the northward of the cape the shore recedes over twenty miles, forming the Bay of Kamishak. In the northern part of this bay lies the Island of Chernaboura ('black-brown'), otherwise called Augustin Island. It is eight or nine miles in diameter, and near its north-eastern part rises to a peak called by Cook, Mount St. Augustin. As laid down by Tebenkoff, the island is nearly round. The northern shores are high, rocky, and forbidding, and are bordered by vast numbers of rocks and hidden dangers. The southern shore is comparatively low.

“Mount St. Augustin was discovered and named by Capt. Cook, May 26, 1778; and he describes it as having 'a conical figure, and of very considerable height.' In 1794 Puget describes it as—

“A very remarkable mountain, rising with a uniform ascent from the shores to its lofty summit, which is nearly perpendicular to the centre of the island, inclining somewhat to its eastern side . . . Towards the seaside it is very low, from whence it rises, though regular, with a rather steep ascent, and forms a lofty uniform, and conical mountain, presenting nearly the same appearance from every point of view, and clothed with snow and ice, through which

neither tree nor shrub were seen to protrude; so that, if it did produce any, they must either have been very small, or the snow must have been sufficiently deep to have concealed them."

"At that time there were native hunters, under the direction of two Russians, hunting or living in the vicinity of the north-eastern point of the island.

"Vancouver placed the peak of this mountain in latitude  $59^{\circ} 22'$ : Tebenkoff places it in latitude  $59^{\circ} 24'$ .

"The peak of St. Augustin is distant forty-nine miles nearly due west (true) from the settlement on the southern point of Port Graham, or, as it is sometimes called, English Harbor. This harbor is situated on the eastern side of Cook's Inlet, near Cape Elizabeth.

"In connection with the fall of pumice-dust at Iliuliuk\* on Oct. 16, 1883, it may be of interest to observe, that the peak of Augustin is over seven hundred miles to the north-eastward of Bogosloff Island, off Unalashka.

"About eight o'clock on the morning of Oct. 6, 1883, the weather being beautifully clear, the wind light from the south-westward (compass), and the tide at dead low water, the settlers and fishing-parties at English Harbor heard a heavy report to windward (Augustin bearing south-west by west three-fourths west by compass). So clear was the atmosphere that the opposite or north-western coast of the inlet was in clear view at a distance of more than sixty miles.

"When the heavy explosion was heard, vast and dense volumes of smoke were seen rolling out of the summit of St. Augustin, and moving to the north-eastward (or up the inlet) under the influence of the lower stratum of wind; and, at the same time (according to the statements of a hunting-party of natives in Kamishak Bay), a column of white vapor arose from the sea near the island, slowly ascending, and gradually blending with the clouds. The sea was also greatly agitated and boiling, making it impossible for boats to land upon or to leave the island.

"From English Harbor (Port Graham) it was noticed that the columns of smoke, as they gradually rose, spread over the visible heavens, and obscured the sky, doubtless under the influence of a higher current (probably north or north-east). Fine pumice-dust soon began to fall, but gently, some of it being very fine, and some very soft, without grit.

"At about twenty-five minutes past eight a.m., or twenty-five minutes after the great eruption, a great 'earthquake wave,' estimated as from twenty-five to thirty feet high, came upon Port Graham like a wall of water. It carried off all the fishing-boats from the point, and deluged the houses. This was followed, at intervals of about five minutes, by two other large waves, estimated at eighteen and fifteen feet; and during the day several large and irregular waves came into

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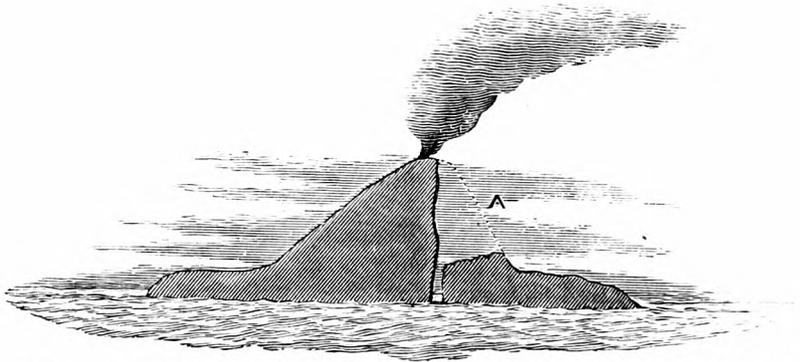
\* Lat.  $53^{\circ} 52'N.$ , Lon.  $166^{\circ} 32'W.$ —Ed. *M. M.*

the harbor. The first wave took all the boats into the harbor, the receding wave swept them back again to the inlet, and they were finally stranded. Fortunately it was low water, or all of the people at the settlement must inevitably have been lost. The tides rise and fall about fourteen feet.

"These earthquake waves were felt at Kadiak,\* and are doubtless recorded on the register of the coast-survey tide-gauge at that place. Also the pumice-ashes fell to the depth of four or five inches, and a specimen of the deposit was given to the tidal observer at St. Paul. It will be interesting to compare these ashes with those collected at Iliuliuk on the 16th of October, and which, from a confusion of dates, were supposed to have come from the new Bogosloff volcanic island. I am of the opinion that they came from St. Augustin.

"The condition of the Island of Augustin or Chernaboura, according to the latest accounts, is this :—

"At night, from a distance of fifty or sixty miles, flames can be seen issuing from the summit of the volcano ; and in the day-time vast volumes of smoke roll from it. Upon nearer approach from English Harbor, it was found that the mountain had been split in two from peak to base by a great rupture extending across it from east to west, and that the northern slope of the mountain had sunk away to the level of the northern cliff.† This is corroborated by the statement of the hunting party in Kamishak Bay. Smoke issued from the peak at a very short distance to the southward of the rupture.



"The party of natives on Kamishak did not approach the islet, though they gave clear and distinct accounts of its eruption and subsequent appearance ; but Capt. C. T. Sands, who was at English Harbor, gave the Alaska company a full description ; and Capt. Cullie of the Kodiak states, that, if there were plenty of water in the line of rupture, it would be possible for a vessel to sail through (see figure). At the time of Capt. Sand's observations the low ground of the island was visible, and seemed to be a vast crater, from which smoke and flames were issuing.

\* Lat. 58°N., Lon. 152°W.

† Capt. Cullie's account.

“But beyond all these phenomena, apart from the volcanic eruption and the rupture of the island, we have the report of Capt. Cullie of the schooner *Kodiak* (from whom we also obtain a statement in regard to the rupture), who approached the island from English Harbor on the 10th of November, and found that a new island, about a mile and a half long and seventy-five feet high, had been upheaved in the ten-fathom passage between Augustin and the mainland to the westward. This passage is from six to eight miles wide, and was sailed through by Puget in Vancouver's voyages of discovery.

“This new island (also reported by the hunting-party in Kamishak) would appear to have arisen during the late volcanic activity. It lies to the north-westward of Chernaboura Island (Augustin), and was distinctly seen from the *Kodiak*, as that vessel lay ten miles to the north-eastward, and had clear weather.

“To show the violence of the volcanic convulsions at this time, two extinct volcanoes on the Alaska peninsula, which are reported to be about west (true) from the active volcano Iliamna (twelve thousand feet high), had burst into activity; and during the day volumes of smoke were distinctly seen, and columns of flame at night. Usually, at that season, Augustin and the peak are covered with deep snow. On the 10th of November, however, when Capt. Cullie approached the island, while there was a depth of four feet of snow at Port Graham (English Harbor), Mount St. Augustin was bare and black.

“During this same season, a party of seven or eight Aleuts had established themselves on Chernaboura (Augustin) Island to hunt the otter during the winter. Two of the women refused to remain on account of the violent noises inside St. Mount Augustin; and they were taken to St. Paul, Kadiak. Since the eruption no one of this party has been seen, nor any signs of their *bidarkas*, although a rescuing party of natives had gone along the coast to learn of their whereabouts. It is feared, therefore, that they have been destroyed. In confirmation of this report of the native women, Capt. Sands says that he and others noticed that St. Augustin was emitting smoke as far back as August; but no other signs were observed before the heavy report of Oct. 6.

GEORGE DAVIDSON,  
*Assistant U. S. Coast and Geodetic Survey.*

#### EXTRAORDINARY PHENOMENON ON THE DEE.

ON Thursday, 21st February, 1884, a most remarkable occurrence took place in the Dee at Connah's Quay, near Chester. The tide flowed at 6.40 a. m., and after two hours' ebb it began to flow again at 8.30, and rose to a height of three feet, when at 9.30 a. m. it ebbed again. Pilots depending upon the tide to come up the river were exceedingly puzzled. So remarkable an event is not remembered among local shipping men.—*Hereford Times.*

#### RAINFALL AT THE WETTEST KNOWN STATION.

THE rainfall at Cherrapunji last year (1883) was 355.25 inches, as compared with 389.82 inches during the year 1882.—*The Colonies.*

## THE SUNSETS AND THE JAVA EARTHQUAKE.

*To the Editor of the Meteorological Magazine.*

SIR,—I found the *Meteorological Magazine* on my return from a delightful walk in the Tyrol over some five feet of hard snow, and hasten to reply to your note appended to my letter.

These sunsets have from time to time been noticed in the local papers, but I have never cut any of them out, being simply a line or two describing what one had seen one self. They first attracted my notice and that of others on the 9th of May, and being unusual, I noted them in my daily weather diary, and enclose the extracts just as I noted them, if they will be of any use.

A navy officer, who passed through Partenkirchen early in August, told me he had noticed them in the Engadine, and that they were much what they saw in northern latitudes, and were considered generally as forerunners of increased cold and bad weather. With the exception of the sunrise of 1st December, when everyone thought Munich was on fire two hours before sunrise, I never saw anything to equal the sunset of Feb. 7th, and sunrise of the 8th, at the Walchensee, the sunset being over the mountains, and the sunrise over the lake. But for the sunset of the previous evening, I should have said the sunrise betokened bad weather. The following day, as my son and I were walking over the pass to Innsbruck, the sun was most extraordinary, with its rings of blue immediately round it, and then the copper band of about 45° diameter, the outer edge shading down to the blue sky, which, though cloudless, almost was milky. Nothing resulted, the weather continuing fine and frosty till Sunday last, 24th, when we had again an orange sunset and glow; and it has snowed, more or less, ever since Monday morning till now (Thursday). My son's remark on the sun on the 9th, was that it was a "sunset all day." At the Walchensee, the people told me that the sunrises and sunsets had continued ever since the summer, and they had never known so much snow. The old man, whose business it is here to look after the ice on the lake, said to me last week that he hadn't known so much snow and so little skating for 47 years; and at Partenkirchen, though there was so much snow on the mountains all the summer, they never were so bare of snow as at the end of August. I was on the Zug-spitz on that day, and there was literally bare rock to the summit, the glacier itself being bare of snow in many places, but it had been a glorious month.

Sincerely yours,

M. F. WARD.

*20, Hees Strasse, Munich, 28th Feb., 1884.*

NOTES COPIED FROM MY DAILY WEATHER ACCOUNT.

1863.

- May 9. Unusual sunset glow.  
 11. Unusually brilliant sunset.  
 18. Very fine sunset and afterglow.  
 June 7. Brilliant sunset and glow.  
 12. Red sunrise.  
 15. Brilliant sunrise and glow, and orange sunset; 11 p.m., dry bulb 60°, wet 55°, unusually warm for that hour.  
 20. Brilliant solar halo and evening glow; treble rainbow.  
 27. Red clouds in E. and S.E. at sunset.  
 July 20. Brilliant mountain glow after 4 hours' rain.  
 21. Brilliant red sunrise; mountains fiery red 4 a.m.; double rainbow; cone of light like tail of comet in S.E. an hour or so before moonrise; disappeared in a quarter of an hour or so.  
 30. Brilliant mountain glow and sunset.  
 Aug. 16. Brilliant sunset and afterglow; cone before moonrise as on 21st July.  
 N.B.—Capt. Noble and others saw cone over moon before rising on the 28th and 29th; here it was cloudless, and moon rose perfectly clear on those evenings.  
 Since 11th January there have been—  
 1884. Jan. 19. Fine red sunset, no afterglow.  
 27-28. Brilliant orange sunsets.  
 Feb. 7. Gorgeous red sunset } I was on the mountain about 3,000 feet above sea.  
 8. " " sunrise } feet above sea.  
 9. Sun surrounded all day by a large copper-coloured band; blue immediately round sun; sky milky. (About 4,000 feet above sea.)  
 A blunt cone of white light, something similar to the zodiacal light in direction and form, has been very conspicuous on all clear evenings, an hour or so before sunset, more so when the body of the sun is behind a chimney stack or other object.  
*Fresh snow.*—June, 4 days; July, 8; August, 2; Sept., 6; Oct., 11; Nov., 7; Dec., 13; Jan., 9; Feb., 4; total, 64.  
*Rain.*—June, 20 days, 14 thunderstorms; July, 17, all thunderstorms; August, 8, ditto; Sept., 15, 4 days thunderstorms; Oct., 9; Nov., 9; Dec. 5; Jan., 8; Feb. 3; total, 94.
- May 10-12. Snow, strong wind; snow down to plain.  
 16-17. Series of thunderstorms.  
 19-20. Snow, strong wind; snow nearly down to plain.  
 June 8-11. Incessant thunderstorm, with heavy rain; snow on mountains.  
 12. Heavy rain 4 p.m. till 4.30 on 13th; 24 hours' rain 1-77 inches.  
 16-19. Incessant heavy rain; floods.  
 21. Violent thunderstorms; heavy rain and snow on mountains; hail; thunderstorm 9.45-12 ('70 in. fell in 25 min.)  
 27. Very fine weather till 13th July, with usual daily thunderstorms.  
 July 21. Heavy rain, 5.10 a.m.  
 22-25. Incessant thunderstorms; snow very low down on mountains.  
 31. Rain; snow on mountains.  
 Aug. 17. Snow; rain; then almost cloudless to end of month.  
 All these sunsets were orange, red and green; I never saw green or blue sun or moon.  
 Jan. 17-23. Clear frost.  
 28 & 29. Snow; strong wind; hail.  
 Feb. 2-11. Clear weather.

[Having no desire for the attainment of anything except the truth, we print Col. Ward's letter and extracts in full, though they are *not what we asked for*. A meteorological register whence one could extract no records of fine sunsets, and specially a register kept amid snow-covered mountains, would be a strange one. We asked for "any printed notices of unusual sunsets, afterglows, &c., published before August 26th," but we have not yet received even one.—ED.]

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*To the Editor of the Meteorological Magazine.*

SIR,—In consequence of what has appeared respecting the presence of iron in the atmosphere, I have been induced, several times since the commencement of the year, to examine the sediment at the bottom of my gauges, and have, in every case, found iron. It seems to be decreasing in quantity, but even this morning I detected its presence.

I think it would be well if observers would examine, and if able to do so analyze, the sediment that they may find in their gauges. It is possible that substances may float in the atmosphere, the existence of which has never been suspected.—Yours respectfully,

S. KING.

*Elswick Lodge, Great Eccleston, Garstang, March 5th.*

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### ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday evening, the 20th ult., Mr. R. H. Scott, M.A., F.R.S., President, in the chair. T. G. Benn, Capt. C. F. Cooke, Francis Galton, M.A., F.R.S., Prof. S. A. Hill, B.Sc., Capt. A. W. Jeffrey, G. Paul, F.G.S., F.R.H.S., R. Veevers, H. T. Wakelam, and E. Wells were balloted for and elected Fellows of the Society. The following papers were read:—

(1.) "The Great Storm of January 26th, 1884," by William Marriott, F.R. Met. Soc. This storm was remarkable for its violence and large area, as well as for the unprecedentedly low barometer reading at its centre. The author had prepared isobaric charts for each hour from noon on the 26th to 3 a.m. on the 27th, and by this means was able to track the storm across the British Isles. The centre of the depression appeared to have first reached the north-west coast of Ireland at noon, and passed in a north-easterly direction over the north of Ireland and across the middle of Scotland, reaching Aberdeen about midnight. Its rate of progress was therefore about 30 miles an hour. A violent gale was experienced all over the British Isles, the greatest hourly velocity of the wind being 68 miles at Valencia at 11 a.m., 70 miles at Holyhead at 2 p.m., 63 miles at Falmouth at 3 p.m., 69 miles at Armagh, and 59 miles at Aberdeen at 5 p.m., 58 miles at Greenwich from 5 to 7 p.m., and 76 miles at Alnwick at

midnight. Thunderstorms occurred on the south-eastern side of the depression, and travelled across the south of Ireland and England at the rate of about 30 miles an hour. The lowest readings of the barometer (reduced to sea level) yet reported were 27·26 ins.\* at Kilcreggan at 8.30 p.m., and 27·332 ins. at Ochtertyre, near Crieff, at 9.45 p.m. In the southern part of England, directly after the minimum had occurred, there was a very sudden rise in the reading of the barometer, in some cases amounting to 0·08 inch in five minutes. From an examination of previous records it appears that there has never before been so low a barometer reading as 27·26 ins., so that this storm may be considered as one of the most remarkable that has occurred in the British Islands.

(2.) "The Height of the Neutral Plane of Pressure and Depth of Monsoon Currents in India," by Prof. E. D. Archibald, M.A., F.R. Met. Soc.

(3.) "The Sunrises and Sunsets of November and December, 1883, and January, 1884," by Hon. F. A. Rollo Russell, M.A., F.R. Met. Soc. The author gives a very interesting account of all the special features of the remarkable sunrises and sunsets which have been observed from November 8th to February 2nd. The following are stated to be the marks distinguishing the peculiar sky-haze from cirrus:—

1. It is commonly much more evenly spread over the sky than cirrus.
2. It is visible (except when very dense or in the neighbourhood of the sun) only about the time of sunrise and sunset. During the day not the faintest trace obscures the clear azure, whereas cirrus becomes more distinct with more daylight.
3. When actually glowing with bright colour it loses its wavy appearance.
4. It has no perceptible motion, unless perhaps when watched through a long period.
5. It does not interfere with the clear definition of the moon, or brilliancy of the stars.
6. It lies almost without exception in long streaks, stretching from between south-south-west and west-south-west to between north-north-east and east-north-east.
7. Its radiant point lies not on the horizon, but far below it.
8. If both cirrus and sky-haze be present, the sky-haze begins to shine with a red light soon after the cirrus has ceased to glow above the western horizon. When cirrus is present, however, there is in general a reaction of effects.
9. The sky-haze is destitute of the fibrous twists and angular branches of cirrus, and, since the sunlight leaves it in regular progression, it must be stratified at the same uniform level.
10. It has always been visible on every clear day for more than two months, and has been quite independent of wind and weather.

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\* This is from an aneroid barometer, which is believed to be nearly correct.

## THE WINTER OF 1883-84.

*To the Editor of the Meteorological Magazine.*

SIR,—December, January and February constituting the three winter months, we are now in a position to review the winter season of 1883-84. The remarkable feature about an exceedingly mild and excessively dry winter seems to be the smallness of the rainfall, notwithstanding the prevalence of S.W. wind, which generally produces mild but wet seasons. I append a short summary of my own observations, placing side by side the record of the last four winters; from this it will be seen that with a higher temperature and a larger percentage of S.W. wind, there has been a far smaller fall in the winter of 1883-84 than in the corresponding season of the three preceding years. I think that those whose record carries them back considerably further than mine carries me, will find it is many years since we experienced a winter at the same time so uniformly mild and dry.

|                              | 1880-81. | 1881-82. | 1882-83. | 1883-84. |
|------------------------------|----------|----------|----------|----------|
| Temperature, Mean .....      | 34·9     | 38·8     | 39·0     | 39·8     |
| „ Absolute Max. ...          | 53·9     | 53·4     | 54·5     | 53·9     |
| „ „ Min. ...                 | 10·7     | 24·9     | 19·1     | 26·7     |
| Frosty nights .....          | 44       | 52       | 50       | 50       |
| Rainfall Total .....         | 6·60     | 6·16     | 7·96     | 3·75     |
| Number of Wet Days .....     | 53       | 41       | 66       | 42       |
| Wind, Percentage of S.W..... | 14       | 23       | 15       | 25       |

Thermometers are verified and placed in a Stevenson screen.

Yours faithfully,

C. W. HARVEY, F.R.Met.Soc.

*Throcking Rectory, Herts, March, 1884.*

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 THE FORTH BRIDGE.

DURING the gales of the 26th and 27th ult., unprecedented wind pressures were experienced at the Forth Bridge works. We learn from Mr. B. Baker, M.I.C.E., that the strongest gusts gave a momentary pressure of 35½ lbs. per square foot on the large board 300 square feet area, put up under the instructions of Mr. Baker, and no less than 65 lbs. per square foot on the small board containing 1·5 square feet.—*The Engineer, Feb. 1, 1884.*

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 NATURAL BAROMETER.

THE natives of the Chiloe Islands make use of a curious natural barometer, to which, from its having been first noticed by the captain of an Italian corvette, the name, "Barometro Araucano" has been given. This novel weather guide was described at a recent meeting of the Linnean Society of New South Wales, as the shell of a crab, one of the *Anomura*, probably of the genus *Lithodes*. It is peculiarly sensitive to atmospheric changes, is nearly white in dry weather but exhibits small red spots on the approach of moisture, and becomes completely red in the rainy season.—*English Mechanic.*

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1883.

| STATIONS.<br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain. |       | Aver.<br>Cloud. |
|--|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|-------------|-------|-----------------|
|  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.      | Days. |                 |
|  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                |             |       |                 |
| England, London .....  | 84·7      | 2     | 42·1     | 16    | 70·5     | 52·1 | 50·7       | 81        | 112·9        | 48·1           | 2·92        | 14    | 6·4             |
| <i>Cape of Good Hope</i> ...                                     | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...             |
| <i>Mauritius</i> .....   | 76·5      | 5     | 58·0     | 25    | 73·4     | 64·1 | 58·8       | 70        | ...          | ...            | ·72         | 12    | 5·3             |
| Calcutta.....  | 92·5      | 11    | 74·9     | 18    | 88·0     | 78·5 | 78·3       | 87        | 158·4        | 73·6           | 16·16       | 27    | 8·8             |
| Madras .....   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...             |
| Bombay.....  | 86·8      | 6     | 73·4     | 10    | 84·2     | 76·8 | 76·7       | 87        | 140·2        | 72·0           | 39·88       | 29    | 9·2             |
| Ceylon, Colombo.....   | 87·0      | 2     | 72·8     | 16    | 84·8     | 77·6 | 71·3       | 75        | 148·0        | 63·5           | 3·16        | 12    | 7·8             |
| <i>Melbourne</i> .....   | 62·0      | 1     | 31·7     | 23    | 55·0     | 41·4 | 41·7       | 80        | 109·5        | 26·2           | 2·55        | 14    | 6·1             |
| <i>Adelaide</i> .....  | 66·5      | 6     | 34·2     | 20    | 58·2     | 44·5 | 42·9       | 73        | 130·2        | 25·1           | 4·20        | 17    | 5·2             |
| <i>Wellington</i> .....  | 59·4      | 14    | 32·0     | 6     | 51·6     | 42·0 | ...        | ...       | 110·0        | 30·0           | 6·27        | 24    | ...             |
| <i>Auckland</i> .....  | 61·0      | 1, 15 | 36·0     | 23    | 57·0     | 47·4 | 44·2       | 74        | 126·0        | 30·5           | 4·79        | 25    | 5·8             |
| <i>Falkland Isles</i> .....                                      | 48·0      | 9     | 21·1     | 20    | 41·2     | 33·2 | 35·0       | 90        | 93·0         | 22·4           | 2·63        | 19    | 6·4             |
| Jamaica.....   | 93·3      | 28    | 70·6     | 17    | 88·6     | 73·8 | 71·5       | 72        | ...          | 62·6           | 1·25        | 5     | 6·0             |
| Barbados .....   | 83·0      | 10    | 70·0     | 3, 27 | 82·0     | 72·0 | 74·1       | 85        | 147·0        | 69·0           | 5·46        | 15    | 6·6             |
| Toronto.....   | 83·4      | 4     | 46·1     | 1     | 74·7     | 55·9 | 58·0       | 73        | 146·4        | 39·8           | 5·57        | 14    | 5·5             |
| New Brunswick, }<br>Fredericton .....                            | 87·7      | 6     | 38·0     | 1     | 75·9     | 52·9 | 56·6       | 74        | ...          | ...            | 4·37        | 13    | 5·8             |
| Manitoba, Winnipeg ...   | 84·5      | 25    | 43·0     | 3, 7  | 74·6     | 50·0 | 54·6       | 55        | ...          | ...            | 1·63        | 8     | 6·7             |
| British Columbia, Yale   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...             |

REMARKS, JULY, 1883.

*Mauritius*.—Rainfall 1·88 in. below, and mean temp 0°·3 above the average; mean pressure 30·216 in.; mean hourly velocity of wind 11·9 miles, extremes 27·6 miles on 31st, and 1·7 miles on 25th, prevailing direction E.S.E. C. MELDRUM, F.R.S.

CEYLON.—TSS occurred on the 10th, 11th and 12th. G. H. SYMONDS.

*Melbourne*.—Mean temp. of air and of dewpoint slightly above the average, and rainfall ·80 in. above it. Prevailing direction of wind N.; strong breezes occurred on 8 days, dense fog on 3rd, 4th and 19th, H showers on 9th, heavy dew on 8 days, hoar frost on 6 days, ice on 4 days; lunar rainbow on 22nd. R. L. J. ELLERY, F.R.S.

*Adelaide*.—Mean pressure 30·212 in., being slightly above the average. Mean temp. 0°·3 below the average; the night of the 19th–20th, was the coldest with one exception experienced for the last 20 years, the min. temp. being 34°·2, while the thermometer on wool registered 22°·9. The rainfall at Adelaide was nearly 1·75 in. above the average of the previous 26 years; the fall was heavy at all places on the Adelaide plains, and especially in the Mount Lofty ranges, where over 8 inches fell. A severe shock of earthquake was experienced at Adelaide on the night of July 7th, and a severe shock was felt at Launceston (Tasmania) on 13th. C. TODD.

*Wellington*.—Showery cold weather almost throughout the month; prevailing winds S.E. and N.E.; very strong on nights of 3rd, 7th and 10th, with R; T on 19th, H on 21st; earthquakes on 4th, 5th and 9th. Mean pressure slightly below, and mean temp. 1°·0 below the average. R. B. GORE.

*Auckland*.—Mean pressure below the average, mean temp. slightly above the average, rainfall also slightly above it. T. F. CHEESEMAN.

BARBADOS.—Mean temp. 76°·0, the same as the average of 25 years, prevailing direction of wind N.E., average velocity 13·9 miles per hour; rainfall 13 per cent. below the average. Five days were overcast; TS on 1st, T and L on 17th.

R. BOWIE WALCOTT.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1883.

| STATIONS.<br><br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain. |       | Aver.<br>Cloud. |
|--|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|-------------|-------|-----------------|
|  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.      | Days. |                 |
|  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                |             |       |                 |
|  | °         |       | °        | °     | °        | °    | 0.100      | °         | °            | inches         |             |       |                 |
| England, London .....  | 82.7      | 21    | 46.9     | 20    | 73.4     | 54.2 | 52.8       | 71        | 113.2        | 49.6           | .93         | 10    | 5.7             |
| <i>Cape of Good Hope</i> ...   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...             |
| <i>Mauritius</i> .....   | 77.5      | 3     | 58.6     | 18†   | 74.1     | 64.2 | 59.5       | 72        | ...          | ...            | 1.33        | 16    | 6.0             |
| Calcutta .....   | 89.7      | 9     | 74.2     | 14    | 87.3     | 78.3 | 78.1       | 87        | 156.5        | 70.8           | 8.15        | 26    | 8.8             |
| Madras .....   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...             |
| Bombay .....   | 88.1      | 17    | 72.0     | 30    | 84.1     | 77.0 | 75.3       | 84        | 143.2        | 70.5           | 12.57       | 26    | 8.1             |
| Ceylon, Colombo .....  | 86.9      | 2.4   | 72.4     | 30    | 82.0     | 76.3 | 73.5       | 84        | 145.5        | 68.0           | 17.86       | 22    | 7.8             |
| <i>Melbourne</i> .....   | 67.2      | 26    | 32.9     | 22    | 59.3     | 42.9 | 41.0       | 71        | 125.0        | 27.9           | .87         | 8     | 5.5             |
| <i>Adelaide</i> .....  | 67.2      | 3     | 37.6     | 22    | 60.4     | 44.4 | 43.3       | 72        | 133.0        | 31.6           | 3.05        | 16    | 4.8             |
| <i>Wellington</i> .....  | 65.0      | 21    | 33.0     | 6     | 55.1     | 43.2 | ...        | ...       | 116.0        | 30.0           | 3.61        | 13    | ...             |
| <i>Auckland</i> .....  | 63.0      | 22    | 36.5     | 7, 24 | 57.0     | 45.1 | 43.8       | 77        | 126.0        | 31.0           | 4.41        | 17    | 5.4             |
| <i>Falkland Isles</i> .....  | 50.3      | 28    | 22.3     | 8     | 42.5     | 33.2 | 35.5       | 90        | 104.0        | 18.8           | 1.17        | 17    | 6.7             |
| Jamaica, Kingston .....  | 90.8      | 15    | 70.7     | 11    | 88.5     | 73.6 | 74.1       | 81        | ...          | 63.2           | 6.62        | 12    | 4.1             |
| Barbados .....   | 86.0      | 24*   | 71.0     | 5     | 83.0     | 73.0 | 74.8       | 83        | 154.0        | 71.0           | 5.12        | 12    | 6.0             |
| Toronto .....  | 82.7      | 22    | 46.3     | 7     | 72.9     | 54.1 | 55.2       | 70        | 141.8        | 39.0           | 1.33        | 8     | 4.8             |
| New Brunswick,<br>Fredericton .....                                  | 89.7      | 23    | 40.3     | 29    | 76.6     | 51.5 | 54.7       | 75        | 76.6         | 51.5           | 1.06        | 12    | 4.7             |
| Manitoba, Winnipeg .....   | 84.8      | 8     | 40.0     | 23‡   | 73.7     | 48.7 | 54.9       | 55        | ...          | ...            | 2.97        | 14    | 7.0             |
| British Columbia, Yale   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...             |

\* And 25. † And 31. ‡ And 26.

REMARKS, AUGUST, 1883.

*Mauritius*.—Rainfall .59 in. below, and temp. 0°·3 above the average ; mean pressure 30.156 in. ; prevailing direction of wind E.S.E., mean hourly velocity 11.7 miles ; strong trade wind blew from 25th to the end of the month ; an unusual disturbance of the tides occurred on 27th. C. MELDRUM, F.R.S.

CEYLON.—TSS occurred daily from 9th to 16th inclusive ; T was heard on 7th and 8th, and L was seen on 19th. Earthquake on 27th. G. H. SYMONDS.

*Melbourne*.—Mean pressure, mean temp. and humidity all about the average ; mean temp. of dew point 1°·2, amount of cloud .7, and rainfall 1.07 in. below their respective averages ; prevailing direction of wind N., strong breezes on 7 days, heavy dew on 7 days, hoar frost on 5 days, severe TS on 4th. R. L. J. ELLERY, F.R.S.

*Adelaide*.—Mean pressure 30.116, slightly below the average of the previous 26 years ; min. 29.416 in. on 11th, the lowest reading in August with one exception ; mean temp. (52°·4) was 1°·6 below the average ; amount of cloud .7 below the average ; rainfall nearly 1 inch above it. The rainfall was considerably in excess of the average over the colony generally. C. TODD.

*Wellington*.—Up to 4th the weather was showery and dull, with S.E. wind ; from 5th to 12th bright, with N.W. wind ; a severe N.W. gale occurred on 13th, followed by R on 14th ; 15th fine, with falling bar, and at night heavy R ; from 17th to 21st fine, from 22nd to 26th cold and showery, with H on 22nd-24th ; the weather was then fine until the night of 30th, when the wind changed to S.E. with R. Prevailing winds N.W. ; mean temp., 1°·1 above the average. R. B. GORE.

AUCKLAND.—Mean pressure a little above the average, mean temp. slightly below the average ; rainfall above it. T. F. CHEESEMAN.

BARBADOS.—Mean temp. 77°·2, very slightly above the average ; mean hourly velocity of wind 9.0 miles ; rainfall 52 per cent. below the average ; five days were overcast. TS to N.W. on 25th. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL,  
FEBRUARY, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                   | Total Rain. | Div.   | STATION.                   | Total Rain. |
|-------|----------------------------|-------------|--------|----------------------------|-------------|
|       |                            | in.         |        |                            | in.         |
| II.   | Dorking, Abinger .....     | 1·92        | XI.    | Carno, Tybrith .....       | 5·45        |
| "     | Margate, Birchington... .. | 1·14        | "      | Corwen, Rhug .....         | 4·65        |
| "     | Littlehampton .....        | 1·72        | "      | Port Madoc .....           | 5·58        |
| "     | Hailsham .....             | 1·81        | "      | I. of Man, Douglas .....   | 4·79        |
| "     | I. of W., St. Lawrence.    | 2·29        | XII.   | Stoneykirk, Ardwell Ho.    | 4·30        |
| "     | Alton, Ashdell.....        | 3·01        | "      | Melrose, Abbey Gate ..     | 3·87        |
| III.  | Winslow, Addington ...     | 1·23        | XIII.  | N. Esk Res. [Penicuick]    | 3·55        |
| "     | Oxford, Magdalen Col... .. | 1·32        | XIV.   | Ayr, Cassillis House ..    | 3·93        |
| "     | Northampton .....          | ·60         | "      | Glasgow, Queen's Park.     | 5·04        |
| "     | Cambridge, Beech Ho... ..  | ·66         | XV.    | Islay, Gruinart School..   | 4·02        |
| IV.   | Southend .....             | ·99         | XVI.   | St. Andrews, Newton Bk     | 1·73        |
| "     | Harlow, Sheering ... ..    | 1·16        | "      | Balquhidder, Stronvar..    | 12·20       |
| "     | Diss .....                 | ·83         | "      | Dunkeld, Inver Braan..     | 6·47        |
| "     | Swaffham .....             | ·91         | "      | Dalnaspidal H.R.S. ...     | 5·36        |
| "     | Hindringham .....          | ·89         | XVII.  | Keith H.R.S. ....          | 1·11        |
| V.    | Salisbury, Alderbury ...   | 2·35        | "      | Forres H.R.S. ....         | ·93         |
| "     | Warminster .....           | 2·61        | XVIII. | Strome Ferry H.R.S....     | 6·01        |
| "     | Calne, Compton Bassett     | 1·58        | "      | Lochbroom .....            | 4·53        |
| "     | Ashburton, Holne Vic..     | 10·29       | "      | Tain, Springfield.....     | 1·04        |
| "     | Holsworthy, Clawton... ..  | 3·95        | "      | Loch Shiel, Glenaladale    | 14·11       |
| "     | Lynmouth, Glenthorne.      | 4·54        | "      | Invergarry .....           | 7·51        |
| "     | Probus, Lamellyn .....     | 6·29        | XIX.   | Lairg H.R.S. ....          | 1·05        |
| "     | Wincanton, Stowell Rec.    | 2·35        | "      | Forsinard H.R.S. ....      | 1·45        |
| "     | Taunton, Fullands .....    | 2·68        | "      | Watten H.R.S. ....         | ·85         |
| VI.   | Bristol, Clifton .....     | 1·85        | XX.    | Dunmanway, Coolkelure      | 11·38       |
| "     | Ross .....                 | 2·66        | "      | Fermoy, Gas Works ...      | 7·42        |
| "     | Wem, Sansaw Hall.....      | 2·02        | "      | Tralee, Castlemorris ...   | 5·30        |
| "     | Cheadle, The Heath Ho.     | 2·06        | "      | Tipperary, Henry Street    | 5·31        |
| "     | Worcester, Diglis Lock     | 2·02        | "      | Newcastle West .....       | 5·06        |
| "     | Coventry, Coundon .....    | 1·87        | "      | Miltown Malbay.....        | 4·09        |
| VII.  | Melton, Coston .....       | ·85         | "      | Corofin .....              | 4·39        |
| "     | Ketton Hall [Stamford]     | ·85         | XXI.   | Carlow, Browne's Hill..    | 4·42        |
| "     | Horncastle, Bucknall ...   | 1·46        | "      | Navan, Balrath .....       | 2·75        |
| "     | Mansfield, St. John's St.  | 2·78        | "      | Mullingar, Belvedere... .. | 3·26        |
| VIII. | Macclesfield, The Park.    | 1·53        | "      | Athlone, Twyford .....     | 4·49        |
| "     | Walton-on-the-Hill.....    | 2·71        | XXII.  | Galway, Queen's Col....    | 4·16        |
| "     | Lancaster, South Road.     | 2·24        | "      | Clifden, Kylemore .....    | ...         |
| "     | Broughton-in-Furness... .. | 5·09        | "      | Crossmolina, Enniscooe..   | 4·72        |
| IX.   | Wakefield, Stanley Vic.    | 2·11        | "      | Carrick-on-Shannon ...     | 3·75        |
| "     | Ripon, Mickley .....       | 2·09        | XXIII. | Dowra .....                | 2·96        |
| "     | Scarborough .....          | 1·75        | "      | Rockcorry.....             | 2·99        |
| "     | East Layton [Darlington]   | 1·35        | "      | Warrenpoint .....          | 4·59        |
| "     | Middleton, Mickleton..     | 2·38        | "      | Newtownards .....          | 3·01        |
| X.    | Haltwhistle, Unthank..     | 2·15        | "      | Belfast, New Barnsley .    | 3·38        |
| "     | Shap, Copy Hill .....      | 7·45        | "      | Cushendun .....            | 3·76        |
| XI.   | Llanfrechfa Grange ...     | 4·64        | "      | Bushmills .....            | 3·16        |
| "     | Llandovery .....           | 5·26        | "      | Stewartstown .....         | 3·43        |
| "     | Solva .....                | 3·72        | "      | Donegal, Revelin Ho....    | ...         |
| "     | Castle Malgwyn .....       | 8·52        | "      | Buncrana .....             | 3·55        |
| "     | Rhayader, Nantgwillt..     | 7·26        | "      | Carndonagh .....           | 4·22        |

FEBRUARY, 1884.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL.   |                                |                            |       |                                 | TEMPERATURE. |       |      |       | No. of Nights below 32°<br>In shade<br>On grass |
|----------|---|-------------|--------------------------------|----------------------------|-------|---------------------------------|--------------|-------|------|-------|---|
|          |   | Total Fall. | Difference from average 1870-9 | Greatest Fall in 24 hours. |       | Days on which .01 or more fell. | Max.         |       | Min. |       |   |
|          |   |             |                                | Dpth                       | Date. |                                 | Deg.         | Date  | Deg. | Date. |   |
| I.       | London (Camden Square) ...  | 1.40        | — .24                          | .30                        | 1     | 14                              | 56.3         | 13    | 28.2 | 3     | 514   |
| II.      | Maidstone (Hunton Court)...   | 1.57        | — .05                          | .30                        | 10    | 17                              | ...          | ...   | ...  | ...   | ...   |
| III.     | Strathfield Turgiss .....   | 1.76        | + .01                          | .27                        | 1     | 13                              | 55.1         | 13    | 27.4 | 3     | 615   |
| IV.      | Hitchin .....   | .93         | — .67                          | .21                        | 21    | 13                              | 53.0         | 13    | 25.0 | 28    | 15...   |
| V.       | Banbury .....   | .96         | — .88                          | .17                        | 1, 9  | 13                              | 53.0         | 13    | 25.5 | 29    | 11...   |
| VI.      | Bury St. Edmunds (Culford)  | .55         | — 1.22                         | .11                        | 21    | 14                              | 53.0         | 14b   | 25.0 | 29    | 8...  |
| VII.     | Norwich (Cossey) .....  | .50         | — 1.25                         | .12                        | 21    | 12                              | 54.0         | 20    | 28.5 | 27f   | 614   |
| VIII.    | Weymouth(LangtonHerring)  | 3.08        | ...                            | .34                        | 27    | 20                              | 52.0         | 20c   | 26.0 | 3     | 2...  |
| IX.      | Barnstaple .....  | 4.45        | + 1.26                         | .77                        | 1     | 22                              | 54.0         | 1d    | 29.0 | 3     | ...   |
| X.       | Bodmin .....  | 7.69        | + 2.82                         | 1.80                       | 17    | 23                              | 53.0         | 9     | 29.0 | 3     | 1 5   |
| XI.      | Cirencester .....   | 1.65        | — .99                          | .35                        | 9     | 16                              | ...          | ...   | ...  | ...   | ...   |
| XII.     | ChurchStretton(Woolstaston)   | 3.29        | + .79                          | .54                        | 1     | 21                              | 50.0         | 14    | 24.5 | 3     | 711   |
| XIII.    | Tenbury (Orleton) .....   | 2.29        | — .18                          | .34                        | 17    | 17                              | 54.0         | 14    | 26.7 | 29    | 613   |
| XIV.     | Leicester .....   | .96         | ...                            | .33                        | 1     | 13                              | 55.2         | 13    | 28.0 | 29    | 410   |
| XV.      | Boston .....  | .72         | — 1.06                         | .41                        | 1     | ...                             | 55.0         | 12e   | 29.0 | 27    | 4...  |
| XVI.     | Grimsby (Killingholme).....   | 1.57        | — .23                          | .93                        | 1     | 19                              | 54.0         | 20    | 29.0 | 29    | 4...  |
| XVII.    | Hesley Hall [Tickhill].....   | 1.18        | ...                            | .42                        | 1     | 17                              | 54.0         | 13    | 24.0 | 29    | 3...  |
| XVIII.   | Manchester (Ardwick).....   | 2.00        | — .19                          | .42                        | 23    | 16                              | 52.0         | 13    | 25.0 | 26    | 6...  |
| XIX.     | Wetherby (Ribston Hall) ...   | 2.77        | + .62                          | 1.28                       | 3     | 10                              | ...          | ...   | ...  | ...   | ...   |
| XX.      | Skipton (Arncliffe) .....   | 4.89        | + .25                          | .85                        | 9     | 21                              | 50.0         | 22    | 24.0 | 22    | ...   |
| XXI.     | North Shields .....   | .92         | — .92                          | .15                        | 1     | 17                              | 53.8         | 4, 5  | 25.8 | 29    | 5 7   |
| XXII.    | Borrowdale (Seathwaite).....  | 14.96       | + 3.51                         | 2.12                       | 9     | 21                              | 49.8         | 13    | 26.7 | 3     | 2...  |
| XXIII.   | Cardiff (Ely).....  | 4.63        | + .97                          | 1.34                       | 17    | 22                              | ...          | ...   | ...  | ...   | ...   |
| XXIV.    | Haverfordwest .....   | 6.84        | + 2.39                         | 1.05                       | 12    | 23                              | 51.5         | 5     | 27.0 | 2     | 310   |
| XXV.     | Plinlimmon (Cwmsymlog) ...  | 4.25        | ...                            | .63                        | 1     | 20                              | ...          | ...   | ...  | ...   | ...   |
| XXVI.    | Llandudno .....   | 2.98        | + .69                          | .47                        | 1     | 19                              | 57.0         | 9     | 32.2 | 29    | 0...  |
| XXVII.   | Cargen [Dumfries] .....   | 6.96        | + 3.15                         | 2.12                       | 12    | 19                              | 50.2         | 4     | 27.0 | 3     | 7...  |
| XXVIII.  | Hawick .....  | 4.18        | + 1.89                         | 1.30                       | 1     | 16                              | ...          | ...   | ...  | ...   | ...   |
| XXIX.    | Douglas Castle (Newmains)   | 7.17        | + 4.00                         | 1.54                       | 12    | 22                              | ...          | ...   | ...  | ...   | ...   |
| XXX.     | Lochgilhead (Kilmory).....  | 5.77        | + 1.38                         | 1.17                       | 2     | 20                              | 52.0         | 4     | 25.0 | 25    | 14...   |
| XXXI.    | Oban (Craigvarren) .....  | 4.27        | — .59                          | .20                        | 16    | 16                              | 51.0         | 9, 13 | 28.5 | 2     | 7...  |
| XXXII.   | Mull (Quinish) .....  | 7.06        | ...                            | .75                        | 9     | 19                              | ...          | ...   | ...  | ...   | ...   |
| XXXIII.  | Loch Leven Sluices .....  | 1.80        | — 1.16                         | .30                        | 20    | 12                              | ...          | ...   | ...  | ...   | ...   |
| XXXIV.   | Arbroath .....  | 1.75        | — .41                          | .30                        | 1, 9  | 14                              | 50.0         | 4     | 30.0 | 29    | 6...  |
| XXXV.    | Braemar .....   | 7.74        | + 5.07                         | 2.10                       | 12    | 17                              | 47.0         | 5     | 16.2 | 29    | 1925  |
| XXXVI.   | Aberdeen .....  | 1.90        | ...                            | .46                        | 13    | 20                              | 53.0         | 4     | 27.0 | 7     | 6...  |
| XXXVII.  | Skye (Sligachan) .....  | 13.66       | ...                            | 2.00                       | 10    | 20                              | ...          | ...   | ...  | ...   | ...   |
| XXXVIII. | Culloden .....  | 1.53        | + .48                          | ...                        | ...   | ...                             | 52.0         | 9     | 25.0 | 29    | 724   |
| XXXIX.   | Dunrobin .....  | ...         | ...                            | ...                        | ...   | ...                             | ...          | ...   | ...  | ...   | ...   |
| XL.      | Orkney (Sandwick).....  | 1.34        | — 1.21                         | .25                        | 4     | 19                              | 48.9         | 4     | 30.8 | 2     | 3 8   |
| XLI.     | Cork (Blackrock) .....  | 9.44        | + 4.85                         | 1.32                       | 20    | 21                              | 54.0         | 18    | 28.0 | 2     | 5...  |
| XLII.    | Dromore Castle .....  | 8.30        | ...                            | 1.36                       | 20    | 25                              | 55.0         | 27    | 30.0 | 2     | 4...  |
| XLIII.   | Waterford (Brook Lodge) ...   | 7.41        | ...                            | .91                        | 13    | 23                              | 52.0         | 9     | 27.0 | 3     | 1 7   |
| XLIV.    | Killaloe .....  | ...         | ...                            | ...                        | ...   | ...                             | ...          | ...   | ...  | ...   | ...   |
| XLV.     | Portarlington .....   | 3.01        | + .80                          | .50                        | 9     | 24                              | 53.5         | 9     | 30.5 | 2     | 3...  |
| XLVI.    | Dublin (FitzWilliam Square)   | 3.52        | + 1.36                         | .70                        | 13a   | 20                              | 54.6         | 9     | 31.8 | 2     | 2 3   |
| XLVII.   | Ballinasloe .....   | 3.66        | + 1.15                         | .76                        | 20    | 24                              | 50.0         | 19    | 30.0 | 2g    | 9...  |
| XLVIII.  | Waringstown .....   | 3.46        | + 1.21                         | .51                        | 20e   | 18                              | 56.0         | 10    | 21.0 | 3     | 814   |
| XLIX.    | Londonderry (Creggan Res.)  | 3.47        | ...                            | .71                        | 20    | 22                              | ...          | ...   | ...  | ...   | ...   |
| L.       | Omagh (Edenfel) .....   | 3.75        | + 1.47                         | .60                        | 20    | 22                              | 56.0         | 8     | 29.0 | 25    | 3...  |

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

a And 20. b And 15. c And 22. d And 10, 13, 15. e And 13. f And 19. g And 3, 11, 22, 26.

## METEOROLOGICAL NOTES ON FEBRUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STREATHFIELD TURGISS.—On the whole the weather was mild and stormy, the R being sufficient to make the clay lands wet and unworkable, on lighter soils spring work is in a forward state. Red japonica in flower on 10th; elm in flower on 21st.

BANBURY.—A dry month with much wind; mean temp.  $41^{\circ}4$ ; vegetation very forward, and weather spring-like towards the end of the month; very welcome frosts on last three days; high wind on 10 days; gale on 20th; S on 3rd and 10th; L on 21st; fog on 7th, 8th and 9th.

CULFORD.—A fine open month, apricots in full bloom, and every kind of vegetation very forward; mean temp.  $41^{\circ}2$ .

COSSEY.—A very dry month; the only Februaries on record with a smaller rainfall being 1857, 0.41 in., 1862, 0.40 in., and 1863, 0.45 in.

LANGTON HERRING.—Mean temp.  $1^{\circ}5$  above the average of 12 years; the only cold days were the 3rd and 29th; the contrast between the temp. at 9 a.m. on the 3rd and on the 4th is striking, the readings being  $29^{\circ}0$  and  $45^{\circ}0$  respectively. On 10th violent hailstorms occurred, accompanied by T and L, and a less violent hailstorm on 11th.

BODMIN.—Another singularly mild month, the temp. only once falling below  $32^{\circ}$ ; mean temp.  $43^{\circ}$ .

CIRENCESTER.—A mild month with moderate rainfall.

WOOLSTASTON.—A wet month; S fell on 1st, 10th, 16th and 29th; a gale of great violence raged during the night of 20th-21st, accompanied by H; mean temp.  $44^{\circ}6$ .

ORLETON.—Much R fell on 1st, and S on 2nd till 8 a.m., when the hills were covered; no R fell afterwards till the 9th, but the sky was generally obscured by clouds, after that date R fell every day till the 24th, making the heavy clay lands very wet; the remainder of the month was dry and colder, with occasional sunshine. The mean temp. was about  $1^{\circ}5$  below the average of 23 years, and the fluctuations were trifling.

LEICESTER.—The month was very dry and mild for the season.

KILLINGHOLME.—The month was unusually mild throughout; both wild and garden flowers blooming remarkably early; heavy R and N.E. gale on night of 1st, but very little R afterwards.

HESLEY HALL.—The weather was mild during the first half of the month, but cold during the latter half, especially on the last day; a little S on 28th.

ARDWICK.—February was on the whole a gloomy month, but not cold; R fell frequently, but not heavily. The temp. was rather high, and there was very little frost, and only one slight fall of S.

SEATHWAITE.—A violent storm of R occurred on the afternoon of the 20th, followed by a S.W. gale, which did considerable damage to plant and property.

## WALES.

HAVERFORDWEST.—The month generally was very stormy and milder than usual. A fierce gale from N. raged all night on 1st, by which roofs were much damaged, and trees blown down; damp, gloomy weather prevailed from 2nd to 8th, when another very serious depression passed over with H, L and sleet; at 8 a.m. terrible forked L, followed by very loud T, occurred over a great part of the county, several houses were struck, and much damage was done, the L struck the Trefgarn Rocks, splintering large masses and hundreds of smaller pieces, and hurling them to great distances, the L ploughing up the ground

round about ; the most violent gale of the winter occurred on the night of the 26th, when many large trees were blown down, plantations destroyed, and houses unroofed ; the month continued unsettled, but colder, to the end ; S fell on 7 days.

#### SCOTLAND.

**CARGEN.**—A very dull, stormy month ; rainfall greatly above the average, and sunshine less than half the average ; a very severe gale was experienced between 2 a.m. and 4 a.m. of 22nd, causing much damage to trees and plantations in the district ; mean temp.  $40^{\circ}1$ , about the average ; L on 9th ; T on 21st.

**HAWICK.**—The month on the whole was mild and open. The 1st was very wet, 1 inch of B falling in 7 hours, which made every rivulet overflow ; 4 in. of S fell on 29th.

**CRAIGVARREN.**—On the whole the month was fine and dry and unusually warm ; the last week was very dry, cold and fair with S.E. wind, ending with a fall of S on 29th. Gale with T on 9th ; very severe gale on 20th, one of the most severe since the Tay Bridge gale ; several gables of new masonry were blown over.

**ABERDEEN.**—High S. to S.E. winds were frequent, and the weather was dry and open till 27th, when S and H set in ; total rainfall considerably below the average ; aurora on 29th ; L on 22nd.

**CULLODEN.**—The month generally was fine, without S, and many days were warm and genial.

**SANDWICK.**—February was warmer and drier and more windy than the average ; temp.  $1^{\circ}2$  above the average ; wind 4126 miles above it ; before the 12th S.W. winds prevailed, and after that S.E. winds almost every day ; auroræ seen on 23rd and 29th.

**BLACKROCK.**—Very stormy weather prevailed up to the 23rd, causing much damage to life and property by land and sea ; little sunshine and frequent heavy falls of B.

#### IRELAND.

**DROMORE CASTLE.**—The characteristics of the month were high temp. and continual B with occasional storms ; during a TS about the middle of the month, a house in a mountain glen was struck by L and part of the roof was taken off ; three distinct streams of electric fluid could be traced, the furniture was damaged, and three cows and one pig in an out-building were killed, but several persons who were in the house were uninjured.

**WATERFORD, BROOK LODGE.**—The wettest February during the last 10 years, rainfall nearly 3 inches above the average for that period ; H on 4 days ; T and L on 20th and 21st ; L on 19th ; some of the hailstones that fell on 21st in Waterford were as large as marbles ; northerly gale on 1st.

**DUBLIN, FITZWILLIAM SQUARE.**—The frostless character of the winter was maintained throughout February, but there was a decrease in the temp. owing to the increasing prevalence of S.E. winds ; the amount of cloud was unusually large (7.7), and the weather was often cheerless and wet. A very violent S. gale occurred on the night of 20th ; mean temp.  $43^{\circ}0$ , about the average ; S or sleet fell on 2nd, 10th and 11th ; H on 10th ; L was seen on 21st, and solar halos on 20th and 25th.

**BALLINASLOE.**—A very wet and blustering month ; the country much flooded.

**OMAGH, EDENFEL.**—The weather of the month was as unsettled and wet as that of January, but with a considerably lower temp.

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

CCXIX.]

APRIL, 1884.

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### JANUARY, 1884, IN THE UNITED STATES.

WHILE we in England during January were revelling in unnatural warmth, and were surrounded by a profusion of flowers almost spring-like, North America, especially the eastern part of the continent, was suffering so great an extreme of cold that in many cases the population suffered considerably, and live stock was frozen to death.

We have considered these conditions sufficiently important and interesting to call for a brief précis of the observations and remarks published in the *Monthly Weather Review* issued by the Signal Service of the United States. We have adhered to the arrangement adopted in the original, merely extracting the most striking facts, and adding a few notes and comments.

The first table gives the mean temperature for January, 1884, and the difference from the average of a series of years for the different districts; we quote all cases where the deficiency exceeds 5° and for some of them have been able to add the maximum departures from the normal temperature during the eleven Januarys 1873-83:—

| DISTRICTS.                     | Mean,<br>Jan. 1884. | Diff. from the<br>average of<br>several years. | Greatest departures, 1873-83. |       |
|--------------------------------|---------------------|--|-------------------------------|-------|
|                                |                     |  | Amount.                       | Year. |
| Ohio Valley .....              | 24°·8               | —8°·2  | °                             | ...   |
| Tennessee .....                | 31·8                | —8·2   | °                             | ...   |
| Eastern Gulf States .....      | 41·2                | —8·2   | °                             | ...   |
| Western Gulf States .....      | 40·9                | —7·0   | —7·6                          | 1881  |
| Upper Lake Region .....        | 13·0                | —6·6   | —9·7                          | 1875  |
| Lower Lake Region .....        | 18·7                | —6·4   | —9·5                          | 1875  |
| Upper Mississippi Valley ..... | 17·9                | —6·0   | —11·6                         | 1875  |
| Southern Slope .....           | 39·0                | —6·0   | —8·9                          | 1881  |
| Rio Grande Valley .....        | 52·6                | —5·3   | °                             | ...   |

The general conditions of mean temperature are summed up as follows, and numerous remarks by the observers are added :—

“The month of January, 1884, was slightly warmer than the average in California, in the northern and middle slopes, and in the middle and southern plateau districts. A comparison of the mean temperatures for January in those districts with the normal, shows departures of from  $0^{\circ}5$  to  $0^{\circ}9$ , except in Southern California, where it amounted to  $1^{\circ}6$ . The mean temp. for the northern plateau does not differ from the normal for that district. In the North Pacific coast region, and in all districts east of the Rocky mountains, excepting the Northern and Middle Slopes, the mean temperature of the month has been below the average. A marked deficiency of  $8^{\circ}2$  occurred in the Ohio valley, Tennessee, and the Eastern Gulf States. In the Lake region, Upper Mississippi valley, West Gulf States, and Southern Slope, the deficiencies ranged from  $6^{\circ}$  to  $7^{\circ}$ . In the other districts east of the Rocky mountains, where deficiencies occurred, they varied from  $2^{\circ}3$  in New England to  $5^{\circ}3$  in the Rio Grande valley.”

#### ALABAMA.

“*Green Springs, Hale County.*—Mean temp.,  $37^{\circ}6$ , is  $9^{\circ}$  below the mean of January, 1883, and is the lowest monthly mean that has occurred during the last ten years.”

#### ILLINOIS.

“*Anna, Union County.*—Mean temp.,  $25^{\circ}6$ , is  $7^{\circ}2$  below the January average of nine years. The temperatures for two of the coldest months of which there is a record, are—

|                                | January, 1864. |       | January, 1884. |
|--------------------------------|----------------|-------|----------------|
| Highest temperature .....      | $67^{\circ}$   | ..... | $65^{\circ}$   |
| Lowest „ .....                 | $-22^{\circ}$  | ..... | $-21^{\circ}$  |
| Monthly mean temperature.....  | $32^{\circ}2$  | ..... | $25^{\circ}6$  |
| Highest daily mean temperature | $58^{\circ}5$  | ..... | $60^{\circ}0$  |
| Lowest „ „ „                   | $-11^{\circ}7$ | ..... | $-15^{\circ}0$ |

“*Riley, McHenry County.*—Mean temp.,  $9^{\circ}8$ , is  $8^{\circ}$  below the January average of the last 21 years, and is, with the exception of that for January, 1875, the lowest for the period named.”

#### INDIANA.

“*Logansport, Cass County.*—Mean temp.,  $18^{\circ}6$  is  $11^{\circ}3$  below the January average of the last 25 years.”

#### MASSACHUSETTS.

“Mr. J. B. Hall, of *Worcester*, reports the mean temp. of January for a period of 45 years to be  $29^{\circ}6$  (?), and the mean for January, 1884, to be  $20^{\circ}4$ , or  $9^{\circ}2$  (?) below the normal.”

#### MISSOURI.

“*Saint Louis.*—Prof. Nipher, director of the ‘Missouri Weather Service,’ reports as follows : January has been unusually cold. The average temperature at the central station was  $22^{\circ}3$ , which is  $9^{\circ}1$  below the normal January temperature for St. Louis, as shown by Dr. Engelmann’s series for 49 years. The average January tempera-

ture was, however, lower than the mean for January, 1884, in the following years, viz., 20°·2 in 1856, 19°·3 in 1857, and 21°·3 in 1875."

NEW YORK.

"Palermo, Oswego County.—Mean temp., 14°·1, is 7°·5 below the January average of the last 31 years. The lowest January mean of that period, 12°·8, occurred in 1881."

OHIO.

"Wauseon, Fulton County.—Mean temp., 14°·5, is 9°·5 below the January average of the last 14 years. The lowest January mean of that period, 12°·2, occurred in 1875."

The absolute minimum temperatures for the month are next dealt with, and out of a total number of 162 readings, no fewer than 101 (63 per cent.) are below zero, 32 being below —25° and 4 below —40°.

A table is given of 64 Signal Service stations with comparisons with previous years, and all stations where the 1884 reading was the lowest, appear below :—

| State or Territory. | Minimum for January, 1884. |       | Minimum in Previous years. |          |
|---------------------|----------------------------|-------|----------------------------|----------|
|                     | Station.                   | Temp. | Temp.                      | Year.    |
| Alabama.....        | Montgomery .....           | 8     | 14                         | '73, '79 |
| Arkansas.....       | Fort Smith.....            | —5    | 2                          | 1883     |
| Delaware.....       | Delaware Breakwater        | 9     | 10                         | 1882     |
| Georgia.....        | Atlanta.....               | —1·3  | 9                          | 1879     |
| ".....              | Augusta.....               | 14    | 15                         | 1873     |
| Illinois.....       | Chicago.....               | —18·5 | —18                        | 1879     |
| Indiana.....        | Indianapolis.....          | —25   | —22                        | 1879     |
| Kentucky.....       | Louisville.....            | —19   | —10                        | '74, '79 |
| Minnesota.....      | Moorhead.....              | —43   | —42                        | 1882     |
| Missouri.....       | St. Louis.....             | —21·5 | —16                        | 1875     |
| Nebraska.....       | Omaha.....                 | —38   | —22                        | 1879     |
| North Carolina      | Charlotte.....             | 5     | 11                         | '79, '81 |
| Ohio.....           | Columbus.....              | —20   | —20                        | 1879     |
| South Carolina      | Charleston.....            | 13    | 19                         | 1873     |
| Tennessee.....      | Knoxville.....             | —16   | —14                        | 1877     |
| ".....              | Nashville.....             | —10   | —8                         | 1877     |

Many of these temperatures would appear much more striking if we compared them with corresponding readings for European stations, roughly, in the same latitude ; thus we have—

|               |         |     |            |      |   |          |         |     |            |       |
|---------------|---------|-----|------------|------|---|----------|---------|-----|------------|-------|
| Knoxville ... | Lat. 36 | ... | Min. temp. | —16° | } | Malta... | Lat. 36 | ..  | Min. temp. | 42°·7 |
| Nashville ... | " 36    | ... | —10°       |      |   |          |         |     |            |       |
| Indianapolis  | " 40    | ... | —25°       |      |   |          |         |     |            |       |
| Columbus ...  | " 40    | ... | —20°       |      |   |          |         |     |            |       |
|               |         |     |            |      |   | Madrid.  | " 40    | ... | 15°·8      |       |

While of the four stations with minimum temperatures below —40° Montana, Poplar River, —48° ; Dakota, Fort Yates, —45°·5 ; Fort

Lincoln,  $-45^{\circ}$ ; and Minnesota, Moorhead,  $-43^{\circ}$ , not one is nearly as far north as either Paris or London.

This, perhaps, is a rather needless comparison, for it simply shows that latitude alone is very little guide as to the climate of a station, but the following remarks clearly show by comparisons with previous years that the temperatures registered in January, 1884, were exceptionally severe.

(To be continued.)

### THE SUN GLOWS.

*The Sun Glows.* By HENRY A. HAZEN. (Excerpt "American Journal of Science." March, 1884. 8vo.)

THIS is a very business-like paper, as will readily be seen by the following extracts:—

It is the purpose of this article to give:

1st. A general idea of the earliest appearances of the phenomenon. 2nd. To describe what may be seen by an ordinary observer even to-day. 3rd. To present the vapor theory and answer objections. 4th. To show why the "volcanic ashes" and "cosmic dust" hypotheses are untenable.

Remarkable sunset phenomena are reported as occurring on various dates at the following places:—

| Date.          | Place.  | Lat.  | Long.  |
|----------------|---|-------|--------|
| 1883, Aug. 28. | Mauritius .....   | 20°S. | 57°E.  |
|                | 30. Maranh, Brazil.....   | 2 S.  | 44 W.  |
| Sept. 1.       | New Ireland .....   | 5 S.  | 152 E. |
|                | 2. Venezuela.....   | 10 N. | 65 W.  |
|                | 5. Hawaii .....   | 20 N. | 156 W. |
|                | 8. Ceylon.....  | 7 N.  | 80 E.  |
|                | 15. South Australia.....  | 38 S. | 143 E. |
|                | 20. Cape of Good Hope .....   | 35 S. | 20 E.  |
| Oct. 8.        | Florida .....   | 29 N. | 82 W.  |
|                | 19. Yuma, California .....  | 33 N. | 114 W. |
| Nov. 9.        | England .....   | 52 N. | 0      |
|                | 20. Turkey.   |       |        |
|                | 27. British Columbia, Ala., Cal., Conn., Dak., Fla., Ga., Ills., Ind., Iowa, Kans., Me., Md., Mass., Mich., Mo., Neb., N. H., N. Y., N. C., Pa., Va., Wis., Germany, Italy, Spain, France, Sweden, England. |       |        |

Allowing for cloudiness, on certain days, it will be seen that before September 8th a belt of the earth's surface  $15^{\circ}$  on either side of the equator was suddenly visited by the phenomenon. At first sight it might appear that there was a regular progression from the Indian Ocean westward, but on that supposition it would be hardly possible to explain why Venezuela should have seen the glow six days earlier than Ceylon, though somewhat farther north. The phenomenon might have been seen at Hawaii and even at Ceylon the last of August had it not been for cloudiness; and granting this, it is plain that appearances might have been well nigh instantaneous over the regions near the equator. The glow was marked at Yuma on October 19, 20 and 21, after which

it ceased for a month. It was first seen in the eastern United States on October 30th, when the appearance was very brilliant; the same sight presented itself the next night, but after that it did not again appear as bright, though carefully looked for, until November 27th. On this night the spectacle in the south-west was grand, and acknowledged by all as the finest even to the present time. The fire engines at Poughkeepsie, N. Y., and at New Haven, Conn., were summoned to "quench the burning skies." On the succeeding night the scene was nearly the same. Since November 23th the phenomenon has continued more or less brilliant, and with a few complete absences it has appeared down to the present (Feb. 3rd, 1884.)

A very remarkable fact is to be noted in connection with the display of November 26th and 27th, and that is, the sudden brightening over an immense region extending over half of Europe, over nearly the whole of the United States and British Columbia, though it had not been specially noted for about a month previous.

The author believes the phenomena to be due to vapour or ice particles at a great elevation, but we do not see that he deals with the fact that there are no records of the unusual prevalence of halos, parhelia, &c., which we have been taught to consider as connected therewith.

We do not see that the author states how the vapour got to, or remained at, such an exceptional altitude as the duration of the glows after sunset indicated.

Lieut. Hazen's remarks upon the Krakatoa dust theory we reprint verbatim.

A most singular hypothesis has been advanced to account for the material in the sky, namely, that the volcanic action at Krakatoa on August 26th and 27th ejected, into the atmosphere, immense masses of ashes which have been distributed by air currents over the earth's surface. Vivid accounts of the terrific nature of this convulsion, whereby a mountain island 2000 feet in height was perceptibly lowered, have been published by eye-witnesses. The position of the volcano was in lat.  $6^{\circ} 12' S.$ , long.  $105^{\circ} 28' E.$  By comparing this position with the dates and positions of the first appearance of the after-glows as already given, it would seem as though there had been a natural progression, but it has been shown that an instantaneous appearance will account for the phenomena as easily. The following are advanced as a few of the objections to this theory.

1st. There must have been sufficient material ejected to cover more than 135,000,000 square miles (the earth's surface  $45^{\circ}$  both sides of the equator). The attempt to add to this quantity by instancing isolated and slightly active volcanoes thousands of miles away can be regarded only as an endeavour to support a weak cause.

2nd. There must have been currents of nearly equal force acting in opposite directions at the same height in the atmosphere, an impossible condition. Meteorology has established that if anything there is a steady current in the upper regions from west to east.

3rd. The upper currents must have had sufficient velocity to carry the ashes a distance of 12,000 miles in 150 hours, or at a rate of 80 miles per hour toward the west. We know little of velocities of air-currents at great heights, but they are probably slight. The summer velocity on Mt. Washington, 6299 feet

above sea, is less than 30 miles per hour; while on Pike's Peak, 14,134 feet in height, it is only 20 miles per hour. The conditions certainly are very diverse at the two stations, and it is possible that the Mt. Washington velocities are 15 per cent. too high, but, allowing for these, there seems to be a possibility of a gradual diminution in wind velocity at increasing heights above the earth's surface.

4th. That the ashes must have been mechanically distributed first along a belt near the equator, and afterward, without addition, except possibly of a meagre character, the currents must have been sufficiently uniform over the whole earth, to have borne them north and south to above latitude 45°. This is well nigh incredible. It seems probable that in a few radial lines from Krakatoa, ashes could have been carried 1,500 or 2,000 miles, and some sporadic cases even greater distances. Professor Loomis, in his *Meteorology*, gives an instance in which volcanic ashes were carried 1,200 miles in a single direction, nearly parallel to the equator, but it is more than likely that these were carried in comparatively narrow streams, and that almost the entire mass of matter ejected from a volcano returns to the earth within a few hundred miles. A good illustration of the nature of a stream of volcanic ashes is given by Mr. Whympfer, in a recent number of "Nature." He gives a description of a cloud of ashes poured forth from the crater of a volcano, carried in a stream in one direction and afterward in another at right angles, but that there was no uniform distribution is plainly shown by the narrative.

5th. That the intermittent nature of the phenomenon precludes the idea of a dust envelope.

6th. That ashes are opaque, while the appearances indicate great transparency.

The author's final paragraph is one which few will dispute:—

While all explanations of the glows are more or less matters of conjecture, yet the field of conjecture is believed to be narrowing, and we may hope ultimately to reach a satisfactory conclusion.

### "THE WINTER OF 1883-84."

*To the Editor of the Meteorological Magazine.*

SIR,—Referring to Mr. Harvey's letter under the above heading, I have ventured to send you my figures to compare with his.

|                   |      |                      |          |
|-------------------|------|----------------------|----------|
| Mean temp. ....   | 41·7 | Frosty nights ....   | 17       |
| Absolute max. ... | 51·0 | Total rainfall ..... | 8·93 in. |
| „ min. ....       | 21·0 | Wet days ....        | 64       |

The above figures show that here it has been a very mild and very wet winter. The difference in the number of frosty nights is remarkable, as well as in the number of wet days, between Mr. Harvey's record and mine. The rainfall has been above the average of the previous eleven winters, being 8·93 in. against 8·74 in.; whilst the number of wet days (64) is the greatest in any year except 1877. I may also say that the winter of 1880-81 was at once the coldest and the driest I ever recorded.—Yours respectfully,

S. KING.

*Elswick Lodge, near Garstang, March 27th, 1884.*

## ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday evening, the 19th inst., at the Institution of Civil Engineers, Mr. R. H. Scott, F.R.S., President, in the chair. Messrs. W. Baily, M.A., W. L. Blore, A. L. Ford, H. Leupold, A. F. Lindemann, F.R.A.S., and Rev. E. B. Smith were elected Fellows of the Society.

The President read a paper entitled, "Brief Notes on the History of Thermometers." He stated that the subject had been handled in a comprehensive manner by Mons. Renou a few years ago, in the *Annuaire* of the French Meteorological Society, so that he should merely mention some of the leading points. The name of the actual inventor of the instrument is unknown. The earliest mention of it, as an instrument then 50 years old, was in a work by Dr. R. Fludd, published in 1638. Bacon also, who died in 1636, mentions it. The earliest thermometers were really sympiezometers, as the end of the tube was open and plunged into water, which rose or fell in the tube as the air in the bulb was expanded or contracted. Such instruments were of course affected by pressure as well as temperature, as Pascal soon discovered. However, simultaneously with such instruments, thermometers with closed tubes had been made at Florence, and some of these old instruments were shown at the loan collection of scientific apparatus at South Kensington in 1876. They are in the collection of the Florentine Academy, and in general principle of construction they are identical with modern thermometers. Passing on to the instrument as we now have it, Mr. Scott said that most of the improvements in construction in the earliest days of the instrument were due to Englishmen. Robert Hooke suggested the use of the freezing point; Halley the use of the boiling point, and the employment of mercury instead of spirit; and Newton was the first to mention blood heat. Fahrenheit was a German by birth, but was a protégé of James I., and died in England. Réaumur's thermometer in its final form owes its origin to De Luc; while the Centigrade thermometer, almost universally attributed to Celsius, was really invented by Linnæus. Celsius's instrument had its scale the reverse way, the boiling point being 0°, and the freezing point 100°. Mr. Scott then gave a brief account of some of the principal forms of self-registering and self-recording thermometers.

After the reading of this paper, the meeting was adjourned, in order to afford the Fellows and their friends an opportunity of inspecting the Exhibition of Thermometers and of Instruments recently invented. This Exhibition was a very interesting one, and embraced 136 exhibits. The thermometers were classified as follows:—(1) Standard, (2) Maximum, (3) Minimum, (4) Combined Maximum and Minimum, (5) Metallic, (6) Self-Recording, (7) Solar Radiation, (8), Sea, (9) Earth and Well, (10) Thermometers used for Special Purposes, (11) Thermometers with various forms of bulbs,

scales, &c., and (12) Miscellaneous Thermometers. In addition to these, there were also exhibited various patterns of thermometer screens, as well as several new meteorological instruments, together with drawings, photographs, &c.

## SPECTROSCOPIC WEATHER FORECASTING.

*To the Editor of the Meteorological Magazine.*

SIR,—I send you a summary of daily forecasts by Grace's rain-band spectroscope for the last three months.

I keep the record under seven different heads, and even in the most settled weather I find variations, so that on scarcely two consecutive days do I ever get exactly the same reading, although the total value of the observation may be the same.

I usually observe at 9 a.m., but on several occasions in January I have had to take a second observation at about 11, owing to insufficiency of light at 9 a.m.

I have, I think, been rather inclined to favour the spectroscope in the summarised results, and have never entered the forecast as (F.) false unless it was utterly and entirely wide of the mark.

On two of the wettest days the spectroscope gave no warning at all, viz., January 26th and 31st; on two other days February 19th and March 4th, it gave a very valuable warning in contradiction to the barometer. On one day, February 15th, it threatened a good deal of rain, but it proved one of the finest days of the month.—I am, Sir, yours truly,

JOHN T. HARDING.

*Pentwyn, near Monmouth, April 2, 1884.*

| 1884               | No. of Observations. | True.        | Approximately True. | False.      |
|--------------------|----------------------|--------------|---------------------|-------------|
| January . . . . .  | 31 . . . . .         | 19 . . . . . | 9 . . . . .         | 3 . . . . . |
| February . . . . . | 29 . . . . .         | 16 . . . . . | 5 . . . . .         | 8 . . . . . |
| March . . . . .    | 31 . . . . .         | 22 . . . . . | 7 . . . . .         | 2 . . . . . |

## RAINFALL AT UPPINGHAM.

By the kindness of the Rev. G. H. Mullins, M.A., F.R.Met.Soc., we have the pleasure of issuing with this number a summary of the rainfall at Uppingham for the past ten years. It is remarkable as being one of the few stations at which July is the month of greatest rainfall, but its excess above October is evidently due to the storms of July 1875 and 1880. This prevalence of a maximum in July seems characteristic of the very central position of Rutland, for on referring to the investigation of seasonal rainfall in the *British Association Report*, 1873, it will be found that almost identical values are given by the observations made at Lyndon in Rutland between 1740 and 1789, and they are almost the only records which give a maximum in that month.

WHITE FROST FOLLOWED BY GALES.

*To the Editor of the Meteorological Magazine.*

SIR,—I hope you will not be annoyed by my asking for an explanation of the following meteorological puzzle.

Hoar frost in autumn and spring is in this part of Ireland regarded as a sure precursor of rainy stormy weather, and I have frequently observed that the arrival of gales, *foretold by American telegraph*, is often preceded by hoar frost.

A typical instance occurred to-day, although no warning of a storm was given, and the forecast was for northerly breezes and fine weather.

Yesterday, Friday, was a dull close day with local showers. The max. temp. was 51°. The evening was gloomy, chilly, and the wind, very light, was northerly.

During the early part of the night the clouds dispersed, and as the temperature fell, thin mist rose from the S., while the surface air was moving from the N.

The minimum recorded 31°, 4 feet above ground. At sunrise the sky was almost cloudless, and a thick hoar frost lay on the grass. A very light southerly breeze was noted, and a bank of cirro-stratus was observed in the W., which gradually spread over the sky.

Between 11 and 12 a.m., a S.W. gale sprang up, and blew fitfully with slight showers till noon, when the wind backed to S.S.W. and S. From that hour until 4 p.m. the gale continued with heavy driving showers. About 5 p.m. the wind lulled, veered to W.S.W. and W., the clouds broke up, and by 5.15 p.m. the sun was shining brightly. At 6 p.m. a bank of dark nimbi hid the western horizon, and the wind was N.W.

I have minutely described this storm as it is a typical one, very like many of our autumn and spring gales.

What puzzles me is the frosty night that foretels these storms. Is there any scientific explanation of this calm, and accompanying fall of temperature, preceding a storm advancing across the Atlantic.

That a fall of temperature below 32° on a coast washed by a sea of from 50° to 55° should induce a storm is easily explained; but why does the temperature so often fall in anticipation of a storm? There may be a very simple explanation of this, but no one hereabouts can give it.—Yours truly,  
 JAMES WISE.

*Rostellan Castle, Co. Cork, March 10th, 1884.*

|                                |            |                        |               |
|--------------------------------|------------|------------------------|---------------|
| March 7th, 6 p.m. ....         | in. 29·805 | March 8th, 5 p.m. .... | in. 29·369    |
| „ 7th, 10 p.m. ....            | 29·855     | „ 8th, 6 p.m. ....     | 29·397        |
| „ 8th, 8 a.m. ....             | 29·793     | „ 8th, 7 p.m. ....     | 29·415        |
| „ 8th, 12 a.m. ....            | 29·651     | „ 8th, 9 p.m. ....     | 29·433        |
| „ 8th, 2 p.m. ....             | 29·558     | „ 8th, 10 p.m. ....    | 29·443        |
| „ 8th, 4 p.m. ....             | 29·456     |                        |               |
| March 7th ..... Max. 51° ..... |            | Min. 45° .....         | Rainfall 0·04 |
| „ 8th ..... „ 46° .....        |            | „ 31° .....            | „ 0·23        |
| „ 9th ..... „ 46° .....        |            | „ 34° .....            | „             |

[Considering that a satisfactory reply to this question would be of

public utility, we forwarded the letter to the Hon. Ralph Abercromby, and have been favoured with the following clear and interesting reply.—ED.]

*To the Editor of the Meteorological Magazine.*

SIR,—The calm, frosty night which often precedes a gale, to which your correspondent, Mr. Wise, alludes, is well known and forms the subject of several popular prognostics.

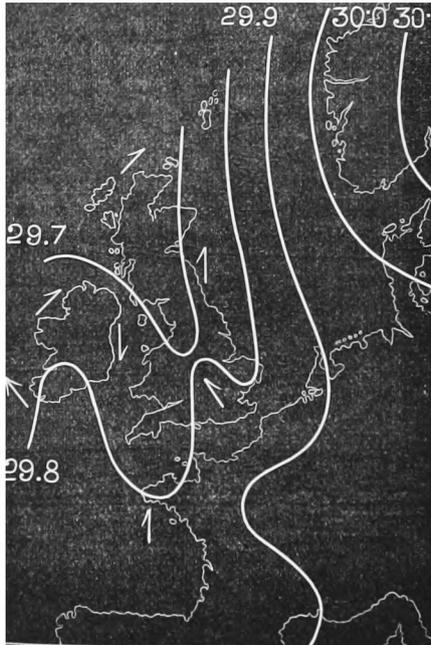
The explanation is very simple, though it is only within the last few years that it has been possible to give the true solution.

The greater portion of all our wind and rain comes from the action of cyclones, and one large class of these is always preceded by a curious wedge-shaped patch of high pressure, just as some big waves are preceded by a small ripple.

In this wedge of high pressure the air is calm, and the sky always clear. This is the primary condition ; the cold is secondary. During the greater part of the year, a calm air and clear sky give full play to the radiation of the season, and white frost is deposited during the night. As the day goes on the cyclone, of which the wedge is as it were the satellite, comes on with wind and rain.

We may, therefore, give the answer to your query thus—a frosty night sometimes precedes wind and rain, because many cyclones develop an area of calm and clear sky in front of, and as a portion of, themselves.

But perhaps all this will be more intelligible to those who are unfamiliar with the modern methods of handling questions about weather, if we give an illustration of the isobars on the day to which



your correspondent refers. In the figure I therefore give the isobars and a few wind arrows, at 8 a.m. on Saturday, March 8th, 1884. We will confine our attention to the isobar of 29·8 inches only. In that line we see a loop of lower pressure over Cornwall; this is a secondary cyclone. In front of this there is a small wedge of higher pressure nearly over Oxford. Over the south of Ireland there is another larger wedge, and if we could have seen further out into the Atlantic, we should have found another small cyclone to the west of Valentia.

The frost which Mr. Wise observed was due to the action of this second wedge, and the gale which followed later on in the day was caused by the cyclone coming in from the Atlantic. In the course of the day some complications occurred, which gave rise to the apparently irregular backing of the wind. These, however, though all explicable, would take too much space if I were to endeavour to detail them.

A full account of the weather in wedges of high pressure, and of the prognostics which are associated with them, will be found in the Quarterly Journal of the Royal Meteorological Society, vol. ix., p. 27, "Abercromby and Marriott on Popular Weather Prognostics."

Yours sincerely,

RALPH ABERCROMBY.

21, Chapel Street, Belgrave Square, London, S. W.

March 12th, 1884.

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### COLONEL WARD'S LETTER ON THE SUNSETS.

WE have been requested by Col. Ward to make it known that the letter published upon page 22 of this volume was a private letter, and was not intended for publication.

Considering that the letter in question was the only one received from Col. Ward, and that in the first paragraph of it he said, "I hasten to reply to your note appended to my letter," *i.e.*, to the note on page 10 of this volume, we at once accepted it as his formal reply; but we have complied with his latest wish.

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### THE AMERICAN METEOROLOGICAL JOURNAL.

WE hear with extreme pleasure that we may soon expect to receive the first number of the above periodical. It will be edited by Prof. M. W. Harrington of the Detroit Observatory, and he will be assisted by some of the most able meteorologists in the States. The effort has our warmest approval, and we venture to suggest that European meteorologists might with advantage put "The American Meteorological Journal, Detroit Observatory, Ann Arbor, Michigan," on their list of exchanges.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPT., 1883.

| STATIONS.<br><br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |        | Average. |      |            |           | Absolute.    |                | Total Rain. |                | Aver.<br>Cloud. |     |
|--|-----------|-------|----------|--------|----------|------|------------|-----------|--------------|----------------|-------------|----------------|-----------------|-----|
|  | Maximum.  |       | Minimum. |        | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.      | Days.          |                 |     |
|  | Temp.     | Date. | Temp.    | Date.  |          |      |            |           |              |                |             |                |                 |     |
| England, London .....  | 75·3      | 18    | 41·4     | 23     | 66·7     | 50·2 | 53·0       | 0.100     | 84           | 120·7          | 35·4        | inches<br>3·83 | 18              | 6·0 |
| Malta .....  | 93·0      | 3     | 62·9     | 29     | 80·5     | 67·1 | 63·8       | 71        | 143·9        | ...            | ...         | ·38            | 5               | 2·3 |
| <i>Cape of Good Hope</i> ...   | ...       | ...   | ...      | ...    | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...            | ...             | ... |
| <i>Mauritius</i> .....   | 76·6      | 18    | 58·5     | 9      | 74·9     | 64·7 | 59·7       | 71        | ...          | ...            | ...         | 1·07           | 13              | 5·9 |
| Calcutta .....   | 90·7      | 24    | 75·2     | 30     | 87·8     | 78·4 | 78·2       | 87        | 159·3        | 70·3           | ...         | 6·96           | 20              | 8·2 |
| Bombay .....   | 84·9      | 19    | 73·5     | 23     | 83·0     | 75·2 | 74·9       | 87        | 147·2        | 68·9           | ...         | 12·37          | 24              | 8·7 |
| Ceylon, Colombo .....  | 87·7      | 14    | 74·8     | 20     | 85·9     | 77·9 | 72·4       | 73        | 146·0        | 69·0           | ...         | 3·30           | 7               | 8·2 |
| <i>Melbourne</i> .....   | 76·2      | 11    | 36·4     | 29     | 61·9     | 44·8 | 42·9       | 71        | 129·4        | 26·4           | ...         | 1·64           | 12              | 5·9 |
| <i>Adelaide</i> .....  | 76·3      | 30    | 40·9     | 5      | 62·6     | 46·3 | 43·7½      | 67        | 139·8        | 31·5           | ...         | 1·86           | 20              | 4·6 |
| <i>Wellington</i> .....  | 60·0      | 5     | 34·3     | 19     | 54·2     | 43·9 | ...        | ...       | 125·0        | 32·0           | ...         | 3·72           | 20              | ... |
| <i>Auckland</i> .....  | 65·0      | 4     | 41·0     | 11, 13 | 60·7     | 47·3 | 44·1       | 69        | 137·0        | 33·5           | ...         | 1·84           | 15              | 5·9 |
| <i>Falkland Isles</i> .....  | 51·0      | 10    | 26·9     | 13     | 44·1     | 35·7 | 35·4       | 86        | 113·0        | 25·8           | ...         | 1·43           | 20              | 7·1 |
| Jamaica .....  | 90·3      | 6     | 71·7     | 16     | 88·0     | 74·0 | 74·5       | 84        | ...          | 66·5           | ...         | 3·63           | ...             | 7·7 |
| Barbados .....   | 84·0      | 5, 9* | 70·0     | 29     | 82·0     | 73·0 | 74·5       | 84        | 152·0        | 63·0           | ...         | 7·04           | 20              | 6·0 |
| Toronto .....  | 75·1      | 1     | 33·4     | 4      | 63·5     | 45·6 | 48·5       | 76        | 133·5        | 27·0           | ...         | 2·38           | 14              | 5·3 |
| New Brunswick,<br>Fredericton .....                                  | 80·7      | 13    | 29·0     | 29     | 68·4     | 42·3 | 45·6       | 73        | ...          | ...            | ...         | 1·71           | 8               | 4·5 |
| Manitoba, Winnipeg ...   | 82·1      | 12    | 19·0     | 30     | 63·6     | 39·2 | 41·7       | 75        | ...          | ...            | ...         | 1·25           | 6               | 5·2 |
| British Columbia, Yale   | ...       | ...   | ...      | ...    | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...            | ...             | ... |

\* And 29

REMARKS, SEPTEMBER, 1883.

MALTA. — Mean temp. 73°·9, mean pressure 29·998 in. ; average velocity of wind, 10·2 miles ; temp. of sea ranged from 79°·5 to 74°·0 ; severe TS on 13th. — J. SCOLES.

*Mauritius*. — Rainfall ·55 in. below, and mean temp. 0°·1 above the average ; mean pressure 30·194 in. ; mean hourly velocity of wind 12·3 miles, extremes 27·6 miles and 1·6 miles, prevailing direction E.S.E. The clouds and sky at sunrise and sunset were coloured more frequently and to a greater extent than usual ; probably partly due to the presence in the air of volcanic dust from Sunda. C. MELDRUM, F.R.S.

COLOMBO. — No TSS occurred during the month ; and from the 8th until about the 15th the rising and the setting of the sun was of an unusual green colour. J. STODDART.

*Melbourne*. — Mean temp. of air and of dewpoint each 0°·7 below the average ; mean pressure humidity and amount of cloud all about the average ; rainfall ·72 in. below it ; prevailing direction of wind S.W. and S. ; strong breezes on 5 days ; heavy squalls on 3rd, 4th and 5th ; heavy dew on 9 days ; thick fog on 16th ; hoar frost on 29th ; sheet L on 18th ; T and L on 22nd. R. L. J. ELLERY, F.R.S.

*Adelaide*. — This month was the coldest September (with one exception) during 26 years, the mean temp., 54°·4, being nearly 3° below the average, while the max. was only 76·3 ; the amount of cloud was rather less, and the rainfall slightly in excess of the average. C. TODD.

*Wellington*. — On the whole a showery month, though with some fine bright days ; prevailing winds S.E., at times squally ; cold towards the end of the month, with H on 17th and 30th, and S on hills on the latter day, slight earthquake on 27th ; mean pressure ·057 in. above, and mean temp. 2°·2 below the average. R. B. GORE.

*Auckland*. — Weather generally fine, with unusually small rainfall, not half the average ; mean pressure and temp. above the average. T. F. CHEESEMAN.

BARBADOS. — Mean temp. 76°·7, slightly above the average ; mean hourly velocity of wind 7·5 miles, extremes 12·9 miles and 3·2 miles ; rainfall 19 per cent. below the average ; 10 days were overcast and clouded ; TS on 16th ; the sun appeared various colours on the evening of the 15th, and morning of 16th. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL,  
MARCH, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | 2·29        | XI.    | Carno, Tybrith ... ..    | 3·39        |
| „     | Margate, Birchington...   | 1·08        | „      | Corwen, Rhug .....       | 2·95        |
| „     | Littlehampton .. .....    | 1·84        | „      | Port Madoc .....         | 3·64        |
| „     | Hailsham .....            | 2·31        | „      | I. of Man, Douglas ..... | 3·21        |
| „     | I. of W., St. Lawrence.   | 1·84        | XII.   | Stoneykirk, Ardwell Ho.  | 3·02        |
| „     | Alton, Ashdell.....       | 2·55        | „      | Melrose, Abbey Gate ..   | 2·46        |
| III.  | Winslow, Addington ...    | 1·42        | XIII.  | N. Esk Res. [Penicuick]  | 2·40        |
| „     | Oxford, Magdalen Col...   | 1·41        | XIV.   | Ayr, Cassillis House ..  | 2·23        |
| „     | Northampton .....         | 1·27        | „      | Glasgow, Queen's Park.   | 2·29        |
| „     | Cambridge, Beech Ho...    | ·69         | XV.    | Islay, Gruinart School.. | 4·26        |
| IV.   | Southend .....            | 1·07        | XVI.   | St. Andrews, Newton Bk   | 2·87        |
| „     | Harlow, Sheering ...      | 1·46        | „      | Balquhidder, Stronvar..  | 7·94        |
| „     | Diss .....                | 1·25        | „      | Dunkeld, Inver Braan..   | 4·90        |
| „     | Swaffham .....            | 1·35        | „      | Dalnaspidal H.R.S. ...   | 4·14        |
| „     | Hindringham .....         | ...         | XVII.  | Keith H.R.S. ....        | 2·50        |
| V.    | Salisbury, Alderbury...   | 2·49        | „      | Forres H.R.S. ....       | 1·05        |
| „     | Warminster .....          | 3·09        | XVIII. | Strome Ferry H.R.S....   | 4·98        |
| „     | Calne, Compton Bassett    | 2·27        | „      | Lochbroom .....          | 3·61        |
| „     | Ashburton, Holne Vic..    | 7·76        | „      | Tain, Springfield .....  | 1·35        |
| „     | Holsworthy, Clawton...    | 3·27        | „      | Loch Shiel, Glenaladale  | 8·64        |
| „     | Lynmouth, Glenthorne.     | 3·80        | „      | Invergarry .....         | 4·58        |
| „     | Probus, Lamellyn .....    | 3·81        | XIX.   | Lairg H.R.S. ....        | 1·64        |
| „     | Wincanton, Stowell Rec.   | 2·97        | „      | Forsinard H.R.S. ....    | 2·67        |
| „     | Taunton, Fullands .....   | 1·76        | „      | Watten H.R.S. ....       | 2·52        |
| VI.   | Bristol, Clifton .....    | 2·69        | XX.    | Dunmanway, Coolkelure    | 9·57        |
| „     | Ross .....                | 2·62        | „      | Fermoy, Gas Works ...    | 3·65        |
| „     | Wem, Sansaw Hall.....     | 1·84        | „      | Tralee, Castlemorris ... | 5·16        |
| „     | Cheadle, The Heath Ho.    | 2·24        | „      | Tipperary, Henry Street  | 3·23        |
| „     | Worcester, Diglis Lock    | 2·49        | „      | Newcastle West .....     | 2·42        |
| „     | Coventry, Coundon .....   | 2·31        | „      | Miltown Malbay.....      | 4·33        |
| VII.  | Melton, Coston .....      | 1·36        | „      | Corofin .....            | 4·48        |
| „     | Ketton Hall [Stamford]    | 1·01        | XXI.   | Carlow, Browne's Hill..  | 2·88        |
| „     | Horncastle, Bucknall ...  | 1·37        | „      | Navan, Balrath .....     | 1·87        |
| „     | Mansfield, St. John's St. | 2·49        | „      | Mullingar, Belvedere ... | 2·69        |
| VIII. | Macclesfield, The Park.   | 2·58        | „      | Athlone, Twyford .....   | 5·02        |
| „     | Walton-on-the-Hill.....   | 2·65        | XXII.  | Galway, Queen's Col...   | 3·52        |
| „     | Lancaster, South Road.    | 3·34        | „      | Clifden, Kylemore .....  | ...         |
| „     | Broughton-in-Furness ..   | 5·31        | „      | Crossmolina, Enniscoe..  | 5·89        |
| IX.   | Wakefield, Stanley Vic.   | 1·20        | „      | Carrick-on-Shannon ...   | 5·06        |
| „     | Ripon, Mickley .....      | 2·61        | XXIII. | Dowra .....              | ..          |
| „     | Scarborough.....          | 2·16        | „      | Rockcorry.....           | 1·77        |
| „     | East Layton [Darlington]  | 3·16        | „      | Warrenpoint .....        | 4·17        |
| „     | Middleton, Mickleton..    | 1·83        | „      | Newtownards .....        | 2·12        |
| X.    | Haltwhistle, Unthank..    | 2·06        | „      | Belfast, New Barnsley .. | 3·87        |
| „     | Shap, Copy Hill .....     | 5·31        | „      | Cushendun .....          | 4·22        |
| XI.   | Llanfrechfa Grange ....   | 3·73        | „      | Bushmills .....          | 3·01        |
| „     | Llandovery .....          | 3·83        | „      | Stewartstown .....       | 3·47        |
| „     | Solva .....               | ...         | „      | Donegal, Revelin Ho....  | ...         |
| „     | Castle Malgwyn .....      | 5·76        | „      | Buncrana .....           | 2·44        |
| „     | Rhayader, Nantgwilt..     | 5·51        | „      | Carndonagh .. .....      | 3·83        |

MARCH, 1884.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL.   |                                |                            |       |                                 | TEMPERATURE. |      |      |       | No. of Nights below 32° |
|----------|---|-------------|--------------------------------|----------------------------|-------|---------------------------------|--------------|------|------|-------|-------------------------|
|          |   | Total Fall. | Difference from average 1870-9 | Greatest Fall in 24 hours. |       | Days on which .01 or more fell. | Max.         |      | Min. |       |                         |
|          |   |             |                                | Dpth                       | Date. |                                 | Deg.         | Date | Deg. | Date. |                         |
| I.       | London (Camden Square) ...  | 1.40        | — .21                          | .56                        | 10    | 7                               | 68.0         | 16   | 27.5 | 1     | 4 10                    |
| II.      | Maidstone (Hunton Court)...   | 1.41        | — .17                          | .63                        | 10    | 11                              | ...          | ...  | ...  | ...   | ...                     |
| III.     | Strathfield Turgiss .....   | 1.58        | + .18                          | .59                        | 3     | 9                               | 67.4         | 16   | 25.3 | 3     | 9 12                    |
| IV.      | Hitchin .....   | 1.18        | — .30                          | .45                        | 3     | 7                               | 63.0         | 17   | 26.0 | 2     | 11 ...                  |
| V.       | Banbury .....   | 1.76        | + .16                          | .63                        | 3     | 10                              | 64.0         | 16a  | 26.0 | 3     | 11 ...                  |
| VI.      | Bury St. Edmunds (Culford) ..   | .95         | — .61                          | .33                        | 10    | 10                              | 66.0         | 17   | 25.0 | 27    | 10 ...                  |
| VII.     | Norwich (Cossey) .....  | 1.31        | — .38                          | .35                        | 10    | 13                              | 69.0         | 16   | 25.5 | 1, 28 | 9 11                    |
| VIII.    | Weymouth (Langton Herring) ..   | 2.69        | ...                            | 1.35                       | 3     | 12                              | ...          | ...  | ...  | ...   | ...                     |
| IX.      | Barnstaple .....  | 3.65        | + 1.16                         | .74                        | 3     | 18                              | 65.5         | 16   | 33.0 | 24    | 0 ...                   |
| X.       | Bodmin .....  | 5.07        | + 1.91                         | 1.29                       | 3     | 16                              | 58.0         | 15b  | 32.0 | 11    | 1 8                     |
| XI.      | Cirencester .....   | 2.46        | + .39                          | .91                        | 3     | 17                              | ...          | ...  | ...  | ...   | ...                     |
| XII.     | Church Stretton (Woolstaston) ..  | 3.15        | + .99                          | .75                        | 4     | 19                              | 64.0         | 16   | 30.0 | 26    | 9 13                    |
| XIII.    | Tenbury (Orleton) .....   | 2.86        | + .99                          | .69                        | 3     | 15                              | 66.7         | 16   | 26.0 | 3     | 11 13                   |
| XIV.     | Leicester .....   | 1.62        | ...                            | .50                        | 3     | 11                              | 69.3         | 16   | 28.8 | 24    | 4 22                    |
| XV.      | Boston .....  | 1.10        | — .19                          | .43                        | 2     | 11                              | 68.0         | 16   | 30.0 | 1     | 4 ...                   |
| XVI.     | Grimsby (Killingholme) .....  | 1.39        | — .27                          | .28                        | 4     | 14                              | 63.5         | 17   | 31.0 | 1, 3  | 2 ...                   |
| XVII.    | Hesley Hall (Tickhill) .....  | 1.46        | — .42                          | .3                         | 9     | 9                               | 69.0         | 16   | 24.0 | 1     | 10 ...                  |
| XVIII.   | Manchester (Ardwick) .....  | 2.22        | — .23                          | .61                        | 4     | 12                              | 64.0         | 16a  | 30.0 | 2     | 3 ...                   |
| XIX.     | Wetherby (Ribston Hall) ..  | 1.93        | — .20                          | .74                        | 5     | 7                               | ...          | ...  | ...  | ...   | ...                     |
| XX.      | Skipton (Arncliffe) .....   | 4.07        | + .69                          | 1.02                       | 4     | 17                              | 66.0         | 17   | 29.0 | 1, 21 | ...                     |
| XXI.     | North Shields .....   | 2.34        | + .89                          | .89                        | 4     | 12                              | 63.5         | 17   | 27.8 | 3     | 7 9                     |
| XXII.    | Borrowdale (Seathwaite) .....   | 13.98       | + 4.09                         | 3.27                       | 14    | 20                              | 66.0         | 16   | 28.6 | 11    | 5 ...                   |
| XXIII.   | Cardiff (Ely) .....   | 3.87        | + 1.18                         | 1.41                       | 3     | 17                              | ...          | ...  | ...  | ...   | ...                     |
| XXIV.    | Haverfordwest .....   | 5.08        | + 1.89                         | .91                        | 2     | 18                              | 59.5         | 16   | 27.5 | 23    | 5 10                    |
| XXV.     | Plinlimmon (Cwmsymlog) ..   | 3.31        | — .60                          | 10                         | 13    | ...                             | ...          | ...  | ...  | ...   | ...                     |
| XXVI.    | Llandudno .....   | 2.12        | + .24                          | .71                        | 4     | 12                              | 67.5         | 16   | 30.0 | 11    | ...                     |
| XXVII.   | Cargen [Dumfries] .....   | 4.19        | + 1.41                         | .84                        | 14    | 18                              | 63.4         | 16   | 27.4 | 11    | 5 ...                   |
| XXVIII.  | Hawick .....  | ...         | ...                            | ...                        | ...   | ...                             | ...          | ...  | ...  | ...   | ...                     |
| XXIX.    | Douglas Castle (Newmains) ..  | 3.18        | + .04                          | .59                        | 9     | 17                              | ...          | ...  | ...  | ...   | ...                     |
| XXX.     | Lochgilthead (Kilmory) .....  | 4.97        | + .36                          | .83                        | 19    | 24                              | 54.0         | 17   | 27.0 | 9, 10 | 12 ...                  |
| XXXI.    | Oban (Craigvarren) .....  | 4.36        | ...                            | .59                        | 6     | 21                              | 62.0         | 16a  | 30.5 | 1     | 1 ...                   |
| XXXII.   | Mull (Quinish) .....  | 5.98        | ...                            | 1.01                       | 6     | 23                              | ...          | ...  | ...  | ...   | ...                     |
| XXXIII.  | Loch Leven Sluices .....  | 2.60        | + .48                          | .50                        | 10    | 11                              | ...          | ...  | ...  | ...   | ...                     |
| XXXIV.   | Arbroath .....  | 2.88        | + 1.25                         | .55                        | 9     | 15                              | 53.0         | 17   | 30.0 | 11    | 5 ...                   |
| XXXV.    | Braemar .....   | 5.88        | + 3.69                         | 1.16                       | 10    | 18                              | 59.4         | 16   | 24.0 | 10    | 14 27                   |
| XXXVI.   | Aberdeen .....  | 3.40        | ...                            | .74                        | 8     | 21                              | 57.0         | 17   | 31.0 | 10c   | 4 ...                   |
| XXXVII.  | Skye (Sligachan) .....  | ...         | ...                            | ...                        | ...   | ...                             | ...          | ...  | ...  | ...   | ...                     |
| XXXVIII. | Culloden .....  | 1.36        | — .39                          | ...                        | ...   | ...                             | 63.0         | 16   | 30.5 | 3, 27 | 8 22                    |
| XXXIX.   | Dunrobin .....  | 1.80        | ...                            | .43                        | 9     | 12                              | 58.5         | 16   | 29.0 | 10    | 8 ...                   |
| XL.      | Orkney (Sandwick) .....   | 3.63        | + .99                          | .53                        | 8     | 15                              | 55.8         | 17   | 29.2 | 11    | 1 9                     |
| XLI.     | Cork (Blackrock) .....  | 5.13        | + 2.37                         | .59                        | 10    | 20                              | 61.0         | 23   | 29.0 | 7d    | 4 ...                   |
| XLII.    | Dromore Castle .....  | 7.10        | ...                            | 1.70                       | 6     | 22                              | 60.0         | 14   | 32.0 | 29    | ...                     |
| XLIII.   | Waterford (Brook Lodge) ..  | ...         | ...                            | ...                        | ...   | ...                             | ...          | ...  | ...  | ...   | ...                     |
| XLIV.    | Killaloe .....  | 4.34        | ...                            | .87                        | 6     | 21                              | 59.0         | 16   | 23.0 | 10    | 6 ...                   |
| XLV.     | Portllington .....  | 1.20        | — .96                          | .32                        | 2     | 23                              | 59.5         | 16   | 29.5 | 10    | 5 ...                   |
| XLVI.    | Dublin (Fitz William Square) ..   | 1.86        | + .13                          | .47                        | 9     | 17                              | 61.1         | 16   | 31.2 | 11    | 1 6                     |
| XLVII.   | Ballinasloe .....   | 3.35        | + .97                          | .53                        | 6     | 22                              | 55.0         | 17   | 27.0 | 30    | 7 ...                   |
| XLVIII.  | Waringstown .....   | 2.53        | + .47                          | .42                        | 30    | 17                              | 63.0         | 16   | 25.0 | 10    | 5 10                    |
| XLIX.    | Londonderry (Creggan Res.) ..   | 2.48        | ...                            | .34                        | 30    | 21                              | ...          | ...  | ...  | ...   | ...                     |
| L.       | Omagh (Edenfel) .....   | 2.79        | + .70                          | .41                        | 2     | 24                              | 61.0         | 16   | 28.0 | 10    | 5 ...                   |

+ Shows that the fall was above the average ; — that it was below it.  
*a* And 17. *b* And 16, 22. *c* And 21. *d* And 8, 9, 10.

## METEOROLOGICAL NOTES ON MARCH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—A very favourable month for tillage operations; salutary cold winds dried the clay fallows, and if the weather was less genial it was decidedly more seasonable; lambing season very favourable. Black-thorn in flower on 3rd, horse chestnut in leaf on 22nd, peacock butterfly seen on 5th, tadpoles on 15th.

BANBURY.—Mean temp.  $42^{\circ}\cdot7$ , a little above the average; high wind on 21st and 31st; fog on 12th and 25th; lunar rainbow at 8.20 p.m. on 12th.

CULFORD.—A remarkably dry and fine month; R much wanted, pheasants commenced laying, and fruit trees looked very promising at the close of the month.

LANGTON HERRING.—From 10th to 30th the weather was very fine: farmers could not have had a more favourable season for ploughing, spring sowing, &c.; mean temp. above the average; solar halos were seen on 5 days; fog on 18th and 19th.

BODMIN.—A singularly mild March; we have literally had no winter. A heavy but brief gale with torrents of R occurred on the 31st, lasting from 6 p.m. to midnight.

WOOLSTASTON.—The first and last weeks of the month were very cold with easterly winds; the middle of the month was warm and genial; mean temp.  $41^{\circ}\cdot9$ ; S fell on 2nd; a strong gale occurred on the night of the 31st.

ORLETON.—The temp. was low till the 12th, with frost almost every night; S fell on 1st and 3rd, and heavy R on 3rd and 4th; it then became warmer, and continued so till the 24th with fine days and much sunshine; the remainder of the month was cloudy, cold, and sunless, with N.E. wind. The mean temp. of the month was  $1^{\circ}\cdot3$  above the average of 23 years; apricots and peaches blossomed about the 19th, and damson trees about the 23rd.

LEICESTER.—A dry month, at times warm for the season; R was needed at the close both for the fields and gardens, but in both the prospect was promising.

KILLINGHOLME.—The month opened with cold weather, but there were some very fine days in the middle; the latter part was cool and dry, and R was wanted at the close.

ARDWICK.—March was on the whole a fine open month, E. wind prevailed for some time, but was not so cold as on other occasions; vegetation is very forward, and we shall this year have a green Easter.

## WALES.

HAVERFORDWEST.—The month as a whole was unusually wet; it commenced cold, stormy and very wet, and some of the heaviest floods of the winter occurred during the first three days. A cold, easterly blast prevailed from the 28th to the end of the month, drying up all the moisture in an almost miraculous manner, and the sudden fall of temp. which accompanied it caused much sickness.

LLANDUDNO.—The weather generally was fine and seasonable; up to the 10th it rained more or less on every day but two; from the 10th till within two days of the close of the month the weather was generally dry and most favourable for agricultural operations; mean temp. nearly  $1^{\circ}\cdot5$  above the average; mean daily range slightly below, and total range considerably above the average.

## SCOTLAND.

CARGEN.—A very dull month, only 68 hours of sunshine, the average being 135 hours; it was very wet up to the 20th, and farming operations were much

impeded in consequence ; mean temp.  $1^{\circ}\cdot 1$  above the average ; S on 3rd ; gale on 20th.

OBAN.—The month on the whole was very fair ; the temp. increased rapidly from 5th to 17th, and on the latter day occurred the highest reading known in March for many years ; thereafter easterly winds set in, and normal weather prevailed to the close of the month. S on 4 days ; H on 3 days ; heavy gale with T and H on 19th.

ABERDEEN.—Rainfall greatly above the average for the month ; strong gales occurred from various directions with heavy showers, giving an unsettled character to the weather till the 23rd, after which date dry weather prevailed for about a week ; but strong S.E. winds, again accompanied by heavy R, blew on 30th and 31st ; aurora on 28th ; and L on 18th.

SANDWICK.—The temp. of the month was mild, but there were gales of 50 miles an hour on the 8th, 9th, 19th and 20th, and one of 60 miles an hour on 10th. The ground was white with S on 10th, and snow rollers were formed on 12th.

#### IRELAND.

BLACKROCK.—During the month there were few days without R, and the winds were very variable.

KILLALOE.—R fell on very many days for March, with very cold S.E. winds, and not a particle of March dust was visible ; agriculture, therefore, was tedious and late ; S on 9th, 10th, and 11th.

DUBLIN, FITZWILLIAM SQUARE.—The weather was generally favourable, and an exceptionally dry period lasted from the 13th to 31st, the rainfall not amounting to one-tenth of an inch. Unusual warmth for the time of the year prevailed between the 14th and 19th ; the mean temp. of the month,  $44^{\circ}\cdot 9$ , was about  $2^{\circ}$  above the average of twenty years ; sleet or S occurred on 10th and 31st, H on 20th and 31st, fog on 4th and 24th ; the wind blew freshly or strongly on 12 days.

BALLINASLOE.—The month was wet and rough, but not so cold as usual, and there was little E. wind ; a heavy fall of S occurred between 11 p.m. on 30th, and 6 a.m. on 31st.

EDENFEL.—Another very mild month, but 24 days with R, and no drying winds, resulted in a most backward seed-time ; the mean temp. on the 16th,  $55^{\circ}$ , is higher than that of any other day in March for more than 20 years.

#### ERRATA IN METEOROLOGICAL MAGAZINE, 1883.

We are glad to be able to state that up to the present time the following are all the errata detected by comparing the annual summaries for 1883 with the records as published monthly. There are twelve errors, and as there are about 3,000 entries in the tables, this gives about one wrong entry to 249 right ones. This, though better than last year, is still below the accuracy which is reached in the annual volume of *British Rainfall*.

#### REGULAR TABLE.

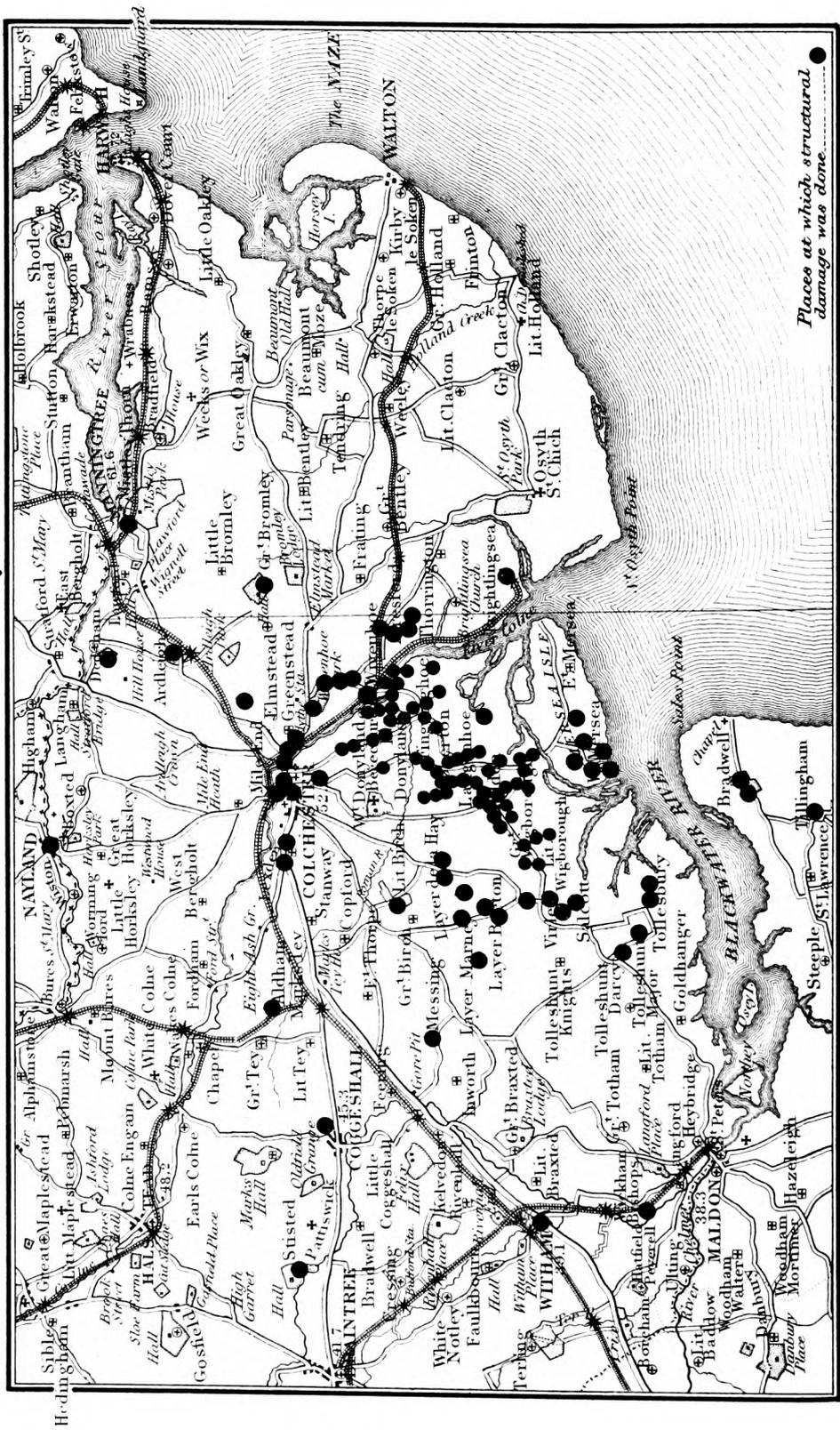
|                                 |      |                                |      |
|---------------------------------|------|--------------------------------|------|
| Bodmin, July, should be .. .. . | 5·01 | Haverfordwest, Aug., should be | 2·36 |
| Haverfordwest, max. fall, April | ·85  | Newmains, December .....       | 5·25 |

#### SUPPLEMENTARY TABLE.

|                                  |      |                                 |      |
|----------------------------------|------|---------------------------------|------|
| Beaminster, July, should be..... | 3·57 | Mickleton, Jan., should be..... | 8·93 |
| Coundon, August .....            | 1·06 | „ April .....                   | 2·19 |
| „ September .....                | 5·51 | Mullingar, Belvedere, Feb.....  | 3·83 |
| Macclesfield, August .....       | 2·78 | „ „ Sept. ....                  | 4·39 |



# SITES OF STRUCTURAL DAMAGE BY EARTHQUAKE OF APRIL 22<sup>ND</sup> 1884.

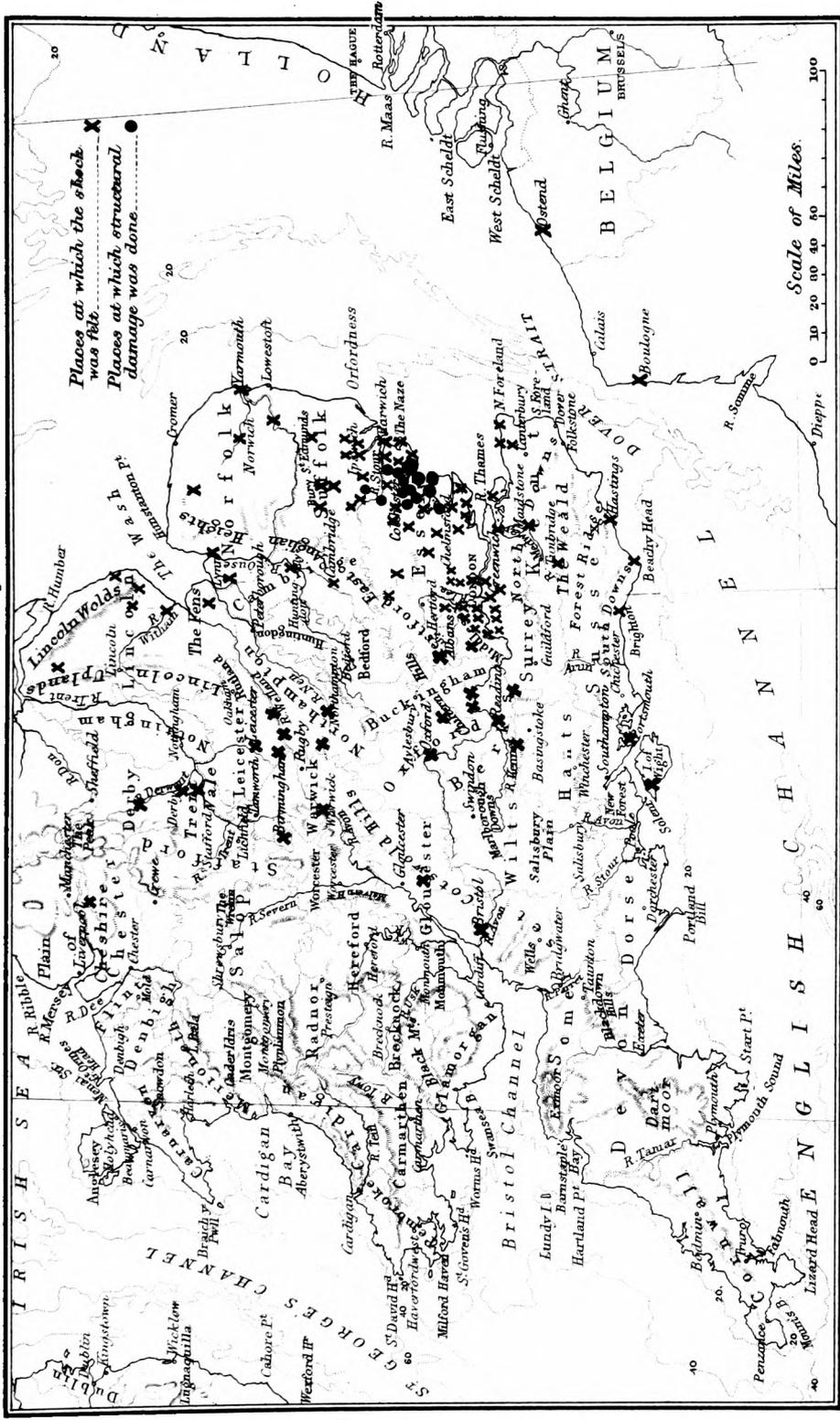


Places at which structural damage was done

Scale of Miles 0 5 10

Stanford's Geog. Estab. London

GENERAL MAP OF AREA OVER WHICH THE EARTHQUAKE OF APRIL 22<sup>ND</sup> 1884 WAS FELT.



Stanford's Geog. Essays, London.



SYMONS'S  
MONTHLY  
METEOROLOGICAL MAGAZINE.

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CCXX.]

MAY, 1884.

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THE GREAT ENGLISH EARTHQUAKE.

WE are not in the habit of employing strong adjectives, they would be out of place in these pages ; as however, during the nineteen years that the *Meteorological Magazine* has been in existence we have had to report the occurrence of several English Earthquakes, and never one which could be compared with that of April 22nd, 1884, we have called it "great," as the only appropriate distinction.

It may be well to give a list of these little shocks for the convenience of reference.

1866. Sept. 13th.—East Budleigh, Sidmouth, Devon. Windows rattled. Vol. I., p. 82.
1867. Feb. 23rd.—Ambleside, Westmoreland. Houses, windows and crockery shaken for several miles round. Vol. II., p. 21.
1868. Jan. 4th.—Wellington, Somerset. Houses and beds shaken in several parts of Somerset. Vol. III., p. 12.
1868. Oct. 30th.—Monmouthshire. Three chairs were reported to be overturned in a house near Monmouth, but there is no record of actual structural damage. This shock was felt in London, the Isle of Wight, and generally in the W. of England from Cornwall to Leicester. A map of the area over which it was felt is given. Vol. III., pp. 153 and 201.
1869. March 15th.—South Lancashire and Yorkshire. This produced two instances of structural damage, a wall was cracked and one chimney was thrown down. Vol. IV., p. 37.
1871. March 17th.—North Lancashire. Felt generally from the centre of England to the South of Scotland, but no structural damage reported. Vol. VI., pp. 32 and 37.
1873. April 29th.—Doncaster. A vibration felt almost exclusively in the town of Doncaster. Possibly an earthquake, possibly not. Vol. VIII., p. 79.
1875. Sept. 23rd.—North West Yorkshire. Slight local tremor, no damage. Vol. X., pp. 143 and 154.

1878. Jan. 28th.—South East England and France. This was felt at many places between London and the Pyrenees; it was recorded on the magnetographs at Kew Observatory, and in Dorset and Jersey it caused bells to ring, but no structural damage is reported. Vol. XIII., pp. 2 and 26.
1883. June 25th. Devon and Cornwall. Very slight shock, and no structural damage. Vol. XVIII., p. 89.

From the above list it will be seen that during nearly twenty years the entire damage reported was one wall cracked and one chimney overthrown. It is not easy to imagine a greater contrast than that statement, and the present condition of the little town of Wivenhoe.

It is difficult to decide upon the mode of adequately reporting the facts respecting the recent shock within the space which we can here devote to it.

We should like to give a list of all known British Earthquakes in which actual structural damage was done, but the compilation of such a list will take both time and space, and must therefore be deferred. It may, however, be well at once to place upon record along with the shock of 1884 that of September 8th, 1692, of which we have records from Coggeshall, from Colchester, and from Ipswich.

The following extract from "Bufton's Diary" is quoted by the Rev. Bryan Dale, in his "Annals of Coggeshall":—

"1692. September 8th being Thursday and the same day that Jacob Cox dyed, about 2 o'clock there was an Earthquake at Coxall and many towns beside hereabouts and at London and several other Countries we heard and ye news-letter said it was at ye same time in Holland and ye rest of ye provinces in ye Netherlands—I was in our garret at that time and heard ye house crack and perceived it shake and was afraid it would fall and therefore ran downstairs."

The Rev. A. Jeffery writes respecting the same earthquake:—

"As far as I am aware, the only other earthquake of which there is any record in the annals of Ipswich took place about two o'clock on the afternoon of Thursday, September 8th, 1692, as recorded by the Rev. John Langston, the first minister of Tacket-street Chapel. In this earthquake, which was felt throughout the East of England, 1,500 of the inhabitants of Port Royal, in Jamaica, perished, being buried beneath the ruins of their own dwellings. Mr. Langston states that the earthquake was preceded by an unusually severe thunderstorm, on August 13th. This information is given in the minute-book of Tacket-street Chapel, which (through the courtesy of Mr. T. Conder, of Christchurch-street) I happen to have in my possession at the present moment for purposes of research."

On reference to Cromwell's "History of Colchester," we find that St. Peter's Church was severely shaken by an earthquake in 1692, the particulars of which are recorded in the parish register, under the hand of the Rev. Robert Dickman, then vicar. The entry is:—

“September 8th, 1692, there happened, about 2 of the clock in the afternoon, for the space of a minute or more, an universal earthquake all over England, France, Holland, and some parts of Germany. And particularly it was attested to me by the masons that were there a-plastering the steeple of St. Peter's, in this town, and upon the uppermost scaffold, that the steeple parted so wide in the midst that they could have put their hand into the crack or cleft, and immediately shut up close again, without any damage to the workmen (who expected all would have fallen down) {or to the steeple itself. Most of the houses here and elsewhere shook, and part of a chimney fell down on North Hill ; and very many who were sensible of it were taken at the same time with a giddiness in their head for some short time. In witness of what is here related, I have hereto set my hand. ROBERT DICKMAN, Minister of St. Peter, Colchester.”

Though from this extract it appears that the convulsion took a much wider area than the present visitation, it is evident that the shock recorded in such quaint language by the Rev. Robert Dickman was not nearly so disastrous as the present one.

Immediately upon hearing of the earthquake of April 22nd, 1884, a letter was sent to the *Times*, specifying some of the features respecting which information was most required, and arrangements were made for an examination of the locality on April 24th, but though scarcely 48 hours had elapsed, many of the tottering stacks had been taken down, and bricklayers were at work in all parts of the district, repairing it is true, but also destroying valuable evidence as to the direction of the shock. Much, however, still remained, and the observations then made will be subsequently discussed ; meanwhile we insert a brief record of what was seen.

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NOTES OF AN INSPECTION OF THE DAMAGE ON THE ROADS FROM COLCHESTER THROUGH ABBERTON, PELDON, AND STROOD GREEN TO MERSEA ISLAND, RETURNING THROUGH LANGENHOE, FINGRINGHOE, ROWHEDGE AND WIVENHOE TO COLCHESTER.

*Colchester.*—The first damage noticed was that two old chimney stacks in North-street, about 100 yards N. of the river Colne, were overthrown ; in the town numerous chimney stacks were down, perhaps 5 per cent. of the whole, but they were mostly old or faulty. About 20 ft. of the top of the spire of the Congregational Church, in Lion Walk, was down, the piece destroyed being that which had been substituted for what had been brought down on a previous occasion by a gale ; the débris fell partly through the roof and partly to N. 35° E. from the tower. Although considerable damage was done, no great force was probably required. The damage in *Colchester* itself seemed to be chiefly on the N.E. side of the town and along East Hill.

The son of Dr. Wallace (who resides in the centre of the town) was standing with his assistant facing S.W., when they considered

that the shock came to them from S.W. and passed to E., and in support of this say that they saw chimney stacks fall to the S.W. of them, and felt the rocking of Dr. Wallace's house, before the spire of the chapel began to fall.

Starting on the road to *Abberton*, the damage in Head-street and the southern part of the town was found to be but slight. St. Giles's Rectory, about one mile S.S.E. of the town, was said to be much damaged.

Nothing of much importance, except a large chimney stack overthrown at *Roman Hill*, was observed until *Abberton* was reached, but there most of the tiled roofs had lost about half their tiles, apparently by a kind of quivering motion, and only a few chimney stacks were left standing. Near Borley's farm, almost the whole of a gable end, facing about S. by E., was thrown down. Between the village and the church is a nearly completed new rectory, very substantially built; none of the three chimney stacks has fallen, but two have their upper parts standing out of the square with their lower ones, indicating the twist which they have had. The architect states that there is scarcely a room in the house which has not sustained injury.

*Abberton Village*.—Not more than half-a-dozen chimney stacks remained standing, and those were all new and good. Most of the tiles had been shaken off the chancel roof of *Abberton Church*, a few off that of the nave, and the mullions of an old window had been shifted. *Abberton Hall*, a small house near the church, has lost part of one chimney stack. The very substantially built mansion known as *Abberton House* had been much shaken, and several of the chimney stacks were in process of removal. Of two old cottages running roughly N. and S., nearly all the tiles had slipped down, the chimney stacks were thrown over, the debris falling in the direction S.S.E. to N.N.W. (owner, working in garden, had to steady himself on his spade). A new and well-built cottage had its gable facing S. thrown out (about 20 feet of brickwork), the chimney stack at E. side fell over to E.N.E. The occupier saw stacks fall, first E. or E.N.E. of him, and afterwards others in S.W.

*Abberton to Peldon*.—Not a chimney stack standing along the road; two or three of the fallen ones appeared to have been very good work.

*Peldon*.—Probably 70 per cent. of all the chimney stacks gone, and several walls much shaken; brickwork as a rule good; S. end wall of cottage facing W. cracked from bottom to top; and the top of the gable fallen (good brickwork). *Peldon Church* had part of its battlements down, and its massive tower, of which the walls are nearly 2 ft. thick, cracked nearly from bottom to top, the crack at 5 ft. above the ground being nearly an inch wide; several large cracks along both sides of the nave and chancel, the portions of wall on different sides of some cracks being in different planes as much as half-an-inch to one inch. The glass from a standard lamp was

thrown in a line E.S.E. to W.N.W. At Peldon Rectory, large, well-built stacks new, but with very heavy cornices, were thrown down, and a similar one was twisted two or three inches; a bronze statuette, weighing about 10 lbs., on a base five or six inches in diameter, and of which the centre of gravity was well within its base was thrown off the mantel-piece. There were cracks in various places, and not one upstairs room was habitable, owing to the roof being broken in by falling chimney-stacks.

In a row of three cottages, facing S.W., out of six chimney-stacks, only one was standing, viz., at the S.E. end, the N.W. stacks having in all cases suffered most; the N.W. end of each cottage had three or four large cracks twenty or thirty feet long, nearly or quite across it in a slanting direction, the top apparently having been thrust forward two or three inches, the S.E. ends appeared to be in their original positions; from the inside of the cottages daylight could be seen through the walls in many places.

Along the road towards Mersea the cottages were shaken, and stacks thrown down, but nothing very striking was seen for about a mile. The "*Rose*" Inn was much shaken; all the chimney-stacks were twisted or fell; two were twisted about four inches, the direction of revolution being from E. by N. to W.; the chimneys were supported by iron stays just below the point of rupture. Several of the walls were bulged, and the inside of one chimney was displaced right down to the fireplace. On the opposite side of the road, at *Peldon Mill* a chimney-stack or two had fallen, and a chimney-shaft, 30 ft. high, was broken across about 10 ft. from the top, and slightly twisted, the shaft was not old, remained upright, and appeared to be well and solidly built.

*Strood Villa*, the residence of Mr. Hugh Green, exhibited the worst specimen of damage. It appeared to be particularly well and substantially built, was of recent date (1860), and all built at one time; it had no tall or heavy chimney stacks and altogether appeared well calculated to escape damage by the shock. But yet it is in such a state that it is a marvel that it stands at all, every wall is cracked and twisted in a manner more suited to iron under the influence of sudden cold than to bricks and mortar; no junction of two walls is left undisturbed, scarcely a door frame is complete in its setting, and no room that is not damaged. The chimneys are of course gone, but there are also two unusual features; first that many panes of glass are broken—this (owing perhaps to the elasticity of glass) is very rare, even where thick walls are broken through. Secondly that about 80 feet of garden wall is down—this also is rare, the walls rarely swayed beyond the point at which the next vibration brought them back, standing, even if weakened.

The damage in *Mersea* proved to be less than was previously reported. Part of a mullion had been thrown W.S.W. from the belfry window of West Mersea Church, and two iron chimney pots fell away to the S.W. of the church, but that appeared to be all the

injury there. At the National School, the bell and bell turret were thrown down. At the White Hart Inn, and at some of the cottages in *West Mersea*, chimneys had been overthrown, but nothing serious was observed.

The road from *West Mersea* to Mersea Lane forms the S.W. boundary of the island, and is 34 ft. above mean sea level, or perhaps 20 ft. above the saltings and muddy foreshore, to which it drops abruptly. Along perhaps 150 yards of this road, on the sea margin of it, *i.e.*, on the margin close to which the ground falls rapidly to the sea, a crack was formed, which in some places was said to have been about three inches wide, and more than two yards deep.

Near the church end of this lane, but on the shore, very little above high water mark, is a square wooden trough, constantly fed with good fresh water. This well formerly belonged to the Benedictine Priory, and is known as St. Peter's Well. During the shock the water was thrown out of the well, and that which refilled it was muddy, and it continued discoloured for about two hours.

Two seafaring men here stated that the shock appeared to travel from N.E., one describing how he saw women run screaming from houses to N. or N.E. of him at the instant that he first felt the shock.

Returning upon our previous path as far as the "Rose" at *Peldon*, we came to *Moor Farm*, where a piano standing on the S.E. side of a wall running S.S.W. to N.N.E. had remained steady at its N.N.E. end, but moved seven inches from the wall at the S.S.W. end. A table lamp fell towards E.S.E., and a small clock was thrown from the mantel-piece a distance of about 5 ft.

Between this and *Langenhoe* Church there are very few buildings, and the only damage observed was at *Peet Tye Hall*.

*Langenhoe*.—The church here suffered very severely; the battlements from the E. side of the tower fell through the roof of the church, and those from the W. side were thrown to the ground. The tower appeared much shaken; there were several large cracks in the walls of the church, and part of the end of the chancel was thrown outwards. *Langenhoe Hall* was shaken, and a chimney stack fell, but no especial damage was noted. *Langenhoe Rectory* is in a bad state; although not an old building, there are several cracks in the walls, and the chimney stacks were so shaken as to require immediate removal; the whole house appears to be considerably strained, and it is stated that scarcely any of the doors would open or shut. The rector states that the cracks in the gravel paths mentioned in the newspapers are due to the dry weather, and had appeared before the occurrence of the earthquake.

At *Fingringhoe*, there were several stacks damaged, and two much twisted; the church was a good deal cracked (but not so much as *Peldon* or *Langenhoe*), and there were one or two portions of masonry in a very unsafe condition. *Fingringhoe Hall* & *East Donyland Hall* were in process of repair.

At *Rowhedge*, probably half the chimney stacks were thrown down,

and along the river front, perhaps 75 per cent., and one or two gables had been thrown down ; there was a considerable variety of structure, but the new and good brickwork had suffered nearly as much as the old.

At *Wivenhoe*, the damage was widespread and resembled the effects of the Regent's Park explosion ; the destruction was greatest in the lower part of the town fronting the river, and here 60 to 70 per cent. of the chimney stacks were thrown down. Several of the houses on the river side on what may be called the quay were, without exaggeration, wrecked ; in one house the gable end facing S.W. was thrown out, but perhaps the worst case may be thus summarised. The floor was so heaved up as to render walking on it difficult in places ; there were several cracks in the walls ; a stack fell and destroyed a part of the back premises ; a gable fell out to N.E., and part of the front wall facing S.W. was thrown down.

The battlements on the N. and W. sides of the church tower were thrown down, and a large crack extended from the top of the tower about half way down. The Independent Chapel, a very large one, had been surmounted by a balustrade and cornice ; nearly the whole of it was thrown down.

At a small but substantial building belonging to *Wivenhoe Hall*, and just outside the village, an entire gable had fallen to N. (about 100 feet of brickwork) ; at *Wivenhoe Hall*, a well-built mansion, heavy chimneys fell in a N.E. direction, and the parapet showed a distinct crack on the N. aspect, but none on the S. ; along the road towards *Colchester* fallen stacks were frequent, the proportion decreasing as *Colchester* was approached.

We must, however, give details of what occurred in other places, and the most convenient mode of doing so will be to take the records arranged in counties, and in the sequence usual in our publications.

#### MIDDLESEX.

The shock was felt in most parts of *London*, especially in the *Strand*, *Fleet Street*, the *City*, also in *Hampstead*, *Crouch End*, *Hornsey* and *Enfield*. Clocks were stopped in several localities, but all details respecting them will be transferred to the *Essex Field Club*.

#### SURREY.

There are two records of its being felt near *Brixton*, and the photographic records of the magnets at *Kew Observatory*, show that they were shaken at 9.17 or 9.18 a.m. At *Frimley* tea was tipped out of the west side of a cup.

#### KENT.

At *Rochester*, *Strood* and *Sheerness* the shock was violent, e.g., at *Strood* the Board School was so shaken that the masters dismissed the scholars. At *Sheerness* and at *Herne Bay* house bells rang, and at

*Greenwich Observatory* the photographic records of several of the instruments show vibration about 9.20 a.m. The shock was also felt at *Chiselhurst, Beckenham, Tunbridge Wells* and *Maidstone*, at the last town a long gas pendant was set swinging.

## SUSSEX.

The shock was felt slightly at *Brighton*, at *Hastings* and at *St. Leonards*; at *Eastbourne* a ceiling was cracked.

## HAMPSHIRE.

At *Freshwater* bed-hangings were set swinging, and at *Portsmouth* light articles of furniture were shaken.

## BERKSHIRE.

Shock felt at *Reading*, and also in the village of *Sulhamstead*, six miles S.W. of *Reading*.

## HERTFORDSHIRE.

*King's Langley*.—Light articles shaken, and curtains set swinging.  
*Royston*.—Shock felt, but no damage done.

## BUCKINGHAMSHIRE.

*Marlow*.—Bed rocked, and pictures swung about. Some persons in a boat in *Temple Lock* were much puzzled by the sensation, and thought they had run foul of something. The shock was also felt at *Taplow* and *Princes Risborough*, and very distinctly at *Wyfold Court* on the top of the *Chiltern Hills*.

## OXFORDSHIRE.

At *Oxford* the vibration was very slight, and at *Tetsworth Castle, Watlington*, the shock was felt in several of the apartments.

## NORTHAMPTONSHIRE.

The shock was felt in *Northampton*, and slightly in other parts of the county.

## CAMBRIDGE.

In *Cambridge* the shock was felt, and the rumble of the explosion heard, doors were opened, and light articles shaken. It was felt at *Ely* and *Wisbeach* also.

## ESSEX.

As this is the county in which almost all the structural damage occurred, it is necessary to take it in detail, and we therefore group the facts under the respective towns and villages, taking them in alphabetical order. The word "Report" against any place, implies that it was one of those our own report, which will be found on pages 51 to 55.

*Abberton*.—Report.

*Alresford*.—A large portion of the tiles have been shaken off the

chancel of the church; several chimneys were overturned at the rectory, and chimneys also fell at the school, and at various houses in the parish.

*Ardleigh*.—The shock here felt much like that in a bad railway carriage running over an ill-made piece of line; the church bells rang, clocks were stopped, and several chimneys were broken.

*Berechurch*.—The fields were said to rise and fall like a wave, but no damage is reported.

*Birch*.—This seems just on the outskirts of the area of damage; a few chimneys were broken, and tiles loosened, but the restoration will only be a matter of a few pounds. A clock which had a heavy pendulum, but which was not going, was started.

*Bishop's Stortford*.—Considerable oscillation, furniture shaken, house bells rung, but no structural damage.

*Braintree*.—No structural damage, but a violent shock, several doors were thrown open, house bells rung, pendant gaseliers set swinging N.W. to S.E., and the safety valve of a boiler raised and steam allowed to blow off.

*Brightlingsea*.—Part of the top of the tower was shaken down and fell through the roof of the church, walls were cracked and chimneys overthrown in several parts of the town, but no serious damage occurred.

*Buckhurst Hill*.—Shock very slight, but a clock stopped proved the time to be between 9.18 and 9.18.30 a.m.

*Chelmsford*.—No structural damage, but the shock was rather severe, e.g., a horse was thrown down, the signalman was thrown against the levers in his box, doors were set swinging, and many clocks were stopped.

*Clacton*.—Shock scarcely perceptible.

*Coggeshall*.—Several chimneys overthrown.

*Colchester*.—Report.

*Dedham*.—The church tower seen to oscillate, bells rung and chimneys overthrown at several houses.

*East Donyland*.—This parish has suffered severely—the gable top of the chancel of the church fell, the school and the rectory had chimneys damaged. Donyland Hall has its front cracked, all the chimneys but one overthrown, breaking up the roof, every room but one is damaged, and in one are four cracks, into each of which a hand could be put. Donyland Lodge was left in such a state that there was only one room in which a fire could be lighted.

*Earls Cone*.—Considerable vibration, but no structural damage.

*Feering*.—Roof of school slightly damaged, children much frightened, and one boy fainted.

*Fingringhoe*.—Report.

*Great Baddow*.—Strong shock, large yard clock stopped.

*Great Bentley*.—Shock severe, but no damage reported.

*Great Bromley*.—Two chimneys overthrown at the rectory.

*Great Horksley*.—Strong vibration, house bells rung, but no structural damage.

*Great Wigborough*.—Church so damaged by falling of pinnacles, by shaking of tower, which now leans over the nave, that the architect advises entire rebuilding. Schools and many farm-houses damaged. A horse thrown down.

*Halstead*.—House bells rung, some glass overthrown and broken, but no serious damage.

*Harwich*.—One person thrown down, house bells rung, but no structural damage.

*Havering*.—This village being on a bed of clay 200 to 700 ft. thick, the shock was not felt, though it was at Romford, three miles off, on the gravel.

*Kelvedon*.—A lady thrown against a wall, a parrot shaken off its perch, the bells in most houses rang, but no structural damage.

*Langenhoe*.—Report.

*Layer Breton*.—Church damaged, but reports differ as to the amount of injury. Chimneys overthrown at the rectory, and some other houses.

*Layer de la Haye*.—The battlements of the church tower, and a quantity of the rubble coating, were dislodged and thrown into the graveyard, a portion of the apex of the south aisle was thrown off, and also the stone cross at the end of the nave. Many chimney stacks in the parish were either rent or thrown down.

*Layer Marney*.—Church tower shaken, but no serious damage.

*Lexden*.—Damage slight, being limited to a few displaced chimney pots and tiles.

*Little Waltham*.—Sharp shock, but no damage.

*Little Wigborough*.—The church damaged, parts of the masonry thrown down. The vicar says, "Church completely riddled, and must be rebuilt."

*Maldon*.—House bells were rung, doors opened and shut, and clocks stopped, but no structural damage.

*Manningtree*.—Several clocks stopped at the railway station, and the station-master thrown out of his chair, house bells rung, and crockery broken, but no structural damage.

*Mersea East*.—There is some difference in the reports as to the damage in this part of Mersea Island, but all statements agree that it was slight.

*Mersea West*.—Report.

*Messing*.—Large cracks in several parts of the church, and chimneys overthrown at some of the cottages.

*North Woolwich*.—Sharp shock but no structural damage.

*Old Heath*.—School slightly damaged; and also nearly every house in the parish; altogether in this little place there are 40 or 50 chimneys thrown down.

*Peldon*.—Report.

*Ramsey*.—Violent oscillation; the Vicar says, "I have experienced

earthquakes in Malta often, but they were not more threatening than this one." No damage done.

*Romford.*—Houses shaken, and pictures set swinging.

*Roxwell.*—Bells rung, but no structural damage.

*Salcot.*—Church damaged.

*Southend.*—Sharp shock, bells rung, small articles thrown down, clock stopped, but no structural damage.

*Strood Green.*—Report.

*Thorpe le Soken.*—Sharp shock, but no structural damage.

*Walton on the Naze.*—Shock felt, but no damage.

*Wickham Bishop.*—Clock stopped, two chimneys thrown down, and one had to be taken down.

*Witham.*—Violent shock, nearly all the house bells rang, small articles thrown down, clocks stopped, but no structural damage.

*Wivenhoe.*—Report.

*Wix.*—Houses shaken, clocks stopped, but no structural damage.

#### SUFFOLK.

*Barham.*—Shock just sufficient to ring the house bells.

*Beccles.*—Shock felt.

*Boxford.*—Bells were rung, and several clocks stopped.

*Bury St. Edmunds.*—Slight shock, but some bells rang.

*Claydon.*—Shock began between 9.17.45 and 9.17.55. Windows rattled, and house bells rang.

*Framlingham.*—Slight shock, no damage.

*Haughley.*—Shock only slight, but some bells rang faintly ; time between 9.17.50 and 9.18.10 a.m.

*Ipswich.*—Violent shock, small articles (*e.g.*, cups of coffee) thrown over, clocks stopped, a donkey thrown down, house bells rung, &c., but no structural damage.

*Henley Road, Ipswich.*—I presume few persons had the opportunity of observing the clouds on the morning of April 22nd, just previous to the shock of earthquake, which I had, so I venture to send you my observations made at the time.

I was lying in bed with my face towards a large window watching the clouds in the north-east part of the sky, and observed them thus for a quarter of an hour, measuring their movements by bars of the window panes, and had decided in my mind that the wind was in the S.E., from the direction the clouds went, hoping we should have it warmer, when all at once the clouds appeared to go and pass in every direction, and mix up together in a remarkable manner. This completely roused my attention, and I looked at a large chestnut tree in the park, saw all the leaves moving, saying to myself, "Whatever are you shuddering for ; there is no wind." Only the leaves moved, not the tree, which stood on a side hill, facing the south.

Then came the awful rumbling sound under the bed, which heaved up. I started upright, saw the north wall of the room bend in and outward, and the pictures on that wall flapped. Those on the other walls only shook and moved, while everything in the room that could jingle did so. A clock on the

north wall did not stop. I saw the small trees in rows from east to west, in the arboretum, shaking, not as if by wind, but as by a hand quickly shaking their stems. Also a tall plant in a pot in my room shook violently all over. The bells in the kitchen all jingled, and other things clattered, but no damage anywhere. My window looks towards the east, and the north wall is an outside wall. I made the observations, of the clouds, the leaves shaking, then the noise, all distinctly, though in quick succession, one after the other, but in how short a time I can't tell, but the clouds decidedly were the first to show any strange movement.—ELLEN BIDDELL.

*Layham.*—Strong shock, house bells rang, and clocks stopped.

*Nayland.*—A small cross thrown off the gable of the congregational chapel.

*Stoumarket.*—Sharp shock but no damage.

*Sudbury.*—Considerable vibration, a few bells rang, but no damage reported.

*Woodbridge.*—Shock slight, damage *nil*.

#### NORFOLK.

*Fakenham and Lynn.*—Shock felt, but no damage.

*Norwich.*—The hospital buildings all rocked about 9.18 a.m., apparently from S. to N.

*Yarmouth.*—Shock quite unmistakeable, some bells rang.

#### GLOUCESTERSHIRE.

*Bristol.*—Shock distinctly felt in the lower part of the city.

*Stroud.*—Shock sufficiently strong to set a card swinging.

#### WARWICKSHIRE.

*Birmingham.*—The vibration was felt in many places, and at the Central Restaurant, glasses were shaken off the shelves.

*Leamington.*—Shock distinctly felt, bed rocked, also a heavy Chinese table.

#### LEICESTERSHIRE.

*Ashby Parva.*—I was in bed (being an invalid), but writing at the time. My chronometer is temporarily out of gear. At 9.19 G.M.T. by my watch, and several clocks in the house (none of which can be trusted separately to a minute or two), I heard a roaring noise in the E., which made me look to a window facing E. by S. Almost simultaneously, heard a fall of soot and some pieces of mortar, and then became conscious that my bed was swaying, or being slightly tilted, apparently from S. to N. (or N. to S.) The shock I computed to last five seconds, and the oscillations—to which I paid careful attention, having had experience of earthquakes long ago—seemed about 2 per second; I lay perfectly still, instead of looking at the watch. Of those members of my household who were on the ground floor, none felt anything. Two servants, occupied in separate rooms on the same floor as I was on myself, heard the noise, and complained that they were seized with giddiness. The shock seemed to me to be marked by far less noise—I mean subterranean noise—but by what one would call “more swing and far less tremor,”

that is, by oscillation of greater length than that of October, 1863, which I felt (much more violently than others in England) at Sellack, in Herefordshire, where some houses were injured on that occasion.—W. CLEMENT LEY.

*Husbands, Bosworth and Market Harborough.*—Sharp shock, but no damage.

*Leicester.*—Shock rather sharp, causing slight panic in one factory—no damage.

RUTLAND.

*Uppingham.*—Shock was felt all round here, but not in this town.

LINCOLNSHIRE.

*Long Sutton.*—Some men were at work upon the church steeple, when it rocked so much that, thinking it was going to fall, they descended.

*Boston.*—Severe oscillation at 9.20 a.m., but no damage; the shock was felt also at *Wainfleet, Skegness, and Spilsby.*

DERBYSHIRE.

*Derby.*—Sharp shock, shaking windows, &c., at 9.20 a.m.

*Brassington, Wirksworth.*—Bed shook as if a dog were under it.

CHESHIRE.

*Altrincham.*—Shock distinctly felt.

FRANCE.

*Boulogne.*—Shock felt in several parts of the town at 9.30 a.m. Paris time (= 9<sup>h</sup>·20<sup>m</sup>·39<sup>s</sup> Greenwich time).

BELGIUM.

*Ostend.*—Room shook and bed oscillated two or three times from N.W. to S.E.

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We are extremely glad to state that the task of thoroughly discussing and reporting upon the mass of correspondence with which we have been favoured, of fully examining the damage done in Essex, and generally of preparing the report upon THE earthquake, has been undertaken by the Essex Field Club, a powerful local scientific society, in whose province the subject naturally falls.

Immediately upon receiving information that the Council of that Society was prepared to carry out the investigation thoroughly, we promised to transfer to it as soon as this article had been published, all the materials which we had been able to collect, and much of which it has been impossible to utilize here.

We have, however, given a selection of facts, and it only remains to concentrate in a few lines the conclusions which we think may be deduced from them, or perhaps we should say, from the whole of the data we have yet seen, both that printed and that which is going to the Essex Field Club :—

1. The shock occurred between 9h. 17m. and 9h. 18m. a.m. on April 22nd, and there does not seem to be evidence of its reaching the most distant localities, *e.g.*, those 150 or 180 miles distant more than about two minutes later.
2. The shock was felt over an area about 250 miles from E. to W., and about 200 miles from N. to S., *i.e.*, about 50,000 square miles. This area (*see general map*) should be studied in comparison with a map coloured geologically.
3. Structural damage is confined to Essex (except two or three insignificant trifles in the south of Suffolk), and the greatest intensity is limited to an area about 9 miles from E. to W., and about 5 miles from S. to N., *i.e.*, about 45 square miles, or less than one-thousandth of the area over which the shock was felt. (*See Special Map.*)
4. In the centre of this area there is one extending five miles westward from the meridian of 1° E., and from two miles to seven miles south of Colchester, within which area of 25 square miles there is hardly a house or a cottage that is not damaged. Fortunately, it is a thinly-peopled agricultural district; had it been otherwise, the wreck of buildings and the loss of life would have been fearful.
5. The statements as to the direction of the movement of the shock are extremely discordant; and some of the evidence afforded by cracked and overthrown buildings *seems* contradictory, but our present impression is that the shock was nearly vertical under the parish of Peldon, about six miles south of Colchester.
6. The shock was indisputably accompanied by sound.
7. We have no information as to the precise sum which would be required to reinstate all the public and private buildings, and the damaged contents of the latter, but we have ourselves seen dozens of cases which £100 would not cover, and several for which five times that sum would not suffice, but the majority of cottage cases would perhaps average £5 a-piece. Moreover, many of the inhabitants who were most shaken have been thoroughly unnerved.
8. Space and time alike preclude our giving the details of clocks stopped, but in the Metropolis there is no marked preponderance of evidence as to any direction. In Colchester, most of those stopped had their pendulums swinging E.-W. In the district of maximum disturbance, nearly all were stopped, irrespective of their position.

JANUARY, 1884, IN THE UNITED STATES.

(Continued from page 36.)

“The minimum temperatures in Montana, Dakota, and Minnesota on the 4th, and during the 5th and 6th, over the central valleys and Southern States, were generally the lowest recorded since the establishment of the Signal Service Stations. Over north-eastern Montana and the northern parts of Dakota and Minnesota the minimum temperatures were— $40^{\circ}$  and below on the morning of the 4th. Very low temperatures also occurred on the 24th, 25th and 26th in the lake region, where, at the most northerly stations, they were lower than those on the previous dates.

DAKOTA.

“*Huron*.—On the 3rd the maximum temperature was  $-4^{\circ}4$ ; minimum,  $-22^{\circ}5$ . On the 4th, the temperature fell to  $-38^{\circ}$ , which is said to be the lowest ever recorded. On that date the temperature did not rise above  $-26^{\circ}$ . A minimum temperature of  $-38^{\circ}$  was also recorded on the 5th.

“*Bismurck*.—The 4th was the coldest day experienced for many years; mean temperature for the day,  $-34^{\circ}3$ ; minimum,  $-40^{\circ}$ .”

ILLINOIS.

“*Rockford, Winnebago County*.—The temperature on the 4th,  $-40^{\circ}$ , is the lowest known for forty years.”

“*Peoria, Peoria County*.—The temperature on the 5th fell to  $-27^{\circ}$ , the lowest recorded during the last 29 years.”

“*Edgington, Rock Island County*.—The weather on the 3rd, 4th and 5th was the coldest experienced since 1856. The thermometer indicated  $-34^{\circ}$  on the morning of the 5th. Many persons were frost-bitten.”

“*Riley, McHenry County*.—The minimum temperature,  $-30^{\circ}5$ , on the morning of the 5th, was the lowest that has occurred during the last twenty-one years. The mean for that date,  $-23^{\circ}$ , is, with the exception of that for January 1, 1864, the lowest daily mean recorded during the last twenty-one years.”

“*Collinsville, Madison County*.—The minimum temperature of the 5th,  $-23^{\circ}$ , was the lowest recorded since January 1, 1864.”

INDIANA.

“*New Albany, Floyd County*.—The 5th was the coldest day that has been experienced for thirty-five years. At 6 a.m. the temperature was  $-23^{\circ}$ ; at noon,  $-10^{\circ}$ ; and at 7 p.m.,  $-12^{\circ}$ .”

“*Sunman, Ripley County*.—On the morning of the 5th the thermometer indicated a temperature of  $-24^{\circ}$ , which is the lowest recorded for the last thirty years.”

## IOWA.

"*Council Bluffs, Pottawattomie County.*—At 10 p.m. of the 4th the thermometer read  $-24^{\circ}$ , the lowest observed for twenty-five years."

## MINNESOTA.

"*Minneapolis.*—The thermometer at noon of the 4th read  $-30^{\circ}$ , the lowest temperature experienced for twenty-five years."

## MISSOURI.

"*Pierce City.*—The temperature at 7 a.m. of the 5th was  $-22^{\circ}$ ; at 2 p.m.,  $-4^{\circ}$ ; 9 p.m.,  $-9^{\circ}$ ; daily mean  $-11^{\circ}6$ . Mr. J. J. Spilman states that that was the coldest day that has occurred since 1847."

"Professor Francis E. Nipher, Director of the Missouri Weather Service, reports:—'The lowest temperature recorded in *Saint Louis* was  $-23^{\circ}4$ , which is half a degree colder than the previously observed minimum in January, 1873. In the State the temperature has fallen still lower. The lowest minimum reported was  $-33^{\circ}$  at *Sedalia*, *Warrenburg* and *Kirkville* reporting  $-32^{\circ}$ ; *Boonville* and *Harrisonville*,  $-31^{\circ}$ ; *Miami*,  $-30^{\circ}$ ; and *Savannah*,  $-27^{\circ}$ . The highest minimum temperatures reported were  $-16^{\circ}$  at *Cairo, Illinois*,  $-23^{\circ}5$  at *Saint Louis*, and  $-24^{\circ}2$  at *Keokuk, Iowa*."

"The following notes on the low temperature of the 5th are given by the observers:—*Saint Charles*, the 5th was the coldest ever observed here; *Oregon*, coldest since January 18th, 1857, when the thermometer registered  $-30^{\circ}$ ; *Ironton*, coldest weather yet observed here, thermometer read  $-23^{\circ}$ ; the coldest heretofore was  $-17^{\circ}$ ."

## OHIO.

"*Findlay, Hancock County.*—The thermometer read  $-20^{\circ}$  on the 5th, which is the lowest observed since 1855, when it read  $-22^{\circ}$ ."

"The following record furnished by Mr. G. W. Harper, of *Mount Auburn, Cincinnati*, shows the lowest temperatures since 1856:—1856, January,  $-14^{\circ}$ ; 1857, January,  $-13^{\circ}$ ; 1879, January 3rd,  $-16^{\circ}$ ; 1880, Nov. 19th,  $-12^{\circ}$ ; 1884, January 5th,  $-20^{\circ}$ ."

"*North Lewisburg, Champaign County.*—The temperature of the 25th,  $-23^{\circ}5$ , was the lowest experienced for 50 years."

## WISCONSIN.

"*Sussex, Waukesha County.*—The 4th was the coldest day that has occurred during the last 20 years, the daily mean temperature being  $-24^{\circ}5$ ."

## EDITORIAL.

BELIEVING that it was desirable to give the whole article upon the earthquake of April 22nd in one month, we have been obliged not only to increase the number of pages, but also to hold over nearly all the articles on general meteorology.

SUPPLEMENTARY TABLE OF RAINFALL,  
APRIL, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | .90         | XI.    | Carno, Tybrith .....     | 1.49        |
| „     | Margate, Birchington...   | 1.50        | „      | Corwen, Rhug .....       | 1.93        |
| „     | Littlehampton .....       | 1.50        | „      | Port Madoc .....         | 1.32        |
| „     | Hailsham .....            | 1.71        | „      | I. of Man, Douglas ..... | ...         |
| „     | I. of W., St. Lawrence.   | 1.16        | XII.   | Stoneykirk, Ardwell Ho.  | ...         |
| „     | Alton, Ashdell.....       | 1.65        | „      | Melrose, Abbey Gate ...  | 1.55        |
| III.  | Winslow, Addington ...    | 1.16        | XIII.  | N. Esk Res. [Penicuick]  | 1.10        |
| „     | Oxford, Magdalen Col...   | 1.69        | XIV.   | Ayr, Cassillis House ... | 1.19        |
| „     | Northampton .....         | 1.52        | „      | Glasgow, Queen's Park.   | .72         |
| „     | Cambridge, Beech Ho...    | 1.17        | XV.    | Islay, Gruinart School.. | 1.61        |
| IV.   | Southend .....            | 1.00        | XVI.   | St. Andrews, NewtonBk    | 1.32        |
| „     | Harlow, Sheering .....    | 1.16        | „      | Balquhider, Stronvar..   | 2.30        |
| „     | Diss .....                | 1.46        | „      | Dunkeld, Inver Braan..   | 1.20        |
| „     | Swaffham .....            | 1.16        | „      | Dalnaspidal H.R.S. ....  | 2.44        |
| „     | Hindringham .....         | ...         | XVII.  | Keith H.R.S. ....        | .95         |
| V.    | Salisbury, Alderbury...   | 1.73        | „      | Forres H.R.S. ....       | .49         |
| „     | Warminster .....          | 2.16        | XVIII. | Strome Ferry H.R.S. .... | 2.46        |
| „     | Calne, Compton Bassett    | 1.82        | „      | Lochbroom .....          | .92         |
| „     | Ashburton, Holne Vic..    | 3.28        | „      | Tain, Springfield.....   | .47         |
| „     | Holsworthy, Clawton ...   | 1.97        | „      | Loch Shiel, Glenaladale  | 1.93        |
| „     | Lynmouth, Glenthorne.     | 1.60        | „      | Invergarry .....         | 1.83        |
| „     | Probus, Lamellyn .....    | 1.94        | XIX.   | Lairg H.R.S. ....        | ...         |
| „     | Wincanton, Stowell Rec.   | 2.74        | „      | Forsinard H.R.S. ....    | .63         |
| „     | Taunton, Fullands .....   | 1.46        | „      | Watten H.R.S. ....       | .53         |
| VI.   | Bristol, Clifton .....    | 1.12        | XX.    | Dunmanway, Coolkelure    | 2.44        |
| „     | Ross .....                | 1.43        | „      | Fermoy, Gas Works ...    | 1.40        |
| „     | Wem, Sansaw Hall.....     | 1.16        | „      | Tralee, Castlemorris ... | 1.89        |
| „     | Cheadle, The Heath Ho.    | 1.64        | „      | Tipperary, Henry Street  | 1.42        |
| „     | Worcester, Diglis Lock    | 1.34        | „      | Newcastle West .....     | 1.39        |
| „     | Coventry, Coundon .....   | 1.94        | „      | Miltown Malbay.....      | 1.56        |
| VII.  | Melton, Coston .....      | 1.54        | „      | Corofin .....            | 1.07        |
| „     | Ketton Hall [Stamford]    | 1.37        | XXI.   | Carlow, Browne's Hill..  | 1.24        |
| „     | Horncastle, Bucknall ...  | .90         | „      | Navan, Balrath .....     | 1.39        |
| „     | Mansfield, St. John's St. | 2.06        | „      | Mullingar, Belvedere ... | 1.32        |
| VIII. | Macclesfield, The Park.   | 1.24        | „      | Athlone, Twyford .....   | 1.53        |
| „     | Walton-on-the-Hill.....   | 1.16        | XXII.  | Galway, Queen's Col....  | 1.31        |
| „     | Lancaster, South Road.    | 1.17        | „      | Clifden, Kylemore .....  | ...         |
| „     | Broughton-in-Furness ..   | ...         | „      | Crossmolina, Enniscoe..  | 1.28        |
| IX.   | Wakefield, Stanley Vic.   | 1.46        | „      | Carrick-on-Shannon ...   | .76         |
| „     | Ripon, Mickley .....      | 2.25        | XXIII. | Dowra .....              | ...         |
| „     | Scarborough.....          | 1.83        | „      | Rockcorry.....           | 1.44        |
| „     | EastLayton[Darlington]    | 1.84        | „      | Warrenpoint .....        | ...         |
| „     | Middleton, Mickleton ..   | 2.36        | „      | Newtownards .....        | 1.00        |
| „     | Haltwhistle, Unthank..    | 1.52        | „      | Belfast, New Barnsley.   | 1.34        |
| X.    | Shap, Copy Hill .....     | 2.01        | „      | Cushendun .....          | 1.00        |
| „     | Llanfrechfa Grange ...    | 1.22        | „      | Bushmills .....          | 1.49        |
| XI.   | Llandoverly .....         | 2.32        | „      | Stewartstown .....       | 1.71        |
| „     | Solva .....               | 1.75        | „      | Donegal, Revelin Ho....  | ...         |
| „     | Castle Malgwyn .....      | 2.09        | „      | Buncrana .....           | 1.53        |
| „     | Rhayader, Nantgwilt..     | 2.44        | „      | Carndonagh .....         | 1.88        |

APRIL, 1884.

| Div.   | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL.   |                                |                            |       |                                 | TEMPERATURE. |      |      |       | No. of Nights below 32° |
|--------|---|-------------|--------------------------------|----------------------------|-------|---------------------------------|--------------|------|------|-------|-------------------------|
|        |   | Total Fall. | Difference from average 1870-9 | Greatest Fall in 24 hours. |       | Days on which .01 or more fell. | Max.         |      | Min. |       |                         |
|        |   |             |                                | Dpth                       | Date. |                                 | Deg.         | Date | Deg. | Date. |                         |
|        |   |             |                                |                            |       |                                 |              |      |      |       |                         |
| inches | inches.   | in.         |                                |                            |       |                                 |              |      |      |       |                         |
| I.     | London (Camden Square) ...  | 1·02        | — 1·00                         | ·36                        | 6     | 14                              | 68·4         | 2    | 29·9 | 23h   | 4 12                    |
| II.    | Maidstone (Hunton Court)...   | 1·17        | — ·68                          | ·47                        | 27    | 15                              | ...          | ...  | ...  | ...   | ...                     |
| III.   | Strathfield Turgiss .....   | 1·64        | — ·27                          | ·55                        | 6     | 11                              | 65·9         | 2    | 22·9 | 23    | 11 15                   |
| III.   | Hitchin .....   | 1·33        | — ·62                          | ·37                        | 6     | 13                              | 63·0         | 2    | 22·0 | 18i   | 11 ...                  |
| IV.    | Banbury .....   | 1·78        | — ·23                          | ·47                        | 6     | 14                              | 64·0         | 3    | 24·5 | 23    | 8 ...                   |
| IV.    | Bury St. Edmunds (Culford)  | ·96         | — ·83                          | ·25                        | 6     | 16                              | 66·0         | 2    | 21·0 | 23    | 13 ...                  |
| V.     | Norwich (Cossey).....   | 1·99        | + ·13                          | ·50                        | 6     | 19                              | 68·5         | 2    | 28·5 | 20j   | 6 11                    |
| V.     | Weymouth(LangtonHerring)  | 2·36        | — ...                          | ·56                        | 1     | 12                              | ...          | ...  | ...  | ...   | ...                     |
| V.     | Barnstaple.....   | 1·55        | — ·83                          | ·31                        | 2     | 11                              | 63·0         | 9b   | 37·0 | 27k   | 0 ...                   |
| VI.    | Bodmin .....  | 2·22        | — 1·11                         | 1·12                       | 4     | 8                               | 57·0         | 6    | 31·0 | 24    | 1 13                    |
| VI.    | Cirencester .....   | 1·85        | — ·55                          | ·51                        | 1     | 11                              | ...          | ...  | ...  | ...   | ...                     |
| VI.    | ChurchStretton(Woolstaston)   | 1·84        | — ·48                          | ·90                        | 3     | 13                              | 61·0         | 3    | 30·0 | 18l   | 7 13                    |
| VI.    | Tenbury (Orleton) .....   | 1·59        | — ·58                          | ·27                        | 5     | 15                              | 63·2         | 8    | 25·2 | 23    | 7 12                    |
| VII.   | Leicester .....   | 1·77        | — ...                          | ·32                        | 6     | 20                              | 67·5         | 3    | 26·2 | 23    | 3 16                    |
| VII.   | Boston .....  | 1·20        | — ·69                          | ·35                        | 12    | 18                              | 67·0         | 2    | 30·0 | 24    | 2 ...                   |
| VII.   | Grimsby (Killingholme).....   | 1·55        | — ·21                          | ·21                        | 12    | 21                              | 64·0         | 2    | 31·0 | 24    | 1 ...                   |
| VII.   | Hesley Hall [Tickhill].....   | 1·34        | — ...                          | ·21                        | 11    | 17                              | 67·0         | 3    | 22·0 | 24    | 7 ...                   |
| VIII.  | Manchester (Ardwick).....   | ...         | — ...                          | ...                        | ...   | ...                             | ...          | ...  | ...  | ...   | ...                     |
| IX.    | Wetherby (Ribston Hall) ...   | 1·69        | — ·82                          | ·59                        | 2     | 10                              | ...          | ...  | ...  | ...   | ...                     |
| IX.    | Skipton (Arncliffe) .....   | 2·76        | — ·30                          | ·52                        | 1     | 18                              | 68·0         | 2    | 27·0 | 23    | 6 ...                   |
| X.     | North Shields .....   | 2·16        | + ·16                          | ·28                        | 1     | 23                              | 61·0         | 4    | 29·2 | 26    | 4 7                     |
| X.     | Borrowdale (Seathwaite).....  | 4·15        | — ·79                          | 1·10                       | 5     | 19                              | 63·2         | 3    | 28·5 | 25    | ...                     |
| XI.    | Cardiff (Ely).....  | 1·58        | — ·76                          | ·45                        | 3     | 11                              | ...          | ...  | ...  | ...   | ...                     |
| XI.    | Haverfordwest .....   | 2·47        | — ·35                          | ·64                        | 1     | 11                              | 58·0         | 10   | 27·1 | 22    | 7 17                    |
| XI.    | Plinlimmon (Cwmsymlog)...   | 1·54        | — ...                          | ·39                        | 3     | 9                               | ...          | ...  | ...  | ...   | ...                     |
| XI.    | Llandudno.....  | 1·19        | — ·69                          | ·42                        | 3     | 11                              | 57·0         | 5c   | 31·2 | 18    | 1 ...                   |
| XII.   | Cargen [Dumfries] .....   | 1·21        | — 1·08                         | ·28                        | 2     | 11                              | 59·8         | 9    | 30·0 | 25    | 4 ...                   |
| XII.   | Hawick .....  | ...         | — ...                          | ...                        | ...   | ...                             | ...          | ...  | ...  | ...   | ...                     |
| XIV.   | Douglas Castle (Newmains)   | ·88         | — 1·00                         | ·35                        | 3     | 7                               | ...          | ...  | ...  | ...   | ...                     |
| XV.    | Lochgilhead (Kilmory).....  | 1·30        | — 1·33                         | ·46                        | 30    | 11                              | 62·0         | 10d  | 29·0 | 13m   | 8 ...                   |
| XV.    | Oban (Craigvarren) .....  | 1·54        | — ...                          | ·59                        | 30    | 12                              | 60·5         | 3    | 35·0 | 1, 12 | 0 ...                   |
| XV.    | Mull (Quinish) .....  | 2·03        | — ...                          | ·92                        | 30    | 14                              | ...          | ...  | ...  | ...   | ...                     |
| XVI.   | Loch Leven Sluices .....  | 1·10        | — 1·11                         | ·20                        | 1a    | 8                               | ...          | ...  | ...  | ...   | ...                     |
| XVI.   | Arbroath .....  | 1·49        | — ·42                          | ·41                        | 2     | 12                              | 53·0         | 4c   | 32·0 | 10n   | 2 ...                   |
| XVII.  | Braemar .....   | 2·45        | + ·37                          | 1·13                       | 5     | 18                              | 59·2         | 3    | 24·8 | 10    | 12 28                   |
| XVII.  | Aberdeen .....  | 1·49        | — ·38                          | ·38                        | 1     | 23                              | 56·0         | 3c   | 29·0 | 27    | 4 ...                   |
| XVIII. | Skye (Sligachan) .....  | 4·27        | — ...                          | 2·77                       | 31    | 8                               | ...          | ...  | ...  | ...   | ...                     |
| XVIII. | Culloden .....  | ·51         | — ·84                          | ...                        | ...   | ...                             | 58·0         | 4    | 31·0 | 21    | 2 17                    |
| XIX.   | Dunrobin .....  | ·44         | — ...                          | ...                        | ...   | ...                             | 56·0         | 3    | 30·0 | 1     | 2 ...                   |
| XIX.   | Orkney (Sandwick).....  | ·76         | — 1·11                         | ·23                        | 30    | 15                              | 54·8         | 3    | 33·3 | 28    | 0 7                     |
| XX.    | Cork (Blackrock).....   | 1·93        | — 1·17                         | ·64                        | 4     | 15                              | 71·0         | 13   | 32·0 | 19    | 1 ...                   |
| XX.    | Dromore Castle .....  | 2·46        | — ...                          | ·56                        | 1     | 14                              | 60·0         | 26   | 32·0 | 18o   | 3 ...                   |
| XX.    | Waterford (Brook Lodge) ...   | ...         | — ...                          | ...                        | ...   | ...                             | ...          | ...  | ...  | ...   | ...                     |
| XX.    | Killaloe .....  | 2·08        | — ...                          | ·62                        | 25    | 10                              | 63·0         | 29   | 29·0 | 24    | 7 ...                   |
| XXI.   | Portarlington .....   | 1·20        | — ·83                          | ·44                        | 4     | 12                              | 60·0         | 9    | 29·5 | 17    | 5 ...                   |
| XXI.   | Dublin (FitzWilliam Square)   | 1·53        | — ·58                          | ·86                        | 4     | 11                              | 59·3         | 7    | 33·9 | 1     | 0 8                     |
| XXII.  | Ballinasloe .....   | 1·01        | — 1·25                         | ·45                        | 4     | 12                              | 57·0         | 10f  | 29·0 | 24    | 5 ...                   |
| XXIII. | Waringstown .....   | 2·30        | + ·41                          | ·62                        | 3     | 11                              | 66·0         | 9    | 29·0 | 24    | 6 17                    |
| XXIII. | Londonderry (Creggan Res.)  | 1·60        | — ...                          | ·50                        | 3     | 14                              | ...          | ...  | ...  | ...   | ...                     |
| XXIII. | Omagh (Edenfel).....  | 1·29        | — ·71                          | ·29                        | 3     | 13                              | 57·0         | 6g   | 32·0 | 7p    | 4 9                     |

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

a And 3, 23. b And 18, 25. c And 8. d And 12. e And 6, 30. f And 29. g And 9, 10, 11.  
 h And 24. i And 22. j And 23, 24, 26. k And 28. l And 22, 23. m And 28. n And 27.  
 o And 21, 22. p And 10, 19, 28.

## METEOROLOGICAL NOTES ON APRIL.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—During the early part of the month growth was suspended in the vegetable world by the cold N.E. winds; beyond this the cold did no harm; the wheat plant on poor clays looked yellow, but on the whole the check was salutary. Swallow first seen on 1st, marten on 10th; cuckoo first heard on 12th, nightingale on 14th.

BANBURY.—Mean temp.  $44^{\circ} \cdot 3$ ,  $1^{\circ} \cdot 5$  below the average; high wind on 16th and 17th, L on 2nd, distant T on 8th, H on 13th, 18th, and 30th.

CULFORD.—A most variable month, commencing with quite summer weather, and ending with sharp frosts: most disastrous to the fruit crop.

COSSEY.—The prevalence of E. wind made this an ungenial month, and the growing corn was injured by the sharp frosts; swallows seen on 11th.

WOOLSTASTON.—A cold month, with harsh E. winds and frosty nights, checking all vegetation; mean temp.  $43^{\circ} \cdot 9$ . A terrific storm of H with T, and vivid L occurred on 3rd; the hailstones were fully as large as hazel nuts, some of them remaining unmelted till the following morning; much damage was done by the H, which lasted about 10 minutes, and a house was struck by the L; a similar storm, but of much less violence occurred on the 23th; cuckoo not heard till 24th.

ORLETON.—Considerable quantities of R fell daily during the first week, with distant TSS on 2nd and 3rd, and the temp. till the 10th was above the average; on the 9th the wind changed to the N.E., where it remained persistently strong and cold till the end of the month with a low temp., and a sky generally clouded; severe frosts occurred on several mornings. The mean temp. of the month was  $3^{\circ} \cdot 5$  below the average of 23 years; the latter portion of the month favourable for the cultivation of the land. Swallows first seen on 7th; cuckoo heard generally on 20th; the smaller summer birds did not appear till the end of the month; damson trees were in blossom about the 6th, and cherry trees about the 15th.

LEICESTER.—The month commenced mild and damp, but in the second week became dry and cold, N. and N.E. winds prevailing to the end; warm genial weather was much needed at the close of the month.

BOSTON.—Frosts on the 23rd and 24th did very serious injury to the fruit crops.

GRIMSBY, KILLINGHOLME.—The polar current prevailed through the month, giving dry cold weather, unfavourable for fields and gardens; it gave way at the close, when a welcome change took place. The frosts seriously injured much of the fruit blossom.

HESLEY HALL [TICKHILL].—A cold month, very trying to weak persons, and doing much damage to the fruit blossoms; milder weather set in at the close. T on night of 2nd.

## WALES.

HAVERFORDWEST.—The month commenced stormy, wet and cold, after which a dry period set in, with bright sunshine frequently, and harsh, dry N. and N.E. breezes, the result being that all the grass and keep for cattle throughout the country seemed to disappear as by magic; the effects on the human constitution were also disastrous. White frosts prevailed throughout the month, and the mean temp. was below the average; the blackthorn blossomed in profusion.

LLANDUDNO.—A fine spring month on the whole, though perhaps too dry, there being scarcely any R between the 6th and 27th. Although the mean temp. was nearly  $3^{\circ}$  below the average, there was only one night of frost, and

the range both diurnal and monthly was considerably less than the average. E. winds prevailed during a great part of the month, though their keenness was somewhat tempered by the large amount of sunshine.

#### SCOTLAND.

**CARGEN.**—Cold easterly winds prevailed during the greater part of the month; mean temp.  $1^{\circ}\cdot7$  below the average; duration of sunshine 50 hours less than the average; T and L on 3rd and 5th, T on 2nd.

**OBAN, CRAIGVARREN.**—A very fair month, and warm for the season, with unusually dry weather, but a low bar. After almost uninterrupted drought for 21 days, a change set in on the evening of the 29th, with heavy R and H and S on the hills; crops were very backward, owing to the drought.

**MULL, QUINISH.**—A dry and sunny, but rather cold month, very favourable for spring cultivation; wind from E. to N. until 28th.

**BRAEMAR.**—The weather was favourable, but very cold E. winds prevailed throughout; the high hills were entirely covered with fresh S, and several severe frosts occurred during the latter part of the month.

**ABERDEEN.**—With the exception of the first three days, when the rainfall was heavy, the weather throughout the month was showery, with a prevalence of S.E. winds; the total rainfall, however, was nearly an inch below the average. Aurora seen on two nights.

**SLIGACHAN.**—A fine dry month; the first ten days warm and genial; from 10th to 20th the weather was very dry, with cold hard E. winds, which checked all vegetation; the latter part of the month was more genial. The night of the 30th was very stormy with R, H, T and L, and a great many lambs perished.

**CULLODEN.**—The month generally was dry, and R was wanted at the close; vegetation late, and making little progress, but not injured by frost.

**SANDWICK.**—April was free from such gales as occurred in the previous month, and was very dry; but the prevailing E. and S.E. winds, coupled with the drought during the latter part, gave a severe check to vegetation. Aurora on 11th and 24th.

#### IRELAND.

**BLACKROCK.**—The month generally was favourable for farming operations; dry E., N.E. and S.E. winds prevailed in the middle and latter part of the month, with some sunshine. Vegetation backward.

**DROMORE CASTLE.**—The beginning of the month was mild, but towards the middle cold hard E. winds set in, checking vegetation; but it made rapid progress during the last six or eight days.

**KILLALOE.**—Rainfall below the average; sharp E. and N.E. winds prevailed from the 5th to the end of the month, with bright clear weather.

**DUBLIN.**—A cold, dry month, the wind blowing almost constantly from easterly points of the compass was of a particularly dry and searching character. Mean temp.  $1^{\circ}\cdot7$  below the average of 20 years. Sleet and S on 1st, L on 4th, fog on 8th, 9th, 11th and 24th.

**BALLINASLOE.**—The month generally was fine, but with very cold, harsh winds, retarding vegetation.

**EDENFEL.**—The month was a dry and favourable, though somewhat ungenial seed-time; vegetation backward.

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EASTER AT THE SORBONNE.

THE gatherings at Paris this year have been overshadowed by a loss which is one not merely to France but to Science. Though M. Dumas had passed beyond the allotted fourscore years, his mind was still clear ; it is but a short time since he delivered an address lasting an hour without a single written note, and his presence and Presidency of the Congress of Electricians had been looked forward to with great interest.

The very morning fixed for the opening of the Sorbonne Réunion had to be appropriated to the obsequies of the great chemist, and it is not often that such a gathering of French savans is possible as was formed round his bier in the Church of Ste. Clothilde.

An attempt was made this year to systematize the communications, and a programme of special subjects for discussion had been prepared and printed. Although we heard little or nothing of the programme, it was by no means a bad one, and may be useful elsewhere or at another time, so we give it here.

*Section for the Mathematical, Physical, Chemical and Meteorological Sciences.*

1. Studies of the mistral.
2. Observations on earthquakes by registering instruments.
3. Heat lightning : frequency of storms in a single day.
4. Study of phenological phenomena.
5. Of what use, as regards weather forecasting, would be the data furnished by electrical and magnetical observations ?
6. Researches on the presence of watery vapour in the atmosphere, made by actinometers and spectroscopes.
7. Comparison of the climates of the south, and of the south-west of France.

In proof of our statement that the programme produced no effect, we subjoin the list of the only papers upon meteorology announced for reading :—

1. M. COULON.—*On a new pluviograph and actinograph.*
2. M. LANGLOIS.—*On a hygrometer giving directly the tension of vapour in the atmosphere.*
3. M. MAC CARTHY.—*On the distribution of rainfall over Algeria.*
4. DR. ROUYER.—*Clouds on the earth's surface.*

Of these only two of the authors attended the meetings, and therefore papers Nos. 3 and 4 were not read. Owing to papers running short on the Thursday afternoon, two extempore communications were made—one by M. Angot and one by M. Renou, of each of which we give a report.

M. RAIMOND COULON.—*Description of a new pluviograph and actinograph.*—M. Coulon began his paper by referring to a popular idea that there is some sort of connection between the tides of the ocean (or at any rate between them when they enter rivers) and the weather experienced on the shores of those rivers. In order to test this, he had designed two instruments, neither aiming at precision, but each intended to give a general notion of the state of the weather. The former was composed of a wheel with buckets at the end of its spokes, and a water pipe from any roof was led over the buckets; therefore, whenever rain was running off the roof, the wheel would turn. Upon the wheel is a stud which, at each revolution, strikes a spring, and thereby completes an electric circuit and draws a pencil about a quarter of an inch along a paper-covered cylinder, which is, by a clock, rotated once in 24 hours; if the rain is very heavy, the lines are too close together to be counted, and as the fall decreases they separate, and thus the amount of shading is roughly proportional to the heaviness of the fall. Thus far the result is not very different from that given by the pattern designed by Dr. Fines, of Perpignan, many years ago. But here we come upon a novelty which may be useful in other cases, and which, therefore, we describe fully.

The paper-covered cylinder is, as we have said, rotated once in 24 hours, but we have also stated that the trace occupies about a quarter of an inch. The paper is, however, about  $2\frac{1}{2}$  inches broad, and therefore there is room for 10 traces, each clear of the other; and as the cylinder can be clamped upon its axle in any position, it is merely necessary each day to slide the cylinder a quarter of an inch forward, and thereby ensure that the record shall fall clear of the previous one. Few arrangements could be more handy than this for showing the prevalence, or absence, of periodicity in any phenomenon; for one at once has on a single narrow strip the records of the same instants of civil time precisely under one another. (And the three strips for the 30 days of a month are, when mounted together, not taller than this page). And as regards tidal phenomena, lunar positions, &c., it is merely necessary to plot on the sheets the time of their occurrence each day, and to join them by a strongly marked line, in order to see if any relation exists between the indications of the pluviograph and the phenomena under examination.

M. Coulon, considering that there may be cloudiness and *almost* rain without any indication being given by his pluviograph, has designed an actinograph, which seems to us a more useful instrument than the now fashionable sunshine recorder. The actinograph has several points in common with the pluviograph, the clockwork sliding cylinder, and the dimensions thereof being similar; it is very small, all being contained in an iron box (with ground glass front) about 10 in. by 6 in. by 5 in. The author considered that the choice of a photographic paper should be based upon the facility with which the fixing could be effected by persons not acquainted with photographic manipulation, nor provided with complete apparatus. He had therefore chosen a ferro-prussiate paper, which, while sufficiently sensitive, required for its fixing nothing more elaborate than dipping in a basin of warm water. The author did not appear to have decided whether the window of his actinograph was to be kept turned towards the position of the sun or not—obviously to do so it must be put upon an equatorial mounting with a driving clock. M. Faye, who was presiding, suggested the simpler and more desirable plan of merely exposing the plate to light coming direct from the zenith.

M. LANGLOIS.—*On a hygrometer giving directly the tension of vapour in the atmosphere.*—This was a notice of two arrangements for determining the decrease in the volume of confined atmosphere consequent upon the extraction of its vapour by contact with concentrated sulphuric acid. It was pointed out by M. Angot that this method is by no means new, and that far better and more accurate forms have been invented and described—*e.g.*, Schwackhöfer's and Dines's.

M. LÉON VIDAL.—*On a pocket photographic apparatus.*—This, though not a meteorological paper, claims notice here as a very useful equipment for the inspectors of meteorological stations. M. Vidal produced from his pockets the whole of the apparatus except the tripod stand, which goes in a bamboo scarcely thicker than an ordinary walking stick. M. Vidal claims for the apparatus that it is of far better quality than any of the many small ones yet brought out, and is lighter and more portable than any of them. The dry plates used are  $2\frac{1}{2}$  inches by  $2\frac{1}{2}$ , but the lenses are so good that the photographs will bear considerable enlargement. It is obvious that if this or some similar apparatus of extreme simplicity and portability can be brought out at a moderate price, there should be a considerable demand for it by geologists and physical geographers. Take for instance the sites of some of our rain gauges, and think how much light would be thrown on discordant records by a series of four or six views of the country in different directions as viewed from the gauge. We have in our mind one instance in which the shape of some hills raises the mean annual rainfall, at absolutely the same elevation, from 66 to 100.

At the request of M. Faye,

M. RENOÛ, gave a brief abstract of his recent investigation into *The relation of the amount of cloud to that of the daily oscillation of the barometer*.—M. Renou began by stating that inasmuch as the hour of both the morning maximum and the afternoon minimum of atmospheric pressure varied with the seasons, the true amplitude was not that between the mean for any two constant hours, but between the hours of highest and lowest mean for each month, assuming, of course, that hourly values alone were being dealt with. He said that at the observatory at Parc St. Maur, in the suburbs of Paris, the mean time of the morning maximum was 8 a.m. in the summer and nearly 11 a.m. in the winter, and the time of afternoon minimum about 5 p.m. in summer, and between 2 and 3 p.m. in winter. M. Renou stated that the amount of the daily oscillation rose from a minimum in November to a maximum in April, and that the curve of the amount of cloud ran almost parallel with it, but in the reverse direction, the decrease of cloud agreeing with increase of barometric range. But there was one remarkable fact, namely that the cloud curve was a month later than the range curve, so that the minimum of cloud fell in May and the maximum in December. M. Renou said that it was very important to make such comparisons for long periods, but at present there were few stations for which hourly records of the amount of cloud as well as of barometric pressure had been published.

M. ANGOT, being also called upon by M. Faye, gave a brief abstract of the report of phenological phenomena in France, which is about to appear in one of the volumes of the *Bureau Central Météorologique*. In a country like France embracing not only a considerable area, but also land differing greatly in altitude, and with about 1500 observers, it soon became evident that curves representing phenological records would really be almost orographical ones. M. Angot therefore found himself confronted by the necessity of determining the nature and amount of correction required by stations at heights of 300 feet and upwards.

As regards plants he found that each 82 ft. of additional altitude above sea level caused a lateness of one day in the leafing, flowering, &c., and M. Angot exhibited to the meeting two maps, one in which the observations were entered as recorded, the other in which they had been corrected for the altitude of the various stations. The necessity for applying some correction of this kind is indisputable, the only uncertainty is as to its amount, and M. Angot's maps seem to show that he has reached it very nearly. Possibly it will eventually be found that the correction varies, according to the inclination of the ground, *e.g.*, that stations open to the south require corrections of 150 ft. for each day, and those on northern slopes of 50 ft. for each day. Soil also will probably have its effect, but these are minor details to be worked out subsequently.

As regards the arrival and departure of migratory birds, M. Angot finds a correction to be also necessary, but not so large a one as for plants. Birds seem to arrive one day later for each 164 ft., and to depart one day earlier for each 328 ft.

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ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday evening, April 16th, at the Institution of Civil Engineers, 25, Great George Street, Mr. J. K. Laughton, M.A., F.R.A.S., Vice-President, in the chair; Messrs. J. Y. Davidson and T. Wright were elected Fellows of the Society.

The following papers were read:—

(1.) "On the origin and course of the Squall which capsized H.M.S. *Eurydice*, March 24th, 1878," by the Hon. Ralph Abercromby, F.R. Met. Soc. It will be remembered that the *Eurydice*, which was a full-rigged corvette, when passing Ventnor, in the Isle of Wight, running free before a westerly wind, with all sails set, was struck by a sudden squall from the north-west; and before sail could be shortened, she went on her beam ends, and the lee ports being open, she filled and foundered. The author has investigated the character of the weather preceding and following the day in question, and finds that the squall was one belonging to the class which is associated with the trough of V-shaped depressions. This squall, which originated in the north of England, swept across the Isle of Wight at a rate of about 38 miles an hour. The V-depression was of an uncommon class, in which the rain occurs after the passage of the trough, and not in front of it, as is usually the case. The weather generally for March 24th was unusually complex, and of exceptional intensity, and for this reason some of the details of the changes cannot be explained. [For another paper on this subject with two maps see *Met. Mag.*, Vol. XIII., p. 33. Ed.]

(2.) "Waterspouts and their formation," by Captain J. W. C. Martyn.

(3.) "The Weather Forecasts for October, November and December, 1883," by C. E. Peek, M.A., F.R. Met. Soc. This is a comparison of the weather indicated in the Forecasts of the Meteorological Office with that actually experienced at Rousdon, in Dorset.

(4.) "On certain effects which may have been produced in the atmosphere by floating particles of volcanic matter from the eruptions of Krakatoa and of Mount St. Augustin," by W. F. Stanley, F.R. Met. Soc. The author having obtained specimens of volcanic dust from Krakatoa, which was collected on board some vessels in the neighbourhood of the eruption, and having examined them under the microscope, is of opinion that such dust, suspended in the atmosphere, was quite capable of producing the recent remarkable sunrises and sunsets and other effects.

At the meeting on May 21st, Mr. R. H. Scott, F.R.S., President, in the chair, Captain W. W. Hampton and C. D. F. Phillips, M.D., F.R.C.S., F.R.S.E., were elected Fellows of the Society.

The following papers were read :—

(1.) "Notes on the Proceedings of the International Polar Conference, held at Vienna, April 17th to 24th, 1884," by R. H. Scott, F.R.S., President. This Conference was held to welcome the several expeditions on their return from the Arctic regions, and to discuss the best mode of utilizing their labours.

(2.) "Meteorological Observations on the Maloja Plateau, Upper Engadine, 6,000 feet above the Sea," by Dr. A. T. Wise, F.R. Met. Soc. The Maloja Plateau is situated at the higher extremity of the Upper Engadine, and is protected from northerly, easterly and southerly winds. The author gives some account of the meteorology of this plateau, and also the observations made during the four months, November, 1883, to February, 1884.

(3.) "On some Results of an examination of the barometric variations in Western India," by A. N. Pearson, F.R. Met. Soc.

(4.) "Illustrations of the mode of taking meteorological averages by the method of weighing paper diagrams," by R. Inwards, F.R. Met. Soc., F.R.A.S.

(5.) "Ten Years' Weather in the Midlands," by Rupert T. Smith, F.R. Met. Soc.

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### VISITATION DAY AT GREENWICH.

EVERYBODY does not know what the above implies, we therefore preface our usual extract from the Astronomer Royal's report, with a brief explanation, the absolute accuracy of which we do not guarantee, but which is as nearly correct as we can make it.

The Royal Observatory was founded in 1675, *i.e.*, in the reign of Charles II., expressly with the object of facilitating the discovery of the longitude at sea, hence naturally the observatory is regarded and charged as a branch of the Admiralty.

On the first Saturday in June of each year, there is a meeting held at the Observatory of a sort of council, called the Board of Visitors, to whom the Astronomer Royal submits a report on the work done during the previous year, and any important proposals which he desires to bring before the Admiralty. This Board of Visitors is almost as venerable an institution as the Observatory itself, for it was in existence in 1748, and how long before that date we are not aware. The Board consists chiefly of *ex-officio* members, *e.g.*, President Royal Society, President Royal Astronomical Society, Hydrographer to the Admiralty, Directors of the Observatories at Cambridge and at Oxford, &c. But besides the actual members of the Board, many leading astronomers and some meteorologists are invited to inspect the observatory, every part of which is on that day thrown open to them. This gathering is that known as visitation day.

The following are the principal paragraphs in the report which deal with meteorology :—

“The meteorological instruments and the Thomson electrometer have been maintained in good order. In the gale of Jan. 23 [1884] the short connecting chain attached to the pressure plate of Osler's anemometer gave way, having perished in course of many years' exposure to the weather. After some delay through our having to wait for a quiet day before the pressure plate could be examined, a new chain was substituted on Feb. 26. The flexible brass chain connecting the external chain with the recording pencil continues to give very satisfactory results.

“A new photographic thermometer apparatus, in which I have arranged that the dry and wet bulb traces shall fall on the same part of the photographic cylinder as regards time-scale, is being made by Messrs. Negretti and Zambra, and, after many delays, is now nearly finished. By means of a long air bubble in the wet-bulb thermometer, with a column of mercury above, the degrees and decades of degrees are registered for this thermometer, just below the trace of the dry-bulb thermometer, and without any interference of the two records. The scale of time for the thermometers will in this arrangement be the same as for all the other registers, both magnetical and meteorological.

“A slight shift has been made in the positions of the rain gauges in the Magnetic ground.

“The observations of the temperature of the Thames made at the Deptford Cattle Market are regularly communicated to the Royal Observatory, and appear to be quite satisfactory.”

“The mean temperature of the year 1883 was  $49^{\circ}\cdot3$ , being  $0^{\circ}\cdot4$  lower than the average. The highest air temperature was  $85^{\circ}\cdot1$  on August 21, and the lowest  $20^{\circ}\cdot6$  on March 24. The mean monthly temperature was above the average in January and February, and below in March and July. In the other months it differed little from the average.

“The mean daily motion of the air in 1883 was 291 miles, being 12 miles greater than the average. The greatest daily motion was 842 miles on December 12, and the least 62 miles on December 26. The pressures exceeding 20 lbs. in 1883 were 28·0 lbs. on January 27, 28·5 lbs. on February 2, 24·4 lbs. on March 6th, 20·5 lbs. on October 17, and 26·5 lbs. on December 12.

“During the year 1883 Osler's anemometer showed an excess of 16 revolutions of the vane in the positive direction N, E, S, W, N, if all the turnings are counted ; or of 19 revolutions in the positive direction if the turnings which are evidently accidental are excluded.

“The number of hours of bright sunshine recorded by Campbell's sunshine instrument during 1883 was 1241, which is about 30 hours above the average of the six preceding years. The aggregate number of hours during which the Sun was above the horizon was 4454, so that the mean proportion of sunshine for the year was 0·280 constant sunshine being represented by 1.

“The rainfall in 1883 was 21·9 inches, being about 3 inches below the average.

“Tracings of the barometer registers for the days following the Krakatoa eruption have been sent to Mr. R. H. Scott and to M. Paul Schreiber. Two series of atmospheric disturbances recurring at intervals of about 36 hours are recorded from August 27 to September 1.

“We remarked no definite connexion between magnetic or electrical disturbances and the phenomena of the remarkable sunsets of the past winter.”

## A HEAVY INDIAN RAINFALL AND ITS RESULT.

WE have been favoured by Mr. W. M. Beaufort with the report recently adopted by the Great Indian Peninsular Railway Company containing the following details of the rainfall of July 1st and 2nd, 1883 :—

“I must, however, refer to the serious interruption of traffic during the half-year on the North-East extension, through damage to the line between 284 and 298 miles, and two large bridges, each of seven 30 feet girder openings at the *Ajunta* and *Bookree* rivers at mileages 295½ and 298 being destroyed by heavy floods on the night of 1st and 2nd July, regarding which I have already fully reported. Through traffic could not be restored over these rivers before the 2nd August, but the line, where damaged, was quickly repaired, and traffic resumed working to each side of the rivers on the 7th July.

“From the commencement I had determined to erect a temporary wooden bridge of full width of river, and to same level as the old bridge over the *Ajunta*, and this was immediately put in hand, and successfully carried through, without cessation, to completion. At the *Bookree*, recognising the greater difficulties of erecting quickly a similar bridge there, I decided to put in a diversion of the line, and a temporary bridge on a low level, which would, in all ordinary cases, have been sufficient, but on the night of the 14th July, a second flood swept along the river, and carried away all the work done in the channel of the river. It was then apparent that nothing short of a work of a much more substantial character would be required, and this was at once commenced, and traffic worked over it on the 2nd August.

“The rainfall which gave rise to the flood on the night of July 1st and 2nd, was confined to the south of the *Sautpura* range, and the wind and rain seem to have been of a cyclonic character, and in fact the meteorological records showed that a cyclone was travelling across the country from the central provinces towards *Indore*. The register of rainfall at *Bhosawul*, gives the very high record for the plains of India of 18·25 inches in 24 hours, of which 15·15 inches fell between 6 p.m. of the 1st, and 6 a.m. of the 2nd July, a rainfall which I believe to be without precedent; whereas at *Khundwa* the quantity of rain which was registered for the same time measured only 1·82 inches.

“The rivers *Taptee* and *Waghur* on either side of *Bhosawul* and the *Sooke Nullah*, which the line of railway crosses, and their tributaries were also in great flood, and between *Bhadli* and *Bhosawul* the way and works were considerably damaged by the heavy rain.

“I am happy to say that the vigilance of the permanent way inspectors, their platelaying mucedadums and patrolmen, on the night of July 1st, effectually secured the safety of the traffic, and there is no casualty to trains or loss of life to record.”—WILSON BELL, C.E.

By the courtesy of the Managing Director of the Company we have obtained some further particulars, which, with our own comments, may be epitomized as follows :—The site of the accident is about 290 miles N.E. of Bombay (about Longitude 76° E., and Latitude 21° N.), between the *Sautpoor* (or *Satpura*) mountains, and the river *Tapty* (or *Taptee*). The rivers mentioned by Mr. Bell are not marked on all maps, but are northern tributaries of the *Tapty*. A rainfall of 15 inches in twelve hours in the wet districts of India

would scarcely claim notice in these pages, but Ravere is in a dry district, the mean rainfall being, according to Mr. C. Chambers' *Meteorology of the Bombay Presidency*, scarcely 20 inches.

Moreover, it appears improbable that the fall can be explained away by the rather old hypothesis of a waterspout, for though a waterspout might easily have produced the 18·25 inches recorded at Bhosawul it would go but a little way towards filling and flooding two Indian rivers. Possibly Mr. Chambers may favour us with some notes upon the subject.

THE MILDNESS OF THE WINTER 1883-4.

For the following remarkable particulars as to the temperature of the past quarter at Greenwich, as prepared by Mr. Glaisher, F.R.S., we are indebted to the Quarterly Return of the Registrar General :

*January.*—The mean temperature of January was 43°·9, being 7°·4 and 5°·3 above the averages of 113 years and 43 years respectively. Back to 1771 there have been only two instances of a mean temperature for January being as warm as 43°·9, viz. :—

1796 ..... 45°·3                      1834 ..... 44°·4

*February.*—The mean temperature of February was 41°·9, being 3°·2 and 2°·4 above the averages of 113 years and 43 years respectively. Back to 1771 there have been twenty-four previous instances of a mean temperature as high as 41°·9, viz. :—

|                  |                  |                  |
|------------------|------------------|------------------|
| 1775 ..... 41°·9 | 1846 ..... 43°·9 | 1867 ..... 44°·7 |
| 1779 ..... 45°·3 | 1848 ..... 43°·4 | 1868 ..... 43°·0 |
| 1794 ..... 44°·7 | 1849 ..... 43°·2 | 1869 ..... 45°·3 |
| 1809 ..... 44°·1 | 1850 ..... 44°·7 | 1871 ..... 42°·4 |
| 1817 ..... 42°·6 | 1856 ..... 42°·0 | 1872 ..... 44°·8 |
| 1822 ..... 43°·3 | 1859 ..... 43°·1 | 1877 ..... 43°·5 |
| 1826 ..... 42°·2 | 1861 ..... 42°·1 | 1878 ..... 42°·2 |
| 1833 ..... 42°·4 | 1863 ..... 42°·1 | 1883 ..... 42°·6 |

*March.*—The mean temperature of March was 44°·5, being 3°·4 and 2°·8 above the averages of 113 years and 43 years respectively. Back to 1771 there have been eleven previous instances, viz. :—

|                  |                  |                  |
|------------------|------------------|------------------|
| 1777 ..... 44°·6 | 1822 ..... 47°·3 | 1871 ..... 44°·9 |
| 1779 ..... 47°·0 | 1830 ..... 45°·8 | 1872 ..... 44°·6 |
| 1780 ..... 49°·2 | 1841 ..... 46°·2 | 1882 ..... 46°·0 |
| 1815 ..... 45°·0 | 1842 ..... 44°·9 |                  |

*January to March.*—The mean temperature for the quarter ending March was 43°·4, being 4°·7 and 3°·5 above the averages of 113 years and 43 years respectively. there have been only three instances of a mean temperature of a quarter as high as this, viz. :—

1822 ..... 43°·5                      1846 ..... 43°·6                      1872 ..... 43°·6

*October to March.*—The mean temperature of the six months from October, 1883, to March, 1884, was 44°·2, being 3° above the average of 113 years, there being only six instances of a temperature as warm or warmer, viz. :—

|                  |                  |                  |
|------------------|------------------|------------------|
| 1819 ..... 44°·3 | 1834 ..... 44°·2 | 1849 ..... 44°·2 |
| 1822 ..... 45°·5 | 1846 ..... 44°·7 | 1877 ..... 44°·6 |

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCT., 1883.

| STATIONS.<br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain. |       | Aver.  |     |
|--|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|-------------|-------|--------|-----|
|  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.      | Days. | Cloud. |     |
|  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                |             |       |        |     |
| England, London .....  | 64·6      | 15    | 36·9     | 22    | 57·7     | 45·0 | 45·9       | 86        | 103·6        | 28·4           | inches      | 1·75  | 14     | 5·9 |
| Malta .....  | 81·8      | 1     | 54·8     | 27    | 73·0     | 62·8 | 58·9       | 76        | 138·2        | ...            | ...         | 2·67  | 12     | 3·4 |
| <i>Cape of Good Hope</i> ...                                     | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...    | ... |
| <i>Mauritius</i> .....   | 80·3      | 24    | 62·0     | 8     | 76·9     | 66·2 | 61·2       | 72        | ...          | ...            | ...         | 1·89  | 13     | 5·9 |
| Calcutta .....   | 92·4      | 6     | 65·2     | 26    | 87·8     | 73·9 | 73·2       | 80        | 156·4        | 55·6           | ...         | ·75   | 3      | 3·1 |
| Bombay .....   | 90·4      | 12    | 72·8     | 30    | 86·0     | 75·6 | 74·4       | 81        | 148·6        | 60·4           | ...         | 10·40 | 12     | 4·1 |
| Ceylon, Colombo .....  | 87·7      | 3     | 71·8     | 15    | 85·5     | 75·4 | 71·5       | 74        | 147·0        | 68·5           | ...         | 14·05 | 21     | 8·4 |
| <i>Melbourne</i> .....   | 86·2      | 20    | 41·7     | 6     | 66·7     | 47·9 | 45·7       | 69        | 143·1        | 32·0           | ...         | 2·79  | 19     | 6·3 |
| <i>Adelaide</i> .....  | 87·3      | 23    | 40·5     | 27    | 69·2     | 50·1 | 45·7       | 59        | 145·0        | 36·2           | ...         | 1·79  | 15     | 5·4 |
| <i>Wellington</i> .....  | 70·0      | 5     | 35·0     | 1     | 59·7     | 45·5 | ...        | ...       | 128·0        | 33·0           | ...         | 4·73  | 14     | ... |
| <i>Auckland</i> .....  | 66·5      | 26*   | 42·0     | 14    | 61·4     | 50·5 | 47·1       | 73        | 139·0        | 38·5           | ...         | 4·16  | 22     | 7·9 |
| <i>Falkland Isles</i> .....                                      | 61·4      | 9     | 28·3     | 3     | 51·2     | 35·9 | 38·5       | 76        | 121·7        | 22·2           | ...         | ·55   | 9      | 6·1 |
| Jamaica .....  | 90·3      | 4     | 70·8     | 8     | 87·7     | 72·9 | 72·9       | 84        | ...          | 65·1           | ...         | 4·46  | ...    | 7·1 |
| Barbados .....   | 84·0      | 21    | 69·0     | 17    | 81·0     | 73·0 | 73·6       | 87        | 145·0        | 62·0           | ...         | 14·72 | 21     | 6·0 |
| Toronto .....  | 71·0      | 10    | 27·1     | 27    | 52·1     | 37·6 | 39·8       | 77        | 128·0        | 21·5           | ...         | ·96   | 14     | 6·7 |
| New Brunswick, }<br>Fredericton .....                            | 72·8      | 10†   | 16·9     | 23    | 52·1     | 30·9 | 34·2       | 76        | ...          | ...            | ...         | 4·06  | 12     | 5·1 |
| Manitoba, St. Andrews  | 66·3      | 7     | 14·7     | 20    | 45·9     | 26·8 | 32·3       | 86        | ...          | ...            | ...         | 2·54  | 11     | 6·8 |
| British Columbia, Yale   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...    | ... |

\* And 29. † And 14.

REMARKS, OCTOBER, 1883.

MALTA.—Mean temp. 67°·0; mean pressure 30·065 in.; average velocity of wind 8·4 miles per hour; temp. of sea ranged from 74° to 70°, the mean being 72°; L on 7 days, T on 5.

J. SCOLES.

*Mauritius*.—Rainfall ·56 in. above the average; mean temp. 0°·5 below it; mean pressure 30·139 in.; mean hourly velocity of wind 11·1 miles, extremes 25°·8 miles and 1·6 miles, prevailing direction E.S.E. Unusually prolonged and intense colorations of the sky before sunrise and after sunset every day, lasting 1h. 15m.

C. MELDRUM, F.R.S.

*Melbourne*.—Mean temp. of air and of dew point below the average; mean pressure, amount of cloud, humidity and rainfall all very near the average; prevailing direction of wind S.W. and W.; strong breezes on 7 days; heavy dew on 7 days; T and L on 3 days. Zodiacal light very bright throughout, and beautiful glows of light visible in the western sky, by many mistaken for the auroral light.

R. L. J. ELLERY, F.R.S.

*Adelaide*.—Mean pressure 30·064, slightly above the average; mean temp. 59°·6, 2°·5 below the average; the month was unusually cold, in fact, with one exception, the coldest since 1857; the mean diurnal range 19°·1 is also very small; rainfall just the average; amount of cloud ·6 above it. On every clear evening during this month, and the last fortnight of September, a peculiar phenomenon has been apparent in the western sky. Shortly after sunset, a red glow will make its appearance at an altitude of about 50°, being very faint at first; but as the brightness of the sky near the horizon dies away with the receding sun, the red glow will expand downwards, becoming at the same time more brilliant, until at last the whole western sky will be lit up with a beautiful light, varying in colour, from a delicate pink to a most intense scarlet, and the spectacle presents a most brilliant appearance. The upper

part will then gradually fade away, until the colour is noticeable only 7° or 8° above the horizon, at which time the light is at its brightest. Afterwards a secondary glow will sometimes make its appearance, at an altitude of about 50°, and gradually spread downwards until the sky is again lit up. In the secondary phenomenon, the colours are generally more delicate. The whole thing will fade away about 8 p.m. This phenomenon has been noticed all over the south eastern portion of this continent, from Pt. Augusta (lat. 32° S.) to Melbourne; and in India, the sun has at times presented a most peculiar appearance, being green at rising, then gradually changing to a blue at noon, and inversely from noon to sunset. Various theories have been started to account for the phenomena.

*Wellington.*—Fine, with northerly winds up to the 9th, on which night it changed to S.E. with heavy R, and continued showery and squally up to 23rd; N.W. gale, 16th, 17th, and 18th; very wet on 19th, with strong wind at night; from 24th to 29th, fine; on 29th, stormy from N.W., with heavy R at night; remainder of month fine; mean pressure above, and mean temp. below the average. R. B. GORE.

*Auckland.*—Showery and variable weather throughout; mean pressure above, and mean temp. considerably below the average; rainfall much in excess.

T. F. CHEESEMAN.

*Falkland Isles.*—A very dry month; rainfall 1.20 in. below the average of 7 years.

F. E. COBB.

*BARBADOS.*—Mean temp. 76°·5, 0°·5 below the average; N.E. winds on 30 days; average velocity 7.3 miles per hour, extremes 13.4 miles and 2.8 miles; rainfall 36 per cent. above the average; evaporation the same as the average; 11 days were overcast; TSS on 15th and 17th. R. BOWIE WALCOTT.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOV., 1883.

| STATIONS.<br><br><i>(Those in italics are south of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain. | Aver. Cloud. |       |
|--|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|-------------|--------------|-------|
|  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.      |              | Days. |
|  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                |             |              |       |
|  | °         |       | °        |       | °        | °    | °          | 0-100     | °            | °              | inches      |              |       |
| England, London .....  | 55.8      | 28    | 28.7     | 13    | 49.9     | 37.2 | 39.4       | 92        | 77.3         | 20.3           | 2.78        | 16           | 6.7   |
| Malta .....  | 73.1      | 8     | 51.2     | 27    | 67.5     | 57.1 | 53.6       | 77        | 128.2        | ...            | 6.24        | 11           | 4.4   |
| <i>Cape of Good Hope</i> ...   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...          | ...   |
| <i>Mauritius</i> .....   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...          | ...   |
| Calcutta .....   | 87.1      | 13    | 51.1     | 22    | 81.2     | 61.0 | 59.5       | 71        | 150.3        | 38.0           | .00         | 0            | 1.8   |
| Bombay .....   | 89.3      | 5     | 66.1     | 26†   | 85.6     | 71.8 | 67.7       | 70        | 145.8        | 53.6           | .86         | 1            | .9    |
| Ceylon, Colombo .....  | 86.7      | 16    | 71.3     | 21    | 84.1     | 73.3 | 70.5       | 76        | 146.0        | 67.0           | 9.12        | 18           | 8.4   |
| <i>Melbourne</i> .....   | 93.0      | 23    | 38.1     | 2     | 73.0     | 51.9 | 49.6       | 67        | 156.1        | 29.1           | 3.22        | 12           | 6.5   |
| <i>Adelaide</i> .....  | 99.0      | 23    | 45.6     | 15    | 77.7     | 56.6 | 49.0       | 52        | 159.9        | 39.6           | 1.83        | 15           | 4.8   |
| <i>Wellington</i> .....  | 71.0      | 14    | 40.3     | 5     | 61.5     | 48.3 | ...        | ...       | 140.0        | 35.0           | 3.40        | 16           | ...   |
| <i>Auckland</i> .....  | 74.0      | 28    | 45.5     | 6     | 65.8     | 51.7 | 48.0       | 69        | 147.0        | 39.0           | 3.49        | 18           | 7.0   |
| <i>Falkland Isles</i> .....  | 62.8      | 4     | 31.2     | 8     | 5.17     | 38.0 | 39.9       | 75        | 121.7        | 24.2           | 2.07        | 21           | 6.2   |
| Jamaica, Kingston .....  | 88.8      | 6*    | 65.0     | 26    | 86.0     | 70.3 | 70.5       | 83        | ...          | 59.0           | 3.67        | ...          | 4.4   |
| Barbados .....   | 83.0      | 1.7   | 70.0     | 24    | 80.0     | 72.0 | 73.6       | 89        | 146.0        | 71.0           | 7.34        | 19           | 6.0   |
| Toronto .....  | 60.1      | 22    | 13.4     | 16    | 44.6     | 29.7 | 32.9       | 77        | 97.0         | 5.0            | 2.47        | 17           | 7.1   |
| New Brunswick, }<br>Fredericton .....                                | 62.7      | 6     | 3.5      | 17    | 42.0     | 23.2 | 28.9       | 81        | ...          | ...            | 2.83        | 12           | 6.0   |
| Manitoba, Winnipeg ...   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...          | ...   |
| British Columbia, Yale   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...          | ...   |

\* Add 10, 11. + And 30.

## REMARKS, NOVEMBER, 1883.

MALTA.—Mean temp.  $61^{\circ}2$ ; mean hourly velocity of wind 9.4 miles; mean temp. of sea  $68^{\circ}0$ ; TSS on four days, and L on two other days. J. SCOLES.

COLOMBO.—TSS occurred on three days, and L was seen on five other days.

J. H. SYMONDS.

Melbourne.—Mean temp. of air and of dew point, both about one degree above the average; pressure and humidity average; rainfall .81 in. and amount of cloud 0.5 above the average; prevailing direction of wind S. and S.W., strong breezes occurring on four days, L on five days, T on three days, H on one day, Aurora Australis on 22nd.

R. L. J. ELLERY, F.R.S.

Adelaide.—Mean pressure about the average; mean temp. ( $67^{\circ}2$ )  $0^{\circ}8$  above the average, the max reached  $90^{\circ}0$  on five days. The state of the atmosphere was very peculiar and unseasonable from 20th to 25th (inclusive) there was a TS or L every day and the weather throughout the period was unseasonably sultry and oppressive. The rainfall of the month was nearly double the average of 26 years, and the total for the 11 months of this year is the greatest (except 1875) during that period being  $6\frac{1}{2}$  inches in excess of the average. The peculiar red glow described in last month's remarks was very bright at the commencement of the month, but towards the end it had become fainter, and the zodiacal light which had not been noticed at the beginning began to be visible, being rather bright at times.

C. TODD.

Wellington.—The weather was unsettled till the 5th, on which day 1.10 in. of R fell, it was then fine with moderate wind, chiefly southerly, till 12th; the 13th was very oppressive, with severe T and heavy R, and the weather continued showery and unsettled, and at times squally, till 25th; the remainder of the month was fine. Mean temp.  $2^{\circ}$  below the average; rainfall nearly one inch below it.

R. B. GORE.

Auckland.—The weather was variable and unsettled during the whole month; mean temp. and pressure both below the average; rainfall in excess, but no heavy fall in one day.

T. F. CHEESEMAN.

BARBADOS.—Mean pressure about the average; mean temp. ( $75^{\circ}8$ )  $0^{\circ}7$  below the average of 25 years; average velocity of wind 9.1 miles per hour, extremes 18 miles and 1 mile; rainfall 10 per cent. below the average; evaporation 18 per cent. above the average; 7 days were overcast.

R. BOWIE WALCOTT.

## CUTTINGS.

A CLOUD OF CARBON.—The black cloud, which recently passed over a part of Lancashire, and darkened certain neighbourhoods for about an hour, appears to have been caused by an accumulation of finely-divided carbon. The Rev. S. J. Perry, Stonyhurst Observatory, writes:—"At 11.30 the darkness was so great that it was found impossible to read even bold print (small pica) close by the window, and at this time a dense black cloud, with a slightly yellowish tinge, hung over the south-west sky; the blackness being most intense at  $10^{\circ}$  above the horizon. At 11.35 it became somewhat lighter, and 11.40 the rain began to fall, and in forty minutes 0.114 inch of rain-water was collected in our rain-gauges, the whole being almost as black as ink, and full of fine carbon in suspension. Hail that fell a mile off to the south-west by south, and snow that fell on the hills two miles to the west, were also black."—*Public Opinion*.

THE CLIMATE OF MANITOBA.—A correspondent says:—"As to the climate, it is far more enjoyable than Ontario; the winter, although cold, is not unpleasant; we were able to work out nearly every day with very little inconvenience; the depth of snow never exceeded twelve inches at any one time, and the roads consequently were excellent for sleighing; we had no rainfall the whole winter, so that stacks were left open without any fear of injury. The summer is all that could be desired; perhaps I should draw attention to the fact that there is a very heavy dew each night, which appears to be sufficient to ensure a luxuriant growth of all kinds of vegetation, and there is also a very large proportion of sunshine, which is another important element in farming."—*The Colonies*.

SUPPLEMENTARY TABLE OF RAINFALL,  
MAY, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | .35         | XI.    | Carno, Tybrith ... ..    | 2.74        |
| „     | Margate, Birchington...   | .20         | „      | Corwen, Rhug .....       | ...         |
| „     | Littlehampton .....       | .43         | „      | Port Madoc .....         | 3.62        |
| „     | Hailsham .....            | .48         | „      | I. of Man, Douglas ..... | 1.26        |
| „     | I. of W., St. Lawrence.   | 1.15        | XII.   | Stoneykirk, Ardwell Ho.  | 2.05        |
| „     | Alton, Ashdell.....       | .76         | „      | Melrose, Abbey Gate ...  | 2.00        |
| III.  | Winslow, Addington ...    | .95         | XIII.  | N. Esk Res. [Penicuick]  | 4.15        |
| „     | Oxford, Magdalen Col...   | .80         | XIV.   | Ayr, Cassillis House ... | 3.80        |
| „     | Northampton .....         | .90         | „      | Glasgow, Queen's Park.   | 2.92        |
| „     | Cambridge, Beech Ho...    | .81         | XV.    | Islay, Gruinart School.. | 2.47        |
| IV.   | Southend .....            | .27         | XVI.   | St. Andrews, Newton Bk   | 1.87        |
| „     | Harlow, Sheering ...      | .52         | „      | Balquhiddier, Stronvar.. | 6.85        |
| „     | Diss .....                | 1.20        | „      | Dunkeld, Inver Braan..   | 2.89        |
| „     | Swaffham .....            | .76         | „      | Dalnaspidal H.R.S. ...   | 4.39        |
| „     | Hindringham .....         | ...         | XVII.  | Keith H.R.S. ....        | 1.72        |
| V.    | Salisbury, Alderbury ...  | .89         | „      | Forres H.R.S. ....       | 1.11        |
| „     | Warminster .....          | 1.53        | XVIII. | Stromes Ferry H.R.S....  | 4.34        |
| „     | Calne, Compton Bassett    | 1.59        | „      | Lochbroom .....          | 4.30        |
| „     | Ashburton, Holne Vic..    | 2.64        | „      | Tain, Springfield.....   | 2.03        |
| „     | Holworthy, Clawton ...    | 1.16        | „      | Loch Shiel, Glenaladale  | 8.67        |
| „     | Lynmouth, Glenthorne.     | 2.13        | „      | Invergarry .....         | 4.64        |
| „     | Probus, Lamellyn .....    | 1.08        | XIX.   | Lairg H.R.S. ....        | ...         |
| „     | Wincanton, Stowell Rec.   | 1.62        | „      | Forsinard H.R.S. ....    | 2.86        |
| „     | Taunton, Fullands .....   | .94         | „      | Watten H.R.S. ....       | 2.25        |
| VI.   | Bristol, Clifton .....    | 2.50        | XX.    | Dunmanway, Coolkelure    | 4.63        |
| „     | Ross .....                | .57         | „      | Fermoy, Gas Works ...    | 1.10        |
| „     | Wem, Sansaw Hall.....     | ...         | „      | Tralee, Castlemorris ... | 2.62        |
| „     | Cheadle, The Heath Ho.    | 1.41        | „      | Tipperary, Henry Street  | 2.08        |
| „     | Worcester, Diglis Lock    | 1.25        | „      | Newcastle West .....     | 2.14        |
| „     | Coventry, Coundon .....   | 1.14        | „      | Miltown Malbay.....      | 4.02        |
| VII.  | Melton, Coston .....      | 1.20        | „      | Corofin .....            | 2.19        |
| „     | Ketton Hall [Stamford]    | 1.28        | XXI.   | Carlow, Browne's Hill..  | 1.52        |
| „     | Horncastle, Bucknall ...  | 1.04        | „      | Navan, Balrath .....     | 1.73        |
| „     | Mansfield, St. John's St. | .80         | „      | Mullingar, Belvedere ... | 2.97        |
| VIII. | Macclesfield, The Park.   | 2.23        | „      | Athlone, Twyford .....   | 3.95        |
| „     | Walton-on-the-Hill....    | 1.27        | XXII.  | Galway, Queen's Col...   | 4.29        |
| „     | Lancaster, South Road.    | 2.65        | „      | Clifden, Kylesmore ..... | ...         |
| „     | Broughton-in-Furness ..   | 4.08        | „      | Crossmolina, Enniscoe..  | 3.14        |
| IX.   | Wakefield, Stanley Vic.   | .99         | „      | Carrick-on-Shannon ...   | 2.74        |
| „     | Ripon, Mickley .....      | .91         | XXIII. | Dowra .....              | ...         |
| „     | Scarborough .....         | ...         | „      | Rockcorry .....          | 2.73        |
| „     | East Layton [Darlington]  | .60         | „      | Warrenpoint .....        | 2.30        |
| „     | Middleton, Mickleton ..   | 1.43        | „      | Newtownards .....        | 2.33        |
| X.    | Haltwhistle, Unthank..    | 3.43        | „      | Belfast, New Barnsley .  | 3.52        |
| „     | Shap, Copy Hill .....     | 4.22        | „      | Cushendun .....          | 3.27        |
| XI.   | Llanfrechfa Grange ...    | 1.95        | „      | Bushmills .....          | 2.45        |
| „     | Llandovery .....          | 2.82        | „      | Stewartstown .....       | 3.08        |
| „     | Solva .....               | ...         | „      | Donegal, Revelin Ho....  | ...         |
| „     | Castle Malgwyn .....      | 1.69        | „      | Buncrana .....           | 2.88        |
| „     | Rhayader, Nantgwillt..    | 3.12        | „      | Carndonagh .....         | 3.12        |

MAY, 1884.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Table to which each station belongs.] | RAINFALL.   |                                |                            |       |                                 | TEMPERATURE. |       |      |       | No. of Nights below 32°<br>In shade On grass |     |
|----------|--|-------------|--------------------------------|----------------------------|-------|---------------------------------|--------------|-------|------|-------|--|-----|
|          |  | Total Fall. | Difference from average 1870-9 | Greatest Fall in 24 hours. |       | Days on which .01 or more fell. | Max.         |       | Min. |       |  |     |
|          |  |             |                                | Dpth.                      | Date. |                                 | Deg.         | Date. | Deg. | Date. |  |     |
|          |  | inches      | inches.                        | in.                        |       |                                 |              |       |      |       |  |     |
| I.       | London (Camden Square) ...   | .78         | - 1.14                         | .15                        | 12    | 11                              | 81.3         | 24    | 35.0 | 1     | 0  | 1   |
| II.      | Maidstone (Hunton Court)...  | .30         | - 1.72                         | .08                        | 3     | 8                               | ...          | ...   | ...  | ...   | ...  | ... |
| III.     | Strathfield Turgiss .....  | .67         | - 1.01                         | .16                        | 5     | 8                               | 82.5         | 24    | 32.4 | 1     | 0  | 4   |
| III.     | Hitchin .....  | .55         | - 1.44                         | .21                        | 2     | 9                               | 74.0         | 24    | 33.0 | 6     | 0  | ... |
| IV.      | Banbury .....  | 1.24        | - .89                          | .28                        | 12    | 10                              | 76.5         | 12    | 33.0 | 1     | 0  | ... |
| IV.      | Bury St. Edmunds (Culford)   | 1.03        | - .87                          | .33                        | 2     | 10                              | 79.0         | 10a   | 31.0 | 6     | 2  | ... |
| V.       | Norwich (Cossey) .....   | .86         | - .95                          | .33                        | 2     | 7                               | 78.0         | 11    | 33.0 | 7     | 0  | 4   |
| V.       | Weymouth(LangtonHerring)   | .77         | ...                            | .20                        | 19    | 10                              | ...          | ...   | ...  | ...   | ...  | ... |
| ENGLAND. | Barnstaple .....   | 1.31        | - .79                          | .45                        | 2     | 10                              | 81.0         | 25    | 37.5 | 1     | 0  | ... |
|          | Bodmin .....   | 1.26        | - 1.58                         | .27                        | 7     | 11                              | 73.0         | 24    | 38.0 | 1     | 0  | 6   |
| VI.      | Cirencester .....  | .78         | - 1.40                         | .16                        | 4     | 9                               | ...          | ...   | ...  | ...   | ...  | ... |
| VI.      | ChurchStretton(Woolstaston)  | 1.34        | - 1.05                         | .43                        | 2     | 12                              | 75.0         | 23    | 35.0 | 7     | 0  | 2   |
| VI.      | Tenbury (Orleton) .....  | .71         | - 1.72                         | .23                        | 2     | 10                              | 78.5         | 11    | 30.5 | 21    | 2  | 7   |
| VII.     | Leicester .....  | 1.10        | ...                            | .38                        | 2     | 12                              | 80.0         | 23    | 34.9 | 5     | 0  | 11  |
| VI.      | Boston .....   | 1.11        | - .66                          | .40                        | 2     | 8                               | 80.0         | 12    | 35.0 | 1     | 0  | ... |
| VI.      | Grimsby (Killingholme).....  | .81         | - .84                          | .24                        | 5     | 12                              | 69.0         | 22    | 36.0 | 1,7   | 0  | ... |
| VI.      | Hesley Hall [Tickhill].....  | .79         | ...                            | .12                        | 19    | 11                              | 83.0         | 11    | 34.0 | 7c    | 0  | ... |
| VIII.    | Manchester (Ardwick).....  | ...         | ...                            | ...                        | ...   | ...                             | ...          | ...   | ...  | ...   | ...  | ... |
| IX.      | Wetherby (Ribston Hall) ...  | .71         | - 1.11                         | .32                        | 4     | 5                               | ...          | ...   | ...  | ...   | ...  | ... |
| IX.      | Skipton (Arneliffe) .....  | 4.53        | + 1.41                         | 1.15                       | 15    | 15                              | 76.0         | 11    | 33.0 | 18c   | 0  | ... |
| X.       | North Shields .....  | .58         | - 1.27                         | .24                        | 4     | 7                               | 72.5         | 16    | 31.2 | 7     | 1  | 1   |
| X.       | Borrowdale (Seathwaite).....   | 17.30       | + 10.32                        | 6.78                       | 8     | 15                              | 76.5         | 23    | 31.5 | 1     | 1  | ... |
| XI.      | Cardiff (Ely).....   | 2.79        | + .19                          | .54                        | 15    | 13                              | ...          | ...   | ...  | ...   | ...  | ... |
| WALES.   | Haverfordwest .....  | 1.76        | - .93                          | .39                        | 2,7   | 11                              | 77.0         | 24    | 31.0 | 20    | 1  | 7   |
| WALES.   | Plinlimmon (Cwmsymlog)...  | 3.45        | ...                            | 1.40                       | 2     | 13                              | ...          | ...   | ...  | ...   | ...  | ... |
| WALES.   | Llandudno .....  | 1.35        | - .27                          | .50                        | 14    | 7                               | 75.2         | 11    | 40.0 | 3,7   | 0  | 0   |
| XII.     | Cargen [Dumfries] .....  | 3.62        | + 1.09                         | 1.09                       | 8     | 16                              | 73.8         | 23    | 30.0 | 7     | 1  | ... |
| XII.     | Hawick (Wilton Hill) .....   | ...         | ...                            | ...                        | ...   | ...                             | ...          | ...   | ...  | ...   | ...  | ... |
| XIV.     | Douglas Castle (Newmains)...   | 4.05        | + 1.71                         | .52                        | 8     | 19                              | ...          | ...   | ...  | ...   | ...  | ... |
| XV.      | Lochgilphead (Kilmory).....  | 5.07        | + 2.31                         | .92                        | 7     | 15                              | 78.0         | 23    | 28.0 | 6     | 1  | ... |
| XV.      | Oban (Craigvarren) .....   | 3.73        | ...                            | .65                        | 15    | 16                              | 73.0         | 24    | 35.0 | 7     | 0  | ... |
| XV.      | Mull (Quinish) .....   | 3.53        | ...                            | .42                        | 21    | 18                              | ...          | ...   | ...  | ...   | ...  | ... |
| XVI.     | Loch Leven Sluices .....   | 3.60        | + 1.31                         | .60                        | 2     | 13                              | ...          | ...   | ...  | ...   | ...  | ... |
| XVI.     | Arbroath .....   | 1.65        | - .12                          | .27                        | 8     | 12                              | 69.0         | 22    | 32.0 | 4     | 1  | ... |
| XVII.    | Braemar .....  | 1.80        | - .62                          | .56                        | 1     | 16                              | 71.8         | 23    | 26.0 | 4     | 4  | 14  |
| XVII.    | Aberdeen .....   | 1.42        | ...                            | .25                        | 14    | 13                              | 73.0         | 22    | 29.0 | 6     | 2  | ... |
| XVIII.   | Skye (Sligachan) .....   | ...         | ...                            | ...                        | ...   | ...                             | ...          | ...   | ...  | ...   | ...  | ... |
| XVIII.   | Culloden .....   | 1.82        | + .04                          | .49                        | 2     | 9                               | 71.0         | 23    | 30.0 | 7     | 1  | 11  |
| XIX.     | Dunrobin .....   | 2.74        | ...                            | .42                        | 2     | 12                              | 69.0         | 23    | 37.0 | 19d   | 0  | ... |
| XIX.     | Orkney (Sandwick).....   | 2.08        | + .21                          | .36                        | 17    | 17                              | 59.6         | 11    | 33.8 | 6     | 0  | 3   |
| XX.      | Cork (Blackrock) .....   | 1.70        | - .46                          | .55                        | 13    | 14                              | 79.0         | 24    | 35.0 | 17e   | 0  | 0   |
| XX.      | Dromore Castle .....   | 4.63        | ...                            | .81                        | 8     | 14                              | 71.0         | 27    | 35.0 | 20    | 0  | ... |
| XX.      | Waterford (Brook Lodge) ...  | 1.29        | ...                            | .51                        | 24    | 15                              | 73.5         | 24    | 33.0 | 19    | 0  | 4   |
| XX.      | Killaloe .....   | 3.21        | ...                            | .61                        | 8     | 16                              | 78.0         | 29b   | 34.0 | 18    | 0  | ... |
| XXI.     | Portarlinton .....   | 1.63        | - .22                          | .29                        | 25    | 18                              | 75.0         | 24    | 37.0 | 5     | 0  | ... |
| XXI.     | Dublin (FitzWilliam Square)  | 1.36        | - .36                          | .26                        | 14    | 16                              | 69.4         | 11    | 37.2 | 6     | 0  | 0   |
| XXII.    | Ballinasloe .....  | 3.22        | + .81                          | .82                        | 8     | 16                              | 69.0         | 24    | 35.0 | 6     | 0  | ... |
| XXI I    | Waringstown .....  | 2.36        | + .25                          | .38                        | 3,8   | 17                              | 76.0         | 24    | 32.0 | 2     | 1  | 5   |
| XXI I    | Londonderry (Creggan Res.)...  | 3.48        | ...                            | .90                        | 8     | 18                              | ...          | ...   | ...  | ...   | ...  | ... |
| XXI I    | Omagh (Edenfel) .....  | 3.50        | + 1.15                         | .65                        | 8     | 21                              | 69.0         | ...   | 37.0 | ...   | ...  | 0   |

+ Shows that the fall was above the average ; - that it was below it.  
a And 11. b And 30, 31. c And 21, 27. d And 21. e And 19.

METEOROLOGICAL NOTES ON MAY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGIS.—The continued dry weather forced on the wheat, and rain was badly needed at the end of the month. Lilac in flower on 1st, mountain ash on 6th, horse chestnut on 20th; corncrake heard on 1st, orange tip butterfly seen on 17th.

BANBURY.—Mean temp. of the month  $53^{\circ}3$ ; no R fell after the 14th, L on four days, H on three days, high wind on five days. The oak was in leaf much before the ash; whitethorn remarkably full of blossom.

CULFORD.—The month was remarkably dry, and R was much needed at the close.

LANGTON HERRING.—A fine, dry, warm month; the temp. generally was higher than that of any May of the preceding twelve. T and L on 24th.

BODMIN.—Mean temp. of the month  $56^{\circ}7$ .

WOOLSTASTON.—A dry month with much E. wind; mean temp.  $51^{\circ}5$ .

ORLETON.—A very dry and fine month; the rainfall was less than one-third of the average, and nearly all of it fell in the first week. There were great fluctuations of temp., but the mean was about  $1^{\circ}3$  above the average of 23 years; on 11th, 23rd and 24th the temp. rose higher than it did on any day during last year. There were many days of brilliant sunshine, and a few frosty nights. Distant T was heard on 5th and 19th, and L was seen on 19th and 24th. The wind was generally strong, and frequently very rough. Apple trees were generally in blossom before the middle of the month.

LEICESTER.—The month was dry, no R falling (except a slight shower on 19th) after the 15th, and at the close of the month all vegetation much needed it. N. or N.E. winds prevailed almost without intermission after the 18th.

KILLINGHOLME.—The latter part of the month was cloudy and cold, with steady polar wind. Strong lands, both pasture and arable, and gardens were suffering much from drought at the close of the month, there having been no previous frosts to pulverize the soil.

ARNCLIFFE.—The month was unusually dry, E. winds prevailing.

SEATHWAITE.—The first part of the month was wild and very wet; the latter part hot and dry. During the first 17 days R fell daily with two exceptions: there were seven falls exceeding 1 in. in 24 hours, H fell on three days, S on one day, and L was seen on one day.

WALES.

HAVERFORDWEST.—The weather during the first 16 days was variable, sometimes wet and often chilly and cold; the oak was in leaf on the 5th, the ash not until the 24th. On the whole the temp. of the month was rather above the average; on 17 days the temp. did not reach  $60^{\circ}$ , it rose above  $60^{\circ}$  on 11 days, and above  $70^{\circ}$  on three days. The rainfall was disastrously small. Prevailing winds N.W. and E.N.E.; from 17th to 23rd a strong polar current prevailed, with much bright sky and sharp white frosts. A TS occurred on the evening of the 24th, and a man and some cattle were killed by L in this county. Cuckoo heard on 5th; whitethorn in blossom on 26th, unusually early for this locality.

SCOTLAND.

CARGEN.—Wet and stormy up to the 17th, afterwards fine and dry, with prevailing E. winds; mean temp. about the average; duration of sunshine 23 hours less than the average. H on 2nd and 4th, L on 3rd and 5th, T on 5th and 19th.

CRAIGVARREN.—The month was dry and seasonable, and warmer than usual, in consequence trees and plants are more luxuriant than for many previous years, but grass is not so forward. There were two distinct periods of gales and rain, viz., from 1st to 3rd, and from 15th to 18th. T, L, and H on 1st.

ABERDEEN.—Weather very dry during the month ; rainfall nearly half an inch below the average.

CULLODEN.—The weather generally was cold, but the frosts were not severe enough to do any material damage.

SANDWICK.—The first seven days of May were cold with H and sleet showers, and Hoy Hill (1,500 feet) was white with S on 3rd ; it was generally wet till the 17th, but after that date little R fell, and the temp. being warmer vegetation made great progress.

#### IRELAND.

CORK.—The month for the most part was cold and ungenial ; dry weather and cold winds made vegetation very backward.

DROMORE CASTLE.—No storms ; vegetation good and crops very promising.

KILLALOE.—The first half of the month was chilly, showery, and gusty, but from the 16th to the close the weather was brilliant ; no frosts ; T on 17th.

DUBLIN.—In most respects this was a favourable month ; mean temp.  $52^{\circ} \cdot 5$ , rather above the average, but there was a prevalence of low temperatures at night. The rainy days were one more than the average ; there was no S or sleet, but H fell on six days ; distant T on two days ; L on 24th ; solar halos on 12th, 21st, and 23rd. Mean humidity 75 : mean amount of cloud  $5 \cdot 5$ .

EDENFEL.—The weather for the first fortnight was continuously wet, with strong westerly winds ; the remainder of the month was fine, the last week being clear and warm.

### HYDROLOGY AND HYDRO-GEOLOGY.

IN a review of the late General Belgrand's excellent work, *La Seine*, in *Met. Mag.*, Vol. viii. (1873), p. 91, we expressed surprise at his defining the word "hydrologiques" as a new word, and pointed out that Beardmore had issued his *Manual of Hydrology* eleven years before. General Belgrand then wrote, pointing out that he had used the word in 1846, in an article in the *Annales des ponts et chaussées*, entitled "*Etudes hydrologiques dans les granits, &c., du bassin de la Seine.*" Can any one quote an earlier use of the word ? It is quite clear that we were right in protesting against hydrology being regarded as a new word in 1873, for the above carries it back to 1846.

Hydro-geology is by many persons supposed to be a new term, but it is nearly a century old, as may be seen from the following title :—

"Lamarck, J. B. *Hydrogéologie ou Recherches sur l'influence qu'ont les eaux sur la surface du globe terrestre, &c.*, par J. B. Lamarck. 8vo. Paris, An. X. [1802]."

Lamarck's work, however, treats chiefly of the action of water on the surface—of subjects which, formerly were grouped as physical geography but, are now called physiographical, rather than of underground waters, to which the term hydro-geology has lately been applied.

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ON THE ABSENCE OF DEW BENEATH A CLOUDLESS  
NOCTURNAL SKY.

By CHARLES TOMLINSON, F.R.S.

MANY of the most striking phenomena of Nature had been accurately observed long before they were generalized or reduced to law. Thus the ancients noticed that dew is formed abundantly on clear moonlight nights, and they attributed its formation to the action of the moon, naming that luminary *rorifera luna*, or dew-making moon. There is also a beautiful passage in Tasso's *Gerusalemme* (VI. 103), which embodies a similar idea, namely, that the moon produces the cold.

*Era la notte, e'l suo stellato velo  
Chiaro spiegava, e senza nube alcuna:  
E già spargea rai luminosi, e gelo  
Di vive perle la sorgente Luna.*

Which may be thus closely translated :

It was the Night, and she, her starry veil  
Unfolded clearly in the cloudless air ;  
The rising Moon now shed her radiance pale,  
And frost of living pearls was scattering there.

The nocturnal formation of dew during warm dry weather is so necessary to the well-being of vegetable life, that the absence of it during periods of drought is attended with loss and inconvenience.

Such occasions must be comparatively rare, I suppose, in this country ; but some years ago, in the month of August, I paid a visit to my late brother-in-law, the Rev. H. Windsor, at his Vicarage, at Kensworth, near Dunstable, during a time of severe drought. There had been no rain for some weeks, and the usual prayer for rain had been offered up in the church.

The Vicarage is situate on clay at the edge of a valley of denudation, extending east and west. The lowest part of the valley consists

of gravel on chalk ; on the south flank, clay with veins of gravel ; and on the north, clay and chalk. The width of the valley is about 360 yards.

Three sets of observations were made with thermometers resting on the ground, and suspended  $3\frac{1}{2}$  feet in the air. The first set, A, was in the Vicarage field, where the grass was much burnt up ; the second set, B, at the lowest point of the valley, amidst scanty clover and dry, withered vegetation ; the third set, C, was in the Vicarage kitchen-garden.

In A, at 2 p.m., the upper thermometer reading was  $82^{\circ}$  F, and the lower  $115^{\circ}$ . At 10 p.m. the readings were  $48^{\circ}$  and  $42^{\circ}$ , with no appearance of dew on the ground, and a clear, calm sky above.

The observations, B, in the valley may be given more in detail :—

|                   | 3½ ft. above ground.          | On ground.            |
|-------------------|-------------------------------|-----------------------|
| 11th August.      |                               |                       |
| Sun on—11.30 a.m. | ..... $69\frac{1}{2}^{\circ}$ | ..... $82^{\circ}$    |
| 1 p.m.            | ..... 75                      | ..... 96              |
| 4                 | ..... 72                      | ..... 90              |
| 5                 | ..... 68                      | ..... $75\frac{1}{2}$ |
| 6                 | ..... 62                      | ..... $62\frac{1}{2}$ |
| 7                 | ..... 55                      | ..... 53              |
| Sunset—7.30       | ..... 49                      | ..... 48              |
| Clear sky—7.45    | ..... 47                      | ..... 46              |
| 8                 | ..... $48\frac{1}{2}$         | ..... 45              |
| 8.30              | ..... 45                      | ..... 42              |
| 9                 | ..... 42                      | ..... 42              |
| 10                | ..... 41                      | ..... 39              |

The observations, C, call for no particular remark. At 10 p.m. the readings were  $47^{\circ}$  and  $44^{\circ}$ .

On the 12th August, the readings at B in the valley were taken every quarter of an hour from 7 to 9 p.m., as follows :—

|                | 3½ ft. above ground.  | On ground.            |
|----------------|-----------------------|-----------------------|
| Sunset— 7 p.m. | ..... $68^{\circ}$    | ..... $66^{\circ}$    |
| .15            | ..... 66              | ..... 63              |
| .30            | ..... $63\frac{1}{2}$ | ..... $60\frac{1}{2}$ |
| .45            | ..... $61\frac{1}{4}$ | ..... $57\frac{1}{2}$ |
| 8              | ..... $58\frac{1}{2}$ | ..... 56              |
| .15            | ..... 56              | ..... 55              |
| .30            | ..... $54\frac{1}{2}$ | ..... 54              |
| .45            | ..... $53\frac{1}{2}$ | ..... $53\frac{1}{2}$ |
| 9              | ..... $52\frac{1}{2}$ | ..... 52              |

On crossing the fields at 10 p.m. there was a bright moon in the south, and a cloudless sky, as it had been for some hours, but there was no trace of dew. The grass in a meadow on the opposite side of the valley was quite dry to the touch on sweeping the hand over it ; the turnips and clover in the valley were singularly cold to the touch, but not at all wet or even moist. In the Vicarage field the grass was not so much burnt as on the opposite side, but there was no trace of wet. The hand swept over it imparted a keen sense of cold, but not of moisture.

On the 15th, a very curious observation was made on a grass plot near the house surrounded by trees. In the evening, after the sun

had been off the plot for some hours, the grass was still warmer than the air, the readings being  $64^{\circ}$  and  $60^{\circ}$ .

On the 16th August, at 7.40 p.m., the readings were  $58^{\circ}$  and  $56^{\circ}$ . There were two ground thermometers—one on a growing turnip leaf, and another on the mould by the side, but both read  $56^{\circ}$ . The ground was warm to the touch, but the turnip leaf uncomfortably cold: no moisture was perceptible. At 7.50 the three readings were

$57^{\circ}$                        $55^{\circ}$                        $55^{\circ}$

The leaves of the turnips (swedes) were so cold and clammy, that it was difficult to persuade one's self that they were not wet; but the feeling of moisture proceeded probably from the warm hand. Next morning the register left on the mould marked  $50^{\circ}$ , and a few scanty beads of dew were noticed on the turnip leaves.

It should be remarked that in a miniature glade of grass, formed by a few trees, the grass had maintained its freshness, and had traces of scanty dew late at night.

On the 17th, the readings in the valley, at 8 p.m., were  $48^{\circ}$  and  $46^{\circ}$ ; and next morning scanty beads of dew, formed doubtless some hours later, were observed on the swedes.

During these observations the greatest difference between the dry and wet bulbs was  $11^{\circ}$ , viz.,  $75^{\circ}$  and  $64^{\circ}$ , corresponding to 4.9 grains of vapour in a cubic foot of air.

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### ROYAL METEOROLOGICAL SOCIETY.

THE concluding monthly meeting of this Society for the present Session was held on Wednesday evening, the 18th inst., at the Institution of Civil Engineers; Mr. R. H. Scott, F.R.S., President, in the chair. Dr. Benjamin A. Gould, Director of the Cordova Observatory, Argentine Republic, was elected an honorary member. The following papers were read:—

(1.) "The Equinoctial Gales—Do they occur in the British Isles?" By Mr. R. H. Scott, F.R.S. The period investigated was the fourteen years 1870–84, and only those storms were selected which had attained force 9 of the Beaufort scale at more than two stations. The results show that the storms are all but exclusively confined to the winter half-year; and also that, for a certain interval, the stream of storm depressions sets over the British Isles, and then for a time takes another path, leaving this country at rest. In some years there are as many as four or five storms in a fortnight; and in others, there are none, or only one. It is further shown that there is no strongly-marked maximum at either equinox.

(2.) "On the physical significance of concave and convex barographic or thermographic traces." By the Hon. R. Abercromby, F.R. Met. Soc. The author shows that a falling barogram is convex when the rate of the fall is increasing, concave when decreasing;

and conversely, that a rising barogram is convex when the rate is decreasing, concave when increasing. As the rate of barometric change is proportional to the steepness of the gradients which are passing, and the wind also depends on the gradients, the author suggests the following rules for judging the coming force of a gale, from the inspection of a barogram :—A convex barogram is always bad, with a falling barometer, and good with a rising one ; and a concave trace is sometimes a good sign with a falling barometer, and not always a bad indication with a rising one. The convexity or concavity of a thermogram is likewise shown to depend on the rate of thermal change. A method is given by which the distribution of diurnal isothermals over the globe can be deduced from the diurnal thermograms in different latitudes ; and it is shown that the shape of diurnal isotherms on a Mercator chart, for a limited number of degrees of latitude, is similar to the shape of the curve of diurnal temperature range, if we turn time into longitude, and temperature into latitude, on a suitable scale.

(3.) "Maritime losses and casualties for 1883, considered in connection with the weather." By Mr. C. Harding, F.R. Met. Soc.

(4.) "The Helm Wind." By the Rev. J. Brunskill, F.R. Met. Soc. This is an account of a wind peculiar to the Crossfell range ; and its presence is indicated by a belt of clouds, denominated the "helm," which settles like a helmet over the top of the mountain, and a "helm bar," which forms a line parallel therewith.

(5.) "Climate of the Delta of Egypt in 1798 to 1802 during the French and British Campaigns." By Surgeon-Major W. T. Black, F.R. Met. Soc. The author has collected and discussed the meteorological observations made in Egypt during the French and British Campaigns at the beginning of the present century.

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On the previous evening (Tuesday), a large number of the Fellows dined together at the Holborn Restaurant to commemorate the favour recently granted by Her Majesty the Queen of according to the Society permission to adopt the prefix "Royal." Mr. R. H. Scott, F.R.S., the President, occupied the chair, and gave the toast of the "Queen and Royal Family." Dr. R. J. Mann proposed "The Royal Meteorological Society," to which Mr. G. J. Symons, F.R.S. (Secretary), responded. Mr. P. Phipps, M.P., gave the health of the "President," to which Mr. Scott replied. The remaining toasts were "The Officers of the Council," proposed by Mr. H. S. Eaton, and responded to by Dr. Tripe (Secretary) ; "The Visitors," proposed by Mr. J. K. Laughton, coupled with the name of Mr. R. McLachlan, F.R.S., and the "Lady Fellows of the Society," proposed by Prof. E. D. Archibald, and acknowledged by Mr. H. Perigal (Treasurer).

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## ON HYGROMETRY.

By M. JULES JAMIN.

[WE are indebted to Mr. R. H. Scott for calling attention to a very important memoir on the above subject by the eminent French physicist, M. Jules Jamin, and also for the loan of the "*Comptes Rendus*" for June 30th, 1884, in which it is published. We at present limit ourselves to printing a translation *in extenso*.—ED.]

M. Mascart publishes annually in the *Annales du Bureau Météorologique de France* the observations made at nearly a hundred stations spread over the whole country, and the same is done by every state in Europe. These documents are precious stores of meteorological facts whence every one can draw. I have already extracted the pressure of the layer of atmosphere between the base and the summit of the Puy de Dôme; I am now going to make some general remarks upon hygrometry.

On looking over the table of relative humidity, one is astonished at its uniformity. The means for all months, and for all seasons, are nearly alike. Thus we have for Clermont Ferrand for noon during 1880—

| Feb. | June. | Aug. | Sept. | Oct. |
|------|-------|------|-------|------|
| 593  | 599   | 570  | 569   | 622. |

It is obvious that there must be great differences between the hygrometric condition of the air in February and in August; therefore if the tables do not show much difference it is probable that the system of reduction is faulty.

This system consists in expressing the relation  $\frac{f}{F}$  of the observed elastic force  $f$ , to the maximum force  $F$ , which the vapour would have at the same temperature if the air were saturated; this is known as relative humidity. Now for a given air, of permanent composition, the quotient  $\frac{f}{F}$  varies, (1) with the proportion of vapour; (2), with the altitude and barometric pressure, since  $f$  is proportional to this pressure; (3) and chiefly with the temperature which changes the value of  $F$ ; it is therefore a function of three independent variables, it is especially a function of  $t$ , and one cannot hope that it will render evident variations in the quantity of vapour. In order to recognize them it is necessary to eliminate the disturbing influences of pressure of altitude and of temperature, but that is easily done.

When chemists are analyzing air, they determine the proportions of oxygen, nitrogen, and carbonic acid; to be logical they should add the proportion of watery vapour. Since this vapour is a gas obeying the same laws as other gases, with reference to expansion and contraction, there is no reason for measuring it differently.

Let  $f^*$  be the vapour tension,  $H$  the total atmospheric pressure,  $H-f$  that of dry air we have—

$$\text{Weight of vapour ... } P = \frac{v (1 \text{ gr. } 293) (0.622) f}{(1 + ar) 760.}$$

$$\text{Weight of dry air ... } P' = \frac{v (1 \text{ gr. } 293) (H-f)}{1 + at 760.}$$

$$\frac{P}{P'} = 0.622 \frac{f}{H-f}$$

$\frac{P}{P'}$  is then the relation of the weight of vapour to that of dry air, it is independent of pressure and temperature, since  $f$  and  $H-f$  follow the same laws, it varies only with the proportion of vapour and measures it; it expresses *hygrometric richness* in weight, and  $\frac{f}{H-f}$  measures its volume.

It must be noticed that observations do not give directly the relation usually preserved,  $\frac{f}{F}$ . In fact the condensation hygrometer measures  $f$ , which is a function of the pressure and therefore of the altitude; the dry and wet bulb hygrometer determines  $\frac{F-f}{H}$ ; but a calculation has to be made in order to pass from the facts observed, and which may then be forgotten, to the function  $\frac{f}{F}$ , the only thing which is preserved; but the introduction of  $F$  brings in the variations due to temperature which cover the influence of vapour and complicate the result. It would not be more difficult to calculate  $\frac{f}{H-f}$  and to keep it only for calculation, preserving only  $\frac{f}{F}$ ; one would thus replace a complex function, which teaches nothing, by the precise weight or volume of the hygrometric component of the atmosphere.

I therefore propose that in meteorological tables *relative humidity*,  $\frac{f}{F}$ , should be replaced by *hygrometric richness*  $\frac{f}{H-f}$ .

In order to justify this proposal, I will give you one example. I select the measures made at Clermont Ferrand in 1880, by M. Alluard, and published in the *Annales Météorologiques*. No very marked differences are to be found in the different months; the values decrease from morning up to 3 p.m., which (as M. Angot has shown) proves the influence of temperature, but there is no evidence of changes of humidity.

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\* To avoid confusion we have adopted M. Jamin's notation, and left the formulæ unconverted, *i.e.*, in metric units.

CLERMONT—Relative Humidity.

|                 | 6 a.m. | 9 a.m. | Noon. | 3 p.m. | 6 p.m. | 9 p.m. |
|-----------------|--------|--------|-------|--------|--------|--------|
| Janvier .....   | 85·3   | 89·6   | 79·5  | 79·5   | 89·6   | 90·3   |
| Février .....   | 80·4   | 71·6   | 59·2  | 54·7   | 74·3   | 77·7   |
| Mars .....      | 83·9   | 59·8   | 68·3  | 39·0   | 52·6   | 69·5   |
| Avril .....     | 81·9   | 71·6   | 63·7  | 61·5   | 71·5   | 76·6   |
| Mai .....       | 75·9   | 58·7   | 49·3  | 49·3   | 54·7   | 70·8   |
| Juin .....      | 82·5   | 64·4   | 58·9  | 58·1   | 65·2   | 81·2   |
| Juillet .....   | 79·8   | 60·1   | 48·0  | 47·4   | 57·5   | 79·3   |
| Août .....      | 86·9   | 66·2   | 57·0  | 57·9   | 71·6   | 83·8   |
| Septembre ..... | 88·6   | 67·9   | 56·9  | 55·1   | 73·3   | 83·4   |
| Octobre .....   | 84·9   | 74·2   | 62·9  | 62·2   | 78·7   | 85·5   |
| Novembre .....  | 88·2   | 80·8   | 70·4  | 73·0   | 82·6   | 85·4   |
| Décembre .....  | 81·7   | 77·2   | 70·8  | 69·7   | 79·1   | 82·6   |

The following is the same table modified by the substitution of  $\frac{f}{H-f}$  for  $\frac{f}{F}$ . To avoid decimals the results have been multiplied by 100,000.

[With every respect for M. Jamin, we are bound to point out that the following is *not* the same table. The former gives the observations at only Clermont Ferrand, *i.e.*, at the base of the mountain ; the following table gives both the Clermont Ferrand values (called the Plain), and those for the Puy de Dôme (called the Summit).—ED. M. M.]

|                 |              | 6 a.m. | 9 a.m. | Noon. | 3 p.m. | 6 p.m. | 9 p.m. | $\frac{F}{H-F}$ |
|-----------------|--------------|--------|--------|-------|--------|--------|--------|-----------------|
| Janvier .....   | Plaine ..... | 410    | 444    | 526   | 560    | 500    | 459    | 380             |
|                 | Sommet ..... | 473    | 395    | 439   | 458    | 437    | 446    | 514             |
| Février .....   | Plaine ..... | 606    | 660    | 727   | 715    | 727    | 696    | 646             |
|                 | Sommet ..... | 609    | 607    | 671   | 657    | 626    | 626    | 617             |
| Mars .....      | Plaine ..... | 635    | 776    | 862   | 749    | 795    | 814    | 666             |
|                 | Sommet ..... | 663    | 676    | 715   | 733    | 712    | 688    | 779             |
| Avril .....     | Plaine ..... | 842    | 932    | 946   | 945    | 967    | 898    | 876             |
|                 | Sommet ..... | 740    | 756    | 791   | 807    | 775    | 535    | 687             |
| Mai .....       | Plaine ..... | 981    | 1019   | 1001  | 1012   | 979    | 969    | 917             |
|                 | Sommet ..... | 831    | 868    | 877   | 883    | 868    | 830    | 823             |
| Juin .....      | Plaine ..... | 1249   | 1268   | 1291  | 1270   | 1278   | 1497   | 1106            |
|                 | Sommet ..... | 973    | 1036   | 1099  | 1130   | 1094   | 1023   | 944             |
| Juillet .....   | Plaine ..... | 1534   | 1607   | 1566  | 1567   | 1668   | 1599   | 1377            |
|                 | Sommet ..... | 1240   | 1304   | 1384  | 1427   | 1402   | 1380   | 1354            |
| Août .....      | Plaine ..... | 1482   | 1588   | 1581  | 1611   | 1808   | 1663   | 1318            |
|                 | Sommet ..... | 1267   | 1348   | 1383  | 1428   | 1426   | 1452   | 1250            |
| Septembre ..... | Plaine ..... | 1269   | 1472   | 1460  | 1435   | 1499   | 1418   | 1137            |
|                 | Sommet ..... | 1129   | 1173   | 1128  | 1264   | 1275   | 1263   | 1125            |
| Octobre .....   | Plaine ..... | 1092   | 1109   | 1108  | 1125   | 1139   | 1115   | 946             |
|                 | Sommet ..... | 900    | 896    | 945   | 981    | 985    | 810    | 926             |
| Novembre .....  | Plaine ..... | 674    | 719    | 770   | 783    | 727    | 714    | 649             |
|                 | Sommet ..... | 627    | 618    | 650   | 650    | 639    | 630    | 599             |
| Décembre .....  | Plaine ..... | 644    | 715    | 832   | 930    | 812    | 816    | 765             |
|                 | Sommet ..... | 658    | 669    | 702   | 724    | 699    | 663    | 665             |

We see immediately from this last table—

- (1). That hygrometric richness increases from morning till noon, or 3 p.m., and afterwards decreases as the sun descends, and during the night; this is due to two causes, to evaporation during the day, and to the expansion of the atmosphere.
- (2). That the richness increases from January to July or August, and then decreases; that it varies from 0.005 to 0.018, that is to say that it is three or four times greater in summer than in winter. We find also that it increases in hot countries, and is even greater at Laghouat than at Marseilles; hence we must conclude with M. Dove that there is less dry air in summer than in winter in the northern hemisphere.
- (3). The hygrometric capacity of the air, that is to say the maximum of vapour which it can contain, is expressed by  $\frac{F}{H-F}$ . Now temperature and  $F$  decrease with elevation; on the other hand  $H$  decreases equally [? Ed.]. These are two inverse causes of variation; experience shows that the capacity decreases but very slowly. Similarly the richness is always rather less at the summit of the Puy de Dôme than at its base.
- (4). The last column of the table measures the total capacity during the night during the period of lowest temperature. It is generally greater than the richness at 6 a.m., but not always, whence we may conclude that the air is saturated at all heights when the temperature is at its minimum. This explains all the condensations of vapour which generally take place at night.

To sum up; the values of  $\frac{f}{F}$  only teach us the degree of dryness or relative humidity; they do not measure the quantity of vapour.

On the contrary, the relation  $\frac{f}{H-f}$  measures the hygrometric composition of the air, and brings out the changes produced by day, night, summer and winter, at various altitudes and latitudes.

This is why, I repeat, that it would be well to suppress the values of  $\frac{f}{F}$  and to substitute for them  $\frac{f}{H-f}$ . M. Mascart and M. Angot have been good enough to undertake the calculations which this will involve, and the results will be published in the *Annales du Bureau Central Météorologique*, after having been communicated to the Academy.

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REMARKABLE RAIN.

*To the Editor of the Meteorological Magazine.*

SIR,—The rainfall of Saturday night and Sunday morning, the 28th and 29th of June, must be reckoned among the heaviest falls that have been observed here. Between 10.30 p.m. on Saturday, and 9 a.m. on Sunday, there fell no less than 2.44 inches. The temperature on Saturday reached a maximum of 85°. The movements of the barometer were comparatively trifling, the total fall between 9 a.m. on Saturday and 9 a.m. on Sunday being about 15 hundredths of an inch. The rain fell in very heavy storms, and was accompanied with a good deal of lightning and thunder.

The following are the most remarkable falls of rain previously recorded here :—

On March 11–13, 1859, 3.04 inches fell in 48 hours.

On August 6, 1865, 2.68 inches fell in 24 hours, and of this about 2¼ inches fell within four hours.

On July 14–15, 1875, 3.08 inches fell in 38 hours, and about 2.9 inches in 24 hours.

On October 21–24, 1882, about 3.7 inches fell within an interval of 60 hours.

GEORGE F. BURDER.

*Clifton, June 30th, 1884.*

HYDROLOGY.

*To the Editor of the Meteorological Magazine.*

SIR,—The word “hydrology” was used in the last century, for J. G. Wallerius published at Stockholm, in 1748, a work entitled *Hydrologia, eller Beskrifning af Vatten Riket*. See Poggendorff, *Biog.-lit. Handwörterbuch*, t. II., p. 1252.—Yours faithfully,

A. LANCASTER.

*Bruxelles, June 26th, 1884.*

[Our Belgian friends are always to the front in bibliographical matters, and M. Lancaster in the above note carries the employment of the word back nearly a century. We have never seen the above work, and it does not appear in any printed catalogue in our possession. We cannot recollect whether or not it is in the MS. catalogue sent to the United States Signal Office, and the only reference to it in our own MS. catalogue is the apparently incomplete one :—

WALLERIUS, J. G.—*Hydrologia, eller Watturiket, Stockholm, 1748.*

There seem to be three editions of it, for M. Lancaster quotes the title in Danish, and the following extract from the Royal Society Catalogue implies that it was printed in German and translated into French :—

WALLERIUS, Johan Gotsch. — *Minéralogie, ou description du Règne Mineral. Ouvrage traduit de l'Allemand. Tome 2. [Minéralogie with Supplement and Hydrologie.] 2 parts in 1 vol. 8vo, Paris, 1753–59.—ED.]*

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DEC., 1883.

| STATIONS.<br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain.   |       | Aver.<br>Cloud. |
|--|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|---------------|-------|-----------------|
|  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.        | Days. |                 |
|  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                |               |       |                 |
| England, London .....  | 54·9      | 13    | 28·3     | 7     | 44·9     | 36·4 | 36·6       | 89        | 72·3         | 23·7           | inches<br>·75 | 14    | 7·4             |
| Malta .....  | 68·5      | 9     | 42·8     | 27    | 60·4     | 50·9 | 46·5       | 74        | 110·2        | 36·5           | 4·08          | 12    | 4·8             |
| <i>Cape of Good Hope</i> .....                                   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...           | ...   | ...             |
| <i>Mauritius</i> .....   | 85·0      | 5     | 64·8     | 15    | 82·2     | 72·5 | 68·3       | 76        | 137·6        | 55·8           | 4·02          | 13    | 6·3             |
| Calcutta .....   | 78·8      | 3     | 46·7     | 24    | 73·2     | 53·9 | 53·1       | 73        | 136·5        | 36·6           | 2·54          | 2     | 2·0             |
| Bombay .....   | 85·6      | 11    | 63·0     | 17    | 82·6     | 66·5 | 59·5       | 61        | 136·5        | 46·2           | ·00           | 0     | 1·6             |
| Ceylon, Colombo .....  | 86·2      | 5     | 68·1     | 29    | 84·6     | 71·6 | 68·6       | 73        | 146·5        | 63·0           | 7·32          | 8     | 7·5             |
| <i>Melbourne</i> .....   | 99·3      | 29    | 46·2     | 4     | 74·7     | 54·0 | 48·8       | 61        | 157·0        | 36·0           | 1·60          | 12    | 5·9             |
| <i>Adelaide</i> .....  | 100·0     | 28    | 49·5     | 25    | 80·7     | 58·7 | 49·0       | 48        | 158·9        | 40·4           | ·90           | 10    | 3·4             |
| <i>Wellington</i> .....  | 72·3      | 18    | 43·3     | 10    | 64·0     | 50·9 | ...        | ...       | 140·0        | 40·0           | 3·53          | 12    | ...             |
| <i>Auckland</i> .....  | 76·0      | 28    | 50·0     | 30    | 67·3     | 56·4 | 52·6       | 72        | 147·0        | 42·0           | 4·33          | 19    | 6·9             |
| <i>Falkland Isles</i> .....                                      | 60·8      | 9     | 32·1     | 21    | 51·0     | 38·7 | 38·9       | 75        | ...          | ...            | 3·18          | 21    | 6·8             |
| Jamaica .....  | 89·8      | 19    | 63·6     | 10    | 85·6     | 68·3 | 67·9       | 78        | ...          | 56·3           | ·17           | ...   | 4·7             |
| Barbados .....   | 81·0      | 1*    | 69·0     | var.  | 79·0     | 71·0 | 73·0       | 86        | 143·0        | 65·0           | 5·48          | 17    | 6·0             |
| Toronto .....  | 48·7      | 12    | —4·0     | 23    | 33·1     | 18·5 | 24·0       | 82        | 97·0         | —10·0          | 1·46          | 22    | 8·1             |
| New Brunswick,<br>Fredericton .....                              | 43·9      | 8     | 24·0     | 23    | 29·3     | 5·6  | 16·5       | 88        | ...          | ...            | 3·34          | 17    | 6·3             |
| Manitoba, St. Andrews  | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...           | ...   | ...             |
| British Columbia, Yale   | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...           | ...   | ...             |

\* And 10 and 11.

## REMARKS, DECEMBER, 1883.

**MALTA.**—Violent gale on 13th; from noon to 3 p.m. the wind maintained a velocity of 45 miles an hour, and in a violent gust part of a stone wall was thrown down; Mean temp. 55°·0; temp. of sea ranged from 67° to 61°; mean hourly velocity of wind 11·9.

J. SCOLES.

**Mauritius.**—Rainfall 1·96 in., and mean temp. 0°·5 below average; mean hourly velocity of wind 10·6 miles, extremes 50 miles and 0 miles, direction S.E. to N.E. L on 4 days, T and L on 3 days. Unusual sunsets and sunrises were observed more or less during the whole month, but not so intense as in September and October. Generally there were two red glows. The first commenced at 14m. after sunset, and lasted about 24m., and the second commenced at 38 m. after sunset, and lasted till 1h. 17m. after sunset. In the mornings the first red glow began about 1h. 26m. before sunrise. All the prismatic colours were observed, especially on December 8th and 10th. By January 28th, the phenomenon had nearly disappeared, the principal and almost only colours being yellow and orange. The secondary illumination had ceased.

C. MELDRUM, F.R.S.

**Ceylon.**—Thunder on 4 days.

J. H. SYMONDS.

**Melbourne.**—Mean temp., pressure, and humidity all about the average; rainfall 79 in., and temp. of dew point 1°·5 below the average; prevailing winds S. and W.; strong breezes on 9 days; heavy dust storm on 5th; hot wind on 29th; T and L on 3 days, and T or L alone on 4 other days.

R. L. J. ELLERY, F.R.S.

**Adelaide.**—An unusually low bar. reading occurred on 11th, accompanied by a dust storm (believed to be the heaviest since 1851), and followed in the evening by a heavy TS with destructive H; the mean temp. (69°·7) was 1°·3 below the average, and the max. was unusually low. The average amount of cloud was slightly below the average, but the rainfall and wet days were rather in excess.

C. TODD.

**Wellington.**—Up to the 19th it was generally fine, but at times dull, and there was some strong wind; the 10th and 11th were stormy, and after the 19th the weather was showery, squally, and unpleasant; mean temp. 3°·7 below the average, rainfall slightly below it.

R. B. GORE.

*Auckland.*—Weather on the whole cold, wet, and unseasonable; pressure and temp. considerably below the average; rainfall largely in excess.—T. F. CHEESEMAN.

*Falkland Isles.*—Snow fell for several hours on 21st, a most unusual occurrence.

F. E. COBB.

BARBADOS.—Mean temp. (75°·0) the same as the 23 years average; wind from N. E. all the month but two days; mean hourly velocity 11 miles, extremes 20 miles and 2 miles; rainfall and evaporation very near the average.

R. BOWIE WALCOTT.

## SEVERE THUNDERSTORMS.

*To the Editor of the Meteorological Magazine.*

SIR,—The violent thunderstorms of the past ten days have done immense mischief in this neighbourhood, and the local newspapers are full of records of casualties and accidents of different descriptions, which it would be impossible to enumerate in your pages.

When I mention that on Friday, the 4th inst., I calculated that upwards of two hundred flashes struck objects within five hundred yards of this house, and that in my own small garden, which, inclusive of my house, occupies scarcely one acre of ground, two flashes have, during the series of storms, struck and injured the trees, you will admit that the bombardment was somewhat hot.

On the 4th inst., at 1.30 p.m., a thunderstorm slowly formed in south-west by south. The sky shortly afterwards became one of remarkable grandeur. The Cirrus, pouring off the summit of the storm, spread in the form of a half-open fan, far past the zenith to the north-north-east, the ice-cloud hanging in dense tubercles. That the altitude of these tubercles was upwards of five miles could be ascertained, when the storm was about four miles distant by the time interval of the thunder. The flashes were not then too numerous to admit of this calculation. The thunder after each flash was first heard in the direction of the storm, then rolled through the zenith, and was last heard in the direction of the clear sky in the north-north-east. From the duration of the claps, as well as from other data, it is certain that the fan-shaped conducting cloud extended for a distance of more than fourteen miles in front of the storm.

The storm, which occupied the centre or apex of the fan, increased enormously in intensity, and by the time it had reached this place the flashes were unusually frequent, sometimes three, and at one time four occurring in a second. A light Easterly breeze, which had prevailed before the storm, gave way, as usual, to a strong South-West squall during its passage, but returned, soon after the storm had passed to the North-Eastward.

One episode, which occurred while the storm was at its height, is perhaps worth mentioning. A flash just missed my kitchen-chimney and struck an elm-tree in the kitchen-garden, twenty-five yards from the house. From this it passed through the boughs to another tree, down which it stripped the bark, until it arrived opposite the wet thatch of a cowshed, through which it passed to the ground. Two cows belonging to me were in the shed at the time, fastened by iron chains round their necks. One of the animals escaped uninjured, the other was knocked down senseless. I had her dragged out into

the meadow, where, as soon as the storm had cleared, she was surrounded by a ring of agriculturists and members of the grazing interest. Each of these proposed a different remedy, but all agreed that death was in any case inevitable, for the all-sufficient reason that, though they had all seen animals killed, they had never previously happened to see one only paralysed, by lightning. Three-quarters of an hour after the accident, the cow got up and walked about, though with stiff limbs and neck.

On the 8th inst., another severe thunderstorm arose from the same quarter, under similar meteorological conditions, and passed over this village at the same hour, 3.30 p.m., the cannonade being again very close.

On the 9th, incessant thunder commenced in the east-south-east, at 1.30 p.m., and soon after in the S.E. and S. The part of this storm which was in south-south-east came over this place at 3.30, and was most exceptionally severe. The nearest flash struck a large elm in my carriage drive, passing into my front gate, which is of iron, and hurling pieces of bark nearly to the front door, as well as against some houses on the other side of the road.

All the storms of this period were preceded by the "Turret-cloud," which I have described in *Modern Meteorology*, p. 131-133.—Yours very truly,

W. CLEMENT LEY.

*Ashby Parva, Lutterworth, July 13th.*

[We shall be glad of newspaper and other reports of damage by these storms.—ED.]

### A HEAVY INDIAN RAINFALL.

*To the Editor of the Meteorological Magazine.*

SIR,—I may mention that twenty years ago I was well acquainted with the locality in India where the great fall of rain, recorded at page 76 of your last number took place; and that very soon after the line of rail was opened from Bosawul for a few miles towards Jubbulpoor, a similar fall of rain took place, which carried away a bridge, and part of a village, which had stood in the same spot above a century. The train coming up soon after the catastrophe, was precipitated into the torrent, and all (I think) were lost, including Holkar's minister. My impression is that this took place at the Sookee Nullah, which is mentioned at page 76; at all events, it was not many miles from Bosawul, for the line was then open for only about 30 miles above that junction. Exact information could be given of this by the Company.

There was also a similar fall about 100 miles higher up the line, about the same time, which carried away the Towah bridge in its early stages, when that river rose in the gorge about 90 feet in a few hours.

But such storms are rare. Personally I never recorded, or saw recorded above some seven inches of rain in that part of India in 24 hours, during several years of residence there in the Forest department.—Your obedient Servant,

C. PEARSON, LIEUT.-COL.

*Downton, Kington, New Radnor.*

SUPPLEMENTARY TABLE OF RAINFALL,  
JUNE, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | 1·99        | XI.    | Carno, Tybrith .....     | 1·40        |
| "     | Margate, Birchington...   | ·71         | "      | Corwen, Rhug .....       | 1·89        |
| "     | Littlehampton .....       | 1·15        | "      | Port Madoc .....         | 1·43        |
| "     | Hailsham .....            | 2·44        | "      | I. of Man, Douglas ..... | ·69         |
| "     | I. of W., St. Lawrence.   | 2·00        | XII.   | Stoneykirk, Ardwell Ho.  | ·55         |
| "     | Alton, Ashdell .....      | 2·00        | "      | Melrose, Abbey Gate ...  | ·88         |
| III.  | Winslow, Addington ...    | 1·32        | XIII.  | N. Esk Res. [Penicuik]   | 1·45        |
| "     | Oxford, Magdalen Col...   | 2·05        | XIV.   | Ayr, Cassillis House ... | ·98         |
| "     | Northampton .....         | ·66         | "      | Glasgow, Queen's Park.   | ·77         |
| "     | Cambridge, Beech Ho...    | 1·19        | XV.    | Islay, Gruinart School.. | ·71         |
| IV.   | Southend .....            | 1·21        | XVI.   | St. Andrews, Newton Bk   | ·40         |
| "     | Harlow, Sheering ... ..   | 1·67        | "      | Balquhider, Stronvar..   | 1·69        |
| "     | Diss .....                | ·95         | "      | Dunkeld, Inver Braan..   | ·39         |
| "     | Swaffham .....            | ·99         | "      | Dalnaspidal H.R.S. ...   | 1·17        |
| "     | Hindringham .....         | ...         | XVII.  | Keith H.R.S. ....        | 2·07        |
| V.    | Salisbury, Alderbury ...  | 2·86        | "      | Forres H.R.S. ....       | 1·04        |
| "     | Warminster .....          | 3·90        | XVIII. | Strome Ferry H.R.S....   | 3·13        |
| "     | Calne, Compton Bassett    | 2·75        | "      | Lochbroom .....          | 1·60        |
| "     | Ashburton, Holne Vic...   | 1·07        | "      | Tain, Springfield .....  | ·92         |
| "     | Holsworthy, Clawton...    | 1·67        | "      | Loch Shiel, Glenaladale  | 4·42        |
| "     | Lynmouth, Glenthorne.     | 2·02        | "      | Invergarry .....         | 1·47        |
| "     | Probus, Lamellyn .....    | 2·34        | XIX.   | Lairg H.R.S. ....        | ...         |
| "     | Wincanton, Stowell Rec.   | 2·94        | "      | Forsinard H.R.S. ....    | 1·38        |
| "     | Taunton, Fullands .....   | 2·42        | "      | Watten H.R.S. ....       | 1·29        |
| VI.   | Bristol, Clifton .....    | 3·87        | XX.    | Dunmanway, Coolkelure    | ·95         |
| "     | Ross .....                | 4·05        | "      | Fermoy, Gas Works ...    | 1·70        |
| "     | Wem, Sansaw Hall .....    | ...         | "      | Tralee, Castlemorris ... | 1·26        |
| "     | Cheadle, The Heath Ho.    | 2·06        | "      | Tipperary, Henry Street  | ·55         |
| "     | Worcester, Diglis Lock    | 2·74        | "      | Newcastle West .....     | ·60         |
| "     | Coventry, Coundon .....   | 2·15        | "      | Milton Malbay .....      | 1·37        |
| VII.  | Melton, Coston .....      | ·96         | "      | Corofin .....            | 1·14        |
| "     | Ketton Hall [Stamford]    | ·72         | XXI.   | Carlow, Browne's Hill..  | ·84         |
| "     | Horncastle, Bucknall ...  | ·45         | "      | Navan, Balrath .....     | 1·03        |
| "     | Mansfield, St. John's St. | ·87         | "      | Mullingar, Belvedere ... | 1·08        |
| VIII. | Macclesfield, The Park.   | 1·31        | "      | Athlone, Twyford .....   | ·85         |
| "     | Walton-on-the-Hill .....  | 1·39        | XXII.  | Galway, Queen's Col....  | ·90         |
| "     | Lancaster, South Road.    | ·90         | "      | Clifden, Kylemore .....  | 2·47        |
| "     | Broughton-in-Furness ..   | ·74         | "      | Crossmolina, Enniscoe..  | 1·02        |
| IX.   | Wakefield, Stanley Vic.   | ·61         | "      | Carrick-on-Shannon ...   | ·49         |
| "     | Ripon, Mickley .....      | 1·04        | XXIII. | Dowra .....              | ...         |
| "     | Scarborough .....         | ·47         | "      | Rockcorry .....          | 1·49        |
| "     | East Layton [Darlington]  | ·63         | "      | Warrenpoint .....        | ·39         |
| "     | Middleton, Mickleton ..   | ·21         | "      | Newtownards .....        | 1·25        |
| X.    | Haltwhistle, Unthank..    | ·60         | "      | Belfast, New Barnsley .. | ·90         |
| "     | Shap, Copy Hill .....     | ·64         | "      | Cushendun .....          | ·71         |
| XI.   | Llanfrechfa Grange ...    | 2·20        | "      | Bushmills .....          | ·81         |
| "     | Llandovery .....          | 2·99        | "      | Stewartstown .....       | 1·60        |
| "     | Lower Solva .....         | ·24         | "      | Donegal, Revelin Ho....  | ...         |
| "     | Castle Malgwyn .....      | 1·42        | "      | Buncrana .....           | 1·35        |
| "     | Rhayader, Nantgwilt..     | 2·10        | "      | Carndonagh .....         | ·65         |

JUNE, 1884.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Table to which each station belongs.] | RAINFALL.   |                                |                            |       |                                 | TEMPERATURE. |                 |      |                 | No. of Nights below 32° |          |
|----------|--|-------------|--------------------------------|----------------------------|-------|---------------------------------|--------------|-----------------|------|-----------------|-------------------------|----------|
|          |  | Total Fall. | Difference from average 1870-9 | Greatest Fall in 24 hours. |       | Days on which .01 or more fell. | Max.         |                 | Min. |                 | In shade                | On Grass |
|          |  |             |                                | Dpth                       | Date. |                                 | Deg.         | Date            | Deg. | Date.           |                         |          |
| I.       | London (Camden Square) ...   | 2.84        | + .17                          | 1.47                       | 5     | 7                               | 81.7         | 27              | 40.6 | 1               | 0                       | 1        |
| II.      | Maidstone (Hunton Court)...  | 1.17        | — .90                          | .32                        | 4     | 7                               | ...          | ...             | ...  | ...             | ...                     | ...      |
| III.     | Strathfield Turgiss .....  | 2.50        | + .40                          | .90                        | 6     | 8                               | 83.3         | 28              | 33.9 | 1               | 0                       | 0        |
| IV.      | Hitchin .....  | 1.39        | — .74                          | .47                        | 5     | 10                              | 78.0         | 27              | 42.0 | 7,14            | 0                       | 0        |
| V.       | Banbury .....  | 1.87        | — .57                          | .75                        | 28    | 8                               | 80.0         | 27 <sup>a</sup> | 34.0 | 1               | 0                       | 0        |
| VI.      | Bury St. Edmunds (Culford)   | 1.33        | — .94                          | .50                        | 6     | 9                               | 82.0         | 28              | 37.0 | 16 <sup>b</sup> | 0                       | 0        |
| VII.     | Norwich (Cossey) .....   | .51         | — 1.71                         | .16                        | 8     | 9                               | 80.0         | 13 <sup>c</sup> | 41.5 | 26              | 0                       | 0        |
| VIII.    | Weymouth (Langton Herring)   | 2.90        | ...                            | 1.02                       | 28    | 9                               | ...          | ...             | ...  | ...             | ...                     | ...      |
| IX.      | Barnstaple .....   | 1.69        | — 1.03                         | .55                        | 28    | 8                               | 82.0         | 28              | 40.0 | 1               | 0                       | 0        |
| X.       | Bodmin .....   | 1.18        | — 2.03                         | .26                        | 6     | 14                              | 73.0         | 26 <sup>d</sup> | 43.0 | 7,10            | 0                       | 0        |
| XI.      | Cirencester .....  | 3.29        | + .80                          | 1.30                       | 28    | 8                               | ...          | ...             | ...  | ...             | ...                     | ...      |
| XII.     | Church Stretton (Woolstaston)  | 3.02        | + .15                          | 1.04                       | 28    | 9                               | 78.0         | 28              | 42.0 | 10              | 0                       | 0        |
| XIII.    | Tenbury (Orleton) .....  | 2.82        | + .08                          | 1.55                       | 28    | 9                               | 82.0         | 13              | 32.5 | 1               | 0                       | 1        |
| XIV.     | Leicester .....  | 1.86        | ...                            | .57                        | 6     | 12                              | 83.0         | 28              | 33.6 | 1               | 0                       | 1        |
| XV.      | Boston .....   | .46         | — 1.79                         | .18                        | 8     | 7                               | 81.0         | 13              | 42.0 | 17              | 0                       | 0        |
| XVI.     | Grimsby (Killingholme).....  | 1.02        | — 1.35                         | .31                        | 6     | 9                               | 78.0         | 13              | 39.0 | 1               | 0                       | 0        |
| XVII.    | Hesley Hall [Tickhill].....  | .68         | ...                            | .39                        | 8     | 7                               | 84.0         | 27              | 34.0 | 1               | 0                       | 0        |
| XVIII.   | Manchester (Ardwick).....  | .88         | — 2.28                         | .27                        | 8     | 7                               | 82.0         | 28              | 45.0 | 1               | 0                       | 0        |
| XIX.     | Wetherby (Ribston Hall) ...  | .66         | — 2.21                         | .29                        | 8     | 4                               | ...          | ...             | ...  | ...             | ...                     | ...      |
| XX.      | Skipton (Arneliffe) .....  | .61         | — 3.21                         | .18                        | 8     | 12                              | 85.0         | 28              | 37.0 | 3               | 0                       | 0        |
| XXI.     | North Shields .....  | 1.35        | — .68                          | .47                        | 8     | 8                               | 79.0         | 13              | 38.0 | 1               | 0                       | 0        |
| XXII.    | Borrowdale (Seathwaite).....   | 1.47        | — 6.34                         | .44                        | 24    | 10                              | 81.0         | 28              | 39.0 | 4               | 0                       | 0        |
| XXIII.   | Cardiff (Ely) .....  | 2.28        | — .78                          | 1.60                       | 28    | 9                               | ...          | ...             | ...  | ...             | ...                     | ...      |
| XXIV.    | Haverfordwest .....  | .43         | — 2.60                         | .12                        | 1,28  | 7                               | 80.0         | 27              | 35.0 | 9               | 0                       | 1        |
| XXV.     | Plinlimmon (Cwmsymlog) ...   | 2.07        | ...                            | .80                        | 28    | 8                               | ...          | ...             | ...  | ...             | ...                     | ...      |
| XXVI.    | Llandudno .....  | 1.18        | — .82                          | .69                        | 28    | 6                               | 81.0         | 28              | 41.5 | 10              | 0                       | 0        |
| XXVII.   | Cargen [Dumfries] .....  | .46         | — 2.71                         | .11                        | 29    | 10                              | 82.6         | 28              | 38.0 | 14              | 0                       | 0        |
| XXVIII.  | Hawick (Wilton Hill).....  | .44         | ...                            | .19                        | 5     | 6                               | ...          | ...             | ...  | ...             | ...                     | ...      |
| XXIX.    | Douglas Castle (Newmains) ...  | .69         | — 2.32                         | .23                        | 29    | 5                               | ...          | ...             | ...  | ...             | ...                     | ...      |
| XXX.     | Lochgilthead (Kilmory).....  | 1.35        | — 2.49                         | .45                        | 1     | 9                               | 85.0         | 28              | 35.0 | 8,9             | 0                       | 0        |
| XXXI.    | Oban (Craigvarren) .....   | 1.81        | ...                            | .48                        | 1     | 17                              | 78.0         | 28              | 38.0 | 13              | 0                       | 0        |
| XXXII.   | Mull (Quinish) .....   | 1.21        | ...                            | .40                        | 1     | 11                              | ...          | ...             | ...  | ...             | ...                     | ...      |
| XXXIII.  | Loch Leven Sluices .....   | .30         | — 2.47                         | ...                        | ...   | ...                             | ...          | ...             | ...  | ...             | ...                     | ...      |
| XXXIV.   | Arbroath .....   | .37         | — 2.24                         | .12                        | 16    | 10                              | 68.0         | 12 <sup>f</sup> | 41.0 | 6               | 0                       | 0        |
| XXXV.    | Braemar .....  | .80         | — 2.29                         | .16                        | 1     | 15                              | 80.7         | 28              | 52.0 | 9               | 2                       | 5        |
| XXXVI.   | Aberdeen .....   | .98         | ...                            | .36                        | 22    | 12                              | 73.0         | 28              | 38.0 | 5               | 0                       | 0        |
| XXXVII.  | Skye (Sligachan) .....   | 4.63        | ...                            | 1.50                       | 2     | 13                              | ...          | ...             | ...  | ...             | ...                     | ...      |
| XXXVIII. | Culloden .....   | .97         | — 1.28                         | .30                        | 23    | 6                               | 75.0         | 29              | 37.0 | 6               | 0                       | 2        |
| XXXIX.   | Dunrobin .....   | .80         | ...                            | .25                        | 21    | 8                               | 68.5         | 29              | 39.5 | 5               | 0                       | 0        |
| XL.      | Orkney (Sandwick) .....  | 1.59        | — .21                          | .34                        | 12    | 16                              | 65.0         | 30              | 41.7 | 5               | 0                       | 1        |
| XLI.     | Cork (Blackrock) .....   | .70         | — 2.85                         | .14                        | 28    | 7                               | 84.0         | 24              | 43.0 | 8               | 0                       | 0        |
| XLII.    | Dromore Castle .....   | 1.56        | ...                            | .45                        | 10    | 7                               | 72.0         | 23              | 40.0 | 19              | 0                       | 0        |
| XLIII.   | Waterford (Brook Lodge) ...  | .56         | ...                            | .17                        | 3     | 6                               | 76.0         | 21              | 37.0 | 1               | 0                       | 2        |
| XLIV.    | Killaloe .....   | .35         | ...                            | .12                        | 1     | 6                               | 81.0         | 14              | 42.0 | 2               | 0                       | 0        |
| XLV.     | Portarlington .....  | .54         | — 1.89                         | .21                        | 1     | 9                               | 77.0         | 27              | 41.0 | 13              | 0                       | 0        |
| XLVI.    | Dublin (Fitz William Square)   | 1.25        | — .95                          | .55                        | 3     | 10                              | 75.4         | 13              | 43.1 | 1               | 0                       | 0        |
| XLVII.   | Ballinasloe .....  | .63         | — 2.56                         | .17                        | 1     | 11                              | 72.0         | 27              | 38.0 | 14              | 0                       | 0        |
| XLVIII.  | Waringstown .....  | .84         | — 1.82                         | .24                        | 7     | 8                               | 85.0         | 27              | 33.0 | 9               | 0                       | 0        |
| XLIX.    | Londonderry (Creggan Res.)..   | 1.45        | ...                            | .32                        | 1     | 13                              | ...          | ...             | ...  | ...             | ...                     | ...      |
| L.       | Omagh (Edenfel) .....  | 1.35        | — 1.70                         | .32                        | 29    | 17                              | 78.0         | 28              | 42.0 | 1 <sup>g</sup>  | 0                       | 0        |

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

<sup>a</sup> And 28. <sup>b</sup> And 17. <sup>c</sup> And 26, 28. <sup>d</sup> And 27. <sup>e</sup> And 13. <sup>f</sup> And 13. <sup>g</sup> And 6, 9, 13.

METEOROLOGICAL NOTES ON JUNE.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The continuance of fine weather enabled farmers to make their hay in excellent order; wheat promises to be better than for many years past; barley and peas look well; roots need rain. T on 4th, TS on 5th; first wheat ears on 8th; hay cut on 9th.

BANBURY.—T and L on 6th; T on 7th and 8th; T, L, and heavy R on 28th.

CULFORD.—A very hot, dry, month; hay crops very poor; everything suffering from want of rain.

LANGTON HERRING.—A very fine month; with temp. slightly above the average; distant T was heard on the 7th and 11th, and on some other days, and a rather violent TS occurred on the evening of 28th, 1.02 in. of R falling between 9 p.m. on that day and 2 a.m. on 29th. From 12th to 22nd, the weather was perfect for haymaking, but the crop is light.

ORLETON.—The temp. was low on the first nine days, with much cloud, frequent falls of R, and distant TSS; the weather then became unusually bright and dry, with a prevailing N. wind and cold nights. On the 28th the temp. rose to 81°·7, followed after midnight by distant T, and an immense fall of R 1.73 in. in less than 20 hours, which apparently did not extend far to the E.; the drought before this had very seriously affected all vegetation, except the wheat crop. The mean temp. of the month was about a quarter of a degree above the average of 23 years. Distant T on six days.

LEICESTER.—From 8th to 28th very little R fell, and both fields and gardens were much in need of moisture, but a refreshing R occurred on 29th.

BOSTON.—Rainfall of the month the smallest recorded in June since 1868, in which year the fall during the three months, May, June, and July, was only 1.25 in. Wheat in ear on 10th.

KILLINGHOLME.—A very dry month, great inconvenience caused by want of water for all purposes.

ARDWICK.—A very dry fine month, but the night temp. was rather low, which, with the drought, was injurious to vegetation; the health of the city was threatened by the want of R to flush the sewers, and in some parts of Lancashire, owing to the want of water, several works had to be partially or entirely closed; refreshing showers fell at the end of the month. Hay and straw short.

ARNCLIFFE.—Hay crop light, owing to want of R, and pastures much dried up.

WALES.

HAVERFORDWEST.—Temp. about the average, it rose to 70° twice in the first 17 days, but with these exceptions was low day and night, particularly up to the 10th, before which date it rarely reached 60°; the 9th was remarkably cold, the min. on grass being as low as 27°·5; after the 18th the temp. increased considerably, but from the 27th to the end of the month, the weather was unsettled, and in some places much R fell, accompanied by T and L. Rainfall the smallest since 1859, the year of the memorable drought, when .30 in. fell. Hay crop very light; wheat looks well on good land; public health remarkably good, and death rate very low.

LLANDUDNO.—A month of fine dry and sunny weather, but the mean temp. was about 2° below the average; more than two-thirds of the R fell on the 28th and 29th, a TS occurring on the first-mentioned day. The winds were light and variable; duration of bright sunshine 202 hours. Hay crop very light, and pastures suffered much from drought.

## SCOTLAND.

CARGEN.—Light and variable winds prevailed during most of the month ; the mean temp. was  $0^{\circ}\cdot7$ , and the duration of sunshine 15 hours below the average ; from May 17th to June 30th only  $\cdot50$  in of R fell, and the crops generally suffered from drought.

CRAIGVARREN.—One of the finest and most genial months experienced for many years ; it produced a golden hay crop, and left vegetation in a most luxuriant state, on 30th an unusually heavy white mist prevailed for 20 hours over the sea, stopping all steamboat traffic.

ABERDEEN.—The month on the whole was fine, the first six days were fair followed by a week of showery weather, and it was again showery from 21st to 26th ; the remainder of the month was fine, though not always bright.

CULLODEN.—The weather was very dry all through the month, little R fell and that at long intervals, doing no good to pastures or grain crops, which at the close were suffering considerably.

SANDWICK.—The rainfall was irregular, heavy falls occurring in some districts, while others were parched ; the temp. was low during the first part of the month, owing to northerly winds, but it became warm during the latter part, the temp. in shade rising to  $65^{\circ}$ , and in sun to  $110^{\circ}$ . There was a strong breeze of about 40 miles an hour on the morning of the 25th.

## IRELAND.

CORK.—Dry weather prevailed during the greater part of the month, with a high and steady bar ; from May 13th to June 21st R fell on only nine days, the amount scarcely exceeding  $\cdot50$  in. ; no TSS.

DROMORE CASTLE.—Fine weather with heavy dews at night ; all crops very promising.

WATERFORD.—Rainfall  $2\cdot69$  in. below the average of 10 years, and number of wet days 10 below the average. T on 13th and 29th ; thick fog on 12th. The country is very parched, and the crops very backward.

KILLALOE.—The loveliest June in a record of 39 years ; max. temp. in shade  $79^{\circ}$  to  $80^{\circ}$  on several days. Only twice during the past 39 years was the rainfall of June less than one inch. viz., 1849,  $\cdot73$  in. ; 1870,  $\cdot71$  in.

DUBLIN.—The month as a whole was very fine, dry, and warm, though it was cold and showery at the beginning ; mean temp. very near to the average of 20 years. Rainfall the smallest in any June since 1877, when only  $\cdot92$  in. fell, and number of wet days also small. L on 3rd and 28th ; distant T on 30th. Prevailing direction of wind N.W. ; mean humidity 74 ; mean amount of cloud  $6\cdot7$ .

BALLINASLOE.—The driest month during 12 years, warm and pleasant.

WARINGSTOWN.—A very dry month, and the last week intensely hot.

EDENFEL, OMAGH.—The month afforded the longest continuance of summer weather that has been experienced for many years.

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CCXXIII.]

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THE THUNDERSTORMS OF JULY, 1884.

As intimated in our last, we now present a first instalment of the list of damages by the thunderstorms of last month. We know that it is very imperfect, as very few of our correspondents seem to have noticed the editorial plea for information appended to the interesting letter by the Rev. W. Clement Ley. Still the list is terribly heavy, and when we arrive at the close, and try to sum up the actual pecuniary loss (irrespective of course of the many human lives to which no price could be attached), we think that its amount will be larger than most persons would imagine.

Much of the information rests upon the authority of country newspapers; it may therefore be well to state that nearly thirty years since we devoted three years to forming similar tables, *but* we sent every paragraph to the clergyman or other responsible person in each parish, so that any stretching or misstatement might be detected. We have not done so now for two reasons (1) because not one per cent. of the paragraphs in 1857-59 proved to be the least exaggerated, and (2) because the experience then gained shows that the errors are not serious enough to be worth the time necessary to hunt them out.

We reserve all comments until the list be finished, and in the meanwhile shall be glad of additional facts.

FRIDAY, JULY 4th.

BERKSHIRE.

*Aston, Wallingford.*—C. Bearley and T. Streakes were killed while at work in a field; their clothes were completely burned. A horse was killed in the neighbourhood.

BUCKINGHAMSHIRE.

*Addington, Winslow.*—Very sharp TS at 1.30 p.m., some trees struck.

*Olney.*—Tree struck.

OXFORDSHIRE.

*Banbury.*—Several trees struck; at Town's End four or five standing together were destroyed.

*Deddington*.—W. H. Smith was sheltering under a tree, and just going to eat the dinner which his wife had brought him, when he was killed, though his wife sustained no serious injury.

*Magdalen Coll. Oxford*.—T and B.

*Oxhill*.—Messrs. Parker had a cow killed.

*South Newington, Deddington*.—Mr. Tustain had a cow killed.

*Upton, Burford*.—Mr. Berridge had a horse killed.

#### NORTHAMPTONSHIRE.

*Althorp House, Northampton*.—Three horses killed.

*Benefield, Oundle*.—Several sheep killed.

*Braybrook, Rothwell*.—Cattle killed.

*Brigstock, Thrapstone*.—Mr. Ashwell had two sheep killed.

*Chacombe, Banbury*.—A tree struck at the Priory, and a sheep belonging to Mr. Hiron killed.

*Cold Ashby, Daventry*.—A cottage struck and bedstead scorched, though the child in it was uninjured.

*Cottesbrook, Rothwell*.—A horse while drawing a grocer's cart from this village to *Creaton* was struck dead. Nothing is reported respecting the driver.

*Delapré Park, Northampton*.—Five valuable horses belonging to Mr. J. A. S. Bouverie were sheltering under a tree; although little damage was done to the tree, four of the horses were killed, and the fifth was injured.

*Drayton, near Daventry*.—Three sheep belonging to Mr. Wearing were killed.

*Easton Neston, Towcester*.—Very severe storm, the most so since August 13th, 1866. Tree struck.

*Farndon, Market Harboro'*.—Public house struck.

*Gayton, Towcester*.—Messrs. Lovell's house struck.

*Guilborough, Daventry*.—Part of a chimney knocked off a cottage.

*Hemington, Oundle*.—Trees struck.

*Hulcote, Towcester*.—A horse belonging to Mr. Jennaway killed while grazing.

*Little Bowden, Market Harborough*.—A bullock killed.

*Lower Boddington, Banbury*.—A cow belonging to Mr. Andrews killed.

*Northampton*.—Chimney of 76, Hunter-street, struck; the lightning appeared to pass down a metal bedstead, and then to ignite the skirting-board against which it stood. Chimney of factory in St. Edmund's-road damaged, also (slightly) the roof of the barracks, and several dwelling-houses and trees struck.

*Oundle*.—Heavy TS, and .33 in. of R in 45 minutes.

*Peterborough*.—Many sheep and cattle killed in this neighbourhood.

*Raunds, Higham Ferrers*.—A tree struck at Mr. Askham's, a groove being ploughed out from one of the branches to the earth. Several men were sheltering beside a loaded waggon of hay, to which four horses were attached, all the horses were struck down, two being

killed, and of the others one had to be slaughtered ; the men were very slightly injured.

*Staverton, Daventry.*—A valuable cow was killed, and an elm at Catesby House injured. A strong sulphurous odour was very perceptible during the storm.

*West Haddon, Daventry.*—TS passed from S to N, between 2.30 and 3.30 p.m.

*Wollaston, Wellinboro.*—A malting in Long-street was struck about 3 p.m., ignited, and entirely destroyed.

HUNTINGDON.

*Ramsey.*—A tree shivered at Park Farm, and a cow killed. A hay-stack near Puttock Bridge ignited and destroyed.

*Sawtry, Whittlesea.*—Four beasts killed here, and a number of cattle and sheep killed in other places.

BEDFORDSHIRE.

*Turvey, Bedford.*—At 3 p.m. an ash-tree in the hedge between Mr. Paine's and Mr. Whitworth's meadows was completely stripped and set fire to. It continued burning until the Monday.—[Even if we assume that it ceased to burn at midnight on Sunday, it still leaves 33 hours for it to have continued alight.—ED.]

CAMBRIDGE.

*Conington, Caxton.*—A large oak tree splintered.

*Stonea, near March.*—Eighteen sheep belonging to Mr. Morton killed.

*Whittlesea.*—Ricks set on fire.

STAFFORDSHIRE.

*Heath House, Cheadle.*—TS.

WARWICKSHIRE.

*Bilton, Rugby.*—Some posts and rails in a field split, two beasts belonging to Mr. Fuller killed, and the top struck off a tree opposite the post office.

*Birdingbury.*—Two very valuable heifers belonging to Mr. Lucas were killed.

*Coombe Abbey.*—Struck, and slightly injured.

*Harington.*—Some trees splintered.

*Hillmorton, Rugby.*—Mr. Rathbone had two beasts killed, and on Mr. Rodgers' land a tree was struck.

*Hill, Leamington Hastings, Southam.*—Mr. Gilks lost a valuable sheep, and an elm tree was shivered.

*Rugby.*—Two trees struck, one in Dale Street and the other in Hillmorton Road,

*Wolston, Coventry.*—Eleven sheep belonging to Mrs. Parsons were killed under a tree ; a cow belonging to Mr. Eales was struck dead in the open field, and an elm at the vicarage struck.

LEICESTERSHIRE.

*Ashby Parva.*—A cow belonging to the Rev. W. C. Ley was

stunned, but eventually recovered, and an elm tree near to the shed in which the cow was, was also stripped of some of its branches and bark. A large ash tree on the road from Ashby to Gilmorton was nearly destroyed.

*Burton Lazars, Melton.*—Mr. Benskin was on the top of a hay-rick, the storm becoming heavy he descended, and within three minutes a flash struck the rick, split a fork which had been left upon it, and also the ladder standing against it, and ignited the rick. [Another account comes from the same village, but gives the farmer's name as Sapcote; doubtless both refer to one event.—ED.]

*Cold Overton, Melton.*—Mr. Eaton had just alighted from his trap, taken out the horse, and left the trap, when it was struck, the iron of the splash-board and of the seat bent, and the trap sent away several yards.

*East Norton, Leicester.*—Several animals killed.

*Long Whatton, Loughborough.*—Mr. Wilkins had a very valuable horse killed.

*Loughborough.*—TS from 2.45 to 3.40 p.m. Black Horse Hotel struck, out-buildings damaged, and a clock stopped at 3.3 p.m. A boy named Arthur Orton was struck in The Pastures, but recovered consciousness within an hour. A chimney-stack was struck at Park-lane.

*Lubenham, Market Harboro'.*—A sheep killed, a chimney demolished, and an ash tree split from top to bottom.

*Melton.*—A chimney was struck in King-street; the owner of the house, Mr. Southgate, was sitting in the room conversing with a friend; the latter says that hearing a noise in the chimney he turned to see the cause, and saw a ball of fire in the grate. The ball immediately exploded, and the lightning passed between himself and Mr. Southgate on its course out of the room through the open window.

*Scalford, Melton.*—Mr. Kirk had a ewe and a lamb killed; and Mr. Wright lost a sheep.

*Shangton, Leicester.*—Some bullocks killed.

*Sheepshead, Loughborough.*—Mr. Cook's house struck, he temporarily stunned; the general damage was not serious, but "several tins were pierced as with a red hot iron."

*Sileby, Leicester.*—Mr. Dakin had a cow killed.

*Somerby, Melton.*—Mr. Gilford had five sheep killed, and a tree in the village was stripped of its bark, and the earth round its roots scattered.

*Stonton Wyrille, Market Harboro'.*—Mrs. Garratt had a bullock killed.

*Whitwick, Ashby-de-la-Zouch.*—Mr. Green's house was struck in the evening, and two cows were killed.

*Willoughby, Lutterworth.*—A ball of fire was observed to strike a stack of clover, to divide it to the centre, and to set it on fire.

*Wymeswold, Loughborough.*—T. Hubbard and his uncles, J. and W. Tuckwood, were mowing rye grass, the storm being heavy, and there

being no trees they got close to a hedge, and covered themselves with some of the rye grass, while in this position they were all struck, and two out of the three killed instantly, the other recovered. There were no marks on the deceased, except that their faces were very blue.

RUTLAND.

*Uppingham.*—A gasometer was overthrown during the storm, but whether it was struck by lightning is unknown.

LANCASHIRE.

*Barrowford, Burnley.*—A horse was killed while grazing in a field, and two men who were near were struck, but not fatally.

*Breeze Hill, Liverpool.*—T.

*Burrow, Hornby.*—Mr. Capstick had two sheep killed.

*Nelson, Burnley.*—Two men seriously injured. [Probably another report of the Barrowford accident.—ED.]

*Whittington, Hornby.*—An ash tree split.

YORKSHIRE.

*Crosshills.*—A cartload of hay struck and ignited.

*Ingleton.*—Mr. J. Towers had six sheep killed.

*Scarborough.*—TS.

*Skipton.*—A tree shivered in the churchyard.

*Slatenber, Ingleton.*—A building belonging to Mr. Hezeltine was struck, and considerably damaged.

DURHAM.

*Whorlton, Darlington.*—Hot, with TS, and .25 in. of R between 6 and 7 p.m.

NORTHUMBERLAND.

*Unthank Hall, Haltwhistle.*—A very severe TS with vivid and nearly continuous L; a cow killed under a tree near the hall. In four hours 2.01 in. of R fell here and on the hills; it must have been very heavy, for the burns were swelled beyond all experience, and came down in such volume and with such violence that bridges, watergates, large stone gateposts, &c., were carried away.

SCOTLAND.

DUMFRIESSHIRE.

*Lockerbie.*—The chimney of Miss Foster's house in Arthur's-place was demolished, and the roof damaged.

EDINBURGHSHIRE.

*Leith.*—The top flat of No. 24, Glover-street was entered by the lightning, the bell wires melted, and other damage done. A young man in bed, though much frightened at the ruin in his room, was quite unhurt.

FIFESHIRE.

*Kirkcaldy.*—Much damage was done in the town and suburbs. Miss Ramsay's house in Gallatown was struck, and the gas-pipes

exploded. At the Gallatown Maltings a ventilator was struck, and one of the beams shattered. At Sinclairtown Mr. Reid's house was struck, the woodwork set on fire, and various articles destroyed; a hay-rick was also struck and consumed.

## PERTHSHIRE.

*Avintully*.—A thatched house was struck, set on fire, and partly burned; the inmates were rescued.

TSS were also reported from *Hawick, Roxburgh, Cussilis, Ayr, Stronvar, PERTH, Cawdor and Glenfinnan, INVERNESS, and Miltown Malbay, CLARE.*

## SATURDAY, JULY 5th.

## KENT.

*Goodnestone, Wingham*.—The stables of Sir Brook Bridges were struck and ignited, and three valuable horses burned.

*Sarr, Ramsgate*.—The house occupied by Mr. Rogers was struck, and considerably damaged.

## CAMBRIDGESHIRE.

*Cambridge*.—During the height of the storm a fire occurred about 3 a.m., at a shop in Sussex-street, which was believed to have been caused by lightning.

*Kingston, Caxton*.—A woman died suddenly during the storm, but it was probably due to fright.

## ESSEX.

*Colchester*.—A house struck, and several persons slightly injured.

## SUFFOLK.

*Boxford*.—Several trees struck, and insulators on telegraph poles broken.

*Culford, Bury St. Edmunds*.—T.

*Rendlesham Hall, Woodbridge*.—TSS.

## NORFOLK.

*Diss*.—TS early.

*Watton*.—The telegraph instrument at the post office damaged.

## DORSETSHIRE.

*Stowell Rectory, Sherborne*.—TSS.

## LANCASHIRE.

*Breeze Hill, Liverpool*.—T L.

## YORKSHIRE.

*Spennymore*.—A house was struck at night, the chimney being shattered, and J. Watson, who was within, was temporarily paralysed.

## DURHAM.

*Burnhope, Lanchester*.—A house struck, and partly demolished, but the inmates escaped.

*Consett.*—During the storm in the afternoon, the house of a miner named T. Gill was struck and much damaged. Gill, who was nursing a child, was killed, but the child escaped.\*

*Lane Head, Weardale.*—Two men were at work on the spire of the Wesleyan Chapel, when it was struck, and they were knocked down insensible, but they eventually recovered.

*Whorlton, Darlington.*—TS.

NORTHUMBERLAND.

*Newcastle.*—Several animals killed in this neighbourhood.

SCOTLAND.

INVERNESS.

*Fort William.*—L. McDonnell was killed while driving some cattle across a field; another young man had a narrow escape, as he saw the lightning strike the earth beside him.

*Uig, Skye.*—Two cows killed, and the telegraphic communication interrupted.

TS at *Hawick*, ROXBURGH; *Stronvar* and *Dalnaspidal*, PERTH; and *Kilkishen*, CLARE.

SUNDAY, JULY 6th.

MIDDLESEX.

*Pinner.*—TS.

SURREY.

*Wallington.*—Distant T at 4 p.m.

HEREFORDSHIRE.

*Ross.*—TSS from 4 to 5 a.m., and in E. from 2.15 to 4.15 p.m.

STAFFORDSHIRE.

*Heath House, Cheadle.*—T.

LEICESTERSHIRE.

*Loughborough.*—Slight TS in afternoon.

*Woodhouse, Mount Sorrel.*—Two calves, belonging to Mr. Holt, killed in a field.

LANCASHIRE.

*Breeze Hill, Liverpool.*—TS.

*Everton, Liverpool.*—During a storm in the morning, lightning passed through the roof of Holy Trinity Church, filling the building with a pale blue flame. The current passed between two boys, paralyzing the arm of one and scorching the boot of the other. A panic ensued; most of the congregation rushed out, and the service was abruptly closed. The bell was rendered useless, and coping-stones weighing several hundredweights were hurled some distance. A child lying ill in bed at Everton was struck by the lightning and killed.

\* Once reported as having happened on Sunday, 6th.

## YORKSHIRE.

*Northallerton*.—Many cattle killed, and the railway works much damaged.

*Rawcliffe, Goole*.—Lightning struck one end of a clover stack, passed completely through it, and entered the ground; shortly afterwards smoke was seen to arise, and the stack was found to be on fire.

## DURHAM.

*Whorlton*.—Heavy TS, and 2·01 in. of R between 0 and 1 p.m.

## SCOTLAND.

## DUMFRIESSHIRE.

*Lockerbie*.—Sixteen sheep were leaving a field in single file, when the foremost was struck, the lightning ran along the line and killed the whole of them.

## ELGIN.

*Forres*.—Heavy TS.

## INVERNESS.

*Cawdor*.—T.

## TUESDAY, JULY 8th.

## SUSSEX.

*Littlehampton*.—T.

## HANTS.

*Redlands, Emsworth*.—TS at 2 a.m.

## NORTHAMPTON.

*Oundle*.—T.

## WILTS.

*Pewsey*.—T.

## STAFFORD.

*Heath House, Cheadle*.—TS.

## LANCASHIRE.

*Breeze Hill, Liverpool*.—T L.

## YORKSHIRE.

*Scarborough*.—TS.

## WESTMORELAND.

*Shap*.—TS at 9.30 p.m.

## SCOTLAND.

## ROXBURGH.

*Hawick*.—T.

## FIFE.

*Newton Bank, St. Andrew's*.—TS and ·35 in. of R in 25 minutes.

## ON THE FORMATION OF AIR BUBBLES IN WATER BY DROPS OF RAIN.

By CHARLES TOMLINSON, F.R.S.

BEING caught in a very heavy shower of rain, I sought refuge under an archway, and soon saw the roadway flooded, and a small torrent hurrying along the gutter. But what most arrested my attention was a number of large, well-formed bubbles of air bursting on the surface. I watched these with considerable curiosity, and called to mind some of the accounts given in books on physics as to the cause of the formation of similar bubbles. Thus, when a bullet is fired, or allowed to fall into water, the air is said to be dragged down by the bullet. Others affirm that it is the air adhering to the bullet that forms the bubble, or the adhesion of air to the solid.

I mentioned the phenomenon to one of my scientific colleagues at King's College, and he at once gave the adhesion theory, and remarked that a globule of mercury let fall into water did not form a bubble.

The earliest notice that I have met with of the phenomenon in question, is that by the celebrated Mariotte (who shares with Boyle the discovery of the law of gaseous elasticity) in his *Œuvres*, Leide, 1717, vol. ii., p. 353. He remarks that each drop of rain, in falling from the height of the cloud, drags down two or three times as much air as its own size, as may be shewn by letting a little ball of lead fall into a bucket of water; for as soon as it touches the bottom two or three bubbles of air rise, each as large as itself, which can only proceed from air which follows it to the bottom of the vessel. He compares it to the action of the *Trombe*, in which air is dragged down by falling water.\*

It is a mistake to suppose that the air, thus liberated by a body projected into water is adhering air, or air driven in by the projectile, or that the effect is quite the same as the action of the *Trombe*.

In *Poggendorff's Annalen*, vol. xcv. (May, 1855), Professor Magnus refers incidentally to the phenomenon. He says that when a projectile penetrates water, it produces an excavation, of which it forms the bottom, and which closes at the surface before it is complete. The air thus enclosed rises later to the surface. But as the horizontal section of this excavation is always greater than that of the projectile, and increases with its *vis viva*, it follows that the volume of air thus imprisoned may be many times greater than that

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\* The *Trombe* is an ingenious arrangement for furnishing a wind blast in the Catalan method of smelting iron. A tree is hollowed out, and its lower end inserted into the top of a large wooden chest, while near its upper end a number of apertures, sloping downwards, are cut through the wood. The water of a mountain stream is so led as to pour into the top of the hollow tree, and the descending water exerting no lateral pressure, air rushes in by the slits, as into a vacuum, and accumulating under pressure in the chest, escapes by a blast pipe into the furnace, while an opening near the bottom of the chest, allows the superfluous water to run off.

of the projectile. It is further remarked that air cannot be introduced into water by a lateral projection of the solid.

In the *Comptes Rendus* for 1867, p. 564, M. Melsens adopts the view of Mariotte, that a leaden ball drags down air. He says that a bullet weighing nearly an ounce, let fall from a height of about forty inches, liberated a volume of air twenty times greater than that of the bullet. Half of the air escaped before the bullet got to the bottom; the other half ascended from the bottom. The length of the column of water is not given.

In the same volume of the *Comptes Rendus*, page 797, is an account of an experiment by M. Laroque, in which he allowed to fall into water a long cylinder of elder pith, to which a small sphere of lead was attached at the lower extremity. The cylinder penetrates the water a certain distance, is then arrested for a moment, and ascends. While falling into the water, a portion of the cylinder remains above its surface; but air-bubbles are formed below the sphere of lead, and are even propelled a little way below it, and ascend less quickly than the cylinder.

According to M. Laroque, the air is pushed forward by the projectile, and he concludes generally that when a projectile is darted into water, air penetrates (1) because it is pushed forward by compression (2) because it is dragged into the depression by the projectile, and the water closes over it; while (3) the volume of air thus imprisoned depends on the density and cohesion of the liquid, and the *vis viva* of the projectile at the moment when it strikes the water.

The phenomenon forms a good lecture-table experiment, if exhibited on a large scale. My mode of showing it is to fill with water a cylindrical glass vessel, 19 inches high, and  $3\frac{1}{2}$  inches in diameter, and to suspend some feet above it a glass funnel, so arranged that the axis of the funnel shall be in the same vertical line as the axis of the cylinder. A small leaden or iron bullet, or large shot, put into the funnel, is thus neatly delivered to the water, and as soon as the shot strikes the bottom, several bubbles of air escape, and oscillate up to the surface. By catching the air thus liberated in a graduated inverted test tube, filled with water, the relation between the volume of the solid and that of the liberated air can easily be estimated.

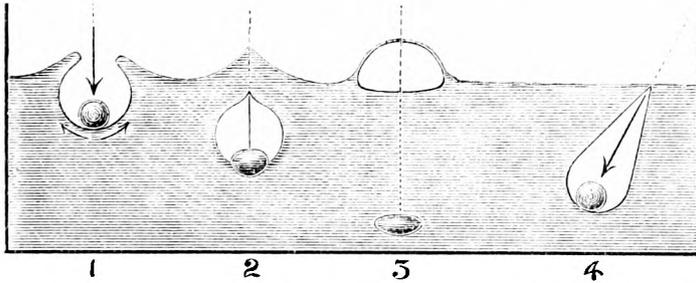
Small marbles may also be used, or inch lengths of thick wire with a similar result. The shot, &c., may be wet, or the lead amalgamated, but the result is the same, so that adhering air is not to be taken into account.

The experiment was also carefully and repeatedly tried with mercury, which formed no exception to the general result, as had been supposed. Indeed seeing how large a bubble can be formed by a drop of rain falling into water, it was not likely that a fluid upwards of thirteen times heavier than water should form an exception.

The experiment was also tried with other liquids, such as paraffin oil, spirits of wine, and ether, the volume of air liberated, depending on the height of the fall of the solid body, and the density of the liquid, the volume of air bearing an inverse relation to the density.

The result then, according to my view, may be thus stated:—When a heavy body, such as a bullet, falls upon water, it descends to a certain depth, and leaves above it a cylindrical space, into which air rushes more quickly than the water can fill it up. The shot continuing to fall, constantly clears a space, into which the air as constantly rushes; until the shot being arrested by the bottom of the vessel, the air is detached by the concussion, and forms into bubbles, which ascend.

The dimensions of the vacuous space formed by the bullet depend of course upon its density and *vis viva* or velocity of descent, the greater the fall the larger the space and the larger the volume of air liberated. Thus when a bullet is fired into water from a gun, the *vis viva* is great, and the volume of air liberated is large in proportion. Or when a drop of rain falls from a cloud, it has an enormous *vis viva*, and hence the magnitude of the bubble even in water as shallow as the gutter I was watching while taking shelter from the rain. The process of the formation of the bubble may be



thus graphically represented:—*Firstly.* The rain-drop preserving its integrity as a drop by means of its surface tension, penetrates the water, and leaves an empty space as in *Fig. 1*, into which air rushes before the water can close up the space. *Secondly.* The water closes in, and imprisons the air-bubble, which descends with the rain-drop, as in *Fig. 2*. *Thirdly.* The drop reaches the bottom of the puddle, and the air-bubble is detached, becomes convex by the resistance of the water during its ascent, and reaches the surface as a hemisphere, as in *Fig. 3*, and then bursts.

*Fig. 4* shews the formation of a bubble when the direction of the rain is oblique.

*Highgate, N., 18th July, 1884.*

SUPPLEMENTARY TABLE OF RAINFALL,  
JULY, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | 1·44        | XI.    | Carno, Tybrith .....     | 3·75        |
| „     | Margate, Birchington...   | 1·68        | „      | Corwen, Rhug .....       | ...         |
| „     | Littlehampton .....       | 2·54        | „      | Port Madoc .....         | 5·22        |
| „     | Hailsham .....            | 1·90        | „      | I. of Man, Douglas ..... | 4·36        |
| „     | I. of W., St. Lawrence.   | 2·09        | XII.   | Stoneykirk, Ardwell Ho.  | 4·20        |
| „     | Alton, Ashdell .....      | 2·37        | „      | Melrose, Abbey Gate...   | 6·58        |
| III.  | Winslow, Addington ...    | 2·69        | XIII.  | N. Esk Res. [Penicuick]  | 5·65        |
| „     | Oxford, Magdalen Col...   | 2·26        | XIV.   | Ayr, Cassillis House ... | 4·65        |
| „     | Northampton .....         | 3·75        | „      | Glasgow, Queen's Park.   | 5·38        |
| „     | Cambridge, Beech Ho...    | 2·44        | XV.    | Islay, Gruinart School.. | 2·56        |
| IV.   | Southend .....            | 1·96        | XVI.   | St. Andrews, Newton Bk   | 4·35        |
| „     | Harlow, Sheering ...      | 2·04        | „      | Balquhider, Stronvar..   | 6·82        |
| „     | Diss .....                | 1·26        | „      | Dunkeld, Inver Braan..   | 5·64        |
| „     | Swaffham .....            | 2·00        | „      | Dalnaspidal H.R.S. ...   | 5·53        |
| „     | Hindringham .....         | ...         | XVII.  | Keith H.R.S. ....        | 1·90        |
| V.    | Salisbury, Alderbury ...  | 2·33        | „      | Forres H.R.S. ....       | 1·45        |
| „     | Warminster .....          | 3·51        | XVIII. | Strome Ferry H.R.S....   | 5·57        |
| „     | Calne, Compton Bassett    | 2·06        | „      | Lochbroom .....          | 5·13        |
| „     | Ashburton, Holne Vic..    | 4·93        | „      | Tain, Springfield .....  | 1·93        |
| „     | Holsworthy, Clawton...    | 3·62        | „      | Loch Shiel, Glenaladale  | 6·37        |
| „     | Lymouth, Glenthorne.      | 2·36        | „      | Invergarry .....         | 3·84        |
| „     | Probus, Lamellyn .....    | 3·68        | XIX.   | Lairg H.R.S. ....        | 2·51        |
| „     | Wincanton, Stowell Rec.   | 4·43        | „      | Forsinard H.R.S. ....    | 1·91        |
| „     | Taunton, Fullands .....   | 2·48        | „      | Watten H.R.S. ....       | 2·01        |
| VI.   | Bristol, Clifton .....    | 3·67        | XX.    | Dunmanway, Coolkelure    | 6·01        |
| „     | Ross .....                | 3·51        | „      | Fermy, Gas Works ...     | 1·50        |
| „     | Wem, Sansaw Hall .....    | 2·68        | „      | Tralee, Castlemorris ... | 3·58        |
| „     | Cheadle, The Heath Ho.    | 3·23        | „      | Tipperary, Henry Street  | 4·36        |
| „     | Worcester, Diglis Lock    | 3·72        | „      | Newcastle West .....     | 3·36        |
| „     | Coventry, Coundon .....   | 3·37        | „      | Miltown Malbay .....     | 3·57        |
| VII.  | Melton, Coston .....      | 4·92        | „      | Corofin .....            | 2·85        |
| „     | Ketton Hall [Stamford]    | 3·52        | XXI.   | Carlow, Browne's Hill..  | 3·67        |
| „     | Horncastle, Bucknall ...  | 3·50        | „      | Navan, Balrath .....     | 3·20        |
| „     | Mansfield, St. John's St. | 3·83        | „      | Mullingar, Belvedere ... | 3·39        |
| VIII. | Macclesfield, The Park.   | 3·83        | „      | Athlone, Twyford .....   | 2·96        |
| „     | Walton-on-the-Hill .....  | 4·86        | XXII.  | Galway, Queen's Col...   | 2·94        |
| „     | Lancaster, South Road.    | 6·63        | „      | Clifden, Kylemore .....  | 8·12        |
| „     | Broughton-in-Furness ..   | 6·87        | „      | Crossmolina, Enniscoe..  | 4·44        |
| IX.   | Wakefield, Stanley Vic.   | 3·11        | „      | Carrick-on-Shannon ...   | 4·24        |
| „     | Ripon, Mickley .....      | 3·75        | XXIII. | Dowra .....              | ...         |
| „     | Scarborough .....         | 2·29        | „      | Rockcorry .....          | 2·79        |
| „     | East Layton [Darlington]  | 5·18        | „      | Warrenpoint .....        | 3·92        |
| „     | Middleton, Mickleton ..   | 5·73        | „      | Newtownards .....        | 4·22        |
| X.    | Haltwhistle, Unthank..    | 9·29        | „      | Belfast, New Barnsley..  | 4·35        |
| „     | Shap, Copy Hill .....     | 5·77        | „      | Cushendun .....          | 4·03        |
| XI.   | Llanfrechfa Grange ...    | 3·83        | „      | Bushmills .....          | 3·06        |
| „     | Llandovery .....          | 4·22        | „      | Stewartstown .....       | 3·12        |
| „     | Lower Solva .....         | 3·06        | „      | Donegal, Revelin Ho....  | ...         |
| „     | Castle Malgwyn .....      | 3·90        | „      | Buncrana .....           | 3·42        |
| „     | Rhayader, Nantgwillt..    | 4·77        | „      | Carndonagh .....         | 3·58        |

JULY, 1884.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Table to which each station belongs.] | RAINFALL.   |                                |                            |                 |                                  | TEMPERATURE. |       |      |                 | No. of Nights below 32° |       |
|----------|--|-------------|--------------------------------|----------------------------|-----------------|----------------------------------|--------------|-------|------|-----------------|-------------------------|-------|
|          |  | Total Fall. | Difference from average 1870-9 | Greatest Fall in 24 hours. |                 | Days on which -0.1 or more fell. | Max          |       | Min. |                 |                         |       |
|          |  |             |                                | inches.                    | in.             |                                  | Dpth         | Date. | Deg. | Date            | Deg.                    | Date. |
| I.       | London (Camden Square) ...   | 2.46        | — .01                          | .60                        | 9               | 17                               | 86.9         | 4     | 42.2 | 26              | 0                       | 0     |
| II.      | Maidstone (Hunton Court)...  | 1.45        | — .59                          | .30                        | 4               | 15                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| III.     | Strathfield Turgiss .....  | ...         | ...                            | ...                        | ...             | ...                              | ...          | ...   | ...  | ...             | ...                     | ...   |
| IV.      | Hitchin .....  | 3.89        | + 1.19                         | 1.75                       | 9               | 16                               | 80.0         | 4     | 42.0 | 25              | 0                       | 0     |
| V.       | Banbury .....  | 2.86        | — .12                          | .49                        | 4               | 23                               | 82.0         | 3,4   | 39.0 | 26              | 0                       | ...   |
| VI.      | Bury St. Edmunds (Culford)   | 2.32        | — .65                          | .32                        | 24 <sup>a</sup> | 18                               | 87.0         | 3,8   | 42.0 | 25              | 0                       | ...   |
| VII.     | Norwich (Cossey).....  | 2.17        | — .58                          | .63                        | 21              | 14                               | 85.5         | 3     | 44.0 | 20              | 0                       | 0     |
| VIII.    | Weymouth(LangtonHerring)   | 2.41        | —                              | .42                        | 15              | 17                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| IX.      | Barnstaple.....  | 3.12        | — .43                          | .83                        | 23              | 19                               | 80.0         | 3     | 49.0 | 1,26            | 0                       | 0     |
| X.       | Bodmin .....   | 4.29        | + .85                          | .58                        | 14              | 25                               | 73.0         | 20    | 49.0 | 2 <sup>b</sup>  | 0                       | ...   |
| XI.      | Cirencester .....  | ...         | ...                            | ...                        | ...             | ...                              | ...          | ...   | ...  | ...             | ...                     | ...   |
| XII.     | ChurchStretton(Woolstaston)  | 3.30        | + .27                          | .51                        | 11              | 22                               | 75.0         | 8     | 46.0 | 26              | 0                       | 0     |
| XIII.    | Tenbury (Orleton) .....  | 3.21        | + .30                          | .51                        | 13              | 18                               | 76.8         | 8     | 40.2 | 26              | 0                       | 0     |
| XIV.     | Leicester .....  | 3.31        | ...                            | .44                        | 23              | 22                               | 86.0         | 3,4   | 42.2 | 26              | 0                       | 0     |
| XV.      | Boston .....   | 2.41        | — .12                          | .40                        | 10              | 15                               | 84.0         | 4     | 44.0 | 26              | 0                       | ...   |
| XVI.     | Grimsby (Killingholme).....  | 2.36        | — .42                          | .52                        | 10              | 20                               | 76.0         | 13    | 44.0 | 26              | 0                       | ...   |
| XVII.    | Hesley Hall [Tickhill].....  | 2.65        | —                              | .83                        | 10              | 19                               | 87.0         | 3     | 41.0 | 20              | 0                       | ...   |
| XVIII.   | Manchester (Ardwick).....  | 4.23        | + .42                          | .66                        | 9               | 22                               | 79.0         | 3,4   | 47.0 | 26              | 0                       | 0     |
| XIX.     | Wetherby (Ribston Hall) ..   | 4.05        | + 1.44                         | 1.16                       | 11              | 11                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| XX.      | Skipton (Arncliffe) .....  | 7.75        | + 2.80                         | 1.25                       | 10              | 27                               | 72.0         | 31    | 39.0 | 24              | 0                       | ...   |
| XXI.     | North Shields .....  | 2.72        | + .17                          | .38                        | 22              | 19                               | 75.0         | 31    | 41.5 | 26              | 0                       | 0     |
| XXII.    | Borrowdale (Seathwaite).....   | 10.01       | + 1.24                         | 2.37                       | 15              | 25                               | 81.9         | 3     | 41.5 | 20              | 0                       | ...   |
| XXIII.   | Cardiff (Ely) .....  | 5.12        | + 1.31                         | 1.23                       | 26              | 22                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| XXIV.    | Haverfordwest .....  | 4.97        | + 1.04                         | 1.57                       | 7               | 19                               | 75.3         | 3     | 43.0 | 1               | 0                       | 0     |
| XXV.     | Plinlimmon (Cwmsymlog)...  | 5.04        | —                              | .87                        | 28              | 21                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| XXVI.    | Llandudno.....   | 4.48        | + 1.77                         | .91                        | 5               | 20                               | 72.0         | 5     | 42.8 | 21              | 0                       | ...   |
| XXVII.   | Cargen [Dumfries] .....  | 5.67        | + 2.54                         | .91                        | 9               | 22                               | 78.8         | 4     | 41.0 | 20 <sup>a</sup> | 0                       | 0     |
| XXVIII.  | Hawick (Wilton Hill).....  | 5.49        | —                              | 1.21                       | 5               | 20                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| XXIX.    | Douglas Castle (Newmains)...   | 4.95        | + 1.66                         | 1.58                       | 10              | 17                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| XXX.     | Lochgilphead (Kilmory).....  | 5.26        | + .72                          | 1.73                       | 10              | 23                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| XXXI.    | Oban (Craigvarren) .....   | 6.57        | —                              | 2.41                       | 10              | 22                               | 75.0         | 5     | 44.0 | 20              | 20                      | ...   |
| XXXII.   | Mull (Quinish).....  | 4.83        | —                              | 1.32                       | 10              | 22                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| XXXIII.  | Loch Leven Sluices .....   | 5.30        | + 2.25                         | 1.10                       | 11              | 13                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| XXXIV.   | Arbroath .....   | 4.89        | + 2.25                         | 1.20                       | 11              | 22                               | 68.0         | 17    | 43.0 | 20              | 0                       | ...   |
| XXXV.    | Braemar .....  | 4.93        | + 2.07                         | 1.56                       | 10              | 26                               | 75.3         | 4     | 39.0 | 20              | 0                       | 0     |
| XXXVI.   | Aberdeen .....   | 2.93        | —                              | .65                        | 15              | 18                               | 70.0         | 13    | 39.0 | 26              | 0                       | ...   |
| XXXVII.  | Skye (Sligachan) .....   | ...         | ...                            | ...                        | ...             | ...                              | ...          | ...   | ...  | ...             | ...                     | ...   |
| XXXVIII. | Culloden .....   | 3.86        | + 1.08                         | .81                        | 7               | 15                               | 75.0         | 9     | 41.0 | 20 <sup>c</sup> | 0                       | 0     |
| XXXIX.   | Dunrobin .....   | 2.04        | —                              | .45                        | 23              | 16                               | 69.5         | 8     | 38.5 | 20              | 0                       | ...   |
| XL.      | Orkney (Sandwick).....   | 2.54        | — .12                          | .69                        | 13              | 15                               | 68.8         | 10    | 41.3 | 22              | 0                       | 2     |
| XLI.     | Cork (Blackrock) .....   | 2.64        | — .20                          | .49                        | 9               | 17                               | 84.0         | 2     | 44.0 | 7               | 0                       | ...   |
| XLII.    | Dromore Castle .....   | 6.28        | —                              | .90                        | 6,9             | 22                               | 67.0         | 31    | 47.0 | 4               | 0                       | ...   |
| XLIII.   | Waterford (Brook Lodge) ...  | 2.19        | —                              | .31                        | 11              | 19                               | 75.0         | 29    | 44.0 | 19              | 0                       | 0     |
| XLIV.    | Killaloe .....   | 4.33        | —                              | .48                        | 6               | 17                               | 75.0         | 2     | 45.0 | 19              | 0                       | ...   |
| XLV.     | Portlarington .....  | 2.51        | — .17                          | .48                        | 22              | 23                               | 75.0         | 2     | 45.0 | 18              | 0                       | 0     |
| XLVI.    | Dublin (FitzWilliam Square)  | 2.35        | — .07                          | .42                        | 22              | 25                               | 70.7         | 5,30  | 47.1 | 17              | 0                       | 0     |
| XLVII.   | Ballinasloe .....  | 2.69        | — .19                          | .48                        | 27              | 21                               | 70.0         | 5     | 40.0 | 19              | 0                       | ...   |
| XLVIII.  | Waringstown .....  | 3.19        | — .39                          | .57                        | 28              | 22                               | 80.0         | 4     | 44.0 | 19              | 0                       | 0     |
| XLIX.    | Londonderry (Creggan Res.)...  | 2.84        | —                              | .35                        | 28              | 24                               | ...          | ...   | ...  | ...             | ...                     | ...   |
| L.       | Omagh (Edenfel).....   | 3.46        | + .21                          | .83                        | 23              | 21                               | 76.0         | 3     | 44.0 | 18              | 0                       | 0     |

+ Shows that the fall was above the average ; — that it was below it.  
<sup>a</sup> And 28.      <sup>b</sup> And 9, 26.      <sup>c</sup> And 27, 29.

## METEOROLOGICAL NOTES ON JULY.

**ABBREVIATIONS.**—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

[For details respecting the thunderstorms, see separate article.]

## ENGLAND.

**BANBURY.**—The weather of the month was very unfavourable for getting hay, but was useful to grain crops, although they were considerably beaten down by the R. At the close of the month much hay was still out, some grass remained uncut, and the corn harvest had not commenced. T on 5 days.

**CULFORD.**—The ground at the beginning of the month was very dry, and although showers were general and frequent throughout, the quantity of moisture was not sufficient for dry soils. Harvest progressing favourably.

**WOOLSTASTON.**—A wet month; the hay harvest secured with much difficulty. Mean temp., 60°·0.

**ORLETON.**—The weather during the month was very showery, and there was rarely a day without a few spots of R; T was heard on 6 days, and L was seen on 2 days; on the 13th there was a great fall of R for a few minutes. The temp. was equable, and about 0°·5 below the average of 23 years; the bar. was generally steady. The crop of hay was very light, and much of the late secured was damaged by R.

**LEICESTER.**—The month was a very unsettled one, and T and L were frequent; on the 8th, between 4.15 p.m. and 4.45 p.m., the wind changed from E. to S.W., then to N.E., and then to S.W.

**MANCHESTER.**—June having been very dry, rain was much required at the beginning of this month, but on the 3rd day the dry weather ceased and welcome R began, and fell more or less for nearly 20 consecutive days, restoring vegetation, and replenishing to a large extent the supply of potable water, which had got dangerously low, besides flushing the sewers, and thereby improving the health of the town. The night temperatures were rather low; only two TSS occurred of any note.

**KILLINGHOLME.**—A real summer month; frequent T and L and many showers, but none heavy; more R wanted on heavy lands. Corn likely to be good in quality.

**ARNcliffe.**—During a violent TS on 3rd, '65 in. of R fell in 45 minutes, a larger quantity than had fallen during the 48 days previous.

**NORTH SHIELDS.**—T on 6 days.

## WALES.

**HAVERFORDWEST.**—The month was fine and warm, with high day and night temp. up to the 15th; after St. Swithin's Day (which was very wet and stormy) the weather continued broken and wet for several days, and did not recover its fine summer character until the 29th, from which date to the 31st the temp. steadily increased, and the air was very dry. The temp. rose to or above 70° on 12 days, and the R fell mostly at night. As a whole, it was certainly the finest July since 1880. Prevailing winds, Southerly, N. and N.W. On the 27th, at 11 p.m., a bright, but small meteor was seen in the S.E., at an angle of 45° above the horizon. Wheat and oats look very well, but barley is thin on most grounds; the frequent R during the greater part of the month did wonders for the green crops.

**LLANDUDNO.**—The temp. of the month, although equable, was slightly below the average, and the range, both diurnal and monthly, considerably less than usual. R fell on 20 days, the average being about 11 days, and the total fall was large; the pastures, gardens, and green crops, which had suffered much from the drought of the previous month, were of course much benefited by this excess of R, which falling mostly in showers, did not interfere materially with out-door exercise. Duration of bright sunshine, 137 hours.

## SCOTLAND.

**CARGEN.**—A very unusual number of TSS occurred during the first half of

of the month ; mean temp. ( $59^{\circ}2$ ) about the average ; duration of sunshine 40 hours below the average. T on 10 days.

HAWICK.—A fine growing month ; T on 6 days.

OBAN.—A glorious month, with sufficient R to encourage vegetation, which with ample sunlight has made excellent progress. In the latter half of the month the temp. fell considerably. T and L on 3rd, 4th, 9th and 10th. On 10th, 2.41 in. of R fell in 7 hours ; new rifts were opened in the hill sides, and a large amount of debris carried down.

ABERDEEN.—During the first week of the month foggy weather was experienced, and the prevailing winds during the first fortnight were south-easterly. Rainfall somewhat above the average.

CULLODEN.—The R of the month fell generally with TSS, chiefly between the 7th and 25th, and in consequence the hay crop was more or less damaged, but other crops benefited ; the weather during the last week was particularly fine and dry.

SANDWICK.—A pleasant month ; the rainfall was just about the average and the temp. was about the mean of the previous 57 years. The most remarkable feature of the month was the fog which prevailed more or less every day from 2nd to 9th, inclusive.

#### IRELAND.

CORK.—The weather about the beginning and in the middle of the month was dry, but frequent slight showers, generally in the evening or night, refreshed vegetation, so that the dryness of June proved less injurious than was expected.

DROMORE.—A bad month for harvesting ; potatoes suffering much from blight.

WATERFORD.—The weather of the month was very unsettled, although there were no heavy rains. Atmosphere remarkably clear on 25th.

KILLALOE.—A very beneficial month for all purposes ; a sufficiency of R, without excess to injure haymaking. Mean temp.  $60^{\circ}4$ .

DUBLIN.—True to its traditional character, July was a very showery month, R falling on 25 days, compared with an average of 17.6 days ; nevertheless the total did not quite reach the average, the explanation being that the R fell chiefly in the form of showers, the 28th being the only thoroughly wet day. The mean temp. ( $59^{\circ}7$ ) was almost identical with the average of 20 years, and owing to the prevalence of clouds and the frequency of showers by day, the extremes were not great. Distant T was heard on 2 days, but Dublin enjoyed a complete immunity from TSS, and there was no H. Mean humidity 78 ; mean amount of cloud 6.4 ; prevailing winds S.E. and W.

EDENFEL, OMAGH.—The weather up to the 12th was a continuance of the magnificent summer which marked the latter half of June, but from the 13th a copious rainfall, accompanied by a calm, humid atmosphere, forced into luxuriance crops and foliage of every kind.

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#### METEOROLOGY AT THE INTERNATIONAL HEALTH EXHIBITION.

A CONFERENCE was held at the Health Exhibition on Thursday, July 17th, and Friday, July 18th, under the auspices of the Royal Meteorological Society. The chair was taken on the first day by J. Norman Lockyer, Esq., F.R.S., and on the second day by Dr. J. H. Gilbert, F.R.S. The following papers were read, and discussions ensued upon them :—

*On some relations of Meteorological Phenomena to Health.* By J. W. Tripe, M.D., F.R. Met. Soc.

In ages long past these relations excited much attention, but the knowledge concerning them was of the vaguest kind ; even now no

great advance has been made, because it is only quite recently that we have been able to compare an accurate record of deaths with observations taken at a number of reliable meteorological stations. My remarks will refer to the relations between (1) meteorological phenomena and the bodily functions of man, and (2) between varying meteorological conditions and death-rates from certain diseases.

Too much attention is paid to the barometer, for it really indicates only the variations in the weight of air pressing on our bodies, and these produce but little effect on health, for the advantages resulting from a residence at mountain stations are chiefly due to the generally altered climatic conditions, and the total change in the daily habits.

Man can bear greater variations of temperature than any other animal, for a temperature of  $-70^{\circ}$  F. can be safely borne in the Arctic Regions, and  $120^{\circ}$  F. has been registered in Australia, so that he can live in fairly good health within a range of nearly  $200^{\circ}$  F. The effects of high temperature vary greatly according to the humidity, the effect of a moist air being to prevent evaporation, and the consequent cooling of the body; the effects of temperature also depend on the extremes, for when the days are hot and the nights cool, the system becomes partially restored; hot climates are not necessarily injurious to Europeans, but their children certainly degenerate, and after two or three generations die out.

The direct influence of rain on man is not marked except by its giving moisture to the air, and by altering the level of ground water; when ground water has a level less than 5 feet below the surface, the locality is unsuitable for habitation. Varying amounts of moisture in the air materially affect the health and comfort of man, as not only the evaporation from the skin, but also the amount of effete matter carried off from the lungs, depends upon it.

Variations of pressure and temperature affect the circulation of air in the soil, and as this "ground air" is frequently combined with dangerous gases, its effect on health is at times considerable.

There are certain known relations between meteorological phenomena and disease, but on the other hand there are many unknown relations; for instance, small-pox, while of an ordinary type, will sometimes assume an epidemic form under meteorological conditions with which it usually declines. A mean monthly temp. below  $44^{\circ}6$  is adverse to the spread of scarlet fever, and deaths from this disease are most numerous with a temp. between  $45^{\circ}$  and  $57^{\circ}$ . Diseases of the lungs, excluding consumption, are fatal in proportion to the lowness of the temp. and excess of moisture. The relations between high summer temp. and diarrhoea have long been seen, but the cause is not clearly known, and the reason for its excess in certain districts has not been discovered. With regard to the relation between meteorological phenomena and many diseases, such as sunstroke, liver diseases, yellow fever, cholera, whooping cough, measles, &c., our knowledge is very limited.

*(To be continued.)*

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THE THUNDERSTORMS OF JULY, 1884.

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TUESDAY, JULY 8th.

SUSSEX.

*Littlehampton.*—T.

HANTS.

*Redlands, Emsworth.*—TS at 2 a.m.

NORTHAMPTON.

*Kilsby, Daventry.*—The railway station was struck about 3 p.m. ; a guard who witnessed it described the appearance as that of a small cloud coming down to the chimney stack, and then knocking down part of the wall.

*Oundle.*—T.

WILTS.

*Pewsey.*—T.

STAFFORD.

*Heath House, Cheadle.*—TS.

WARWICK.

*Coventry.*—A young man named Wheatley was cleaning a tombstone and surrounded by tall elms, when he was struck and rendered unconscious ; his hair was singed, his neck, back, and the calf of his leg were discoloured and badly burnt. Part of the crown of his hat was cut away, and the remainder divided into strips ; the left leg of his trousers was torn from the knee downwards, and his left boot was cut into fragments. A cow and five lambs were killed.

*Leamington.*—A chimney in Sherbourne-terrace was demolished.

LEICESTERSHIRE.

*Ibstock, Market Bosworth.*—At 4.30 p.m. the postal telegraph instrument was struck and rendered useless, the dial being blackened. A gas-pipe was also partly severed.

*Long Whatton, Melton.*—Mr. Wilkins had a valuable horse killed.

*Loughborough.*—Very severe TS, 4.40 to 5 p.m. ; about 0.50 in. of R in 10 minutes. Three cows were in a field at Meadow-lane, two

were killed, one was in a shed being milked, the other was outside—where the third was is not stated—the man who was milking was struck but recovered.

*Stoney Stanton, Melton.*—About 7 p.m. two houses in the village were struck, and a very large oak tree was shivered.

*Whitwick, Ashby-de-la-Zouch.*—At 4.45 p.m. a large tree at Mr. Stinson's was shivered in fragments, also another at Mr. Biddle's and the chimney of Mr. Reed's house was damaged.

NOTTINGHAM.

*Carlton, Worksop.*—Cottage struck, but no one hurt.

LANCASHIRE.

*Breeze Hill, Liverpool.*—T L.

*Preston.*—A spinning mill in Derby Street was struck, as was also a boy named T. Ashworth, who was in a hut in a brick field at the top of Miller-road.

YORKSHIRE.

*Scarborough.*—TS.

WESTMORELAND.

*Shap.*—TS at 9.30 p.m.

SCOTLAND.

ROXBURGH.

*Hawick.*—T.

FIFE.

*Newton Bank, St. Andrew's.*—TS and .35 in. of R in 25 minutes.

WEDNESDAY, JULY 9th.

HERTFORDSHIRE.

*Baldock.*—Telegraphic instruments at the post office deranged. One heifer killed and another temporarily disabled.

*Bygrave, Baldock.*—An oak tree splintered.

*Hitchin.*—It is 20 years since I have had to chronicle such a deluge of rain as we had during the thunderstorm between 1.30 and 3 p.m.

My gauge at *Oston Heal* (one mile west) collected 1.19 in.

That at *Wratten* ... .. „ 1.75 „

And at *Fairfield* (three-quarter mile east) „ 2.75 „

The volume of water poured into the river in less than a quarter of a mile killed over 200 fine trout, to the total weight of three to four cwt. ; every fish seems to have been suffocated by the rush of turbid water.--W. LUCAS.

*Stevenage.*—The clock on Colonel Medcalf's house at *Aston* was struck.

## NORTHAMPTON.

*Cold Ashby, Daventry.*—Mr. Evans's cottage struck, the chimney thrown down, and much damage done internally, but a child left on a bed was found uninjured.

*Oundle.*—Some sheep killed.

*Thrapston.*—A party of fishermen were making for shelter under a willow tree, when they saw it split in two by the lightning.

## HUNTINGDON.

*Tetworth, Abbotsley.*—A bullock killed.

## BEDFORD.

*Sandy.*—Heavy TS.

*Tempsford, Potton.*—Eleven bullocks killed beneath a tree.

## CAMBRIDGE.

*Comberton, Cambridge.*—A farm was struck and much damaged, and two pigs were killed.

*Little Gransden, Caxton.*—Two trees struck.

## NORFOLK.

*Diss.*—T in afternoon.

*Norwich.*—Two persons in different parts of the town were struck, and rather seriously injured. A chimney was struck in West Pottersgate-street.

*Martham, Yarmouth.*—At 8.45 p.m. Mr. Edmond's thatched barn was struck and ignited.

*Off the Norfolk Coast.*—The steamer "Cambria," on her voyage from London to Dundee, was struck about 7.30 p.m. while passing through Yarmouth Roads: the mast was shivered and other damage was done.

## GLOUCESTER.

*Maisemore.*—TS.

## HEREFORD.

*Ross.*—TS at night.

## STAFFORD.

*Heath Ho., Cheadle.*—TS.

## WARWICKSHIRE.

*Keresley, Coventry.*—Twelve sheep killed and several trees struck.

## LEICESTERSHIRE.

*Great Bowden, Market Harboro'.*—A horse and a sheep were killed.

*Heather, Ashby-de-la-Zouch.*—Two beasts killed while grazing.

*Loughborough.*—Slight TS about 2.30 p.m.

*Thringstone, Whitwick.*—The chimney of the Vicarage was struck and one room damaged.

## NOTTINGHAM.

*East Markham, Tuxford.*—Mr. H. Clark had a cow killed.

*Hodsock Priory, Worksop.*—Very heavy H and R. 2.04 in. in 24 hours. 1.34 in. fell between 3 p.m. and 4.20 p.m.

*Upton, Southwell.*—Mr. Twidale had between 30 and 40 sheep killed under one tree.

*West Drayton, Tuxford.*—Mr. Richards had a cow killed while grazing in an open field.

## DERBYSHIRE.

*Belper.*—Two villas damaged.

*Ilkeston, Derby.*—A signal box set on fire and the tower of the church damaged.

## LANCASHIRE.

*Bilsborrow, Preston.*—Three cows in the fields killed.

*Cloughton, Garstang.*—The Hall struck and slightly damaged.

*Heaton with Oxcliffe, Lancaster.*—Mr. Cottam had four lambs killed.

*Lancaster.*—Five out of the eight telegraph instruments were damaged.

*Royton, Oldham.*—Five men at work on a reservoir took shelter in a hut, two were killed and the other three injured.

## YORKSHIRE.

*Bottom Boat, Wakefield.*—An old woman sitting by a cottage fire-place was killed, and her daughter who was near was injured.

*Bramley, Rotherham.*—Railway Station struck and roof ignited.

*Doncaster.*—A girl struck, who remained unconscious more than an hour.

*Howden.*—Mr. Noble had a valuable horse killed, and some hay-cocks on Mr. Simpson's land were ignited.

*Kilton-in-Cleveland, Guisborough.*—Mr. Judson with three men was carting hay, when all were struck by lightning and rendered unconscious.

*Meltham Mills Vic.*—A flash of L passed through the kitchen, melted some gas pipe in the cellar, and ignited the gas.

*Rothwell, Leeds.*—J. Hainsworth, engine driver at the collieries, was walking home with three men, when he was killed and the others were rendered insensible for a few minutes.

*Scarborough.*—TS.

*Stanley, Wakefield.*—Violent TS, a woman killed.

## THURSDAY, JULY 10th.

## BEDFORDSHIRE.

*The Lodge, Sandy.*—TS.

## DEVON.

*Cookbury Wick, Torrington.*—TS.

## YORKSHIRE.

*Normanton.*—Two girls struck, but each eventually recovered.

*Pocklington.*—Mr. Jackson's house at Moor Lane struck, and considerably injured.

DURHAM.

*Whorlton*.—T and heavy R.

NORTHUMBERLAND.

*Unthank Hall, Haltwhistle*.—Heavy TS. with 2·10 in. of R.

SCOTLAND.

LANARKSHIRE.

*Motherwell*.—A cottage struck and some rooms entirely wrecked.

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SATURDAY, JULY 12th.

HERTFORDSHIRE.

*Cheshunt*.—Two horses killed.

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SUNDAY, JULY 13th.

TS with R at *Heath Ho., Cheadle*, STAFFORD; *Broughton-in-Furness*, LANCASHIRE; *Stanley, Wakefield*, YORKS; *Castle Lodge, Keswick*, CUMBERLAND; *Shap*, WESTMORELAND; *Hawick*, ROXBURGH; *Stronvar* and *Dalnaspidal*, PERTH.

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MONDAY, JULY 14th.

TS at *Newton Bank, St. Andrew's*, FIFESHIRE, with 0·07 in. of R in four minutes; *Stronvar*, PERTHSHIRE, at 3.30 p.m.; and *Forsinard*, SUTHERLAND.

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TUESDAY, JULY 15th.

TS at *Sandy*, BEDFORDSHIRE, and *Maisemore*, GLOUCESTERSHIRE.

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WEDNESDAY, July 16th.

T at *Castle Lodge, Keswick*, and *Newton Bank, St. Andrew's*.

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THURSDAY, JULY 17th.

T at *Heath Ho., Cheadle*, STAFFORDSHIRE, and TS at *Loughborough*, at 2.45 p.m.

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SATURDAY, JULY 19th.

TS at *Rendlesham Hall*, SUFFOLK, at *Diss*, NORFOLK, and T at *Heath Ho., Cheadle*, STAFFORD.

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SUNDAY, JULY 20th.

T at *Castle Lodge, Keswick*, CUMBERLAND.

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THURSDAY, JULY 24th.

MIDDLESEX.

*London*.—TS in afternoon.

## SUSSEX.

*Slinfold, Horsham.*—Five horses and two boys at Dedisham farm were knocked down ; three horses were killed, one was blinded, the two boys and the fifth horse recovered.

*Addington, Winslow, BUCKS, and Oundle, T, H, and R ; Rendlesham Hall, SUFFOLK, TS, Diss, TS in afternoon ; Compton Bassett, Calne, T L and H ; Pewsey, WILTS, T ; Ross, HEREFORD, TS at 3 p.m. ; Heath Ho., Cheadle, TSS.*

## WILTS.

*Monckton Deverill, near Warminster.*—Twelve heifers standing beside a rolled wire fence with wooden posts were killed ; they were standing in two lines, nine in] one place, and three in another, the distance between the two groups being about 200 yards ; fifteen of the wooden posts were damaged, and one much split. One cow was lying down close to the fencing, and was scarcely injured at all.

## NOTTINGHAM.

*Nottingham.*—A milkman (J. Harris) was killed instantly while serving milk to some men working at a sewer ; his hair was ignited.

TSS also occurred at *Breeze Hill, Liverpool ; Newton Bank, St. Andrew's, FIFESHIRE ; and Brook Lodge, Waterford.*

## FRIDAY, JULY 25th.

## RUTLAND.

*Oakham.*—A flash of L struck the spire of the church, damaging the lightning conductor. It then entered the tower splintering the floor, and passing through entered the church and ignited the gas.

## SATURDAY, JULY 26th.

## LANCASHIRE.

*Haverthwaite, Colton.*—At 8.50 a.m. there was a single flash of L, which struck the Blackbeck gunpowder works, exploded the corning house, killed three men, and ignited the clothes of the fourth.

## ADDENDA.

FRIDAY, 4TH.—*Banbury.*—TS. Animals were killed at several places near. In one discharge the flash is said to have moved slowly. In the course of the storm several trees were blown down or damaged by a revolving gust of wind of almost momentary duration.—*Carlisle.*—Stack struck in Blackfriars-street, and at another house in the same street the gas was ignited ; Crown Inn, Botchergate, chimney struck.

SUNDAY, 6TH.—*Bolton.*—In the morning the Chadwick Orphanage was struck, also a chimney in Castle-street.

ON THE RAINFALL OF JAPAN.

(Based upon J. J. REIN'S *Japan*. London, Hodder and Stoughton.)

So little is generally known as to the rainfall of this great country, that we have extracted from Rein's book some of the leading facts, converted them into English measures, and arranged them as systematically as practicable.

| Stations.    | Lat. North. | Lon. East. | No. of years observations. | MEAN RAINFALL IN INCHES. |                    |                     |                |                |
|--------------|-------------|------------|----------------------------|--------------------------|--------------------|---------------------|----------------|----------------|
|              |             |            |                            | Year.                    | 6 months Oct.-Mar. | 6 months April-Sep. | Wettest month. | Driest month.  |
| Tôkio .. ... | 35°40'      | 139°45'    | 5                          | 65·40                    | 23·87              | 41·53               | 13·27, Sept.   | 2·29, Jan.     |
| Yokohama     | 35 26       | 139 49     | 7                          | 70·63                    | 24·92              | 45·71               | 10·20, Sept.   | 2·36 ,,        |
| Osaka .....  | 34 20       | 135 19     | 1                          | 41·06                    | 15·32              | 25·74               | 6·77, Oct.     | 1·42 ,,        |
| Nagasaki..   | 32 44       | 129 42     | 1                          | 47·95                    | 12·52              | 35·43               | 11·02, April   | 1·06 ,,        |
| Hakodate .   | 41 46       | 140 45     | 9                          | 51·85                    | 23·03              | 28·82               | 8·35, Aug.     | 2·24, Feb.&Mar |
| Sapporo ..   | 43 4        | 141 23     | 1                          | 45·40                    | 27·05              | 18·35               | 6·61, Oct.     | 1·54, April    |

At Yokohama in one year Dr. Mourier collected only 41·66 in. September, 1878, was very wet, 18·98 in. fell at Tokio during the month, and 6·93 in. is reported to have fallen in 30 hours at Yokohama.

In Northern Japan some valleys have much snow, *e.g.*, in the valley of Tetori-gawa, in the province of Kaga, at an altitude of 700-800 metres (2297-2625 ft.) above sea level, 6 metres (19·7 ft.) is usual, and 2 metres (6·6 ft.) is an exceptionally small quantity.

The following table of monthly values consists partly of means and partly of absolute readings, but the third column gives the period over which the observations extended.

| Station.     | Period of Observation. | Jan. | Feb. | Mar. | April. | May  | June | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|--------------|------------------------|------|------|------|--------|------|------|-------|------|-------|------|------|------|--------|
|              |                        | in.  | in.  | in.  | in.    | in.  | in.  | in.   | in.  | in.   | in.  | in.  | in.  |        |
| Tôkio .....  | 3 years.               | 3·35 | 3·50 | 4·25 | 3·07   | 6·02 | 7·80 | 4·17  | 3·54 | 13·47 | 4·88 | 4·61 | 2·24 | 60·90  |
| „ Knipping   | 1873-77.               | 2·29 | 2·48 | 5·32 | 3·58   | 5·47 | 7·95 | 5·28  | 5·98 | 13·27 | 7·52 | 3·35 | 2·91 | 65·40  |
| *Yokohama.   | 1863-69.               | 2·36 | 3·31 | 5·04 | 6·57   | 5·83 | 8·19 | 8·23  | 6·69 | 10·20 | 6·93 | 3·46 | 3·82 | 70·63  |
| +Osaka ..... | Dec'69toJan'71         | 1·42 | 1·50 | 1·53 | 3·70   | 5·08 | 2·83 | 5·00  | 3·42 | 5·71  | 6·77 | 2·64 | 1·46 | 41·06  |
| Nagasaki ..  | 1872.                  | 1·06 | 2·32 | 3·51 | 11·02  | 4·88 | 5·67 | 2·60  | 5·75 | 5·51  | 1·18 | 1·77 | 2·68 | 47·95  |
| Hakodate .   | 9 years.               | 5·95 | 2·24 | 2·24 | 2·52   | 2·48 | 6·93 | 2·99  | 8·35 | 5·55  | 4·73 | 4·33 | 3·54 | 51·85  |
| Sapporo ...  | 1876.                  | 3·31 | 4·96 | 3·07 | 1·54   | 2·87 | 3·54 | 1·93  | 4·65 | 3·82  | 6·61 | 6·42 | 2·68 | 45·40  |

\* Dr. Hepburn.

+ Dr. Gratama.

A HEAVY INDIAN RAINFALL.

To the Editor of the *Meteorological Magazine*.

SIR,—Mr. Fred. Chambers, the acting superintendent of the Government Observatory, Bombay, has forwarded to me a copy of your magazine for June, 1884, in which some remarks are made regarding the heavy rainfall which occurred at Bhosawul on the night of 1st July, 1883. As I had already written upon the cause of the Surat floods, Mr. Chambers thought I might be able readily to supply the notes you had invited.

The 15·15 inches of rain which fell at Bhosawul between 6 p.m.

of the 1st and 6 a.m. of the 2nd July last year, were due to a cyclone which crossed the Indian Peninsular from the head of the Bay of Bengal to the head of the Arabian Sea. The following is a brief history of the matter :—On the 26th June the Bengal Meteorological Office reported a cyclone to be forming at the head of the bay, and on the 28th the storm signals were hoisted in Calcutta to give warning that a cyclone was expected to pass inland between Saugor Island and False Point. On the morning of the 29th there had been a rainfall at False Point of over 10 inches, and the barometer at Saugor Island had during the preceding 24 hours fallen one-fifth of an inch, making a total fall of three-fifths in four days. On the 30th the centre of the cyclone had moved inland, and was over the hill districts of Orissa, and the barometer at Saugor Island had risen one-third of an inch. The next day (July 1st) the centre had moved as far westward as Seoni in the Central Provinces, and falls of 4 and 5 inches were reported from the stations about. By the morning of July 2nd, the centre of the cyclone had travelled to the neighbourhood of Indore, and very heavy rain had fallen over the hill districts which give rise to the Taptee and Nerbudda rivers, the heaviest falls having occurred in the Taptee valley. At Chikalda there had been a fall of over 21 inches in the previous 30 hours; at Amraoti they had 10.25 inches in the same period; at Akola 8.81 inches, at Buldana 7.01, and at Bhosawul in the previous 24 hours, they had the 18.25 inches which you have referred to. On the morning of the 3rd the centre was over Kutch, and severe gales were felt in Kattiawar and parts of Guzerat and Rajputana; at Rajkote they had a fall of 9.85 inches of rain during the preceding twelve hours. On the morning of the 4th the centre of the cyclone had moved out into the Arabian Sea, a little to the S.W. of Karachi, where it was encountered by the B. I. S. N. Co.'s steamer "Oriental," with the effect of causing her to lose her awning, some of her sails, and two of her boats. By the afternoon of the same day the storm was lost to further observation.

It was this cyclone which caused the flooding of the Taptee and the submergence of Surat. On the evening of the 3rd the river at Surat had risen 45 feet, higher by 3 feet than it was known to have risen before. The country for miles around was under water; in Surat the ground floors of many of the houses which were approached by flights of six or seven steps were covered with four or five feet of water; the B. B. & C. I. Railway embankments, both to the north and south of Surat, were seriously damaged, and the bridge over one of the Taptee tributaries was carried away; and all this in addition to the damage done to the G. I. P. Railway bridges.

The excessive damage done by this cyclone was due to the accidental position of the track of heavy rain, which was a little on the south side of the Satpura and Maha Deva Hills, thus causing by far the greater moiety of the drainage work to be done by the Taptee. Had the centre been only a little further north, the Nerbudda and Taptee rivers would have had an equal share of the work, and while

of course there must inevitably have been considerable damage done, it would not have been so great as was actually the case.

The rainfall at Bhowal of 15·15 inches in 12 hours was undoubtedly very unusual; the fall at Chikalda (near Elichpur) of 21·22 inches in 30 hours, was also very heavy.—Yours, &c.,

A. N. PEARSON,

Acting Meteorological Reporter for Western India.

*Meteorological Office, Bombay, 29th July, 1884.*

## METEOROLOGY AT THE INTERNATIONAL HEALTH EXHIBITION.

*English Climatological Stations.* By G. J. Symons, F.R.S.

The Royal Meteorological Society has equipped a Climatological Station in the grounds of the Health Exhibition, in order that anyone organizing a station may see one arranged in accordance with the regulations of the Society.

The object of the Climatological Station is to determine the elements of the climate of a place, hence only such instruments are used as are necessary for that purpose. From observations of these instruments, the highest, lowest, and mean temperatures, the range of temperature as well as the humidity of any locality, can be obtained. Each of these conditions exerts a great influence on health. This is especially true in the case of range of temperature as two places having the same mean temperature may vary considerably, one having a generally equable temperature, while the other is subject to great extremes of heat and cold.

It was in the hope that stations may be started at as many as possible of the English Health Resorts, that the Royal Meteorological Society equipped the Climatological Station. The Society has established 82 stations, from each of which, returns of observations, made with accurate and verified instruments, are received, and each station is regularly inspected by the Assistant Secretary. The positions of these stations are shown on the accompanying map,\* and from a single glance, it is obvious that there is still room for many more.

*The Equinoctial Gales: Do they occur in the British Isles?*

By R. H. Scott, M.A., F.R.S.

This was a re-examination of the results described in a previous paper on the subject, read before the Royal Meteorological Society,† and it confirmed in every particular the statements then made.

*Some Occasional Winds and their Influence on Health.*

By W. Marriott, F.R.Met.Soc.

All winds may be regarded as caused directly by differences of atmospheric pressure, just as the flow of water is due to difference in level. The air flows spirally outwards from a region of high pressure, in the direction of the hands of a watch, in the northern

\* The map is exhibited in the Meteorological Annexe at the Health Exhibition.

† See *Met. Mag.*, No. CCXXII. (July, 1884), p. 87.

hemisphere, and spirally inwards in a region of low pressure, in the direction opposite to that of the hands of a watch. The movements are exactly the reverse in the southern hemisphere.

The wind most dreaded in this country is the East wind, it generally blows in the spring for several days together; it is dry, cold, and very penetrating.

“ When the wind is in the East,  
’Tis good for neither man nor beast.”

Such winds blowing over the human body, tend to reduce the temperature of its surface, not only by conduction, but also by evaporating moisture from it, and rendering a large amount of heat latent.

The *Mistral* is a very dry and cold N. W. wind, which blows along the Gulf of Lyons; it is often strong enough to blow a man off his horse.

The *Scirocco* occurs along the North African coast, in Sicily, South Italy, &c.; it is a hot S. E. wind blowing from the Sahara. It is dry on the coast of Africa, but in crossing the Mediterranean it becomes moist; in Sicily it sometimes raises the temp. to  $110^{\circ}$  in the shade.

The *Simoom* occasionally visits the deserts of Kutchee, Upper Scinde, and similarly constituted tracts of country in the East. Sudden and singularly fatal in its effects, invisible and intangible, it passes like a knife through the air, leaving a well-defined narrow track marked by the sudden extinction of life, both animal and vegetable. At the close of the hot weather in 1856, five men were on their way from Kandahar to Shikarpoor, when the blast crossing their path, killed three of them and disabled the remaining two.

The *Hot Wind* is one of the features of the climate of Australia; it blows in November, December and January; it is very hot and dry, but not remarkably unhealthy; its actual temperature varies from  $80^{\circ}$  to  $110^{\circ}$ , but it seldom reaches  $100^{\circ}$ .

*Cumulative Temperature.* By R. H. Scott, M.A., F.R.S.

On the walls of the Meteorological Annexe will be found a series of diagrams, exhibiting for various districts in the United Kingdom the march of Temperature, Rainfall and Bright Sunshine. The object of these curves is to show clearly some of the most important factors in the growth of crops. As regards the three elements represented on the diagrams, the curves for rainfall and sunshine require but little explanation, as the successive steps of the curves show the successive weekly totals of rain or sunshine.

The case as regards temperature is, however, different, and those who examine the diagrams will see that there are two curves, one ascending, the other descending; the one red, the other blue. A certain arbitrary base line is assumed, and the values are measured above or below that line.

It is proved almost beyond a doubt, that each individual cereal requires a definite amount of heat to bring it to maturity. Thus maize requires more than wheat, and wheat again more than barley or oats.

Now various investigators, and notably Boussingault and Prof. Alphonse de Candolle, of Geneva, have devoted much attention to

this subject, and the latter has come to the conclusion that a certain total amount of temperature above a definite base line is necessary for plant growth, and that this "sum of temperature" varies for each crop. He found that plants did not give indications of active vegetation until the temperature rose above  $42^{\circ}$  F., and this temperature is taken as the base for all the diagrams.

Although Prof. de Candolle propounded his views some years ago, at the Vienna Conference in 1874 meteorologists were quite at sea as to how these sums of temp. were to be calculated. This problem has been solved by Lieut.-General Strachey; he proposes to adopt as a unit of temperature, to supply a standard for calculation, one degree continued for the unit of time, either one hour or one day, as the case may be.

Such a unit may be conveniently called an hour degree, or day degree. The unit of time adopted for the calculations to which I am about to refer is a day, and the unit of what may be termed the effective temperature is therefore a *day degree*. A day degree therefore signifies one degree F. of excess or defect of temperature above or below  $42^{\circ}$  F. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours.

The first step towards determining this effective temperature in day degrees resolves itself into determining the average temperature for the period under consideration. Most observers record the maximum and minimum temperatures once in 24 hours, and it is found that the mean of these readings is nearly the average for the day. If the max. and min. are both above  $42^{\circ}$  all the accumulated temperature is to the good; it is all on the positive side. If they are both below  $42^{\circ}$  it is all on the negative side; but if one is above and the other below, one portion of the effective temp. is positive, and the other negative.

Now, General Strachey carried out a long series of calculations, based on the observed hourly temperatures at Kew Observatory, and at other stations in the United Kingdom, in order to ascertain the magnitude of the co-efficient by which the difference between either of these extreme temperatures and the base temperature ( $42^{\circ}$  F.) should be multiplied so as to obtain the values of the temperatures in excess or defect of  $42^{\circ}$  F. expressed in day-degrees, and he found that this, *for a weekly period*, was 0.4.

Accordingly we get the following rules:—

If the mean of the day is above  $42^{\circ}$  F., we multiply the difference between the minimum and  $42^{\circ}$  by 0.4 (four-tenths), and call this *the negative effective temperature*.

To find the positive effective temperature we subtract from the difference between the mean for the day and  $42^{\circ}$  the negative effective temperature just determined.

If the mean of the day is below  $42^{\circ}$  F. the proceeding is similar; but we first ascertain the positive effective temperature, and subtract that from the difference between  $42^{\circ}$  F. and the mean, thus obtaining the negative effective temperature.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JAN., 1884.

| STATIONS.<br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |       |            |           | Absolute.    |                | Total Rain. |       | Aver.<br>Cloud. |
|--|-----------|-------|----------|-------|----------|-------|------------|-----------|--------------|----------------|-------------|-------|-----------------|
|  | Maximum.  |       | Minimum. |       | Max.     | Min.  | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.      | Days. |                 |
|  | Temp.     | Date. | Temp.    | Date. |          |       |            |           |              |                |             |       |                 |
| England, London .....  | 55·6      | 29    | 32·2     | 1     | 48·8     | 39·2  | 40·3       | 86        | 57·1         | 28·6           | 2·30        | 16    | 7·2             |
| Malta .....  | 62·6      | 6     | 42·7     | 18    | 58·1     | 47·5  | 44·0       | 75        | 119·2        | 36·0           | 2·43        | 9     | 4·0             |
| <i>Mauritius</i> .....   | 86·0      | 9     | 69·0     | 30    | 83·7     | 73·5  | 69·4       | 76        | 138·5        | 58·2           | 5·68        | 20    | 6·1             |
| Calcutta.....  | 82·6      | 30    | 50·1     | 11    | 76·4     | 54·8  | 54·5       | 73        | 136·0        | 39·4           | ·02         | 1     | 1·4             |
| Bombay.....  | 88·5      | 7     | 61·6     | 29    | 81·3     | 65·3  | 61·3       | 66        | 137·4        | 49·0           | ·03         | 1     | 0·4             |
| Ceylon, Colombo.....   | 88·8      | 23    | 68·8     | 24    | 86·4     | 71·2  | 66·5       | 67        | 146·5        | 62·0           | ·06         | 2     | 4·0             |
| <i>Melbourne</i> .....   | 97·8      | 19    | 45·1     | 18    | 74·0     | 54·1  | 50·2       | 65        | 156·2        | 36·0           | 4·75        | 11    | 6·1             |
| <i>Adelaide</i> .....  | 110·2     | 13    | 45·1     | 21    | 80·8     | 59·5  | ...        | 46        | 169·3        | 40·4           | 1·71        | 12    | 4·2             |
| <i>Wellington</i> .....  | 70·8      | 2     | 45·5     | 5, 19 | 64·0     | 51·6  | ...        | ...       | 139·0        | 40·0           | 9·58        | 18    | ...             |
| <i>Auckland</i> .....  | 77·5      | 9     | 50·0     | 4     | 68·0     | 55·9  | 50·6       | 68        | 149·0        | 42·0           | 1·64        | 16    | 6·0             |
| Jamaica.....   | 88·4      | 16    | 63·5     | 30    | 84·8     | 67·5  | 66·8       | 78        | ...          | 56·5           | ·75         | ...   | 3·2             |
| Barbados .....   | 79·0      | 30    | 66·0     | 27    | 77·0     | 70·0  | 70·2       | 82        | 140·0        | 63·0           | 2·01        | 14    | 6·0             |
| Toronto .....  | 40·1      | 30    | -13·1    | 25    | 23·1     | 7·6   | 14·7       | 85        | 100·0        | -22·0          | 3·30        | 19    | 8·3             |
| New Brunswick,<br>Fredericton .....                              | 43·9      | 10    | -34·5    | 29    | 19·5     | -4·7  | 9·0        | 86        | ...          | ...            | 3·06        | 13    | 4·8             |
| Manitoba, Winnipeg...  | 30·0      | 17    | -44·5    | 3     | 0·6      | -22·0 | 0·5        | 86        | ...          | ...            | ·61         | 8     | 4·1             |
| British Columbia,<br>Spence's Bridge ...}                        | 49·0      | 8     | -9·0     | 1     | 30·0     | 16·4  | ...        | ...       | ...          | ...            | ·00         | 0     | ...             |

REMARKS, JANUARY, 1884.

MALTA.—Mean temp. 52°·1; mean hourly velocity of wind 11 miles, on 14th the velocity averaged 30 miles for 7 hours, and on 28th 33 miles for 7 hours; the temp. of the sea fell from 61° to 59°. J. SCOLES.

*Mauritius*.—Rainfall ·26 in., mean temp. 0°·6, and mean hourly velocity of wind 0·8 mile below their respective averages. T on every day from 5th to 11th inclusive, and L on 15th. Prevailing wind S.E. to E. by N. The secondary glow has appeared occasionally, and lasted 1 hour 20 min. after sunset. C. MELDRUM, F.R.S.

*Melbourne*.—Mean temp. of air 3°·5 of dew point 2°·6, and mean pressure ·052 in. below their respective averages; mean degree of humidity 1, amount of cloud 1·0, and rainfall 3·15 in. above their respective averages. Prevailing wind S. and W., strong breezes on 7 days. Dust storms on 5th and 7th; L on 20th. Dull and showery from 20th to 28th, very heavy showers on 21st. R. L. J. ELLERY, F.R.S.

*Adelaide*.—The coldest January (excepting 1868) since 1856, the mean temp. (70°·2) being 4°·6 below the average, and the min. the lowest ever recorded in January. Some hot weather occurred in the first part of the month, but from 19th to 28th it was cold, squally, and showery, with H and T. The red glow was visible on clear evenings throughout the month. C. TODD.

*Wellington*.—Generally showery and squally till 23rd, the wind being frequently strong. On 20th R began, and 5·05 in. fell in 36 hours, doing considerable damage. Fine from 23rd to 27th, then showery. Prevailing wind, N.W.; mean temp. 5°·1 below average; rainfall thrice the average. R. B. GORE.

*Auckland*.—Weather singularly cold and variable, the mean temp. being considerably below the average of previous years. Rainfall comparatively small, but spread over an unusual number of days. T. F. CHEESMAN.

BARBADOS.—The mean temp. (73°·3) was the same as the average of 25 years. The wind was from N.E., and averaged 14·3 miles per day, the extremes being 22·0 miles and 5·3 miles. Four days were overcast. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL,  
AUGUST, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | 1·73        | XI.    | Carno, Tybrith .....     | 2·10        |
| „     | Margate, Birchington...   | ·53         | „      | Corwen, Rhug .....       | 1·00        |
| „     | Littlehampton .....       | 1·56        | „      | Port Madoc .....         | 1·75        |
| „     | Hailsham .....            | 1·90        | „      | I. of Man, Douglas ..... | 1·47        |
| „     | I. of W., St. Lawrence.   | 1·12        | XII.   | Stoneykirk, ArdwellHo.   | 1·42        |
| „     | Alton, Ashdell.....       | 2·41        | „      | Melrose, Abbey Gate...   | 2·52        |
| III.  | Winslow, Addington ...    | 1·54        | XIII.  | N. Esk Res. [Penicuick]  | 1·40        |
| „     | Oxford, Magdalen Col...   | 1·52        | XIV.   | Ayr, Cassillis House ... | 2·26        |
| „     | Northampton .....         | 1·80        | „      | Glasgow, Queen's Park.   | 2·71        |
| „     | Cambridge, Beech Ho...    | 1·47        | XV.    | Islay, Gruinart School.. | 3·39        |
| IV.   | Southend .....            | ·67         | XVI.   | St. Andrews, NewtonBk.   | 2·41        |
| „     | Harlow, Sheering ...      | ·95         | „      | Balquhider, Stronvar..   | 5·66        |
| „     | Diss .....                | 1·19        | „      | Dunkeld, Inver Braan..   | 2·23        |
| „     | Swaffham .....            | 2·37        | „      | Dalnaspidal H.R.S. ...   | 5·10        |
| „     | Hindringham .....         | ...         | XVII.  | Keith H.R.S. ....        | 2·25        |
| V.    | Salisbury, Alderbury...   | 1·38        | „      | Forres H.R.S. ....       | 1·18        |
| „     | Warminster .....          | 1·60        | XVIII. | Strome Ferry H.R.S....   | 6·07        |
| „     | Calne, Compton Bassett    | 1·45        | „      | Lochbroom .....          | 1·94        |
| „     | Ashburton, Holne Vic..    | 2·01        | „      | Tain, Springfield.....   | 2·20        |
| „     | Holsworthy, Clawton...    | 2·72        | „      | Loch Shiel, Glenaladale  | 7·16        |
| „     | Lynmouth, Glenthorne.     | 2·87        | „      | Invergarry .....         | 3·45        |
| „     | Probus, Lamellyn .....    | 1·78        | XIX.   | Lairg H.R.S. ....        | 2·96        |
| „     | Wincanton, StowellRec.    | 2·04        | „      | Forsinard H.R.S. ....    | 3·54        |
| „     | Taunton, Fullands .....   | 1·40        | „      | Watten H.R.S. ....       | 4·09        |
| VI.   | Bristol, Clifton .....    | 2·74        | XX.    | Dunmanway, Coolkelure    | 1·96        |
| „     | Ross .....                | 2·02        | „      | Fermoy, Gas Works ...    | 1·30        |
| „     | Wem, Sansaw Hall.....     | 1·95        | „      | Tralee, Castlemorris ... | 1·42        |
| „     | Cheadle, The Heath Ho.    | 2·73        | „      | Tipperary, Henry Street  | 1·07        |
| „     | Worcester, Diglis Lock    | 2·26        | „      | Newcastle West .....     | ·84         |
| „     | Coventry, Coundon .....   | 2·41        | „      | Miltown Malbay.....      | 2·12        |
| VII.  | Melton, Coston .....      | 1·74        | „      | Corofin .....            | 2·40        |
| „     | Ketton Hall [Stamford]    | 1·51        | XXI.   | Carlow, Browne's Hill..  | ·66         |
| „     | Horncastle, Bucknall ...  | 1·61        | „      | Navan, Balrath .....     | 1·23        |
| „     | Mansfield, St. John's St. | 2·37        | „      | Mullingar, Belvedere ... | 2·21        |
| VIII. | Macclesfield, The Park.   | 2·58        | „      | Athlone, Twyford .....   | 1·98        |
| „     | Walton-on-the-Hill.....   | 2·34        | XXII.  | Galway, Queen's Col...   | 1·58        |
| „     | Lancaster, South Road.    | 1·79        | „      | Clifden, Kylemore .....  | 9·20        |
| „     | Broughton-in-Furness ..   | 1·39        | „      | Crossmolina, Enniscoe..  | 2·85        |
| IX.   | Wakefield, Stanley Vic.   | 1·12        | „      | Carriek-on-Shannon ...   | 2·53        |
| „     | Ripon, Mickley .....      | 1·51        | XXIII. | Dowra .....              | ...         |
| „     | Scarborough.....          | 1·54        | „      | Rockcorry.....           | 1·54        |
| „     | EastLayton[Darlington]    | ·89         | „      | Warrenpoint .....        | 1·00        |
| „     | Middleton, Mickleton..    | ·92         | „      | Newtownards .....        | 2·53        |
| X.    | Haltwhistle, Unthank..    | 1·28        | „      | Belfast, New Barnsley .  | 3·24        |
| „     | Shap, Copy Hill .....     | ·86         | „      | Cushendun .....          | 3·65        |
| XI.   | Llanfrechia Grange .....  | 2·16        | „      | Bushmills .....          | 3·97        |
| „     | Llandovery .....          | 3·40        | „      | Stewartstown .....       | 2·28        |
| „     | Lower Solva .....         | 1·79        | „      | Donegal, Revelin Ho....  | ...         |
| „     | Castle Malgwyn .....      | 2·23        | „      | Buncrana .....           | 3·92        |
| „     | Rhayader, Nantgwilt..     | 3·32        | „      | Carndonagh .....         | 3·81        |

AUGUST, 1884.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Table to which each station belongs.] | RAINFALL.   |                                |                            |                 |                                 | TEMPERATURE. |                 |      |                 | No. of Nights below 32° |     |
|----------|--|-------------|--------------------------------|----------------------------|-----------------|---------------------------------|--------------|-----------------|------|-----------------|-------------------------|-----|
|          |  | Total Fall. | Difference from average 1870-9 | Greatest Fall in 24 hours. |                 | Days on which .01 or more fall. | Max.         |                 | Min. |                 |                         |     |
|          |  |             |                                | Dpth                       | Date.           |                                 | Deg.         | Date            | Deg  | Date.           |                         |     |
|          |  | inches      | inches.                        | in.                        |                 |                                 |              |                 |      |                 |                         |     |
| I.       | London (Camden Square) ...   | .89         | - 1.85                         | .30                        | 27              | 10                              | 88.4         | 8               | 45.7 | 26              | 0                       | 0   |
| II.      | Maidstone (Hunton Court)...  | .61         | - 1.63                         | .33                        | 27              | 5                               | ...          | ...             | ...  | ...             | ...                     | ... |
| III.     | Strathfield Turgiss .....  | ...         | ...                            | ...                        | ...             | ...                             | ...          | ...             | ...  | ...             | ...                     | ... |
| IV.      | Hitchin .....  | 1.76        | -.52                           | .43                        | 27              | 12                              | 86.0         | 11              | 42.0 | 25              | 0                       | 0   |
| V.       | Banbury .....  | 1.94        | -.76                           | .97                        | 31              | 9                               | 86.0         | 11              | 41.0 | 26              | 0                       | ... |
| VI.      | Bury St. Edmunds (Culford)   | 1.23        | -.94                           | .35                        | 31              | 11                              | 86.0         | 11              | 37.0 | 26              | 0                       | ... |
| VII.     | Norwich (Cossey) .....   | 1.46        | - 1.16                         | .49                        | 19              | 11                              | 88.5         | 11              | 41.5 | 27              | 0                       | 0   |
| VIII.    | Weymouth(LangtonHerring)   | 1.35        | ...                            | .40                        | 31              | 11                              | ...          | ...             | ...  | ...             | ...                     | ... |
| IX.      | Barnstaple .....   | 3.40        | -.70                           | .80                        | 31              | 11                              | 87.0         | 8               | 43.0 | 26 <sup>b</sup> | 0                       | 0   |
| X.       | Bodmin .....   | 2.19        | - 2.65                         | .79                        | 31              | 14                              | 78.0         | 23 <sup>a</sup> | 47.0 | 5               | 0                       | 0   |
| XI.      | Cirencester .....  | 1.79        | - 1.87                         | .62                        | 31              | 11                              | ...          | ...             | ...  | ...             | ...                     | ... |
| XII.     | ChurchStretton(Woolstaston)  | 2.35        | - 1.73                         | 1.34                       | 31              | 10                              | 84.0         | 11              | 46.0 | 26              | 0                       | 0   |
| XIII.    | Tenbury (Orleton) .....  | 1.99        | - 1.73                         | 1.07                       | 31              | 12                              | 87.0         | 11              | 41.0 | 5               | 0                       | 0   |
| XIV.     | Leicester .....  | 2.25        | ...                            | .92                        | 31              | 10                              | 90.0         | 8,11            | 41.5 | 26              | 0                       | 1   |
| XV.      | Boston .....   | 1.11        | - 1.50                         | .71                        | 31              | 5                               | 87.0         | 11              | 42.0 | 27              | 0                       | 0   |
| XVI.     | Grimsby (Killingholme).....  | 1.36        | - 1.56                         | .42                        | 31              | 8                               | 81.5         | 24              | 46.0 | 26              | 0                       | ... |
| XVII.    | Hesley Hall (Tickhill).....  | 1.29        | ...                            | .66                        | 31              | 7                               | 92.0         | 11              | 40.0 | 5,20            | 0                       | ... |
| XVIII.   | Manchester (Ardwick) .....   | 1.75        | - 2.17                         | .50                        | 31              | 8                               | 85.0         | 11              | 47.0 | 26              | 0                       | 0   |
| XIX.     | Wetherby (Ribston Hall) ...  | .79         | - 1.84                         | .42                        | 28              | 5                               | ...          | ...             | ...  | ...             | ...                     | ... |
| XX.      | Skipton (Arncliffe) .....  | 1.93        | - 3.87                         | .48                        | 27              | 12                              | 85.0         | 8               | 40.0 | 25              | 0                       | ... |
| XXI.     | North Shields .....  | .72         | - 2.37                         | .25                        | 24              | 9                               | 80.5         | 24              | 40.5 | 26              | 0                       | 0   |
| XXII.    | Borrowdale (Seathwaite).....   | 3.36        | - 7.68                         | .88                        | 10              | 14                              | ...          | ...             | ...  | ...             | ...                     | ... |
| XXIII.   | Cardiff (Ely) .....  | 3.02        | - 2.31                         | 1.06                       | 31              | 10                              | ...          | ...             | ...  | ...             | ...                     | ... |
| XXIV.    | Haverfordwest .....  | 1.70        | - 3.27                         | .90                        | 31              | 13                              | 80.0         | 10              | 39.0 | 26              | 0                       | 1   |
| XXV.     | Plinlimmon (Cwmsymlog) ...   | 3.36        | ...                            | 1.09                       | 27              | 11                              | ...          | ...             | ...  | ...             | ...                     | ... |
| XXVI.    | Llandudno .....  | 1.03        | - 2.16                         | .53                        | 27              | 7                               | 80.8         | 8               | 48.0 | 5               | 0                       | 0   |
| XXVII.   | Hagen [Dumfries] .....   | 1.32        | - 2.95                         | .46                        | 27              | 12                              | 83.6         | 8               | 39.0 | 29              | 0                       | ... |
| XXVIII.  | Hawick (Wilton Hill).....  | 1.32        | ...                            | .51                        | 12              | 7                               | ...          | ...             | ...  | ...             | ...                     | ... |
| XXIX.    | Douglas Castle (Newmains)  | 1.27        | - 3.03                         | .31                        | 31              | 11                              | ...          | ...             | ...  | ...             | ...                     | ... |
| XXX.     | Lochgilphed (Kilmory).....   | 6.47        | + 1.25                         | 1.00                       | 27              | 20                              | ...          | ...             | ...  | ...             | ...                     | ... |
| XXXI.    | Oban (Craigvarren) .....   | 4.20        | ...                            | .95                        | 15              | 22                              | 77.0         | 8               | 45.0 | 29              | 0                       | ... |
| XXXII.   | Mull (Quinish) .....   | 5.42        | ...                            | .93                        | 27              | 25                              | ...          | ...             | ...  | ...             | ...                     | ... |
| XXXIII.  | Loch Leven Sluices .....   | 1.50        | - 2.58                         | .50                        | 13              | 6                               | ...          | ...             | ...  | ...             | ...                     | ... |
| XXXIV.   | Arbroath .....   | 1.55        | - 1.78                         | .59                        | 12              | 9                               | 72.0         | 24              | 40.0 | 29              | 0                       | ... |
| XXXV.    | Braemar .....  | 2.46        | - 1.97                         | .50                        | 12              | 19                              | 76.0         | 12              | 35.8 | 27              | 0                       | 2   |
| XXXVI.   | Aberdeen .....   | 2.08        | ...                            | .73                        | 28              | 14                              | 71.0         | ...             | 40.0 | 28 <sup>c</sup> | 0                       | 0   |
| XXXVII.  | Skye (Sligachan) .....   | ...         | ...                            | ...                        | ...             | ...                             | ...          | ...             | ...  | ...             | ...                     | ... |
| XXXVIII. | Culloden .....   | 1.35        | - 1.65                         | .33                        | 28              | 7                               | 77.0         | 10              | 39.0 | 27              | 0                       | 1   |
| XXXIX.   | Dunrobin .....   | 2.31        | ...                            | .79                        | 28              | 12                              | 71.5         | 6               | 41.0 | 27              | 0                       | ... |
| XL.      | Orkney (Sandwick).....   | 2.81        | -.09                           | .82                        | 28              | 12                              | 69.7         | 6               | 44.3 | 27 <sup>d</sup> | 0                       | 0   |
| XLI.     | Cork (Blackrock) .....   | .73         | - 3.10                         | .13                        | 10              | 13                              | 88.0         | 8               | 45.0 | 31              | 0                       | 0   |
| XLII.    | Dromore Castle .....   | 2.89        | ...                            | .55                        | 29              | 15                              | 72.0         | 19              | 41.0 | 28              | 0                       | ... |
| XLIII.   | Waterford (Brook Lodge) ...  | .62         | ...                            | .30                        | 12              | 10                              | 79.0         | 7               | 39.0 | 26              | 0                       | 2   |
| XLIV.    | Killaloe .....   | 1.44        | ...                            | .30                        | 17              | 11                              | 74.0         | ...             | 45.0 | 23              | 0                       | ... |
| XLV.     | Portarlinton .....   | 1.20        | - 1.87                         | .26                        | 12 <sup>e</sup> | 16                              | 78.0         | 11              | 43.0 | 28              | 0                       | ... |
| XLVI.    | Dublin (FitzWilliam Square)  | .78         | - 2.40                         | .34                        | 27              | 8                               | 74.9         | 12 <sup>e</sup> | 44.6 | 29              | 0                       | 0   |
| XLVII.   | Ballinasloe .....  | 2.42        | - 1.61                         | 1.28                       | 16              | 18                              | 72.0         | 8,9             | 40.0 | 5               | 0                       | ... |
| XLVIII.  | Waringstown .....  | 1.86        | - 1.58                         | .61                        | 27              | 16                              | 83.0         | 9               | 41.0 | 28              | 0                       | 0   |
| XLIX.    | Londonderry (Creggan Res.)   | 3.46        | ...                            | .97                        | 16              | 23                              | ...          | ...             | ...  | ...             | ...                     | ... |
| L.       | Omagh (Edenfel) .....  | 2.41        | - 1.24                         | .60                        | 16              | 17                              | 75.0         | 8,9             | 42.0 | 28              | 0                       | ... |

a And 24. b And 27, 29. c And 29. d And 28. e And 17.  
 + Shows that the fall was above the average ; - that it was below it.

## METEOROLOGICAL NOTES ON AUGUST.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

[For details respecting the thunderstorms, see separate article.]

## ENGLAND.

**BANBURY.**—The weather was exceedingly favourable for harvest, which was nearly completed by the end of the month. The R at the end was very useful for grass and green crops. Harvest the best for some years. Mean temp.  $63^{\circ}$ ; average amount of cloud at 9 a.m., 5·9; the max. in shade reached  $80^{\circ}$  on 7 days; T and L on 3 days.

**CULFORD.**—The weather of harvest-time was most favourable and the crops were all gathered in in excellent condition; frost on grass on 26th.

**LANGTON HERRING.**—From the beginning of the month to the 24th, only ·22 in. of R fell, and all the wheat crop in this neighbourhood was ingathered under the most favourable circumstances. The mean temp. at 9 a.m. was  $1^{\circ}\cdot9$  above the average of 12 years; on the 9th the temp. at 9 a.m. was  $75^{\circ}$ , which is  $1^{\circ}$  higher than that registered at that time on any other day during 12 years; the range of pressure was very small. Violent TS on 24th from 9 to 12 p.m.

**WOOLSTASTON.**—An exceptionally hot and dry month; mean temp.  $62^{\circ}\cdot4$ . The harvest generally was secured in splendid condition. A great fall of temp. occurred in the last week of the month.

**ORLETON.**—Remarkably fine and hot, with a very high day temp. till the 24th, but the nights were generally clear and cold. The temp. rose above  $80^{\circ}$  on 8 days. On the 25th the wind changed to the northward, and the remainder of the month was cold, the temp. being below the average. The mean of the month was  $2^{\circ}\cdot7$  above the average of 23 years, and has only once been exceeded during that period. Very little R fell till the 31st, when more than 1·25 in. fell in 24 hours. L was seen on 8th, and distant T heard on 10th. A very favourable month for the harvest.

**LEICESTER.**—The early part of the month was hot and dry, the temp. in shade rising to  $90^{\circ}$  on the 8th and 11th, and to  $139^{\circ}$  in the sun on the 11th. A very sudden change occurred late in the month, on the 24th the max. was  $85^{\circ}\cdot6$ , on the 25th  $68^{\circ}\cdot5$ , and on the 26th,  $56^{\circ}\cdot8$ . A very useful fall of ·92 in. of R occurred on 31st.

**KILLINGHOLME.**—A month of splendid weather; corn carried in first-rate condition. Yield moderate on heavy land; a welcome fall of R occurred on 31st. Harvest general by the 8th.

**MANCHESTER.**—An exceedingly fine month; there were 20 days of unbroken, fine, sunshiny weather. The temp. during the first half was high, reminding one of old-fashioned summers, but towards the end the weather broke, and the temperature fell considerably. The month was very fine for harvest operations, and there is every reason to think that the year will prove to be fully an average, or above, for cereal produce. Long-continued thunder on the 9th.

## WALES.

**HAVERFORDWEST.**—A remarkably fine month, with a great amount of sunshine; the driest and finest August since 1880. T and magnificent sheet L on 10th, and again on 24th. The 24th was very hot (max.  $78^{\circ}\cdot0$ ) but a change of wind from S.E. to N.W. and N.N.E. followed, and the max. of the 25th was only  $60^{\circ}\cdot6$ , with a min. on the morning of the 26th of  $39^{\circ}$  in air, and  $32^{\circ}$  on grass. The month ended much cooler, with refreshing rain. The temp. exceeded  $70^{\circ}$  on 17 days, and reached  $80^{\circ}$  once, and nearly reached it on 7 other days. The weather was everything that could be wished for to secure a fine harvest.

LLANDUDNO.—Altogether a splendid month. Such an August has not been equalled here for 10 or 11 years, the weather being dry, sunny and warm. The mean temp. was fully 2 per cent above and the rainfall 66 per cent. below the average; R fell on 7 days only, the average being 14·5, and there were 200 hours of bright sunshine during the month. The daily range of temp. was just the average, and the monthly range but slightly above it. The health of the community was excellent.

#### SCOTLAND.

CARGEN.—Mean temp. of the month 1° above the average. A severe TS occurred on 12th, causing a good many accidents to stock in the district; T or T and L on 4 other days.

HAWICK.—TSS occurred on the 10th, 11th and 24th, the rest of the month was most genial and kind.

OBAN.—Although the customary break in the weather came on the 12th (accompanied by heavy T and L and R) the month was on the whole a fair one, and there is a promise of a good harvest. The change was preceded by a heavy white fog, a common coincidence this summer. T and L also on the 8th.

BRAEMAR.—A very fine seasonable month; crops maturing rapidly. T and L on 9th, 11th and 14th.

ABERDEEN.—Rainfall about 1·25 in. below the average for August. The prevailing winds were southerly to south-westerly. Very fine weather was experienced throughout the month. T and L on 12th and 24th; H on 25th.

CULLODEN.—The month was particularly fine, warm, and dry. Little R fell except in T showers. The period between the 1st and 9th was fair and dry; from 9th to 18th heavy TSS were prevalent; from the 19th to the end of the month fair and fine harvest weather prevailed.

SANDWICK.—The temp. of August was 1°·3 above the mean of 57 years, and the rainfall rather below it. T and L on the 11th and 13th, and T on the 23rd. The weather was generally pleasant, and favourable to vegetation. Harvest begun.

#### IRELAND.

DROMORE.—On the whole a fair month, but there were some very heavy winds from N.N.W.

WATERFORD.—Very little wind during the month; rainfall 2·99 in. below the average of ten years. Frequent heavy dews, and occasional T.

KILLALOE.—A splendid harvest month, only interrupted towards the close by some heavy showers, bringing up a wonderful crop of mushrooms all over the county. Mean temp. 61°·1.

DUBLIN.—A very fine and summerlike month, with high temp. and scanty rainfall. The prevalent winds were S.E. to S.W. and moderate in force; mean temp. 60°·3, 1°·4 above the average of 20 years. Rainfall the smallest for any August during 20 years, and rainy days only half the average. T and L on 11th; L on 13th, 14th and 28th. Mean humidity 78; mean amount of cloud, 5·7.

BALLINASLOE.—The month generally was fine. Very heavy R on the afternoon of the 16th, 20 in. fell between 3.10 and 3.30 p.m.

EDENFEL, OMAGH.—The first half of the month was generally hot and clear; the latter half showery and humid, but as a whole it was very favourable. Harvest commenced here on 20th, three weeks earlier than last year.

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METEOROLOGY AT THE HEALTH EXHIBITION.

IN a previous number we gave a brief abstract of the papers read at the Conference held at this Exhibition, but as regards the exhibition itself, we have been restrained from comment at an earlier date by our determination to write nothing upon the subject until the awards of the Juries were announced.

The day has not yet come when scientific instruments are considered worthy of as good a position as a wax model of a big turnip, or when thermometers are regarded as having as much to do with health as the design on the outside of a cup. Music and daintily dressed dairymaids draw great crowds, and therefore get the best positions; while Meteorology and Mr. Francis Galton's important Anthropometric laboratory are honoured with the use of an iron shed which nobody else would have.

We leave our readers to consider whether Health or Profit has been the primary consideration.

However, late as the publication of the awards has driven us, we have to tell our readers as tersely as possible what to look for in the short interval yet remaining; and there are several objects of considerable interest.

We need not stop long in the meteorological section itself. Our readers will find that the leading London firms, Casella, Hicks, and Negretti & Zambra, maintain their high position. The following are among the chief novelties:—

**Casella.**—Six's thermometer with adjustable electric contacts so that a bell can be rung on the temperature rising above or falling below any desired temperature; this is, we believe, the only hermetically sealed thermometer with which this can be done.

**Denton** shows the set of thermometers exhibited by him at the Royal Meteorological Society, and, as upon the Jury requiring them to be reverified at Kew, the errors remain the same as they were in 1881, this maker must be congratulated on having effected one of the greatest improvements in mercurial thermometers yet made.\*

**Hicks.**—An air meter, with sand glass attached; this is very

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\* *Met. Mag.*, Vol. xvii. (1882), p. 168.

handy for ventilation measurements. Extremely delicate and sensitive clinical thermometers.

**Negretti & Zambra.**—A dry and wet bulb thermometer, ringing a bell on any required temperature being reached; and a large dial electrically recording anemometer; this firm also shows a set of its turnover thermometers.\*

**Watson.**—We may also mention an ingenious but not rigorously accurate thermometer shown by Watson; it is a mercurial thermometer, with a rather large bulb, and divided on the stem; at about three inches from the bulb a wire is coiled round the tube and the two ends of the wire project and rest on a little double bracket, the position of these centres is such that when the temperature rises the upper part of the thermometer becomes heavier, and the thermometer takes a position more nearly horizontal than before; when the temperature falls, the density of the mercury in the bulb increases, the length of the column becomes less and the thermometer becomes more nearly vertical. The temperature is, therefore, shown not merely accurately on the tube itself, but also approximately, and at a distance of many feet, by the inclination of the tube of the thermometer, which points to a very boldly engraved metallic arc, with the degrees in large figures. For hospitals, and many other purposes, these thermometers, if durable, will be useful.

In the grounds will be found a complete climatological station, equipped and worked under the superintendence of the Royal Meteorological Society, with Stevenson's stand, sunshine recorder, &c. A very useful little "Memorandum on Climatological Observations and their relation to Public Health," has been distributed gratuitously by the Society.

At the back of the dairies are a Montsouris thermometer stand, rain gauge, &c., as used at the normal schools of France.

In the Belgian Court will be found the publications, &c., of the *Société Royale de Médecine Publique de Belgique*, a body which is studying with great care the relations between meteorology and disease. Some details of the climate of Carlsbourg, Paliseul, will also be found, exhibited by The Christian Brothers' Institute.

**Richard Frères.**—In a dark corner of the French Court will be found an exhibit of the highest interest, that of Messrs. Richard Frères, which contains a collection of self-recording meteorological instruments, which, considering both quality and price together, are unequalled. Messrs. Richard, with wisdom and justice, do not claim that their instruments should be regarded as absolute standards, but they work very well (*e.g.*, it is quite exceptional for the thermograph to be 1° F. in error, and yet it only requires five minutes' attention once a week) and are an indescribable comfort to observers who wish their records to be beyond suspicion. The barograph is well-known, having been imported into this country and sold by hundreds, although not with Messrs. Richard's name. The firm also exhibits

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\* See *Met. Mag.*, Vol. xviii. (1883), p. 150.

recording hygrometers, rain gauges, &c. As we hope ere long to describe these instruments fully, and to engrave them, we do not now enter into details.

M. Marie Davy, Director of the Montsouris Observatory, Paris, shows patterns of some of the instruments used there, also engravings and views of the observatory and of all the instruments, as well as a series of the publications.

Among the Japanese exhibits will be found a very interesting collection of tables and diagrams relating to the climate of that country.

## THE THUNDERSTORMS OF AUGUST, 1884.

### SATURDAY, AUGUST 9th.

#### SURREY.

*Addlestone*.—Woburn Park Hotel struck.

*Chertsey*.—Rick on Mr. Vincent's land in Staines Lane struck and burnt.

*Hatchlands, Addlestone*.—The house of Mr. R. Roake, chimney struck, and ornaments in room damaged.

*Ripley, near Woking*.—G. H. Mitchell sheltered under a tree and was killed by a flash of L; the tree was much damaged.

#### LEICESTER.

*Melton*.—Offices at cattle market struck and much damaged.

#### LINCOLN.

*Stamford*.—St. Michael's Rectory struck, and curtains ignited.

#### NOTTINGHAM

*Sneinton*.—A child named Spinks killed in bed.

#### DERBY.

*Charlesworth, Glossop*.—Two cows killed and a house wrecked.

*Hayfield*.—Two houses struck, a girl injured, and several trees split.

#### CHESHIRE.

*Armhill*.—Pig struck, and horse belonging to Mr. J. Clayton killed.

*Staleybridge*.—A chapel, farmhouse, and other buildings struck.

#### LANCASHIRE.

*Ashton-under-Lyne*.—Several buildings damaged and flooded.

*Burnley*.—Man and woman killed. Several houses struck and a man rendered insensible.

*Darwen*.—A young man named Marsden, living in Duckworth-street, was killed by the L while playing at football; another young man named R. Farnworth was seriously injured.

*Padiham, Burnley*.—Farm-house struck, and a girl badly burnt.

*Rochdale*.—The petroleum works of Mr. Andrew Scott were set on fire by the lightning, and destroyed.

*Rossendale Valley, Lancashire.*—Good deal of damage by H and B; hailstones three inches long, and one inch thick, frequent; 186 squares of glass broken in the Catholic school, Newchurch.

*Royton.*—Lightning struck, and set fire to the Royton Cotton Mills, but the damage was confined to a portion of two rooms.

## YORKSHIRE.

*Barnsley.*—S. Carrington, stoker at Messrs. Craikes's Collieries, struck, and seriously hurt.

*Cheapside.*—Two houses much damaged.

*Hayton.*—Cow killed.

*Helmsley.*—An ash tree near the station was struck.

*Norwood, Beverley.*—House struck and injured.

*Queensgate Road, Beverley.*—Haystack set on fire.

## DURHAM.

*Billingham, Stockton.*—Cow killed.

*Preston, Stockton.*—A cow belong to Mr. R. H. Appleton was killed.

*Spennymoor, Hartlepool.*—Chimney of a house in South-street struck and split; Mrs. Wheatley sitting in the kitchen with a child, was covered with soot from the chimney, but not injured.

*Stockton.*—Lightning struck a house in Finkle-street, fused a gas pipe, and set the premises on fire. A horse, belonging to Mr. Pearson, in a field behind St. Peter's Church, was struck.

## ROSS.

*Lochalsh District.*—Four sheep killed near Auchtertyre.

## SUNDAY, AUGUST 10th.

## YORK.

*Mickleton-in-Teesdale.*—Several sheep killed in the higher parts.

*Moorhouses, Pateley Bridge.*—A barn, occupied by Mr. Joseph Hall, was struck and set on fire, and the building and contents destroyed.

*Thoralby Hawes.*—Cow killed belonging to Mrs. Scott.

*Whitbrigs, Mickleton-in-Teesdale.*—The house of Mr. John Burney was struck by lightning, which descended the chimney into the parlour, knocked a hole through the wall, and ignited some hay.

## ISLE OF MAN.

*Kirkmichael.*—A hotel was partially destroyed.

## MONDAY, AUGUST 11th.

## WARWICK.

*Camphill, Birmingham.*—Tenement in Abbey Green shattered, the occupant (J. Burton) escaped unhurt.

*Higham.*—House struck and greatly damaged.

## LANCASHIRE.

*Bury.*—Theatre and Free School struck, but not much damaged.

## YORK.

*Bedale District.*—Many trees struck and considerable damage to stock and buildings, a valuable dog killed.

*Easingwold.*—Gable end of a warehouse struck.

*Hawes Junction.*—Horse killed belonging to Mr. Metcalfe of Moorcock Inn.

*Little Langton, Northallerton.*—A stonemason named Taylor took his little girl in his arms to carry her to shelter but was struck by L and killed on the spot, the child being uninjured.

*Low Hawkhills, Easingwold.*—A wall knocked down.

*Masham.*—A few trees struck.

*Park House Farm, Newburgh, near Easingwold.*—Thirty-one lambs belonging to Mr. Brown were killed under a tree.

*South Moors, Easingwold.*—A cow killed.

*Thirsk.*—L very destructive on the east side of the town.

## MONMOUTH.

*Newport.*—L played about the waggons on the goods bank for some time. Three men employed about them were struck, but not seriously injured.

## MONTGOMERY.

*Berriew.*—A farmhouse called Cefn Rallt was struck, ignited, and burnt to the ground.

## ISLE OF MAN.

*Ramsey.*—House struck (Mr. Kellow Lucas's) the roof and furniture in more than one room much damaged. A nurse and children had marvellous escapes. Another house was struck, the furniture damaged, and a young man temporarily stunned.

## ABERDEEN

*Braemar.*—Some trees struck, and a short distance beyond the Linn of Dee on the N. side of the river, the face of the hill was serrated, and scores of tons of rock, &c., dislodged; at the close of the storm rain fell for about five minutes very like a waterspout.

## BANFF.

*Glenrinnnes.*—Parish church struck and set on fire.

## TUESDAY, AUGUST 12th.

## MIDDLESEX.

*London.*—Stack of chimneys thrown down at house in Mile End-road, and one of the telegraph wires crossing Mile End-road, near Leslie-street, was severed. A chimney-stack was struck at a public-house in Sandringham-road, West Hackney.

## ESSEX.

*Chingford.*—Two trees opposite the Royal Forest Hotel were shivered.

*Waltham Abbey.*—Two horses were killed on Waltham Marsh.

## NORFOLK.

*Bacton.*—Mrs. Little, coming down stairs with a child in her arms, was killed ; the child was only slightly scorched.

*Congham, Lynn.*—Two horses, working in a harvest-field, killed.

*Dilham.*—A bullock killed.

*Honing.*—Stack of hay burnt.

*Ludham.*—Two cottages set on fire by L and destroyed.

*Worstead.*—Two stacks of hay ignited, and partially consumed.

*Yarmouth.*—Lightning passed through the roof and two floors of a house in Albert-square, doing much damage to furniture.

## LINCOLN.

*Grimsby Docks Railway Station.*—Signal-post struck, and a piece broken off, and an old carriage at the G.N.R. goods-yard was struck.

*Waltham.*—Corner of a house thrown down.

*West Marsh, Grimsby.*—Chimney-stack struck in Ayscough-street, and the brickwork, the roof, and a fireplace damaged.

## YORK.

*Alne, Helmsley.*—Cow killed while grazing in a field.

*Lartington Station, Barnard Castle.*—Chimney about 9 ft. high knocked down, damaging roof.

*Levisham, Whitby.*—Hailstones fell one inch and a half in circumference.

*North Ormsby, Middlesboroagh.*—A milk-woman was struck, and rendered insensible.

*Old Ormsby, Middlesborough.*—A labourer was killed by the electric fluid while at work in a field.

*Scalby.*—A ball of lightning went down a chimney, destroying much furniture.

*Scarborough.*—Stack fired by L in Filey-road.

*Yedingham, Scarborough.*—Three horses killed, and some sheep killed on the wolds.

## DURHAM.

*Barnard Castle Moor.*—Three brothers named Stoddart were struck, but not much hurt.

*Stockton.*—The works of the Tees Scoriæ Company were struck. A house in Tilery-terrace was struck, and the roof almost stripped, and a house in Teesdale-street, South Stockton, had the roof and windows damaged.

*Westholm, Barnard Castle.*—Oak tree cleft from top to bottom.

WESTMORELAND.

*Kendal*.—A large barn containing hay was destroyed.  
*Old Hutton, Kendal*.—The church was struck, and the spire partially demolished.

SCOTLAND.

WIGTOWN.

*Little Hills, Kirkcinner*.—Two cows killed.  
*Wigtown*.—The L struck the chimney of Rochdale House, split it, entered the kitchen, melted the gas pipe and lighted the gas.

KIRKCUDBRIGHT.

*Bettyknowes*.—Two horses killed.  
*Market Hill, Castle Douglas*.—Photographic studio partially wrecked.  
*Netherthird*.—Foal killed.  
*Queen Street, Castle Douglas*.—Gable of a house struck, and the chimney wrecked.  
*South Park*.—Five calves killed.

DUMFRIES.

*Corrie Knowe, Annan*.—Farmhouse struck, the L passing down the chimney, knocking out a grate and disarranging the furniture.  
*Gottesbie, Applegarth*.—Two cows killed while grazing.  
*Halldykes*.—Eight lambs on the way to Lockerbie for sale, were struck at Halldykes and killed.  
*Solway Cottage, Annan*.—Chimney struck.  
*Tundergarth Mains, Lockerbie*.—Barn struck and damaged.  
*Wamphraygate, Annandale*.—Nine cattle struck, eight of them being killed outright.

BERWICK.

*Lauder, Burnfoot*.—Three sheep killed.  
*Lauder*.—The Earl of Lauderdale, riding a pony on the moors, was struck and only lived a few hours, the pony was killed instantly. Two keepers attending him were unhurt, though dazzled by the L.

HADDINGTON.

*Prestonpans*.—Chimney of the Free Church Manse struck and split, and the chimney of Mrs. Copeland's house also struck.  
*Tranent*.—Two houses in the village struck, and a dog killed.

EDINBURGH.

*Broomhills, Burdiehouse*.—Haystack set on fire and burnt, the L was seen to roll along the ground like a ball of fire for a considerable distance before striking the stack.  
*Dalkeith*.—A sheep in a field by Bonnyrigg-road was killed, and a tree in the same neighbourhood was struck.

*Edinburgh.*—A house in Bristo-street was set on fire, and the Clarendon Hotel was struck. At the Caledonian Station, West Princes Street, the gas was ignited near the roof, but practically no harm was done; a chimney stack in Dalkeith-road was damaged, a chimney struck at Bruntsfield-crescent, and at Quarry Holes, Easter-road two telephone wires were destroyed. The gable over the east window of the Chapel Royal at Holyrood was struck and a quantity of stone dislodged. The lightning conductor at St. Giles' was three times struck about noon. A gentleman passing along Easter-road "observed dropping from the clouds an immense ball of fire, on nearing the ground it burst with a terrific crash, leaving a cloud of smoke."

*Gilmerton.*—A girl at West Edge was kneeling beside her father in the cottage, when she was struck by L and killed, one of the father's arms was scorched, but he was not seriously injured.

*Granton Pier.*—A signalman at the North British Railway loading slip had his flag struck from his hand and his arm was affected for some time. Another railway official standing on the line experienced a slight shock.

*Harden Green, Dalkeith.*—A man struck by L and severely injured.

*Leith.*—North Trinity House was set on fire and considerable damage done, and Grecian Cottage, Trinity, was also struck. A tenement in Mitchell-street was struck and two of the fire grates forced out, and the gas ignited; the roof of Bonnington sugar refinery was struck, and it is reported that at the premises of a wine merchant in Constitution-street, the L struck a bottle that was being washed by a lad, though he was unhurt.

*Little Catpair Farm, Stow.*—A man named John Mackay, going up to the farm about 3 p.m. with a water cart was killed by the L, the horse was also killed.

*Newbattle.*—A sheep killed and a hay stack set on fire and burnt.

*Newhaven Police Station.*—Gas ignited and telegraphic communication destroyed.

#### LINLITHGOW.

*West Benhar.*—Two women working near the pits were struck and severely scorched.

*Whitburn.*—The house occupied by the manager of the gas works was struck and the roof set on fire; the grate in the parlour was thrown into the middle of the room.

(To be continued).

HEAVY RAIN DURING GALE OF OCTOBER 13TH, 1881.

*To the Editor of the Meteorological Magazine.*

SIR,—Your letter of Feb. 23rd last has been mislaid during my change of residence, so please excuse so late a reply. I have looked up the notes I have on rainfall on Plynlimmon, in October, 1881, when I was engaged in securing a water supply for the town of Aberystwith from Llyn-Llygad-Rheidol, which is situated on the north-west of the Plynlimmon range. The Llyn is 1,650 feet above the sea—the water area on completion of the work was 12 acres—the area of gathering ground, 133 acres. In order to secure storage of water for Aberystwith, the Llyn was *tapped* 15 feet under its natural overflow; consequently, the water was run off to this depth by opening out the ground to the north of the Llyn, which work was carried out during the months of August, September, and October of the year 1881.

When the embankment was completed and the outlet valve closed, it was found that between 4 p.m. on the 13th and 8 a.m. on the 14th of October, 1881, the lake filled 6 feet, over a mean area of 10½ acres, being equal to a rainfall of 5·6 inches, in 16 hours.

It would be valuable and interesting if a record of the quantity of water carried at certain points of our rivers was tabled in connection with the rainfall on the contributory watershed. A gauge is now placed to one of our Severn Bridges here, which may be of help in recording for the Upper Severn and Vyrnwy.

I am, yours faithfully,

THOS. S. STOOKE.

*31, St. John's Hill, Shrewsbury. 20th Sept., 1884.*

[This, from both a meteorological and an engineering standpoint, seems one of the most important records that we have met with. Meteorologists will not soon forget the gale which prevailed during the day mentioned by Mr. Stooke. According to Mr. Harding's maps,\* the centre of the storm passed during the hours mentioned, from about 300 miles W. of Ireland to the vicinity of Edinburgh. This rainfall must, however, have been very local, for (though there was a heavy fall in the north of Glamorganshire) the stations nearest to Plynlimmon had an unusually *small* fall, the totals for the whole month being :—

|                            |      |                             |      |
|----------------------------|------|-----------------------------|------|
|                            | in.  |                             | in.  |
| Cardiganshire, Goginan ... | 2·50 | Radnorshire, Nantgwillt ... | 5·54 |
| „ Gogerddan ..             | 2·67 | Montgomery, Llangurig ..    | 2·80 |
| „ Cwmsymlog. 3·05          |      | „ Llanidloes ...            | 3·50 |

The nearest of these stations is, however, 7 miles from Llyn-Lygod-Rheidol.—ED.]

\* Quarterly Journal Met. Soc., Vol. VIII., p. 17.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1883.

| STATIONS.          | ABSOLUTE. |              |          |             | AVERAGE. |      |       |               |                |                 | ABSOLUTE.         |        | TOTAL RAIN. |     | AVER-<br>AGE. |
|--------------------|-----------|--------------|----------|-------------|----------|------|-------|---------------|----------------|-----------------|-------------------|--------|-------------|-----|---------------|
|                    | Maximum.  |              | Minimum. |             | Max.     | Min. | Mean. | Dew<br>Point. | Humi-<br>dity. | Max. in<br>sun. | Min. on<br>grass. | Depth. | Days.       |     |               |
|                    | Temp.     | Date.        | Temp.    | Date.       |          |      |       |               |                |                 |                   |        |             |     |               |
| London .....       | 85·6      | June 29      | 22·4     | March 24    | 58·2     | 42·7 | 50·5  | 43·1          | 81             | 125·5           | 19·3              | 24·40  | 164         | 6·2 |               |
| Mauritius .....    | 86·1      | Mar. 14 & 18 | 58·0     | July 25     | 78·7     | 69·2 | 74·0  | 64·8          | 74             | ...             | ...               | 47·69  | 180         | 5·9 |               |
| Calcutta .....     | 100·2     | May 24       | 46·2     | February 8  | 85·7     | 69·6 | 77·7  | 68·8          | 77             | 163·0           | 32·3              | 52·58  | 122         | 4·7 |               |
| Bombay .....       | 92·5      | April 17     | 61·0     | February 2  | 85·2     | 73·9 | 79·6  | 71·1          | 76             | 149·4           | 46·2              | 90·18  | 123         | 4·1 |               |
| Ceylon, Colombo.   | 92·0      | April 4      | 67·8     | February 10 | 86·0     | 75·3 | 80·7  | 71·4          | 74             | 156·0           | 60·0              | 103·61 | 162         | 7·0 |               |
| Melbourne .....    | 104·9     | January 15   | 31·7     | July 23     | 68·1     | 49·7 | 58·9  | 47·4          | 70             | 165·0           | 26·2              | 23·70  | 130         | 5·9 |               |
| Adelaide .....     | 109·5     | January 15   | 34·2     | July 20     | 71·7     | 52·9 | 62·3  | 47·0          | 59             | 174·0           | 25·1              | 26·76  | 159         | 4·8 |               |
| Wellington .....   | 85·0      | February 21  | 32·0     | July 6      | 61·2     | 48·8 | 55·0  | ...           | ...            | 148·0           | 30·0              | 52·00  | 168         | ... |               |
| Auckland .....     | 85·1      | January 19   | 36·0     | July 23     | 65·2     | 53·3 | 59·3  | 50·8          | 74             | 147·0           | 30·5              | 52·22  | 216         | 6·5 |               |
| Falkland Isles ... | 68·0      | January 28   | 11·8     | June 19     | 47·9     | 36·8 | 42·4  | 38·9          | 85             | 134·0           | 13·6              | 29·39  | 233         | 7·1 |               |
| Jamaica ..         | 93·3      | July 28      | 63·6     | Dec. 10     | 86·8     | 71·5 | 79·2  | 70·7          | 79             | ...             | 56·3              | 30·10  | ...         | 4·9 |               |
| Barbados .....     | 86·0      | Aug. 24 & 25 | 66·0     | January 11  | 80·5     | 71·6 | 76·1  | 72·8          | 83             | 154·0           | 62·0              | 68·50  | 194         | 6·0 |               |
| Toronto .....      | 83·4      | July 4       | -10·5    | February 10 | 50·1     | 33·0 | 41·6  | 36·4          | 76             | 146·4           | -14·5             | 34·13  | 181         | 6·4 |               |

## ON THE CLIMATE OF THE BRITISH EMPIRE DURING 1883.

THE accompanying Climatological Table for 1883 is precisely similar in arrangement to that for the preceding year printed in the Magazine for September, 1883, and the stations quoted are the same, but unfortunately the total number has decreased by three. The observations at Winnipeg, which for so many years maintained its unenviable distinction for extreme climate, have been discontinued, and so have those for the somewhat similar station of Sydney, Cape Breton. The place filled heretofore in the summary of extremes by Winnipeg is now occupied by Toronto, which experienced the absolutely lowest temperature in shade,  $-10^{\circ}5$ ; the lowest on grass,  $-14^{\circ}5$ ; the lowest mean daily temperature, and the greatest total range.

The extremes at the other end of the scale are distributed much the same as they were last year. Adelaide again had the highest shade temperature (but it was  $109^{\circ}5$  instead of  $112^{\circ}0$ ) the highest temperature in sun, and the lowest mean humidity; it also had the greatest mean daily range, which last year occurred at the Cape of Good Hope, the third station which is absent from the table this year. Barbados again appears with the smallest total range ( $20^{\circ}$ ) a value precisely similar to that for the preceding year, in fact a comparison of the two tables will show that in almost every element the climate of this station was remarkably similar during the two years, the greatest difference being in the amount of rain. This station also gives the least mean daily range, the value being  $0^{\circ}6$  less than that for Mauritius, which last year had the most equable temperature.

Ceylon again had the highest mean temperature and the greatest rainfall. Falkland Isles was once more the most humid and the most cloudy station, and Bombay the least cloudy.

## SUMMARY.

Highest temperature in shade,  $109^{\circ}5$ , at Adelaide on January 15th.

Lowest temperature in shade,  $-10^{\circ}5$ , at Toronto, February 10th.

Greatest range in year,  $93^{\circ}9$ , at Toronto.

Least range in year,  $20^{\circ}$ , at Barbados.

Greatest mean daily range,  $18^{\circ}8$ , at Adelaide.

Least mean daily range,  $8^{\circ}9$ , at Barbados.

Highest mean daily temperature,  $80^{\circ}7$ , at Colombo, Ceylon.

Lowest mean daily temperature,  $41^{\circ}6$ , at Toronto.

Driest station, Adelaide; mean humidity, 59.

Dampest station, Falkland Isles; mean humidity, 85.

Highest temperature in sun,  $174^{\circ}0$ , at Adelaide.

Lowest temperature on grass,  $-14^{\circ}5$ , at Toronto.

Greatest rainfall, 103.61 inches, at Colombo, Ceylon.

Least rainfall, 23.70 inches, at Melbourne.

Most cloudy station, Falkland Isles; average amount, 7.1.

Least cloudy station, Bombay; average amount, 4.1.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEB., 1884.

| STATIONS.<br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |       |            |           | Absolute.    |                | Total Rain. |       | Aver. Cloud. |
|--|-----------|-------|----------|-------|----------|-------|------------|-----------|--------------|----------------|-------------|-------|--------------|
|  | Maximum.  |       | Minimum. |       | Max.     | Min.  | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.      | Days. |              |
|  | Temp.     | Date. | Temp.    | Date. |          |       |            |           |              |                |             |       |              |
| England, London .....  | 56·3      | 13    | 28·2     | 3     | 48·2     | 37·2  | 37·5       | 85        | 81·7         | 25·0           | 1·40        | 14    | 7·1          |
| Malta .....  | 67·0      | 9     | 41·2     | 23    | 61·2     | 49·2  | 48·6       | 81        | 124·5        | 36·0           | ·67         | 6     | 4·1          |
| <i>Mauritius</i> .....   | 85·5      | 6     | 67·9     | 10    | 83·4     | 72·9  | 69·6       | 78        | 137·7        | 63·3           | 3·78        | 18    | 6·2          |
| Calcutta .....   | 87·1      | 28    | 50·0     | 11    | 80·9     | 59·1  | 58·4       | 71        | 147·3        | 50·6           | ·29         | 2     | 2·0          |
| Bombay .....   | 86·1      | 3     | 61·6     | 1     | 81·3     | 67·1  | 64·9       | 71        | 141·0        | 50·1           | ·00         | 0     | 0·9          |
| Ceylon, Colombo .....  | 93·4      | 19    | 68·8     | 4     | 88·0     | 72·1  | 68·2       | 67        | 145·0        | 60·0           | ·90         | 2     | 2·8          |
| <i>Melbourne</i> .....   | 100·7     | 13    | 45·0     | 5     | 74·3     | 55·7  | 53·2       | 70        | 158·0        | 38·7           | 1·95        | 9     | 6·4          |
| <i>Adelaide</i> .....  | 104·8     | 20    | 47·7     | 27    | 86·4     | 62·3  | 49·9       | 42        | 167·0        | 38·7           | ·12         | 3     | 3·9          |
| <i>Wellington</i> .....  | 79·0      | 23    | 44·0     | 10    | 67·7     | 52·3  | ...        | ...       | 136·0        | 41·0           | 1·29        | 9     | ...          |
| <i>Auckland</i> .....  | 74·0      | 8     | 48·5     | 10    | 69·2     | 56·8  | 52·3       | 68        | 148·0        | 42·5           | 1·61        | 10    | 6·7          |
| Jamaica .....  | 88·0      | 9     | 62·3     | 7     | 83·6     | 67·0  | 66·4       | 79        | ...          | 55·9           | ·11         | ...   | 3·3          |
| Barbados .....   | 79·0      | var.  | 67·0     | var.  | 78·0     | 70·0  | 70·0       | 82        | 141·0        | 64·0           | 1·42        | 8     | 6·0          |
| Toronto .....  | 43·4      | 19    | -7·2     | 29    | 30·7     | 15·7  | 21·2       | 83        | 115·0        | -14·0          | 2·81        | 23    | 8·6          |
| New Brunswick, }<br>Frederickton .....                           | 46·4      | 14    | -18·0    | 11    | 27·6     | 3·1   | 15·0       | 86        | ...          | ...            | 5·12        | 17    | 7·3          |
| Manitoba, Winnipeg ...   | 21·8      | 25    | -42·7    | 7     | 2·3      | -29·6 | -8·0       | 95        | ...          | ...            | 1·34        | 8     | 5·2          |
| British Columbia, }<br>Spence's Bridge ...                       | 61·0      | 25    | -14·0    | 20    | 22·2     | 5·8   | ...        | ...       | ...          | ...            | ·00         | 0     | ...          |

REMARKS, FEBRUARY, 1884.

MALTA.—Mean temp. 54°·2; mean hourly velocity of wind 8·5 miles, for four hours on the 19th the velocity averaged 31·5 miles; the temp. of the sea varied from 59° to 61°.

J. SCOLES.

*Mauritius*.—Rainfall 1·62 in., mean temp. 0°·9, and mean hourly velocity of wind 2·1 miles below their respective averages. Prevailing wind E.S.E. to E. by N. T and L on 12 days. TS on 18th with H (a rare thing here), and several houses struck.

C. MELDRUM, F.R.S.

COLOMBO.—TSS on 27th, 28th, and 29th. T on 26th.

J. H. SYMONDS.

*Melbourne*.—Mean temp. 1°·9 below average; temp. of dew point, pressure, and rainfall average; humidity 4, and cloud 1·2 above average. Prevailing winds S. and S.W., strong on 3rd, 23rd, and 26th, hot wind on 13th; heavy dew on 4 days, fog on 2 days.

R. L. J. ELLERY, F.R.S.

*Adelaide*.—Dew deposited on 11 nights—a most unusual number. Bar. remarkably unsteady, and the max. reading 30·441 in., the highest on record in February. Mean temp. average, but hot weather prevailed from 8th to 21st; the max. temp. was above 90° on 15 days, the average number being 10, and the absolute min. was within 0°·2 of the lowest on record.

C. TODD.

*Wellington*.—On the whole, fine, bright and warm, with light showers at intervals, at times very warm. Prevailing wind N.W., strong on 4 days. Earthquakes on 1st and 6th. Mean temp. 2°·7 below average; pressure above it. R. B. GORE.

*Auckland*.—Pressure unusually high throughout the month. Mean temp. 4°·6 below the average; rainfall less than half the average.

T. F. CHEESEMAN.

BARBADOS.—Pressure steady, and slightly below the average. Mean temp. 73°·7, 0°·4 above the average. The wind was N.E., except for part of one day; average velocity 13·6 miles, extremes 20 miles, and 4·7 miles. Rainfall below the average; evaporation 30 per cent. above the average; only one day overcast.

R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL,  
SEPTEMBER, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | 2·74        | XI.    | Carno, Tybrith ... ..    | 3·05        |
| "     | Margate, Birchington...   | 4·80        | "      | Corwen, Rhug .....       | 1·88        |
| "     | Littlehampton .....       | 3·94        | "      | Port Madoc .....         | 6·87        |
| "     | Hailsham .....            | 4·42        | "      | I. of Man, Douglas ..... | ...         |
| "     | I. of W., St. Lawrence.   | 3·25        | XII.   | Stoneykirk, Ardwell Ho.  | 2·66        |
| "     | Alton, Ashdell.....       | 2·57        | "      | Melrose, Abbey Gate...   | 3·06        |
| III.  | Winslow, Addington ...    | 1·35        | XIII.  | N. Esk Res. [Penicuik]   | 2·70        |
| "     | Oxford, Magdalen Col...   | 1·36        | XIV.   | Ayr, Cassillis House ... | 4·46        |
| "     | Northampton .....         | 1·14        | "      | Glasgow, Queen's Park.   | 2·29        |
| "     | Cambridge, Beech Ho...    | 1·60        | XV.    | Islay, Gruinart School.. | ...         |
| IV.   | Southend .....            | ...         | XVI.   | St. Andrews, Newton Bk   | 2·28        |
| "     | Harlow, Sheering ... ..   | 1·59        | "      | Balquhider, Stronvar..   | 6·41        |
| "     | Diss .....                | 3·44        | "      | Dunkeld, Inver Braan..   | 2·66        |
| "     | Swaffham .....            | 2·13        | "      | Dalnaspidal H.R.S. ...   | 5·48        |
| "     | Hindringham .....         | ...         | "      | Keith H.R.S. ....        | ·57         |
| V.    | Salisbury, Alderbury ...  | 1·32        | XVII.  | Forres H.R.S. ....       | ·54         |
| "     | Warminster .....          | 1·56        | XVIII. | Strome Ferry H.R.S. ...  | 5·29        |
| "     | Calne, Compton Bassett    | 1·91        | "      | Lochbroom .....          | 4·24        |
| "     | Ashburton, Holne Vic..    | 3·11        | "      | Tain, Springfield.....   | ...         |
| "     | Holsworthy, Clawton ...   | 2·30        | "      | Loch Shiel, Glenaladale  | 9·33        |
| "     | Lynmouth, Glenthorne.     | 1·92        | "      | Invergarry .....         | 5·79        |
| "     | Probus, Lamellyn .....    | 2·58        | XIX.   | Lairg H.R.S. ....        | ...         |
| "     | Wincanton, Stowell Rec.   | 1·91        | "      | Forsinard H.R.S. ....    | 1·49        |
| "     | Taunton, Fullands .....   | 1·39        | "      | Watten H.R.S. ....       | ·85         |
| VI.   | Bristol, Clifton .....    | 2·00        | XX.    | Dunmanway, Coolkelure    | 5·88        |
| "     | Ross .....                | 1·24        | "      | Fermoy, Gas Works ...    | 2·26        |
| "     | Wem, Sansaw Hall.....     | 1·44        | "      | Tralee, Castlemorris ... | 2·76        |
| "     | Cheadle, The Heath Ho.    | 2·41        | "      | Tipperary, Henry Street  | 2·04        |
| "     | Worcester, Diglis Lock    | 1·30        | "      | Newcastle West .....     | 3·09        |
| "     | Coventry, Coundon .....   | 1·02        | "      | Miltown Malbay.....      | 3·94        |
| VII.  | Melton, Coston .....      | ·98         | "      | Corofin .....            | ...         |
| "     | Ketton Hall [Stamford]    | 1·33        | XXI.   | Carlow, Browne's Hill..  | 2·12        |
| "     | Horncastle, Bucknall ...  | 1·22        | "      | Navan, Balrath .....     | 1·55        |
| "     | Mansfield, St. John's St. | 1·18        | "      | Mullingar, Belvedere ... | 2·92        |
| VIII. | Macclesfield, The Park.   | 4·18        | "      | Athlone, Twyford .....   | 2·27        |
| "     | Walton-on-the-Hill.....   | 2·62        | XXII.  | Galway, Queen's Col....  | 2·68        |
| "     | Lancaster, South Road.    | 3·87        | "      | Clifden, Kylemore .....  | 7·97        |
| "     | Broughton-in-Furness ..   | ...         | "      | Crossmolina, Enniscoe..  | ...         |
| IX.   | Wakefield, Stanley Vic.   | ·74         | "      | Carrick-on-Shannon ...   | 2·81        |
| "     | Ripon, Mickley .....      | 1·39        | XXIII. | Dowra .....              | ...         |
| "     | Scarborough .....         | 1·30        | "      | Rockcorry.....           | 2·60        |
| "     | East Layton [Darlington]  | 1·56        | "      | Warrenpoint .....        | 2·25        |
| "     | Middleton, Mickleton ..   | 2·11        | "      | Newtownards .....        | 2·13        |
| X.    | Haltwhistle, Unthank..    | 2·44        | "      | Belfast, New Barnsley .  | 3·43        |
| "     | Shap, Copy Hill .....     | 5·40        | "      | Cushendun .....          | 4·23        |
| XI.   | Llanfrechfa Grange ....   | 2·05        | "      | Bushmills .....          | 4·53        |
| "     | Llandovery .....          | 4·99        | "      | Stewartstown .....       | 3·30        |
| "     | Lower Solva .....         | 2·26        | "      | Donegal, Revelin Ho....  | ...         |
| "     | Castle Malgwyn .....      | 2·81        | "      | Buncrana .....           | 3·40        |
| "     | Rhayader, Nantgwillt..    | 4·48        | "      | Carndonagh .....         | 3·68        |

SEPTEMBER, 1884.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Table to which each station belongs.] | RAINFALL.      |   |                                  |       |      | Days on which<br>"01 or more fell. | TEMPERATURE. |       |          |          | No. of<br>Nights<br>below<br>32° |       |
|----------|--|----------------|---|----------------------------------|-------|------|------------------------------------|--------------|-------|----------|----------|----------------------------------|-------|
|          |  | Total<br>Fall. | Difference<br>from<br>average<br>1870-9 | Greatest<br>Fall in<br>24 hours. |       | Max. |                                    | Min.         |       | In shade | On grass |                                  |       |
|          |  |                |   | Dpth                             | Date. |      |                                    | Deg.         | Date. |          |          | Deg.                             | Date. |
| I.       | London (Camden Square) ...   | inches 1·77    | inches. — ·73                           | in. ·57                          | 3     | 15   | 81·5                               | 18           | 40·6  | 30       | 0        | 0                                |       |
| II.      | Maidstone (Hunton Court) ...   | 3·52           | + 1·21                                  | 1·36                             | 3     | 12   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| III.     | Strathfield Turgiss ...  | ...            | ...                                     | ...                              | ...   | ...  | 82·0                               | 17           | 39·0  | 25       | 0        | 0                                |       |
| IV.      | Hitchin ...  | 2·00           | — ·48                                   | ·88                              | 3     | 12   | 76·0                               | 17           | 36·0  | 29       | 0        | ...                              |       |
| V.       | Banbury ...  | 1·21           | — 1·60                                  | ·39                              | 21    | 11   | 78·0                               | 17           | 36·0  | 30       | 0        | ...                              |       |
| VI.      | Bury St. Edmunds (Culford) ...   | 2·49           | — ·29                                   | 1·12                             | 5     | 12   | 76·0                               | 17           | 32·0  | 29       | 1        | ...                              |       |
| VII.     | Norwich (Cossey) ...   | 2·69           | — ·39                                   | 1·43                             | 4     | 14   | 76·5                               | 16           | 35·0  | 30       | 0        | 1                                |       |
| VIII.    | Weymouth (Langton Herring) ...   | 1·27           | ...                                     | ·29                              | 21    | 15   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| IX.      | Barnstaple ...   | 2·24           | — 2·04                                  | ·31                              | 21    | 18   | 78·5                               | 19           | 46·0  | 27       | 0        | ...                              |       |
| X.       | Bodmin ...   | 2·71           | — 2·53                                  | ·87                              | 15    | 18   | 76·0                               | 17           | 42·0  | 30       | 0        | 0                                |       |
| XI.      | Cirencester ...  | 1·36           | — 1·78                                  | ...                              | ...   | ...  | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XII.     | Church Stretton (Woolstaston) ...  | 1·39           | — 2·08                                  | ·33                              | 6     | 14   | 71·5                               | 17           | 45·0  | 22d      | 0        | 0                                |       |
| XIII.    | Tenbury (Orleton) ...  | 2·07           | — 1·28                                  | ·86                              | 21    | 13   | 79·8                               | 17           | 32·0  | 30       | 1        | 1                                |       |
| XIV.     | Leicester ...  | 1·30           | ...                                     | ·25                              | 6     | 13   | 83·5                               | 17           | 34·9  | 30       | 0        | 3                                |       |
| XV.      | Boston ...   | 1·34           | — 1·27                                  | ·31                              | 4     | 12   | 75·0                               | 16           | 37·0  | 30       | 0        | ...                              |       |
| XVI.     | Grimsby (Killingholme) ...   | 1·15           | — 1·92                                  | ·26                              | 6     | 11   | 72·5                               | 16a          | 41·0  | 30       | 0        | ...                              |       |
| XVII.    | Hesley Hall [Tickhill] ...   | ·81            | ...                                     | ·26                              | 8     | 11   | 82·0                               | 17           | 39·0  | 3        | 0        | ...                              |       |
| XVIII.   | Manchester (Ardwick) ...   | 3·01           | — ·76                                   | ·48                              | 6     | 16   | 72·0                               | 13e          | 45·0  | 27f      | 0        | ...                              |       |
| XIX.     | Wetherby (Ribston Hall) ...  | 2·21           | — ·87                                   | 1·06                             | 22    | 8    | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XX.      | Skipton (Arncliffe) ...  | 2·64           | — 2·94                                  | ·70                              | 6     | 18   | 74·0                               | 18           | 38·0  | 3        | 0        | ...                              |       |
| XXI.     | North Shields ...  | ·64            | — 1·68                                  | ·21                              | 21    | 13   | 72·2                               | 20           | 41·0  | 6        | 0        | 0                                |       |
| XXII.    | Borrowdale (Seathwaite) ...  | 11·97          | — 1·25                                  | 1·90                             | 30    | 19   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XXIII.   | Cardiff (Ely) ...  | 2·17           | — 2·63                                  | ·60                              | 21    | 13   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XXIV.    | Haverfordwest ...  | 3·68           | — 1·37                                  | ·77                              | 6     | 15   | 76·4                               | 18           | 39·0  | 4, 29    | 0        | ...                              |       |
| XXV.     | Plinlimmon (Cwmsymlog) ...   | 4·99           | ...                                     | 1·03                             | 21    | 16   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XXVI.    | Llandudno ...  | 1·67           | — 2·08                                  | ·45                              | 6     | 16   | 72·0                               | 19           | 46·0  | 4        | 0        | 4                                |       |
| XXVII.   | Cargen [Dumfries] ...  | 3·39           | — 1·02                                  | ·78                              | 30    | 17   | 73·4                               | 17           | 39·6  | 5        | 0        | ...                              |       |
| XXVIII.  | Hawick (Wilton Hill) ...   | 3·89           | ...                                     | 1·40                             | 6     | 13   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XXIX.    | Douglas Castle (Newmains) ...  | 3·18           | — 1·22                                  | ·75                              | 6     | 16   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XXX.     | Lochgilphead (Kilmory) ...   | 5·87           | + ·11                                   | ·84                              | 28    | 20   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XXXI.    | Oban (Craigvarren) ...   | 5·61           | ...                                     | 1·06                             | 30    | 18   | 79·0                               | 15           | 42·0  | 1        | 0        | ...                              |       |
| XXXII.   | Mull (Quinish) ...   | 4·41           | ...                                     | ·53                              | 30    | 20   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XXXIII.  | Loch Leven Sluices ...   | 2·50           | — ·73                                   | ·90                              | 29    | 11   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XXXIV.   | Arbroath ...   | 1·68           | — 1·39                                  | ·53                              | 6     | 13   | 66·0                               | 9, 10        | 40·0  | 6        | 0        | ...                              |       |
| XXXV.    | Braemar ...  | 1·93           | — 2·01                                  | ·35                              | 6, 30 | 15   | 68·2                               | 12           | 27·0  | 5        | 2        | 5                                |       |
| XXXVI.   | Aberdeen ...   | 1·50           | ...                                     | ·38                              | 6     | 15   | 70·0                               | 20           | 37·0  | 3        | 0        | ...                              |       |
| XXXVII.  | Skye (Sligachan) ...   | 15·26          | ...                                     | 3·70                             | 30    | 18   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| XXXVIII. | Culloden ...   | ·74            | — 2·16                                  | ·26                              | 30    | 4    | 75·0                               | 11           | 37·0  | 4        | 0        | 2                                |       |
| XXXIX.   | Dunrobin ...   | ·93            | ...                                     | ·20                              | 28    | 9    | 70·0                               | 11           | 41·0  | 1        | 0        | ...                              |       |
| XL.      | Orkney (Sandwick) ...  | 1·69           | — 1·80                                  | ·33                              | 24    | 16   | 67·5                               | 10           | 44·9  | 29       | 0        | 0                                |       |
| XLI.     | Cork (Blackrock) ...   | 2·07           | — 2·08                                  | ·62                              | 15    | 16   | 80·0                               | 18b          | 37·0  | 2        | 0        | ...                              |       |
| XLII.    | Dromore Castle ...   | 2·79           | ...                                     | ·80                              | 9     | 13   | 71·0                               | 21           | 44·0  | 29       | 0        | ...                              |       |
| XLIII.   | Waterford (Brook Lodge) ...  | 2·08           | ...                                     | ·29                              | 25    | 15   | 75·5                               | 17           | 36·0  | 3        | 0        | 3                                |       |
| XLIV.    | Killaloe ...   | 3·15           | ...                                     | ·50                              | 6, 7  | 17   | 74·0                               | 18b          | 40·0  | 2        | 0        | ...                              |       |
| XLV.     | Portarlington ...  | 1·97           | — 1·21                                  | ·42                              | 7     | 19   | 74·0                               | 19           | 41·0  | 2        | 0        | ...                              |       |
| XLVI.    | Dublin (Fitz William Square) ...   | 1·21           | — 1·20                                  | ·31                              | 7     | 14   | 73·7                               | 9            | 45·1  | 5        | 0        | ...                              |       |
| XLVII.   | Ballinasloe ...  | 2·31           | — 1·65                                  | ·36                              | 7     | 20   | 69·0                               | 19           | 40·0  | 5        | 0        | ...                              |       |
| XLVIII.  | Waringstown ...  | 2·73           | — ·62                                   | 1·20                             | 6     | 16   | 76·0                               | 10c          | 40·0  | 2, 3     | 0        | ...                              |       |
| XLIX.    | Londonderry (Creggan Res.) ...   | 3·82           | ...                                     | ·96                              | 6     | 21   | ...                                | ...          | ...   | ...      | ...      | ...                              |       |
| L.       | Omagh (Edenfel) ...  | 3·17           | — ·87                                   | 1·08                             | 6     | 19   | 71·0                               | 19           | 40·0  | 30       | 0        | ...                              |       |

a And 17. b And 19. c And 11, 19. d And 23, 30. e And 15, 17. f And 30.  
+ Shows that the fall was above the average; — that it was below it.

## METEOROLOGICAL NOTES ON SEPTEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

**BANBURY.**—Harvest work was a little hindered in the first week, but the weather afterwards was very favourable, and all crops were well secured. Mean temp.,  $58^{\circ}2$ ; T and L on 2nd and 10th; T on 9th.

**CULFORD.**—The R in the early part of the month did much to improve the root crops, and to revive the parched up pastures, supplying plenty of food for cattle, which had become very scarce on this light soil.

**LANGTON HERRING.**—A fine, warm month, favourable for the ingathering of the harvest. From the 9th to the 21st, the weather was very hot; the mean temp. was  $2^{\circ}7$  above the average of the preceding 12 years.

**BODMIN.**—A remarkably fine month.

**WOOLSTASTON.**—A pleasant genial month; mean temp.  $57^{\circ}0$ .

**ORLETON.**—A very pleasant month, with much sunshine, and a mean temp. about  $1^{\circ}3$  above the average of 23 years. The middle of the month was very warm, the temp. rising above  $70^{\circ}$  on 8 days. The bar. was generally high and steady, and the rainfall was less than the average. A sharp storm of L T and R passed over between 10 and 10.30 a.m. on the 21st, and there was a thick fog all the morning. T was heard also on the 2nd and 15th. The first frost of the season occurred on the morning of the 30th. Fog occurred on several mornings; and there was a great gale of wind on the evening of the 6th, and the morning of the 7th.

**LEICESTER.**—The month was very fine and dry, suitable for the close of harvest, and for the preparation of the land for autumn sowing.

**KILLINGHOLME.**—The month was remarkably fine, with a very small rainfall. T and L on 21st.

**ARDWICK.**—There was a considerable change in the weather this month. At the beginning it rained nearly every day; it was fine in the middle, and became wet again towards the end. The temp. also fell considerably. T on 1st and 21st.

**NORTH SHIELDS.**—TSS on 1st, 2nd, 3rd and 21st.

**SEATHWAITE.**—From 21st to 30th was very wet ( $9\cdot37$  in. of R falling in the 10 days) and at times stormy. T on 2nd and 21st.

## WALES.

**Haverfordwest.**—One of the finest Septembers remembered. During the first 8 days the temp. seldom rose above  $60^{\circ}$  and considerable amounts of R fell, principally at night, the days being mostly fine but cloudy. After the 9th the temp. rose, and on 10 days  $70^{\circ}$  or upwards was registered. No such late and great heat occurred during the preceding 35 years, though in 1868 the max. for the month was higher, and the weather was similar, but it did not last until such a late date. The max. temp. in September, 1868, was  $78^{\circ}8$ , but there were only six days on which  $70^{\circ}$  was reached. A great fall of temp., and a severe TS occurred on the morning of the 21st, causing damage and loss of life; the storm lasted 90 minutes, and  $\cdot30$  in. of R fell in 20 minutes.

**Llandudno.**—A month of splendid weather, the mean temp. being one degree above, and the rainfall much below the average. Though the number of days on which R fell was about the average, the falls were often very slight. There was but little wind, and a fair amount of sunshine. The range of temp., both diurnal and monthly, was considerably below the average, the former being  $10^{\circ}7$ , and the latter  $26^{\circ}0$

## SCOTLAND.

CARGEN.—T and L on 1st ; T on 2nd and 6th.

HAWICK.—Very stormy on the 6th, 26th, 27th and 28th ; T on the 21st and 23rd. The middle of the month was fine, the latter half very wet. Very stormy and windy on night of 6th.

CRAIGVARREN.—The month was very dry until the 21st, and all early crops were well secured. On the 13th and following days there were gorgeous sunsets with strong colours, resembling those of last year, but pink predominated, and there was considerable refraction. After the 21st, the weather was exceptionally stormy, with heavy R. T and L on 2nd and 29th.

BRAEMAR.—A very excellent month, crops all secured in fine condition ; T and L on 2nd ; L on 21st.

ABERDEEN.—The month was characterized by fine weather, with the exception of some days of fog and mist. Rainfall nearly two inches below the average. T and L on 2nd and 4th ; L on 1st and 21st. Brilliant aurora on 17th.

CULLODEN.—The month was remarkable for the small rainfall and for the long intervals without R. From the 1st to 24th clear, sunny weather prevailed, some days, particularly the 9th, 10th and 11th, being very warm. The weather generally was calm and very favourable for harvesting the crops.

SANDWICK.—The rainfall in September was only about half the average. The temp. was mild, and there was no gale until the 28th, when it blew 50 miles an hour from noon until 2 p.m., so the crops were cut in the finest harvest weather remembered ; T on 4th.

## IRELAND.

DROMORE.—A fair month, but there were one or two severe storms.

WATERFORD.—The driest September since 1865, rainfall little more than half the average ; most favourable for getting in the harvest.

KILLALOE.—With sufficient rainfall, though rather less than the average, there were many fine warm days, enabling harvest work to be completed in a very satisfactory manner. Mean temp.  $57^{\circ}5$ .

DUBLIN.—In keeping with the summer months of 1884, September was in all respects favourable, towards the end, indeed, the weather was somewhat changeable and showery, but in the middle of the month beautiful autumnal or even summerlike weather prevailed. The mean temp. was  $56^{\circ}9$ ,  $1^{\circ}8$  above the average of 20 years. The rainfall was little more than one half the average for the same period, and in only two Septembers has the fall been smaller. L was seen on the evening of the 1st ; solar halos appeared on the 25th and 29th, and a lunar halo on the 7th. There was a bright aurora on the 17th ; fog on the 8th, 10th, 11th, 12th, 17th and 19th, and very heavy dews about the middle of the month. The mean humidity was 83, and the mean amount of cloud, 4.8 ; prevailing wind westerly.

WARINGSTOWN.—A very fine month with temp. above  $70^{\circ}$  on 9 days. On the whole this has been the most favourable harvest time for very many years. Grain yielding well, though straw somewhat short. Some second crops of hay were saved in good order.

EDENFEL, OMAGH.—With the exception of a few days at the beginning of the month, and the last week, the weather was really magnificent, resulting in a bountiful and well-saved harvest.

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CCXXVI.]

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THE THUNDERSTORMS OF 1884.

(Concluded from page 140.)

[NOTE.—The summation of the facts reported for the whole period will be found on pages 155 to 159.]

TUESDAY, AUGUST 12th—(continued.)

LANARK.

*Blackwood, Stonehouse.*—A horse killed, and another injured.

*Braidwood.*—A brakesman, employed by the Caledonian Railway Company, struck and stunned.

*Broomfield Terrace, Airdrie.*—L came down the chimney, forced out the stove, and damaged the furniture.

*Carbarns, Wishaw.*—A sheep and a cow killed.

*Dalmacouter Farm, Airdrie.*—Haystack struck and burned.

*Glasgow.*—A girl named Flora Smith was struck in Regent-street and blinded. The steeple of St. Mark's Free Church was struck, cutting away some stone work and shattering the slates. Three men erecting a stack in Swanston-street, Bridgeton, were struck and rendered insensible. A roof at Clyde-place was partly destroyed, and a roof and tower on houses in John Knox street damaged.

*Greenhead Farm, Wishaw.*—Hayrick burned.

*Halestonemuir, Dalserf.*—Two cows killed.

*Larkhall.*—Two cows killed.

*Merryton, Larkhall.*—Haystack set on fire.

*Overtown, Wishaw.*—Horse killed.

*Stonehouse.*—Three houses struck in Kirk-street.

*Sunnyside Railway Station, Coatbridge.*—The chimneys and roof were shattered about 11.15 a.m., the station agent's house sustained considerable damage, the L having passed down the chimney.

*Wellgatehead, Lanark.*—A chimney-top much rent by L, and a number of trees in the neighbourhood shattered.

*Yieldshields, Carluke.*—Hayrick struck and set on fire.

AYR.

*Cambusdoon.*—Several sheep were killed under a tree, where a man had also taken shelter.

- Chalmerhouses, Irvine.*—Hayrick struck and ignited.  
*Eglington Chemical Works.*—Chimney struck.  
*Galston Railway Station.*—A telegraph inspector working at the instrument received a shock which paralysed his arm.  
*High Grange, Maybole.*—Five sheep killed.  
*Hillhouse, Irvine.*—The house of a ploughman was burned.  
*Kilmarnock.*—Part of the coping of the chimney of Messrs. Ferguson's mill was thrown down.  
*Maybole.*—Chimney stack at shoe factory shattered, and the Parish Church spire greatly damaged.  
*Roadside House, Troon.*—L ignited the thatch and the house was burnt to the ground.  
*Sandhill House, Troon.*—L struck and entered the house.  
*Troon.*—A vessel in the harbour had her topmast carried away.  
*Whitlitts, Ayr.*—House struck, the grate in one room, and the hearthstone in another, broken.

## RENFREW.

- Ardgowan Street, Port Glasgow.*—About 5 p.m. several men were employed on a steel ship in course of construction at Messrs. Russell and Co's. yard, when six of them were struck down and severely injured. They were all much burned about the face, and from one of them the whole inside skin of the mouth was peeled off, another had a mark left on his back as large as a man's hand, and resembling the trunk and branches of a tree.  
*Auchenlôdmont, Paisley.*—Stack of hay burnt.  
*Greenhead Farm, Houston.*—Chimney struck and damaged.  
*Johnstone Foundry, Paisley.*—Part of a chimney knocked down.  
*Neilston Colliery.*—A man ascending the shaft was struck and considerably injured.

## DUMBARTON.

- Warriston, Helensburgh.*—W. Hutchison while working in the vinery was struck by L and rendered insensible for half-an-hour.

## STIRLING.

- Banton, Kilsyth.*—A horse was struck and nearly cut in two, and a large block of buildings was rent from top to bottom.  
*Curriemyre Farm, Kilsyth.*—A cow was killed.  
*Gartness.*—A man killed.  
*Kilsyth.*—A large chimney stalk was struck and part of it dislodged. The roof of a house was also much damaged.  
*Riskend Farm, Kilsyth.*—Chimney struck and the grate thrown into the room.  
*Main Street, Kilsyth.*—Chimney stack struck and the masonry dislodged.  
*Royal Bank, Kilsyth.*—Chimney struck, gas pipe fused and gas ignited.  
*Twecher, Kilsyth.*—An engine was struck and the boy attending to it severely injured.

## BUTE.

*Portrye Farm, Millport.*—Cow killed.

## ARGYLL.

*Inverary.*—The L struck the Established Church, but little damage was done.

## CLACKMANNAN.

*Alloa.*—The telegraph instruments at the Post Office and at the North British Railway Station were broken.

*Whins, Alloa.*—A tree struck.

## KINROSS.

*Craighead Farm, Fossoway, Kinross.*—A tall plane tree was struck, and a bull, three cows, and five calves sheltering under it killed. A cow a few yards distant was temporarily paralyzed.

*Dowhill, Cleish.*—Four cattle killed.

## FIFE.

*Auchtermuchty.*—L struck the waste store of Messrs. Curr & Co., descended the chimney and ignited the waste, greatly alarming two girls in the store.

*Balbegie Woods, Thornton.*—A cow killed.

*Birns, Ladybank.*—Cow killed.

*Carnock, Dunfermline.*—Chimney rent and ceiling damaged.

*Carseknowes, Kettle.*—L struck the roof of a stable and killed a horse inside.

*Cellardyke.*—The steeple of the new Established Church was struck, and a few slates dislodged from the roof. At the Post Office the telegraph instrument was destroyed and some papers were lighted.

*Chapel Green, Elie.*—Chimney at Carrack House struck and some masonry displaced.

*Demperston, Auchtermuchty.*—A large poplar tree struck.

*Freuchie, Ladybank.*—L struck the chimney of a house, passed through a room, melted the gas-pipe and ignited the gas.

*Hahill, Collessie.*—Three cattle killed in a field.

*Jamesfield, Newburgh.*—Farmhouse struck and chimney demolished.

*Kilmarnock, Cupar.*—Three cattle killed.

*Kimloch, Cupar.*—Two cattle killed.

*Penitentiary Close, Newburgh.*—Part of the chimney stack thrown down, slates stripped off the roof and some ornaments in the rooms damaged.

*Pitkeirie, Anstruther.*—Hay stack struck and burnt.

*Pittencreich, Cupar.*—A horse killed.

*Rankeilour, Cupar.*—Ox killed.

*Union Bank, Auchtermuchty.*—L struck the chimney, threw down the cans, melted a gas-pipe, and ignited the gas under the top floor.

*West Anstruther.*—House struck, the chimney being shattered.

## PERTH.

*Ballunie Farm, Coupar Angus.*—Lightning descended the chimney, and smashed a clock.

*Bridge of Earn.*—At the path of Condie, a man named William Nicol was killed while gathering sheep; the L seems to have struck his head, and passed through his body.

*Crieff.*—A large tower on a block of buildings in East High-street was struck, and much damaged; and the grate of a dwelling-house in the same neighbourhood was thrown into the middle of the room. A spire, belonging to Messrs. Donaldson, was stripped of slates, and a large oak, believed to be over 500 years old, was shattered.

*Downe.*—The belfry of the Episcopal Church was struck by L, but very little damage was done.

*Maderty, Crieff.*—A horse killed, and a haystack burnt.

*Perth.*—Part of a building in course of alteration collapsed—struck, it is believed, by L—and injured four men.

#### FORFAR.

*Andover Hill, Brechin.*—The tower of Smith's Schools damaged.

*Baldovie Farm, Kirriemuir.*—A calf killed.

*Balownie, Stracathro, Brechin.*—Chimney struck.

*Brechin.*—Smart's Factory struck.

*Broughty Ferry.*—Mr. J. Bremner, residing in Brook-street, was struck by the electric fluid, which is supposed to have travelled into the room by means of a telephone wire. Several persons in the street were struck and stunned, but none seriously injured. A barque lying in the river had the top of her mast shattered. At West Ferry a house was struck, the L descending the chimney, smashed the mantelpiece, and damaged some ornaments; several lamp-posts were knocked down, and two telephone poles damaged. At the Beach two houses were struck, in one the chimney was damaged, in the other the gaspipe melted, and the gas lighted.

*Carnoustie.*—The wife and family of J. Tosh were in a neighbour's house when it was struck, the woman had her face burned, and a boy was rendered insensible; several other houses were struck and damaged. A guard applying the brake to a goods train at the station received a shock, his arms being paralysed for a few minutes.

*Dalhestnie, Edzell.*—A horse killed.

*Douglas, Bleachfield, Dundee.*—Manager's house struck, roof and chimneys damaged, and two grates driven into the rooms.

*Fairmuir, Dundee.*—L struck the chimney and part of the stack was thrown down.

*Forfar.*—Two houses struck, but no one injured.

*Haugmuir, Brechin.*—Three cattle killed.

*Kincraig, Brechin.*—Bullock killed.

*Lochee, Dundee.*—A fire ball burst near the bakehouse of Mr. Rollo, a stable near was stripped of slates, a window was broken, and two men in the bakehouse experienced violent shocks.

*Loch of Liff, Carnoustie.*—Two cattle killed.

*Muirhead of Liff, Carnoustie.*—Three cattle killed.

*Rosewell, Carnoustie.*—L entered by the chimney, destroyed a time-

piece and other articles, and so frightened a young woman that she required medical treatment.

*Union Street, Arbroath.*—Slates dislodged from a house.

*West March, Muirhead of Liff.*—L struck the kitchen chimney, dislodged a grate, and killed a calf in the byre near at hand.

*Whitehills, Forfar.*—Two houses struck, a chimney damaged, a coping-stone thrown down, and slates dislodged.

ABERDEEN.

*Glenmuick, Ballater.*—Coach-house struck, and much of the roof torn off.

*Upper Deeside.*—Huge balls of fire were seen rolling down the slopes of Lochnagar ; and several farm buildings were struck by L.

IRELAND.

DOWN.

*Ballyward, Castlewellan.*—Two men struck dead.

*Waterask, Dundrum.*—Three cows and a horse killed.

Between *Newcastle* and *Annalong* four cows were killed.

MONDAY, SEPT. 1st.

YORK.

*Silsden, Skipton.*—A farmer was fetching his cattle home, when he was struck by L and killed ; two children with him were uninjured.

TUESDAY, SEPT. 2nd.

GLOUCESTER.

*Malswick, Newent.*—An oak tree under which a cow was sheltering was struck, and the cow instantly killed.

*Oakle Farm, Newent.*—Two heifers killed by L.

WEDNESDAY, SEPT. 3rd.

PERTH.

*Dalguise Station, Dunkeld.*—The station agent, Mr. Geddes, was operating the telegraph instrument, when he received a shock which temporarily paralyzed his arm, side, and leg.

THURSDAY, SEPT. 4th.

ARGYLL.

*Lochgair, Lochgilphead.*—Shortly after three o'clock the L killed three cows at pasture, and upwards of a score of sheep on the hill.

PERTH.

*Fernbank House, New Scone.*—About three o'clock L struck the chimney and knocked down the can, and a few minutes afterwards the western wall was shattered and the building set on fire.

## ORKNEY.

*Knochall, Stromness.*—A young woman in a field was killed. The L struck her on the head, her clothes were burned and torn, and her boots wrenched off, but a watch in her pocket was not stopped.

## SUNDAY, SEPT. 21st.

## LINCOLNSHIRE.

*Sleaford.*—The church clock and spire were struck during service. A fodder stack in the neighbourhood was set on fire.

*Worlaby Top, Brigg.*—Wheat stack struck and consumed.

## NOTTINGHAMSHIRE.

*Dunham-on-Trent.*—A large clover rick destroyed.

*St. Bartholomew Stile, Nottingham.*—Two cows in a field killed.

## DERBYSHIRE.

*New Mills, Glossop.*—The Roman Catholic Church of St. Mary was struck by L; much damage was done to the tower, and several large stones broke through the roof.

## LANCASHIRE.

*Widnes.*—At Kaludah-terrace the L struck a chimney, and passed through a bed-room and a drawing-room; in the bed-room the mantelpiece was shattered, and the grate forced into the room; in the drawing-room the mantelpiece and grate were thrown into the room, the gasalier demolished, and the furniture damaged. The occupant of the house was knocked down and rendered insensible, and his two daughters were stunned. At another house a girl was thrown against a wall and hurt. In Waterloo-road the L passed through the roof of a house dislodging some slates, and a woman in the house was stunned.

## YORKSHIRE.

*Asenby, Thirsk.*—Heifer killed.

*Dishforth, Thirsk.*—Two sheep killed.

*Eldmire Hill, Thirsk.*—Two sheep killed.

*Flamborough.*—A horse standing under a shed at the North Star Temperance Hotel, was struck dead.

*Helperthorpe, Great Driffield.*—A large oat stack set on fire by L. Two men in a shed near were struck and knocked off their seats, but not seriously injured. This is the second time this summer that this exposed farm has been struck.

*Howe Hill Lane, Thirsk.*—Implement shed shivered.

*Hull.*—A chimney stack belonging to two houses in Albany-terrace, Anlaby-road, was struck, and the débris falling through the roof did much damage in both houses; two children narrowly escaped.

*Sessay, Thirsk.*—Large tree struck.

*Topcliffe, Thirsk.*—One sheep killed.

*Westwood, Beverley.*—Union Mill struck ; one sail will have to be replaced.

MONMOUTH.

*Dryburgh Street, Monmouth.*—L passed down the bed-room chimney of a house, pierced the floor and tore out the grate in the room underneath, besides greatly damaging the furniture.

BRECON.

*Penwern Farm, Llanspyddid, Brecon.*—A cow killed.

CARNARVON.

*Snowdon.*—A tourist sheltering in a wooden hut was killed by L, and some reports add that the occupier of the hut was hurt.

SUMMARY.

WE are well aware that in these days it is not easy to induce persons to read through a long list of casualties such as we have at last concluded, but we can assure our readers that there are many cases extremely interesting and instructive.

As our Government (unlike those of France and Germany) does nothing towards the registration of damage by lightning, we have made an effort in that direction this year. But it is utterly unreasonable to expect such work to be done by private effort, and we are certain that our list is very imperfect ; as regards minor accidents, injury to trees, to sheep, and to cattle it is probably less than half the truth. Doubtless further information might have been obtained from the Agricultural Insurance Companies, but the compilation of such a list is not our duty, and it ought to be done officially as in other countries. However, we have done what time allowed, and the results are important, and probably unexpected.

**Damage Done.**—The table on page 156 gives an analysis of most of the injuries, but not of all, as several did not render themselves readily to classification.

In preparing to compile this table, a difficulty arose from the occasional employment of vague terms. Sometimes a plural is used with no index number, *e.g.*, "sheep were struck ;" in other places it is "some sheep," and "several sheep," and "many sheep." Nothing could be done in the way of compiling a tabular summary without adopting some definition, and therefore a plural by itself, or with "some" prefixed, has been taken as the lowest value, "several" as half as many again as "some," and "many" as about twice "some." But the "some" itself is variable ; "some" horses probably represents fewer than "some" sheep, so that the final result became rather complicated, and had to be worked out into a table, giving the numerical value to be adopted for every vague expression according to the nature of the object. It is not worth while to print the table, but it may be mentioned that the numbers have been kept as low as possible. "Some" was usually

taken as 2 or 3, and only with one object as high as 6; "several" generally as 3 or 4, never more than 9; and "many" usually as 5 or 6, never as more than a dozen.

The final totals are large; 35 men killed and 91 injured is a sad beginning to the list, and one to which no money value can be assigned. But as regards the other items, we have tried to form an approximate estimate, a very wild one we admit, but one in which we have tried to keep the amounts low, and in which probably errors will neutralize each other. Leaving the people out of the calculation entirely, the damage recorded comes to nearly £10,000, and had all damage been reported and proper records kept of the values, we have no doubt that it would be nearer £30,000 than £10,000.

*Tabular Analysis of Damage by Lightning, July—Sept., 1884.*

| Date.                | MEN.                |           | HORSES.     |           | CATTLE.     |           | SHEEP.     |            | Dogs.    | Pigs.    | Trees.     | STACKS.    |            | Churches.  | Houses.     | Cottages.  | Barns & Sheds. | Chimneys.  | Factories. |
|----------------------|---------------------|-----------|-------------|-----------|-------------|-----------|------------|------------|----------|----------|------------|------------|------------|------------|-------------|------------|----------------|------------|------------|
|                      | Killed.             | Injured.  | Killed.     | Injured.  | Killed.     | Injured.  | Killed.    | Injured.   |          |          |            | Destroyed. | Struck.    |            |             |            |                |            |            |
| July 4               | 5                   | 8         | 10          | 4         | 42          | 5         | 75         | ...        | ...      | ...      | 27         | 3          | 6          | 1          | 17          | 2          | 2              | 8          | ...        |
| " 5                  | 2                   | 7         | 3           | ...       | 6           | ...       | ...        | ...        | ...      | ...      | 6          | ...        | ...        | 1          | 5           | 1          | ...            | ...        | ...        |
| " 6                  | 1                   | 1         | ...         | ...       | 14          | ...       | ...        | ...        | ...      | ...      | ...        | ...        | 1          | 1          | 1           | ...        | ...            | 1          | ...        |
| " 8                  | ...                 | 3         | 1           | ...       | 3           | ...       | 5          | ...        | ...      | ...      | 3          | ...        | ...        | ...        | 2           | 1          | ...            | 2          | 2          |
| " 9                  | 5                   | 14        | 2           | ...       | 20          | 1         | 58         | ...        | ...      | 2        | 6          | ...        | 2          | 1          | 5           | 1          | 1              | 1          | 1          |
| " 10                 | ...                 | 2         | ...         | ...       | ...         | ...       | ...        | ...        | ...      | ...      | ...        | ...        | ...        | ...        | 1           | 1          | ...            | ...        | ...        |
| " 12                 | ...                 | ...       | 2           | ...       | ...         | ...       | ...        | ...        | ...      | ...      | ...        | ...        | ...        | ...        | ...         | ...        | ...            | ...        | ...        |
| " 24                 | 1                   | 2         | 3           | 2         | 12          | 1         | ...        | ...        | ...      | ...      | ...        | ...        | ...        | ...        | ...         | ...        | ...            | ...        | ...        |
| " 25                 | ...                 | ...       | ...         | ...       | ...         | ...       | ...        | ...        | ...      | ...      | ...        | ...        | ...        | 1          | ...         | ...        | ...            | ...        | ...        |
| " 26                 | 3                   | ...       | ...         | ...       | ...         | ...       | ...        | ...        | ...      | ...      | ...        | ...        | ...        | ...        | ...         | ...        | ...            | ...        | ...        |
| Aug. 9               | 5                   | 5         | 1           | 1         | 5           | ...       | 4          | ...        | ...      | 1        | 8          | 1          | 1          | 1          | 24          | ...        | 6              | 2          | 2          |
| " 10                 | ...                 | ...       | ...         | ...       | 1           | ...       | 8          | ...        | ...      | ...      | ...        | ...        | ...        | ...        | 2           | ...        | 1              | ...        | ...        |
| " 11                 | 1                   | 4         | 1           | ...       | 5           | ...       | 31         | ...        | 1        | ...      | 16         | ...        | ...        | 1          | 5           | 1          | 4              | ...        | 1          |
| " 12                 | 9                   | 37        | 20          | 1         | 63          | 7         | 33         | ...        | 1        | ...      | 14         | 8          | 6          | 10         | 46          | 3          | 6              | 26         | 4          |
| Sept 1               | 1                   | ...       | ...         | ...       | ...         | ...       | ...        | ...        | ...      | ...      | ...        | ...        | ...        | ...        | ...         | ...        | ...            | ...        | ...        |
| " 2                  | ...                 | ...       | ...         | ...       | 3           | ...       | ...        | ...        | ...      | ...      | 1          | ...        | ...        | ...        | ...         | ...        | ...            | ...        | ...        |
| " 8                  | ...                 | 1         | ...         | ...       | 3           | ...       | ...        | ...        | ...      | ...      | ...        | ...        | ...        | ...        | ...         | ...        | ...            | ...        | ...        |
| " 4                  | 1                   | ...       | ...         | ...       | ...         | ...       | 20         | ...        | ...      | ...      | ...        | ...        | ...        | 1          | ...         | ...        | ...            | 1          | ...        |
| " 21                 | 1                   | 7         | 1           | ...       | 4           | ...       | 5          | ...        | ...      | ...      | 1          | 2          | 2          | 3          | 3           | ...        | 1              | 1          | 1*         |
| <b>Total</b>         | <b>35</b>           | <b>91</b> | <b>44</b>   | <b>8</b>  | <b>181</b>  | <b>14</b> | <b>239</b> | <b>...</b> | <b>2</b> | <b>3</b> | <b>82</b>  | <b>14</b>  | <b>18</b>  | <b>20</b>  | <b>112</b>  | <b>10</b>  | <b>21</b>      | <b>42</b>  | <b>11</b>  |
| <b>Cost of rein-</b> | <b>stating in £</b> |           | <b>1600</b> | <b>80</b> | <b>2110</b> | <b>40</b> | <b>420</b> | <b>...</b> | <b>1</b> | <b>6</b> | <b>164</b> | <b>560</b> | <b>400</b> | <b>600</b> | <b>2240</b> | <b>100</b> | <b>210</b>     | <b>210</b> | <b>220</b> |
| <b>stating in £</b>  |                     |           |             |           |             |           |            |            |          |          |            |            |            |            |             |            |                |            |            |

\* Windmill.

**Geographical Distribution.**—The first storm period consisted of exactly a week, with an interval of one day; injury occurring on July 4th, 5th, 6th, 8th, 9th and 10th. During this period not one accident is reported from the south-western counties or Wales, in fact not one west of a line drawn from the Isle of Wight to Liverpool, and only two south of the Thames. Another noticeable feature was their

persistence day after day in Northamptonshire and Warwickshire. It might be imagined that the storms which prevailed over Northampton and Lancashire on the 4th, passed eastwards and became those of Norfolk and East Yorks on the 5th, but we cannot say.

On the 6th little injury was done, and the sites were widely spread, reaching from Loughborough to Dumfriesshire.

On the 8th the Northampton, Warwick and Leicester group reappears, and it is repeated on the 9th with a north-westerly extension, running up to Preston. There are only three accidents reported for the 10th, and not improbably two of those really belong to the previous day.

A fortnight then elapsed without any damage being reported, and on 24th there were but three cases very widely spread, viz., Sussex, Wilts and Nottingham. The entry for 25th from Rutland is uncorroborated, and very possibly should be for the 24th.

After another interval of a fortnight, we have on August 9th a slight storm in Surrey, and damage in nearly every county from Leicester northwards up to the Border, but only at one isolated place in Scotland. On August 10th there was a heavy storm in the N. of Yorkshire, and damage was reported in the Isle of Man.

August 11th was the first date on which damage occurred in Wales; much injury was also done in Yorkshire, and at two places in Scotland.

August 12th.—This was by far the worst storm of the year. Damage was done in London, Essex, Norfolk, Lincoln, York, Durham, Westmoreland, and over all Scotland, except the extreme north; also in the N.E. of Ireland.

After an interval of 19 days, damage was done on September 1st at Skipton, Yorks; on the 2nd in the county of Gloucester; on the 3rd in Perth, and on the 4th in Argyll, Perth and Orkney.

There was then an interval of 17 days, followed by a rather widespread series, including Lincoln, Nottingham, Lancaster, Yorkshire, and Wales, on September 21st.

**Ignition.**—Some years since, evidence that lightning produced fire was asked for. Out of the abundant stock furnished by this article, we quote those instances which seem indisputable. Some evidence apparently strong is not really so, *e.g.*, "Lightning struck a cottage from which all the inhabitants were absent, and in ten minutes it was seen to be in flames." In this case the fire was *not* produced by the lightning, but the embers of a nearly dying-out fire were scattered about the room and ignited clothes hung to dry. Much care is therefore necessary before asserting that a case is indisputable, and we guard ourselves by saying that the following cases *seem* indisputable. In consequence of their number we print them in small type:—

July 4th.—*Aston.*—Two men killed in a field, their clothes completely burned.

" " *Northampton.*—*L* appeared to strike a metal bedstead, and then to ignite the skirting board against which it stood.

- July 4th.—*Turvey*.—An ash in a hedge was completely stripped and set fire to.
- „ „ *Whittlesea*.—Ricks set on fire.
- „ „ *Willoughby, Lutterworth*.—A ball of fire was observed to strike a stack of clover, to divide it to the centre and to set it on fire.
- „ „ *Crosshills, Yorks*.—A cartload of hay struck and ignited.
- \* „ „ *Carlisle*.—Gas ignited at a house in Blackfriars-street.
- „ 6th.—*Goole*.—L struck one end of a clover stack, passed completely through it and entered the ground ; shortly afterwards smoke was seen to arise, and the stack was found to be on fire.
- „ 9th.—*Bramley, Rotherham*.—Railway station struck and roof ignited.
- „ „ *Howden*.—Some haycocks were ignited.
- \* „ „ *Meltham Mills*.—Lightning passed through the kitchen, melted some gas pipe in the cellar, and ignited the gas.
- \* „ 25th.—*Oakham*.—Lightning entered the church and ignited the gas
- Aug. 9th.—*Chertsey*.—Rick struck and burnt.
- „ „ *Rochdale*.—Petroleum works set on fire.
- „ „ *Beverley*.—Haystack set on fire.
- \* „ „ *Stockton*.—Lightning struck a house in Finkle-street, fused a gas pipe, and set the premises on fire.
- „ 10th.—*Moorhouses, Pateley Bridge*.—Barn struck and set on fire.
- „ 11th.—*Glenrines*.—Church struck and [roof] set on fire.
- „ 12th.—*Honing, Norfolk*.—Stack of hay burnt.
- „ „ *Worstead*.—Two stacks of hay ignited.
- „ „ *Scarborough*.—Stack fired by lightning.
- \* „ „ *Wigtown*.—Lightning struck the chimney of Rochdale House, split it, entered the kitchen, melted the gas pipe, and lighted the gas.
- „ „ *Broomhills, Edinburgh*.—Haystack set on fire and burned ; the lightning was seen to roll along the ground for a considerable distance before striking the stack.
- \* „ „ *Edinburgh*.—At the Caledonian station the gas was ignited near the roof.
- „ „ *Newbattle, Edinburgh*.—Haystack set on fire.
- \* „ „ *Leith*.—Gas ignited at a tenement in Mitchell-street.
- \* „ „ *Newhaven*.—Gas ignited at police station.
- „ „ *West Benhar, Linlithgow*.—Two women severely scorched.
- „ „ *Dalmacouter, Lanark*.—Haystack burned.
- „ „ *Greenhead, Wishaw*.—Hayrick burned.
- „ „ *Merryton, Lanark*.—Haystack set on fire.
- „ „ *Yieldshields, Lanark*.—Hayrick set on fire.
- „ „ *Chalmerhouses, Ayr*.—Hayrick ignited.
- „ „ *Troon, Ayr*.—Thatch roof ignited.
- „ „ *Auchenlodmont, Paisley*.—Stack of hay burned.
- \* „ „ *Kilsyth, Stirling*.—Chimney struck, gas pipe fused, and gas ignited.
- \* „ „ *Freuchie, Fife*.—Lightning struck a chimney, passed through a room, melted a gas pipe and ignited the gas.
- \* „ „ *Union Bank, Auchtermuchty*.—Lightning struck the chimney, threw down the cans, melted a gas pipe under the top floor, and ignited the gas.
- „ „ *Pitkeerie, Fife*.—Haystack struck and burned.
- „ „ *Maderty, Crieff*.—Haystack burned.
- \* „ „ *Broughty Ferry*.—Gas pipe melted at Beach, and the gas ignited.
- Sept. 4th. - *Stromness, Orkney*.—A woman's clothes burned.
- „ 21st.—*Brigg, Lincoln*.—Wheatstack consumed.
- „ „ *Helporthorpe, Yorks*.—Oatstack set on fire.

Some persons may regard the printing of this list as "slaying the slain," but that is hardly the case; it has often been asserted that lightning is "disruptive" not "heating." Very possibly after the publication of such crushing evidence as the above, we shall hear that "nobody ever disputed it." At any rate, we present the "purely disruptivists" with 44 nuts to crack.

**Lightning and Gas Pipes.**—When the Lightning Rod Conference advised\* that lightning conductors should be connected with "the nearest gas main, not merely to a lead pipe," there were not a few who regarded the advice as somewhat analogous to putting a lighted torch into a barrel of gunpowder. *There is, however, no instance on record of damage resulting from so doing.* On the other hand, in houses not protected by an efficient conductor, the house gas pipes, being in good connection with miles of mains buried in the streets, become virtually indoor lightning conductors, and are constantly so used by the lightning, as the twelve instances marked with an (\*) in the previous table will show; and to them may be added the two following:—

- July 4th.—*Kirkcaldy, Fife.*—House struck and gas pipes exploded.
- „ 8th.—*Ibstock, Market Bosworth.*—A gas pipe was partly severed.

which do not actually prove ignition. We have thus evidence of damage to gas pipes in fourteen separate cases.

**Kind of Trees.**—Nearly a century ago, Mr. Hugh Maxwell reported to the American Academy that elm, chesnut, oak and pine were often struck, ash rarely, and beech, birch and maple never struck.

In 1860 Mr. Symons, in a paper read at the Oxford Meeting of the British Association, stated that out of 16 trees struck in the years 1857-59, 6 were elms, the others were oak, ash and poplar.

In the present paper we have the species of 18 trees recorded, *viz.*, ash 6, elm 5, oak 4, plane, poplar and willow 1 each.

Therefore the sequence reckoning from the oftenest struck is—

- Maxwell.*—Elm, chesnut, oak, pine . . . . . ash.
- Symons.*—Elm, oak, ash, poplar.
- Met. Mag.*—Ash, elm, oak, plane, poplar, willow.

Of course, the above are miserably small numbers to go upon; for instance, our table reports 82 "trees," but only states the species of 18. It is no more trouble to say that an oak was struck than that an ash was struck, and yet the one is far more interesting and instructive than the other.

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\* "Report of Lightning Rod Conference." London: E. and F. N. Spon, 1882, p. 19.

## A TORNADO AT ELY.

*To the Editor of the Meteorological Magazine.*

SIR,—I forward you the accompanying brief account of a small "tornado" experienced last Sunday near Ely. It may be of service to you if you have received no better.

My informant writes from "The Plains," Littleport, Cambs, under date August 31st :—"We have had a sensation here to-day, and while it is fresh in my recollection I must give you an account of it. About 2 p.m., we were visited by a whirlwind of great power and violence, and as we all saw it I am going to describe it as well as my limited abilities permit.

"Since sunrise the morning had been dark with gusts of wind and rain. About noon the rain became very heavy and the wind more fitful. We were at dinner about 1.30, when it again began to pour, but the wind was not very high. In front of us, you remember, there is a wide meadow bordered by the road, from which it is divided by a hedge with large old elms and ash trees. This hedge also bounds the meadow on the left of the house, and runs at right angles from it to the road. Well, about half-past one, as I said before, the rain began again, and continued till nearly two o'clock, when quite suddenly the wind sprang up again with great violence. I was sitting opposite the window when I saw what looked like a pillar of white smoke down to the S.W. It came rapidly across the fen, and caught the stacks just piled in the long ground the other side of the road. Off went the stacks like bundles of straws whirling in all directions, and on came the pillar gyrating across the road. It caught two old elms, and down they came with a crash, split right across their trunks. Then it waltzed across the field, and caught a young larch tree which it whirled and twisted and bent till its branches touched the ground, but the wood being young did not break. Then it moved across to the other hedge, and snap went three more elms; their tops were whirled off into the air, and blown some distance across a stubble field. We rushed to the back of the house, and saw the pillar whirling along across the fen, carrying all before it.

"The strange thing is, that almost instantaneously after it had passed there was an intense stillness. We hurried out as soon as we could to see the damage, and saw the great trees almost stripped of leaves, and lying in the direction of the wind, the ground almost torn up round them.

"It is nearly impossible to describe the sight while it lasted. The air was full of whirling branches, bundles of wheat, leaves, and poor birds. We heard later on that a cow had been blown into the dyke a little further on. The direction of the whirlwind was due N.E."

That is all my correspondent's account, but further particulars could perhaps still be obtained if necessary.

I am, Sir, your obedient servant,

J. HASTINGS WHITE,

31, Leighton Grove, N. W., 6th Sept., 1884.

SUPPLEMENTARY TABLE OF RAINFALL,  
OCTOBER, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | 1·29        | XI.    | Carno, Tybrith ... ..    | 3·42        |
| „     | Margate, Birchington...   | 3·92        | „      | Corwen, Rhug .....       | 3·05        |
| „     | Littlehampton .....       | 1·42        | „      | Port Madoc .....         | 3·91        |
| „     | Hailsham .....            | 1·35        | „      | I. of Man, Douglas ..... | 2·01        |
| „     | I. of W., St. Lawrence.   | 1·32        | XII.   | Stoneykirk, Ardwell Ho.  | 2·69        |
| „     | Alton, Ashdell.....       | ·86         | „      | Melrose, Abbey Gate ...  | 1·59        |
| III.  | Winslow, Addington ...    | ·89         | XIII.  | N. Esk Res. [Penicuick]  | 3·20        |
| „     | Oxford, Magdalen Col...   | ·97         | XIV.   | Ayr, Cassillis House ... | 4·37        |
| „     | Northampton .....         | ·80         | „      | Glasgow, Queen's Park.   | 2·95        |
| „     | Cambridge, Beech Ho...    | 1·23        | XV.    | Islay, Gruinart School.. | 4·64        |
| IV.   | Southend .....            | 1·25        | XVI.   | St. Andrews, Newton Bk   | 1·67        |
| „     | Harlow, Sheering ...      | 1·63        | „      | Balquhider, Stronvar..   | 9·33        |
| „     | Diss .....                | 2·71        | „      | Dunkeld, Inver Braan..   | 3·17        |
| „     | Swaffham .....            | 2·69        | „      | Dalnaspidal H.R.S. ...   | 6·96        |
| „     | Hindringham .....         | ...         | XVII.  | Keith H.R.S. ....        | 4·35        |
| V.    | Salisbury, Alderbury ...  | ·72         | „      | Forres H.R.S. ....       | 2·80        |
| „     | Warminster .....          | ·87         | XVIII. | Strome Ferry H.R.S....   | 8·88        |
| „     | Calne, Compton Bassett    | ·91         | „      | Lochbroom .....          | 6·97        |
| „     | Ashburton, Holne Vic...   | 1·84        | „      | Tain, Springfield.....   | 2·55        |
| „     | Holsworthy, Clawton...    | 2·99        | „      | Loch Shiel, Glenaladale  | 15·94       |
| „     | Lynmouth, Glenthorne.     | 2·56        | „      | Invergarry .....         | 8·13        |
| „     | Probus, Lamelley .....    | 2·12        | XIX.   | Lairg H.R.S. ....        | 5·47        |
| „     | Wincanton, Stowell Rec.   | 1·02        | „      | Forsinard H.R.S. ....    | 4·21        |
| „     | Taunton, Fullands .....   | ·46         | „      | Watten H.R.S. ....       | 4·27        |
| VI.   | Bristol, Clifton .....    | 1·17        | XX.    | Dunmanway, Coolkelure    | 4·07        |
| „     | Ross .....                | 1·05        | „      | Fermoy, Gas Works ...    | 1·54        |
| „     | Wem, Sansaw Hall.....     | 1·02        | „      | Tralee, Castlemorris ... | 2·99        |
| „     | Cheadle, The Heath Ho.    | 1·51        | „      | Tipperary, Henry Street  | 2·89        |
| „     | Worcester, Diglis Lock    | 1·21        | „      | Newcastle West .....     | 2·49        |
| „     | Coventry, Coundon .....   | 1·64        | „      | Miltown Malbay.....      | 4·65        |
| VII.  | Melton, Coston .....      | 1·21        | „      | Corofin .....            | ...         |
| „     | Ketton Hall [Stamford]    | 1·00        | XXI.   | Carlow, Browne's Hill..  | 1·78        |
| „     | Horncastle, Bucknall ...  | 1·20        | „      | Navan, Balrath .....     | 1·66        |
| „     | Mansfield, St. John's St. | ·87         | „      | Mullingar, Belvedere ... | 2·15        |
| VIII. | Macclesfield, The Park.   | 2·26        | „      | Athlone, Twyford .....   | 2·96        |
| „     | Walton-on-the-Hill.....   | 1·44        | XXII.  | Galway, Queen's Col....  | 2·55        |
| „     | Lancaster, South Road.    | 4·11        | „      | Clifden, Kylemore .....  | 6·09        |
| „     | Broughton-in-Furness ..   | 6·07        | „      | Crossmolina, Enniscooe.. | 5·01        |
| IX.   | Wakefield, Stanley Vic.   | ·98         | „      | Carrick-on-Shannon ...   | 3·57        |
| „     | Ripon, Mickley .....      | 1·75        | XXIII. | Dowra .....              | ...         |
| „     | Scarborough.....          | 2·08        | „      | Rockcorry.....           | 2·94        |
| „     | East Layton [Darlington]  | 1·23        | „      | Warrenpoint .....        | 2·30        |
| „     | Middleton, Mickleton..    | 2·94        | „      | Newtownards .....        | 1·77        |
| X.    | Haltwhistle, Unthank..    | 1·87        | „      | Belfast, New Barnsley .  | 2·97        |
| „     | Shap, Copy Hill .....     | 2·40        | „      | Cushendun .....          | 3·96        |
| XI.   | Llanfrechfa Grange . ...  | 1·10        | „      | Bushmills .....          | 4·31        |
| „     | Llandovery .....          | 3·36        | „      | Stewartstown .....       | 2·86        |
| „     | Lower Solva .....         | 1·94        | „      | Donegal, Revelin Ho....  | ...         |
| „     | Castle Malgwyn .....      | 2·28        | „      | Buncrana .....           | 4·65        |
| „     | Rhayader, Nantgwilt..     | 3·93        | „      | Carndonagh .....         | ...         |

OCTOBER, 1884.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL.      |  |                                  |       |         | Days on which<br>-01 or more fell. | TEMPERATURE. |      |      |       | No. of<br>Nights<br>below<br>32° |  |
|----------|---|----------------|--|----------------------------------|-------|---------|------------------------------------|--------------|------|------|-------|----------------------------------|--|
|          |   | Total<br>Fall. | Differ-<br>ence<br>from<br>average<br>1870-9 | Greatest<br>Fall in<br>24 hours. |       | Inchade |                                    | Max.         |      | Min. |       | On<br>grass                      |  |
|          |   |                |  | Dpth                             | Date. |         |                                    | Deg.         | Date | Deg. | Date. |                                  |  |
| I.       | London (Camden Square) ...  | .99            | - 1.71                                       | .43                              | 9     | 10      | 63.9                               | 16           | 32.2 | 29   | 0     | 7                                |  |
| II.      | Maidstone (Hunton Court)...   | 1.30           | - 1.16                                       | .62                              | 9     | 10      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| III.     | Strathfield Turgiss .....   | .83            | - 1.91                                       | .49                              | 9     | 11      | 65.2                               | 16           | 24.7 | 30   | 3     | 6                                |  |
| IV.      | Hitchin .....   | 1.40           | - .78  | .83                              | 9     | 10      | 60.0                               | 6            | 30.0 | 24   | 3     | ...                              |  |
| V.       | Banbury .....   | .86            | - 1.90                                       | .46                              | 9     | 7       | 61.0                               | 16           | 30.0 | 29   | 3     | ...                              |  |
| VI.      | Bury St. Edmunds (Culford)  | 2.33           | + .16  | .86                              | 10    | 12      | 60.0                               | 16b          | 29.0 | 24   | 4     | ...                              |  |
| VII.     | Norwich (Cossey) .....  | 3.02           | + .69  | 2.00                             | 10    | 12      | 61.0                               | 2,7          | 28.0 | 25   | 1     | 8                                |  |
| VIII.    | Weymouth (Langton Herring)  | .94            | ...  | .33                              | 9     | 10      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| IX.      | Barnstaple .....  | 3.93           | - 1.52                                       | .71                              | 8     | 20      | 64.0                               | 1            | 35.0 | 13   | 0     | ...                              |  |
| X.       | Bodmin .....  | 2.40           | - 3.87                                       | .58                              | 8     | 20      | 62.0                               | 2            | 36.0 | 29   | 0     | 1                                |  |
| XI.      | Cirencester .....   | .85            | - 2.39                                       | ...                              | ...   | ...     | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XII.     | Churchstretton (Woolstaston)  | 1.60           | - 3.00                                       | .49                              | 9     | 11      | 63.0                               | 16           | 33.0 | 11   | 0     | 4                                |  |
| XIII.    | Tenbury (Orleton) .....   | 1.05           | - 2.19                                       | .37                              | 9     | 11      | 65.6                               | 16           | 26.8 | 13   | 3     | 8                                |  |
| XIV.     | Leicester .....   | 1.52           | ...  | .40                              | 9     | 13      | 64.7                               | 16           | 31.5 | 5    | 1     | 12                               |  |
| XV.      | Boston .....  | 1.04           | - .99  | .23                              | 10    | 9       | 62.0                               | 16           | 33.0 | 29   | 0     | ...                              |  |
| XVI.     | Grimsby (Killingholme) .....  | 1.38           | - 1.27                                       | .23                              | 10    | 15      | 61.0                               | 18           | 34.0 | 11g  | 0     | ...                              |  |
| XVII.    | Hesley Hall [Tickhill] .....  | .94            | ...  | .29                              | 27    | 12      | 64.0                               | 18           | 33.0 | 5, 9 | 0     | ...                              |  |
| XVIII.   | Manchester (Ardwick) .....  | ...            | ...  | ...                              | ...   | ...     | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XIX.     | Wetherby (Ribston Hall) ...   | 1.26           | - 2.10                                       | .32                              | 12    | 6       | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XX.      | Skipton (Arncliffe) .....   | 4.73           | - 2.53                                       | .77                              | 29    | 18      | 62.0                               | 2            | 30.0 | 12   | ...   | ...                              |  |
| XXI.     | North Shields .....   | 1.65           | - .86  | .65                              | 11    | 12      | 61.5                               | 16c          | 29.8 | 11   | 3     | 4                                |  |
| XXII.    | Borrowdale (Seathwaite) .....   | 10.80          | - 5.75                                       | 2.03                             | 25    | 21      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XXIII.   | Cardiff (Ely) .....   | 1.34           | - 3.89                                       | .40                              | 8     | 11      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XXIV.    | Haverfordwest .....   | 2.53           | - 3.92                                       | .50                              | 11    | 19      | 61.0                               | 1            | 32.0 | 5    | 1     | 2                                |  |
| XXV.     | Plinlimmon (Cwmsymlog) ...  | 6.07           | ...  | .94                              | 27    | 18      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XXVI.    | Llandudno .....   | 1.42           | - 3.17                                       | .24                              | 27    | 18      | 61.8                               | 31           | 40.2 | 11   | 0     | ...                              |  |
| XXVII.   | Cargen [Dumfries] .....   | 1.82           | - 3.89                                       | .34                              | 2     | 15      | 60.8                               | 17           | 28.8 | 11   | 2     | ...                              |  |
| XXVIII.  | Hawick (Wilton Hill) .....  | .87            | ...  | .28                              | 10    | 9       | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XXIX.    | Douglas Castle (Newmains)   | 3.18           | - 1.76                                       | .60                              | 25    | 17      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XXX.     | Lochgilphead (Kilmory) .....  | 7.18           | - 1.14                                       | 1.10                             | 25    | 22      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XXXI.    | Oban (Craigvarren) .....  | 7.03           | ...  | 1.10                             | 25    | 22      | 60.0                               | 6            | 36.0 | 29   | 0     | ...                              |  |
| XXXII.   | Mull (Quinish) .....  | 9.14           | ...  | 1.32                             | 1     | 26      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XXXIII.  | Loch Leven Sluices .....  | 3.10           | - 1.21                                       | 1.00                             | 31    | 9       | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XXXIV.   | Arbroath .....  | 1.43           | - 1.44                                       | .33                              | 11    | 9       | 60.0                               | 3b           | 30.0 | 29   | 1     | ...                              |  |
| XXXV.    | Braemar .....   | 4.24           | - .24  | 1.35                             | 11    | 17      | 62.0                               | 6            | 28.0 | 28   | 5     | 16                               |  |
| XXXVI.   | Aberdeen .....  | 2.69           | ...  | .67                              | 10    | 18      | 62.0                               | 5d           | 30.0 | 28   | 2     | ...                              |  |
| XXXVII.  | Skye (Sligachan) .....  | 17.45          | ...  | 4.30                             | 30    | 26      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XXXVIII. | Culloden .....  | 1.70           | - .59  | .56                              | 27    | 8       | 62.0                               | 2            | 31.0 | 29   | 1     | 9                                |  |
| XXXIX.   | Dunrobin .....  | 4.16           | ...  | .73                              | 9     | 18      | 61.5                               | 21           | 29.0 | 29   | 2     | ...                              |  |
| XL.      | Orkney (Sandwick) .....   | 5.40           | + 1.11                                       | .86                              | 25    | 22      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| XLI.     | Cork (Blackrock) .....  | 1.10           | - 3.64                                       | .31                              | 23    | 13      | 64.0                               | 1e           | 31.0 | 24   | 1     | ...                              |  |
| XLII.    | Dromore Castle .....  | 5.10           | ...  | .90                              | 27    | 17      | 62.0                               | 6            | 31.0 | 28   | 1     | ...                              |  |
| XLIII.   | Waterford (Brook Lodge) ...   | 1.25           | ...  | .46                              | 23    | 13      | 64.5                               | 15f          | 32.0 | 29   | 1     | 10                               |  |
| XLIV.    | Killaloe .....  | 3.44           | ...  | .69                              | 31    | 20      | 63.0                               | 17c          | 34.0 | 25   | 0     | ...                              |  |
| XLV.     | Portarlington .....   | 1.95           | - 1.52                                       | .66                              | 23    | 19      | 61.5                               | 16           | 31.0 | 10   | 1     | ...                              |  |
| XLVI.    | Dublin (FitzWilliam Square)   | .83            | - 2.59                                       | .17                              | 8     | 14      | 64.5                               | 2            | 33.8 | 11   | 0     | 5                                |  |
| XLVII.   | Ballinasloe .....   | 2.80           | - 1.63                                       | 1.02                             | 31    | 20      | 60.0                               | 2            | 32.0 | 11h  | 2     | ...                              |  |
| XLVIII.  | Waringstown .....   | 2.55           | - 1.06                                       | .40                              | 31    | 17      | 64.0                               | 5            | 33.0 | 10i  | 0     | 3                                |  |
| XLIX.    | Londonderry (Creggan Res.)  | 4.65           | ...  | .71                              | 31    | 21      | ...                                | ...          | ...  | ...  | ...   | ...                              |  |
| L.       | Omagh (Edenfel) .....   | 4.52           | + .20  | 1.10                             | 31    | 21      | 62.0                               | 6            | 32.0 | 10   | 1     | ...                              |  |

b And 17, 18. c And 18. d And 6, 17. e And 15, 17, 18. f And 16.

g And 29. h And 25. i And 24.

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

METEOROLOGICAL NOTES ON OCTOBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—Heavy land was too dry for sowing; the clover crop generally was inferior. Autumn tints most beautiful.

BANBURY.—Mean temp.  $48^{\circ}0$ , slightly below the average. A fine month, but the dryness of the land interfered with wheat sowing; high winds occurred in the last week. The autumnal tints were wonderfully fine, as the leaves fell but little until the last week, and there was an abundance of hedge fruit, including blackberries, which have been scarce of late years. S on 10th; fog on 6 days.

CULFORD.—The month was most enjoyable, and very favourable for wheat sowing. The second week was wet, but very mild for the season.

LANGTON HERRING.—Another dry month, and scarcity of water is causing considerable inconvenience. Mean temp. about the average; the mean pressure was higher than that of any month since January. There was a noticeable absence of storms. Fresh gale on 26th; lunar halo on 28th.

BODMIN.—A remarkably dry and fine October; mean temp.  $51^{\circ}8$ .

WOOLSTASTON.—The genial temp. of the first few days of the month was succeeded by a week of sharp wintry weather, with occasional storms of S and sleet; after the 14th the temp. rose again, and the remainder of the month was warm and pleasant; mean temp.  $48^{\circ}3$ .

ORLETON.—The weather till the 20th, with the exception of a few days from the 8th to the 13th, was generally warm and pleasant, with much sunshine; a high and steady bar. The remainder of the month was frequently cold, with rapid fluctuations of temp. and pressure, and frequent rough winds. On the 11th the Clee hills were covered with S, and a severe frost followed on the morning of the 13th. Rainfall very small; mean temp. about the average of the last 23 years.

LEICESTER.—The month was a dry one, and R is very much needed in this county. A remarkable fall of pressure occurred between the 5th and 9th, the difference between the 9 a.m. readings on the two days being 1.204 in.; this was followed by a fall of S, which, however, soon disappeared.

KILLINGHOLME.—A very fine month, but water scarce. Roses still blooming and dahlias, &c., untouched by frost.

ARNcliffe.—Wonderfully dry till the 24th; a wild night on 25th, followed by a period of wet.

SEATHWAITE.—Hills covered with S on 9th; 6.16 in. of R fell in six days, 25th to 30th.

WALES.

HAVERFORDWEST.—The remarkably fine character of the season continued until the 7th, from which date till the 18th the weather was changeable and wet, and from 9th to 12th stormy. Although R was recorded on 19 days, it generally fell in the early morning, and the days were fine and pleasant, and there was a remarkable absence of frost. Autumnal show of berries, and richly coloured tints in the woods and hedges, the finest ever witnessed. Rainfall the smallest in any October since 1850.

LLANDUDNO.—An unusually dry month, though R fell in measurable quantities on no less than 18 days. The mean temp. was slightly below the average, and the range, both monthly and diurnal, considerably below it. It was rather a dull month, the hours of bright sunshine amounting only to 66.

SCOTLAND.

CARGEN.—A dull month, and duration of sunshine 30 hours below the average. Temp. average.

HAWICK.—S on the 10th, and very strong gales on the 14th, 25th, and 30th.

The rest of the month was most genial throughout, and bouquets of single dahlias, sweet peas, mignonette, and many other hardy annuals, could be gathered here at the close.

**CRAIGVARREN.**—The first part of the month exhibited the usual prevalence of S.E. wind and cloudy sky, but on 10th northerly winds and gales set in with some frost and a general fall of S on the hills. From 25th to the close stormy weather, with constant heavy R and some strong gales prevailed.

**QUINISH.**—A wet, stormy month; on the whole warm. Wind S.W. to N.W. throughout.

**BRAEMAR.**—With the exception of snow and sleet on the 10th and 11th, the weather was fine and pleasant.

**ABERDEEN.**—Good seasonable weather throughout the month. Rainfall somewhat below the average. Strong squalls with sleet on 26th. S gale on the 31st.

**CULLODEN.**—Very dry weather. R in small quantities fell at long intervals.

#### IRELAND.

**DROMORE.**—The last week of the month was very stormy.

**WATERFORD.**—Rainfall little more than a quarter of the average. Gales on 9th and 30th. Several small flocks of starlings seen.

**DUBLIN.**—Although a fine and dry month on the whole, a spell of bitterly cold and wintry weather occurred in the second week, and this was in turn followed by a stormy period towards the close, with sudden and extreme variations of temp. The bar. stood remarkably high on the first few days, the exceptional reading of 30·729 in. being recorded on the 5th. The mean temp. was 49°·1, a value almost identical with the average of 20 years. The rainfall was little more than one-fourth of the average for October, which is usually one of the rainiest months of the year. The total is the smallest of any October in the twenty years 1865–84. R on 10th and 26th. Hoar frost on 11th. Mean humidity 84. Mean amount of cloud 5·7.

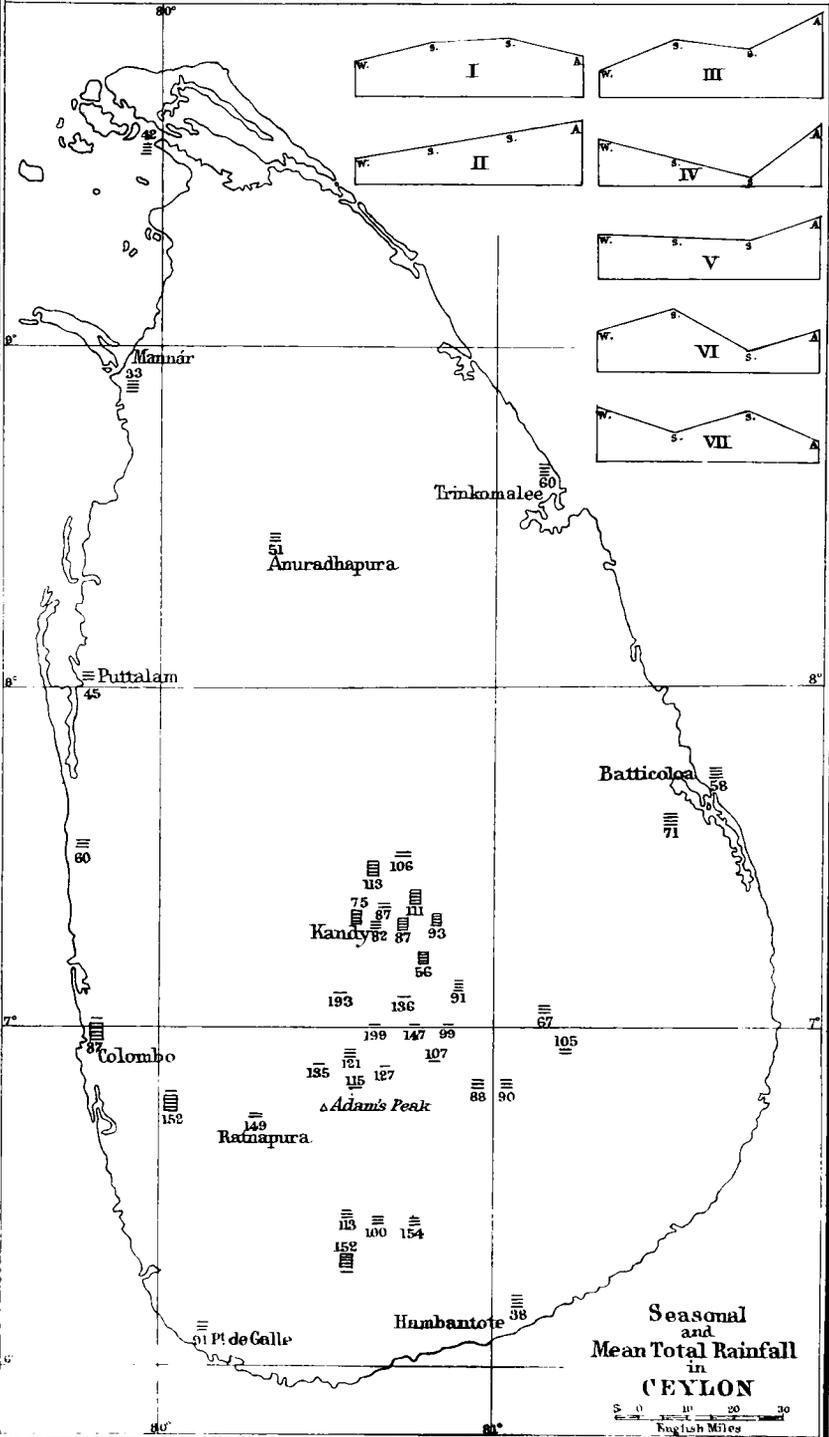
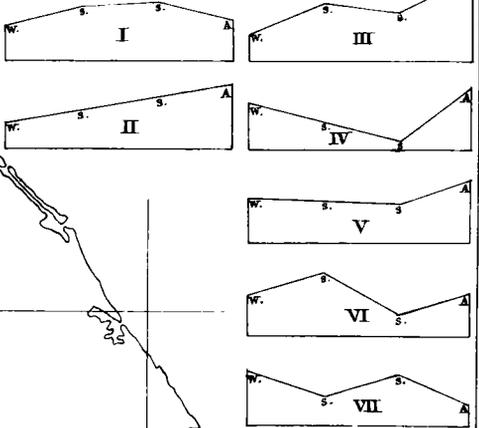
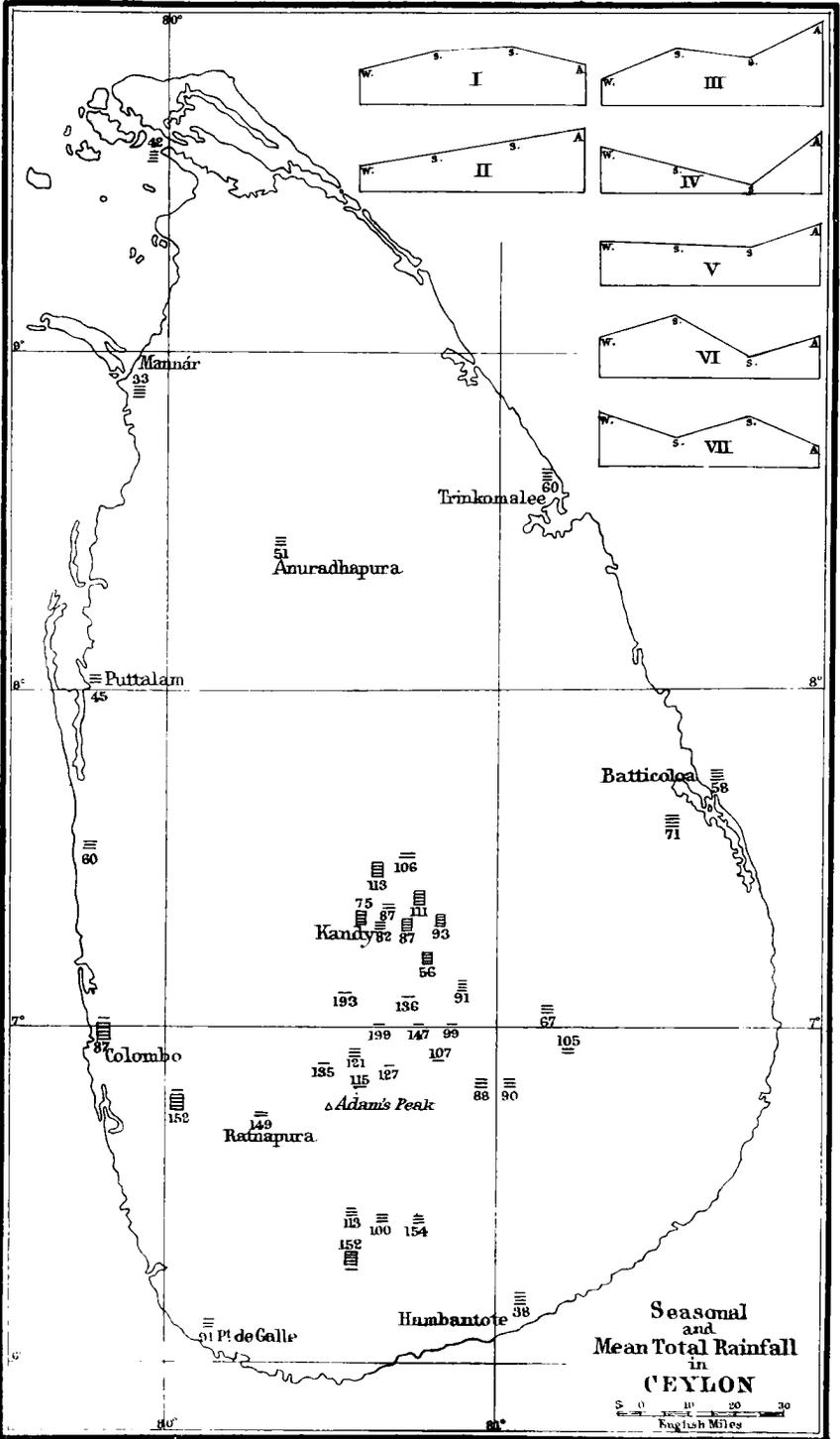
**EDENFEL.**—The month commenced with clear warm weather, but a change occurred suddenly and without warning on 8th, and a period of snow, sleet, and rain accompanied by high winds and night frosts followed. The third week was very fine, the fourth stormy and wet. On the 31st, with a perfectly steady bar., 1·10 in. R fell in 18 hours.

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#### ANOTHER HIGH LEVEL STATION.

OUR readers will remember that Mr. Clement Wragge started first a station at Beacon Stoop on the Weaver Hills in Staffordshire, at 1216 ft. above sea, then went north, and started observations on Ben Nevis at 4406 ft. Owing to Mrs. Wragge's health not being good he left Scotland, and went to Adelaide, South Australia. Arrived there, he immediately resumed observations in the plains near Adelaide, and now we learn by the *Adelaide Evening Journal* that he has started a station on Mount Lofty. This mountain is about 2,200 feet high, rising rapidly from the plains at about 10 miles from Adelaide. The station was started on October 1st, and is provided with a Stevenson screen, Richard barograph, a set of thermometers, and a Snowdon rain gauge.





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In Memoriam.

CHARLES CLOUSTON, LL.D., L.R.C.S. EDIN.

The number of contributors to *British Rainfall* and to this Magazine is so large that if we were to notice any losses but those of altogether exceptional importance, these pages would become biographical rather than meteorological. The Rev. Dr. Clouston, a descendant of one of the Norwegians by whom the Orkney Isles were chiefly peopled, was born in 1800, was trained for the medical profession and took the degree of L.R.C.S. at Edinburgh in 1819, but on returning to his father's manse at Stromness, he decided upon entering the Church.

The first printed note upon meteorology which we can trace to him was 62 years since, viz., a record of the pocky cloud having been seen on March 5th, 1822, when the barometer fell from 29·5 in. at 10 a.m. to 28·3 in. at 7 p.m. His observations of temperature and wind have been published for every month since 1826. The importance of such a long record, kept in an eminently good position on the west coast of Pomona, in the Orkney Isles, will be evident to everyone, and as far back as 1844 this was recognized by the editors of the *Philosophical Magazine*, who published monthly the daily values from Sandwick, having some years previously (in 1839) published a table by him of Orkney mean temperature. In 1841 we find Mr. Clouston writing the articles on "Sandwick," and on the "Orkney Isles" for Sir J. Sinclair's *New Statistical Account of Scotland*. Passing over shorter papers, we come to one which is the standard authority on Orkney climate, the paper read by Dr. Clouston before the British Association at Aberdeen (when the Prince Consort was president) in 1859, and which was subsequently printed *in extenso* by Admiral FitzRoy in the *Fifth Number of Meteorological Papers*. A year or two later Dr. Clouston wrote a *Guide to the Orkney Islands*, which was printed separately, and also as part of *Anderson's Guide to the Highlands and Islands of Scotland*. And last of all, in 1867, we have *An Explanation of the Popular Weather Prognostics of Scotland on Scientific Principles*.

We ought not to omit to mention that Dr. Clouston was the first

to describe and explain the formation of "Snow Rollers." This he did in the *Ann. Nat. Hist.* for 1847, and his paper was reprinted in *Silliman's American Journal* for the same year.

Dr. Clouston's contributions to meteorology were, however, of more importance as an observer than as an author. We have already referred to the publication of his observations by the *Edinburgh Philosophical Journal*. He was for many years a corresponding member of La Commission Hydrométrique de Lyon; and his observations were quoted in several of the reports of that body. When in 1856, Dr. Stark laid the foundations of the *Scottish Meteorological Society*, and tables began to be published by the Registrar-General for Scotland, Sandwick was immediately enlisted; when *British Rainfall*, 1860-61, appeared, the Sandwick returns were there; when Admiral FitzRoy wanted a station, at which to erect a large Robinson anemometer, Sandwick was selected. (By the bye, Dr. Clouston was one of the first to point out the evils of placing anemometers on roofs. Admiral FitzRoy sent instructions for the anemometer to be placed on the roof; but when the assistant-in-charge arrived at Sandwick, Dr. Clouston said, "Oh, that won't do; in the first place the wind is so strong that it will tear the roof off, and therefore our heritors won't allow it; and besides that, up above the roof you will get too much wind, you will get that due to the position of the anemometer, and besides that, you will get the wind which, not being able to get through the house, is deflected to the two sides and over the top." Hence it was that the Sandwick anemometer was mounted on the top of an acute pyramidal structure of wood). Thanks to Admiral FitzRoy's judgment, to the continued support of the meteorological office, and to Dr. Clouston's skill and perseverance, meteorology is richer by a series of almost perfect continuous records of the direction and force of the wind on that wild Atlantic shore for 22 consecutive years. The results for 1863-68 have been worked up, and published in the *Quarterly Weather Report* for 1871.

It would be useful to meteorology, and a graceful memorial to Dr. Clouston, if the results of the entire series were worked up, and published by the Meteorological Office.

The University of St. Andrew's conferred upon him the degree of LL.D., but we believe that he was even more pleased at his election as a Member by the Royal Society of Northern Antiquaries of Copenhagen.

In these pages, we have naturally dwelt chiefly upon Dr. Clouston's meteorological work; but he was a thoroughly well-informed man, he was closely associated with Mr. Farrer in the exploration of that archæological enigma, Maes-Howe, he was a good botanist, but beyond all he was an excellent Pastor. For years he was the only medical man in the parish; in fact, he was in 1882 both Minister and Parochial Medical Officer. He was ordained to the ministry in 1826, and his jubilee in 1876 was celebrated with great *éclat*, addresses and testimonials being presented, and a dinner given to him at Kirkwall,

at which Orcadians "of all shades of opinion" (we quote from the *Orcadian*) assembled to do him honour.

Sandwick Manse was not only a centre of comfort to the parish, it was more than that; we could say much on our own behalf, but we prefer to quote from the leading English scientific journal, *Nature*, and the leading journal in Dr. Clouston's own country, the *Scotsman* :—

"In conclusion, we can only say that a visit to Sandwick was ever a rare treat; the warm hospitality of the Manse, and the interest of the conversation carried on round the table, could not fail to leave an impression which will not easily wear away."—*Nature*.

"Dr. Clouston was a tall, handsome, benevolent, and, of late years, a most venerable looking man. His tastes were cultivated, his home-life refined, his manner stately and courteous, with the old-fashioned dignity. Most distinguished men who went to Orkney, especially if they were scientifically inclined, found their way to Sandwick Manse, where they were always welcomed. A talk of Orkney botany, of Orkney weather, of Orkney customs past and present, a turn to see his full set of meteorological instruments, on which he dilated as on things he loved, a walk to the wild western cliffs and the surging Atlantic, were the incidents of such a visit, and the impressions left on the mind of the visitor were pleasing and enduring. He was, indeed, a man who ministered all his life to his fellow-men in body and mind, who served God, and did his duty."—*Scotsman*.

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#### HEAVY RAIN IN THE N.W. OF SCOTLAND.

DURING the first half of November, while England generally was suffering from drought, and some of our large towns were still facing the possibility of a water famine, unusually heavy rains were falling over the western highlands of Scotland. At Sligachan, Skye, 6·20 in. fell on the 8th, and at Glenaladale 5·21 in. fell on the same day, but although these amounts are exceptionally large, the observers are so used to heavy rain, that they called forth no special comment. At Oban, however, where *only* ! 2·65 in. fell, the observer writes :—

"The town was flooded, and people had to be removed from houses on the S. side by boats, roads were torn up on the hill sides and became torrents. Several road bridges were swept away, and others were wholly immersed under the flood. The railway bridge over the Nant, of a span of 60 ft., was wrecked, through the abutment being swept down by the torrent, and altogether such destruction from sudden rainfall has not been known previously within living memory."

The fall of this one day was specially heavy at somewhat irregularly distributed stations, as the following table shows, probably due to the very irregular conformation of the country, but

it appears strange that Quinish and Kilmory should have registered such comparatively small amounts.

During the first 12 days of the month rain was general over the whole of Scotland, and was very heavy over the west of the country ; at the following nine stations, the fall during that period either exceeded 10 per cent. of the mean annual fall, or was greater than the average fall for the whole month.

| STATION.          | Rainfall<br>Nov. 1st to 12th. | Per-centage<br>of Mean<br>Annual Fall. | Per-centage<br>of Mean Fall<br>for November. |
|-------------------|-------------------------------|--|--|
| Gruinart.....     | 5·76 in.                      | 13                                     | 112  |
| Kilmory.....      | 5·95 in.                      | 10                                     | 111  |
| Stronvar.....     | 6·35 in.                      | 13?                                    | 150?   |
| Oban.....         | 7·04 in.                      | 11?                                    | 99?  |
| Quinish.....      | 8·58 in.                      | 15                                     | 124  |
| Dalnaspidal.....  | 6·73 in.                      | 11                                     | 99   |
| Glenfinnan.....   | 8·40 in.                      | 13                                     | 153  |
| Sligachan.....    | 17·41 in.                     | 21                                     | 189  |
| Strome Ferry..... | 7·62 in.                      | 12                                     | 99   |

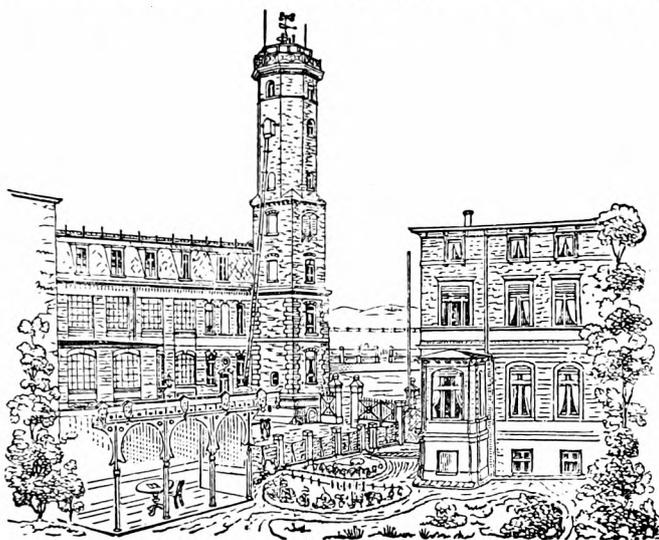
The values for Stronvar and Oban can be considered only as an approximation, as in both cases, the mean is computed from the fall at two different stations.

The greatest intensity of the downpour occurred between the 4th and 8th, and it has been considered of sufficient importance to justify the insertion of the following table ; but at many stations heavy falls occurred also on the 11th and 12th.

| STATION.         | COUNTY.         | NOVEMBER, 1884. |      |      |      |      | Total,<br>5 days. |
|------------------|-----------------|-----------------|------|------|------|------|-------------------|
|                  |                 | 4               | 5    | 6    | 7    | 8    |                   |
| Cassillis.....   | Ayr.....        | ·34             | ·02  | ·22  | ·20  | 1·28 | 2·06 in.          |
| Gruinart.....    | Argyll.....     | ·96             | ·48  | ·41  | ·36  | ·24  | 2·45 ,,           |
| Glasgow.....     | Renfrew.....    | ·30             | ·55  | ·60  | ·10  | ·90  | 2·45 ,,           |
| Holy Loch.....   | Argyll .. ..    | ·61             | ·43  | 1·11 | ·56  | 3·23 | 5·94 ,,           |
| Kilmory.....     | Argyll .. ..    | ·64             | ·84  | ·77  | ·40  | 1·22 | 3·87 ,,           |
| Stronvar.....    | Perth.....      | 1·64            | 1·09 | ·92  | ·37  | 3·51 | 7·53 ,,           |
| Oban.....        | Argyll.....     | ·63             | ·25  | ·51  | ·78  | 2·65 | 4·82 ,,           |
| Quinish.....     | Argyll.....     | 1·08            | ·36  | 1·48 | ·82  | 1·09 | 4·83 ,,           |
| Dalnaspidal..... | Perth .. ..     | 1·40            | ·89  | ·67  | ·54  | 1·32 | 4·82 ,,           |
| Glenfinnan.....  | W. Inverness.   | 1·85            | ·74  | ·81  | 1·13 | 5·21 | 9·74 ,,           |
| Invergarry.....  | W. Inverness.   | 1·50            | ·66  | ·40  | ·61  | 2·12 | 5·29 ,,           |
| Sligachan.....   | Isle of Skye... | 1·86            | 1·00 | ·43  | 2·00 | 6·20 | 11·49 ,,          |
| Strome Ferry ..  | W. Ross.....    | ·72             | ·52  | ·32  | ·72  | 2·07 | 4·35 ,,           |
| Loch Maddy .. .  | W. Inverness.   | 1·25            | ·09  | ·53  | ·65  | ·90  | 3·42 ,,           |
| Lochbroom.....   | W. Ross.....    | ·35             | ·44  | ·39  | ·66  | ·92  | 2·76 ..           |

THE METEOROLOGICAL OBSERVATORY OF THE  
"MAGDEBURG NEWS."

IN the number of this Magazine for February, 1882 (vol. xvii. p. 10), was given under the title "Newspaper Meteorology," a full account of the equipment and organization, under the direction of Dr. Assmann, of the unique meteorological establishment of the *Magdeburgische*



*Zeitung*. Thanks to the courtesy of Dr. Assmann, we now give an engraving of their lofty (112 ft.) tower, but as regards the instruments and arrangements, we must ask our readers to turn back to the article above quoted, as we, on this occasion, have to deal with the publications of the office.

Some of the methods adopted in order to bring the subject of meteorology before the public at Magdeburg are so original that we cannot refrain from mentioning two of them.

At the principal theatre there is a weather case, which is designed to give the public the earliest information possible as to weather changes. It contains (1) a weather map of the previous day, and extracts from the Journal of the *Magdeburgischen Zeitung* Observatory; (2) a reproduction of the curves of all the self-recording instruments for the previous day; (3) a large scale weather map for that day; (4) the forecast for the next day; (5) reports on the heights of the principal rivers of North Germany.

The next, and a still greater novelty, is the following:—In a niche at the corner of two of the chief streets (Hasselbach and Kaiserstrasse) where there is a capital current of air, a barograph and thermograph by Richard, of Paris, have been placed so that the public may see the records of each instrument in the act of being inscribed. Both instruments work admirably in the open air, and they excite in the public a very remarkable amount of interest.

As regards the books which have led to this article, we consider the annual volumes in the highest degree creditable; the director claims for the station rank as a "Station of the 1st Order," and substantiates the claim by two handsome quartos,\* of about 100 pages each. They are arranged almost precisely upon the plans recommended by the Vienna Conference, but as may be inferred from our previous article, they give much more than is usual. For example, on pages 64 to 69 of the first volume we find *in extenso* hourly records on 1st and 15th of each month of dry bulb, amount of vapour and humidity at 6 ft., 56 ft., and 105 ft. above the ground. On subsequent pages, we have the hygrometric values for 56 ft. and 105 ft., at 8 a.m., 2 p.m., and 8 p.m. every day, printed *in extenso*. We have also earth thermometers, at 0, 2 in., 6 in., 3 ft. 3 in., 9 ft. 10 in., and 16 ft. 5 in. deep; and lastly, the result of a Wild's evaporator, giving for 1882 17·91 in., and for 1883, 19·49 in.

In the volume for 1883, the curves of the "Sprung" barograph are given on their full scale—*i.e.*,  $\frac{1}{4}$  inch per hour of time, and 4 inches per inch of barometric change. On this very open scale, it is not remarkable that we have one of the clearest sets of the records of the Krakatoa air waves which we have yet seen.

Dr. Assmann has, however, started another enterprize, and in it seems as successful as in his other efforts. He started in April last a popular Meteorological Magazine.†

It is an 8vo, of about 30 pages per month, and, if we understand aright, will be sent post free (within the Postal Union) for 6s. 3d. per annum. All to whom German type and the German language are no obstacle, would do well to order this interesting periodical.

Perhaps we ought to justify this expression by some quotations, but space is precious. We will quote the contents of the first number, and of a few articles from subsequent ones:—

*Introduction.*

*On Local Weather Forecasting*, by Prof. Boernstein. (This runs through several numbers.)

*The Brownish-red Ring round the Sun*, by A. Grützmacher.

*The Thunderstorm of May 13, 1884*, by Dr. Assmann.

*Survey of the Weather of Central Europe during January, 1884* (continued for each month in subsequent numbers).

*Notes and Correspondence. Night Frost in May. Snow in May. Budgets for Meteorology in various countries. Action of Oil in diminishing roughness of the Sea.*

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\* Jahrbuch der Meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung. Station I. Ordnung. Herausgegeben von Dr. R. Assmann, Vorsteher. Magdeburg, 1883 and 1884.

† *Das Wetter.* Meteorologische Monatschrift für Gebildete aller Stände. Nos. 1-7. A. & R. Faber, Magdeburg.

From following numbers we may select :—

*Explanation of the Brownish-red Ring round the Sun*, by Prof. Kiessling.

Prof. Kiessling, of Hamburg, describes the absence of bright blue sky, which has prevailed for many months, and the coloured ring, which is frequently visible round the sun; its diameter being about  $25^\circ$  with the red (a brownish red) outside, then a silverish zone and a violet inside; he describes fully and clearly the phenomena of diffraction, produced by minute particles of vapour and of dust, and states that the identity of the results observed, with those which can be produced experimentally, is such that there can be no doubt that we have to deal with diffraction, though as yet there is no evidence to show whether its source is in particles of vapour or of dust. Simultaneous observations at Flensburg, Hamburg, Magdeburg, and other places, have proved that the matter is higher than the most lofty cirrus.

While upon this subject, we may mention two subsequent kindred notes, viz., *On the abnormal colouring of the sky*, by Prof. Richter, of Salzburg, in which he calls attention to the almost entire absence since December, 1883, of the usual brilliancy in the blue of the sky, and the substitution for it of a milky opaqueness. The other is an extract from the *Gazette de Lausanne*, of August 1st, giving a description of the rings identical with that above quoted from Prof. Kiessling, and indeed with what we see in England, and closing with the enquiry to which the answer has yet to be given—Are these phenomena the sequel of the wonderful optical phenomena seen all over the world last year, and are they due to the eruption of Krakatoa on August 26th, 1883?

We have space on the present occasion only to mention two other articles, each of considerable interest and ability, viz., *On the theories of the Aurora*, by Dr. Hoppe, of Hamburg; and *On the irregularities in the barometer curve during thunderstorms* by Dr. Ciro Ferrari, of Rome.

If *Das Wetter* goes on as it has begun, the meteorologist who ignores it will do so at his peril.

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## DISTRIBUTION OF RAIN IN CEYLON DURING THE DECADE, 1871-80.

BY PROF. V. RAULIN, of Bordeaux.

Ceylon is formed by a mountain mass which occupies the southern portion of the island, and is surrounded by plains which increase its size especially towards the north.

For the period 1871 to 1880 there are 40 stations in the mountain district at which observations were made from 4 to 10 years. But the low lands, though having ten coast stations, have unfortunately only two stations in the interior, Anuradhapura, a little N.W. of the centre of the island, and Ratnapura, in the S.W.

Ceylon offers, in the seasonal distribution of rainfall, a diversity

of systems greater than, according to my researches, is found in any part of India, except the Madras Presidency and Mysore; a diversity as great as that in Southern France, to which I have called attention in the *Atlas Météorologique de l'Observatoire de Paris, pour 1869-71*, published in 1875, and in my *Observations pluviométriques de la France méridionale* in 1876.

*Régime I.* (dry winter and wet summer) is only found in the high central circle between Pedrotallagalla (8327 ft.) and Adam's Peak (7415 ft.). Stations 1-9 in table.

*Régime II.* (gradual increase from winter to autumn) prevails only at a few isolated stations near those belonging to *Régime III.* Stations 10—13.

*Régime III.* (winter and summer dry, autumn very wet).—This forms a large zone surrounding *Régime I.* on the S.E., S., W. and N.W., and reaching down to the sea coast at Galle, in the S.S.W., and at Chilaw in the W. Stations 14—26.

*Régime IV.* (winter and autumn very wet, summer very dry) prevails on the N., E., and S.E. coasts, and is also found at the N.E. foot of Pedrotallagalla. Stations 27—33.

*Régime V.* (winter and autumn very wet, spring and autumn rather dry) is found to the N.N.E. of the central mass, at several stations at heights of about 3000 feet. Stations 34—41.

*Régime VI.* (spring very wet, summer dry) is found at three stations in the S.W. Stations 42—44.

We have, therefore, round the highest part of the island, on the one hand at Ramboda (3300 ft.) near its N.W. foot, and at Nuwara Eliya (6240 ft.) at the S. foot, and at the Leangwella Estate (3750 ft.) towards the N.N.E. foot, and at only eight miles distance, the two most opposite *régimes*, viz., I. and IV. In France these two *régimes* never approach within at least eighty miles, and then, as between Thiers (Puy de Dome) and Montpezat (Ardèche) they are separated by the intermediary *régimes* II. and III.—V. RAULIN.

[For the further elucidation of this paper, we have prepared the accompanying map, which itself requires a few words of explanation. Owing to the way in which the rainfall stations are packed together in the higher part of the island, space had to be economized as much as possible. Therefore, the names of the stations are nearly all omitted, but they can be ascertained by referring to the table, the figures given being the mean annual rainfall in inches at the localities over which the figures are placed. Above (in a few cases, to avoid crowding, below) these figures are placed horizontal lines, indicative of the *régime* which Prof. Raulin has assigned to each, therefore  $\overline{\overline{51}}$  indicates a mean rainfall of 51 inches per annum, falling in accordance with *régime III.*

The series of small diagrams are not to be regarded as quantitatively accurate, but merely as indicative of the character of the distribution of each *régime*. The letters denote respectively, Winter, Spring, Summer, Autumn.—ED.]

RAINFALL IN CEYLON.

| Stations.   | Height | Years.        | Winter | Spring | Summ'r | Aut'mn | Year.  |
|---|--------|---------------|--------|--------|--------|--------|--------|
|   |        |               | in.    | in.    | in.    | in.    | in.    |
| <b>RÉGIME I. (as at Moulins).—Dry Winter and Wet Summer.</b>                                    |        |               |        |        |        |        |        |
| 1. Rungboda Estate .....  | 3300   | 1870-80 (11)  | 15·22  | 24·93  | 50·02  | 45·55  | 135·72 |
| 2. Nuwara Eliya.....  | 6240   | 1870-80 (10½) | 15·60  | 18·71  | 35·16  | 29·50  | 98·97  |
| 3. Langdale Estate.....   | 4600   | 1868-75 (6¾)  | 10·64  | 16·08  | 44·56  | 36·07  | 107·35 |
| 4. Kabragala Estate .....   | 3750   | 1875-80 (5¾)  | 13·03  | 42·97  | 82·30  | 54·45  | 192·75 |
| 5. Gingeran Oya.....  | 3850   | 1871-80 (10)  | 11·05  | 25·67  | 62·39  | 47·81  | 146·92 |
| 6. Templestove .....  | 4000   | 1872-80 (8½)  | 11·55  | 37·50  | 87·75  | 62·67  | 199·47 |
| 7. Deeside Estate .....   | 4400   | 1873-80 (7½)  | 15·43  | 39·39  | 43·19  | 36·73  | 134·74 |
| 8. Quensland .....  | 4300   | 1873-77 (4½)  | 10·30  | 23·48  | 50·54  | 30·85  | 115·17 |
| 9. Newton Estate .....  | 4000   | 1875-78 (3½)  | 10·45  | 37·52  | 45·13  | 33·66  | 126·76 |
| <b>RÉGIME II. (as at Lyon).—Gradual increase from Winter to Autumn.</b>                         |        |               |        |        |        |        |        |
| 10. Kandanuwara Estate .....  | 2700   | 1872-80 (8¾)  | 21·83  | 24·14  | 22·48  | 37·95  | 106·40 |
| 11. Pendleton .....   | 2300   | 1870-80 (10¾) | 18·11  | 19·62  | 20·05  | 29·56  | 87·34  |
| 12. Ratnapura .....   | 109    | 1870-80 (11)  | 17·78  | 38·33  | 46·25  | 46·84  | 149·20 |
| 13. New Forest.....   | 3500   | 1875-80 (5¾)  | 20·85  | 24·11  | 25·93  | 34·51  | 105·40 |
| <b>RÉGIME III. (as at Mende).—Winter and Summer dry, Autumn very wet.</b>                       |        |               |        |        |        |        |        |
| 14. Anuradhapura.....   | 312    | 1870-80 (10¾) | 11·45  | 14·52  | 4·54   | 20·54  | 51·05  |
| 15. Puttalam.....   | 11     | 1869-80 (11)  | 9·19   | 14·13  | 2·82   | 18·73  | 44·87  |
| 16. Horakele Estate.....  | 50     | 1870-80 (10¾) | 8·58   | 18·85  | 10·67  | 21·81  | 59·91  |
| 17. Ettapola Estate .....   | 2500   | 1877-80 (4)   | 16·60  | 26·75  | 20·51  | 36·77  | 100·63 |
| 18. Kandy .....   | 1650   | 1870-80 (11)  | 15·56  | 16·74  | 20·82  | 28·70  | 81·82  |
| 19. Del Rey, Bagawantalawa  | 4300   | 1872-80 (9)   | 16·04  | 33·93  | 32·57  | 38·44  | 120·98 |
| 20. Galle .....   | 40     | 1870-80 (11)  | 14·35  | 25·92  | 18·97  | 31·53  | 90·77  |
| 21. Springwood Estate.....  | 2250   | 1871-77 (6½)  | 19·05  | 29·20  | 27·09  | 37·86  | 113·20 |
| 22. Vegeriya .....  | 2800   | 1870-80 (9¾)  | 22·51  | 23·25  | 19·59  | 34·92  | 100·27 |
| 23. Nanagalla, Craven Estate  | ?      | 1874-79 (4½)  | 21·33  | 43·95  | 41·74  | 46·48  | 153·50 |
| 24. Wiharagalla .....   | 3100   | 1871-80 (11)  | 20·04  | 27·17  | 6·47   | 34·28  | 87·96  |
| 25. West Meeriabedde.....   | 3500   | 1872-80 (8½)  | 17·22  | 27·07  | 8·81   | 36·62  | 89·72  |
| 26. Badulla .....   | 2220   | 1870-73 (5½)  | 15·99  | 17·98  | 8·33   | 25·09  | 67·39  |
| <b>RÉGIME IV. (as at Montpellier).—Winter and Autumn very wet, Summer very dry.</b>             |        |               |        |        |        |        |        |
| 27. Manaar .....  | 12     | 1870-80 (10¾) | 8·91   | 7·89   | 1·38   | 14·62  | 32·80  |
| 28. Jaffna .....  | 9      | 1871-80 (10)  | 9·90   | 6·15   | 2·67   | 23·22  | 41·94  |
| 29. Trincomalee .....   | 175    | 1870-80 (11)  | 20·49  | 5·65   | 8·46   | 25·40  | 60·00  |
| 30. Batticaloa .....  | 21     | 1870-80 (11)  | 25·06  | 7·02   | 5·19   | 20·53  | 57·80  |
| 31. Rukam.....  | 120    | 1870-80 (10½) | 30·32  | 7·79   | 9·16   | 23·72  | 70·99  |
| 32. Leangwella Estate.....  | 3750   | 1872-80 (8½)  | 40·22  | 17·14  | 5·81   | 28·30  | 91·47  |
| 33. Hambantota .....  | 40     | 1870-80 (11)  | 9·99   | 7·77   | 5·15   | 14·71  | 37·62  |
| <b>RÉGIME V. (as at Limoges).—Winter &amp; Autumn very wet, Spring &amp; Summer rather dry.</b> |        |               |        |        |        |        |        |
| 34. Matella West .....  | ?      | 1869-72 (4)   | 16·87  | 14·16  | 17·69  | 34·94  | 83·66  |
| 35. Gammaduwa Estate .....  | 2400   | 1875-80 (5¾)  | 46·33  | 20·57  | 11·96  | 34·27  | 113·13 |
| 36. Sudu Ganga.....   | 1500   | 1870-78 (8¾)  | 18·94  | 16·50  | 14·32  | 25·11  | 74·87  |
| 37. Leangolla Estate .....  | 2800   | 1876-80 (5)   | 24·32  | 23·06  | 29·29  | 33·86  | 110·53 |
| 38. Illagala Estate .....   | 3300   | 1870-80 (10½) | 22·52  | 20·19  | 17·02  | 33·73  | 93·46  |
| 39. Nugatenna Estate .....  | 3000   | 1870-80 (5¾)  | 33·32  | 14·21  | 11·75  | 27·39  | 86·67  |
| 40. Upper Rajawella .....   | 1500   | 1870-80 (10½) | 14·12  | 12·50  | 10·38  | 18·78  | 55·78  |
| 41. Gourakelle Estate .....   | 4200   | 1876-80 (4¾)  | 25·88  | 21·73  | 13·79  | 34·85  | 96·25  |
| <b>RÉGIME VI. (as at Toulouse).—Spring very wet, Summer dry.</b>                                |        |               |        |        |        |        |        |
| 42. Colombo .....   | 40     | 1870-80 (11)  | 11·01  | 29·50  | 17·14  | 29·21  | 86·86  |
| 43. Geekianekanda .....   | 200    | 1872-80 (8¾)  | 22·85  | 47·58  | 37·65  | 43·61  | 151·69 |
| 44. Sprinvale Estate.....   | 2200   | 1875-80 (5½)  | 17·77  | 46·94  | 41·45  | 46·07  | 152·23 |

## ROYAL METEOROLOGICAL SOCIETY.

THE first Monthly Meeting of this Society for the present Session was held on Wednesday evening, the 19th instant, at the Institution of Civil Engineers, 25, Great George Street, Westminster, S.W., Mr. R. H. Scott, F.R.S., President, in the chair. Messrs. R. Aitken, N. E. Ballou, M.D., Ph.D., F. C. Bayard, LL.M., G. W. Brennan, A.M.Inst.C.E., H. T. Burls, A. Chadwick, M.D., M.R.C.S., R. Cooke, P. H. Emerson, B.A., M.R.C.S., S. Johnson, M.B., C.M., L.R.C.P., F.R.A.S., G. J. Lee, R. M. Mercer, L. P. Muirhead, J. D. W. Vaughan, and J. B. Wilson, were elected Fellows of the Society.

The following Papers were read :—

(1.) "A new Method of Reading the Direction of the Wind on exposed heights and from a distance," by H. Leupold, F.R.Met.Soc. The author has devised a very ingenious and simple electrical anemograph which records both the direction and velocity of the wind on an ordinary Morse printing telegraph paper.

(2.) "Description of a Component Anemograph," by A. N. Pearson, F.R.Met.Soc.

(3.) "On the Injury by Lightning (April 28th, 1884) to the Monument to the first Duke of Sutherland at Lilleshall, Shropshire," by C. C. Walker.

(4.) "On the Mechanical Characteristics of Lightning Strokes," by Col. the Hon. Arthur Parnell. The main objects of this paper were : First, to attempt to show that lightning is not a sort of electric fluid that descends from the clouds, injures buildings and persons in its course, and dissipates itself in the earth, but that it is a luminous manifestation of the explosion caused by two equal forces springing towards each other simultaneously from the earth and the under surface of the inducing cloud, and coalescing or dying out, nearly midway between the two plates of the electrical condenser formed by the earth and the cloud. Secondly, to demonstrate that of these two forces it is the earth-spring, or upward force alone, that injures buildings, persons, or other objects on the earth's surface, and that constitutes tangibly what is rightly known as a lightning stroke. The author gives the details of 278 instances, the records of which he considers demonstrate with more or less precision the existence of an upward direction in the force of the stroke.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1884.

| STATIONS.<br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |       |            |           | Absolute.    |                | Total Rain. |       | Aver.<br>Cloud. |     |
|--|-----------|-------|----------|-------|----------|-------|------------|-----------|--------------|----------------|-------------|-------|-----------------|-----|
|  | Maximum.  |       | Minimum. |       | Max.     | Min.  | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.      | Days. |                 |     |
|  | Temp.     | Date. | Temp.    | Date. |          |       |            |           |              |                |             |       |                 |     |
| England, London .....  | 68·0      | 16    | 27·5     | 1     | 52·7     | 37·5  | 38·6       | 80        | 79·7         | 34·1           | inches      | 1·40  | 7               | 6·3 |
| Malta .....  | 69·2      | 1     | 45·8     | 26    | 62·4     | 51·3  | 50·7       | 84        | 127·8        | 41·5           | 1·38        | 8     | 4·5             |     |
| <i>Mauritius</i> .....   | 85·3      | 6     | 69·3     | 14,19 | 82·6     | 72·3  | 70·3       | 81        | 136·6        | 63·0           | 6·75        | 25    | 6·6             |     |
| Calcutta .....   | 100·2     | 31    | 65·7     | 11    | 93·2     | 71·6  | 68·5       | 68        | 154·1        | 54·8           | 0·06        | 1     | 1·4             |     |
| Bombay .....   | 89·4      | 30    | 69·8     | 8,9   | 85·2     | 73·0  | 70·0       | 72        | 141·1        | 57·9           | 0·00        | 0     | 1·2             |     |
| Ceylon, Colombo .....  | 88·7      | 1     | 72·3     | 9,22  | 86·1     | 74·7  | 73·0       | 78        | 142·6        | 62·0           | 3·84        | 10    | 2·9             |     |
| <i>Melbourne</i> .....   | 96·9      | 25    | 37·1     | 17    | 74·5     | 54·4  | 51·7       | 68        | 147·9        | 28·9           | 3·11        | 9     | 5·9             |     |
| <i>Adelaide</i> .....  | 101·6     | 6     | 50·3     | 12    | 83·5     | 60·2  | 48·7       | 44        | 166·9        | 36·6           | 1·74        | 5     | 3·8             |     |
| <i>Wellington</i> .....  | 72·5      | 22    | 45·5     | 25    | 64·3     | 52·8  | ...        | ...       | 128·0        | 36·0           | 2·44        | 11    | ...             |     |
| <i>Auckland</i> .....  | 73·5      | 18    | 50·0     | 25    | 69·0     | 56·3  | 53·0       | 71        | 142·0        | 42·0           | 2·85        | 11    | 5·5             |     |
| Jamaica .....  | 90·2      | 31    | 63·2     | 22    | 83·7     | 67·5  | 67·8       | 80        | ...          | ...            | 1·14        | ...   | 2·9             |     |
| Barbados .....   | 79·0      | 1,31  | 67·0     | var.  | 78·0     | 69·0  | 70·4       | 67        | 141·0        | 64·0           | 4·76        | 18    | 6·0             |     |
| Toronto .....  | 49·3      | 27    | -7·0     | 1     | 35·1     | 20·5  | 23·8       | 77        | 118·0        | -15·0          | 2·53        | 17    | 5·9             |     |
| New Brunswick,<br>Fredericton .....                              | 52·3      | 24    | -12·7    | 5     | 33·9     | 12·4  | 19·8       | 77        | ...          | ...            | 3·14        | 18    | 5·9             |     |
| Minitoba, Winnipeg ...   | 37·8      | 26    | -32·7    | 5     | 23·5     | -13·0 | -13·0      | 92        | ...          | ...            | 1·20        | 5     | 3·7             |     |
| British Columbia,<br>Spence's Bridge ... }                       | 63·3      | 22    | 9·2      | 6     | 49·8     | 27·8  | ...        | ...       | ...          | ...            | 0·27        | 3     | ...             |     |

REMARKS, MARCH, 1884.

MALTA.—Mean temp., 55°·9; mean hourly velocity of wind, 11·4 miles. Sea temp. steady at 61°.

J. SCOLES.

*Mauritius*.—Rainfall 0·70 in., and temp. 1°, below average; mean hourly velocity of wind, 7·9 miles, extremes 18·3 and 0·0 miles. Prevailing direction, S.E. by E. to E.N.E. T and L on 13 days. Colourations of sky before sunrise and after sunset, few and faint.

C. MELDRUM, F.R.S.

CEYLON.—TSS occurred on 13 days, and T or L alone on 7 days.

J. STODDART.

*Melbourne*.—Mean temp. of air and of dewpoint, each 0°·6 below average; humidity, average; mean pressure and amount of cloud slightly above average; and rainfall ·98 in. above average. Prevailing winds, S. and S.E., generally light. Heavy dews on 8 days. T and L, 25th and 27th; L on 6th.

R. L. J. ELLERY, F.R.S.

*Adelaide*.—Mean temp. 1° above average; max. above 90° on 8 days. Total rainfall above the average, but only ·05 in. fell before the 28th. Temp. of soil at 5 ft. and 8 ft. more than 1° below the average. Dew on 14 nights.

C. TODD.

*Wellington*.—Altogether a pleasant month. Prevailing winds, S.E. and N.W., moderate in force. Slight earthquake on 19th. Mean temp., 3°·7, and rainfall ·40 in. below average.

R. B. GORE.

*Auckland*.—Mean temp. unusually low. Rainfall slightly above average; pressure also above average. Heavy TS on 23rd.

T. F. CHEESEMAN.

BARBADOS.—Pressure very unsteady. Mean temp., 1°·4 below average. Prevailing wind, N.E.; average velocity 15·5 miles, extremes 20·5 and 13·3 miles. Rainfall 60 per cent. above the average, and only once exceeded in March during 33 years. Evaporation high, and nearly equal to the rainfall. Three days overcast.

R. BOWIE WALCOTT.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1884.

| STATIONS.<br><br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain. |       | Aver.  |
|--|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|-------------|-------|--------|
|  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.      | Days. | Cloud. |
|  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                |             |       |        |
|  | °         |       | °        |       | °        | °    | °          | 0.100     | °            | °              | inches      |       |        |
| England, London .....  | 68·4      | 2     | 29·9     | 23*   | 54·9     | 37·8 | 37·5       | 74        | 87·6         | 34·2           | 1·02        | 14    | 6 4    |
| Malta.....   | 74·2      | 19    | 50·9     | 2     | 68·7     | 55·5 | 53·2       | 76        | 133·3        | 46·0           | ·34         | 2     | 3 3    |
| <i>Mauritius</i> .....   | 82·8      | 1     | 67 3     | 8     | 81·0     | 71·3 | 68·1       | 79        | 136·0        | 59·7           | 6·02        | 17    | 6 6    |
| Calcutta.....  | 103·7     | 14    | 69·2     | 23    | 96·5     | 75·5 | 72·8       | 69        | 157·2        | 62·7           | 1·38        | 4     | 2 6    |
| Bombay.....  | 92·4      | 4     | 73·9     | 14    | 87·5     | 76·4 | 73·1       | 74        | 145·8        | 64·0           | 0·00        | 0     | 2 0    |
| Ceylon, Colombo .....  | 88·5      | 23    | 73·3     | 27†   | 86·7     | 75·6 | 73·9       | 79        | 142·3        | 65·0           | 5·35        | 12    | 4 5    |
| <i>Melbourne</i> .....   | 88·2      | 2     | 40·7     | 30    | 69·7     | 50·7 | 49·3       | 71        | 138·2        | 34·7           | ·76         | 8     | 5 9    |
| <i>Adelaide</i> .....  | 88·0      | 13    | 43·8     | 20    | 71·6     | 54·1 | 47·6       | 58        | 146·0        | 36·6           | 1·34        | 10    | 5 2    |
| <i>Wellington</i> .....  | 67·0      | 13    | 39·8     | 11‡   | 60·4     | 48·3 | ...        | ...       | 121·0        | 36·0           | 2·09        | 6     | ...    |
| <i>Auckland</i> .....  | 72·0      | 7     | 46·0     | 21    | 65·4     | 53·1 | 49·1       | 69        | 138·0        | 39·0           | 1·21        | 5     | 4 5    |
| Jamaica, Kingston.....   | 89·1      | 28    | 64·7     | 30    | 84·3     | 68·9 | 70·0       | 80        | ...          | ...            | ·11         | ...   | 3 0    |
| Barbados.....  | 81·0      | var.  | 67·0     | 15    | 80·0     | 70·0 | 70·1       | 77        | 144·0        | 64·0           | 4·69        | 10    | 5 0    |
| Toronto.....   | 67·8      | 27    | 25·1     | 6,12  | 48·5     | 33·2 | 29·0       | 63        | 123·5        | 16·0           | ·95         | 11    | 6 0    |
| New Brunswick, Fredericton.....                                      | 66·5      | 24    | 19·9     | 15    | 49·3     | 32·3 | 33·1       | 76        | ...          | ...            | 3·87        | 18    | 7 5    |
| Manitoba, Winnipeg.....  | 66·0      | 25    | 8 7      | 10    | 42·4     | 23·0 | 32·0       | 78        | ...          | ...            | 2·69        | 12    | 7 1    |
| British Columbia, Spence's Bridge.....                               | 79·3      | 8     | 35·9     | 18    | 66·0     | 42·7 | ...        | ...       | ...          | ...            | ·10         | 2     | ...    |

\* And 24. † And 28. ‡ And 25.

REMARKS, APRIL, 1884.

MALTA.—Mean temp., 61°·0; mean hourly velocity of wind, 11·6 miles; on 28th, velocity averaged 27 miles for 7 hours. Sea temp. rose from 61° to 65°. J. SCOLES.

*Mauritius*.—Rainfall, average; mean temp., 1°·1 below average. Mean hourly velocity of wind equal to average, extremes 27·4 and 2·3 miles; prevailing direction, S.E. to E. L on 7 days, and T on 4 other days. C. MELDRUM, F.R.S.

CEYLON.—TSS or L occurred on every day, but 29th and 30th. J. STODDART.

*Melbourne*.—Mean temp., 0°·3 above, and rainfall 1·51 in. below average. Pressure, temp. of dew point, humidity and amount of cloud, all very near their respective averages. Prevailing winds, S.E. and N., generally moderate; heavy squalls on 24th. Heavy dew on 9 nights. T and L on 14th; L on 22nd. R. L. J. ELLERY, F.R.S.

*Adelaide*.—Mean pressure, ·050 above the average of 27 years; the max. reading (30·525 in.) was one of the highest recorded, and the min. (29·513 in.) was only ·008 in. above the lowest on record. Mean temp. (62°·8) unusually low for April. Dew on 16 nights, and the red glow only noticed twice. C. TODD.

*Wellington*.—Showery from 5th to 10th and on 30th, remainder of month fine and bright. L on 16th. Earthquakes on the 11th, 16th and 25th. Mean temp., 2°·8, and rainfall 1·51 in. below their respective averages. R. B. GORE.

*Auckland*.—On the whole a remarkably fine month, with little rain or wind. Pressure unusually high throughout. T. F. CHEESEMAN.

JAMAICA.—The rainfall over the Island generally was only one-half the average; at many places no R fell at all, and at only a few places in the west central districts was there any considerable rainfall. MAXWELL HALL.

BARBADOS.—Pressure fairly steady; mean temp. (74°·2), 1°·1 below average. Prevailing wind, N.E.; mean hourly velocity, 10·6 miles, extremes 14·5 miles and 6·2 miles. Rainfall 47 per cent. above, and evaporation 30 per cent., below their averages. 2·06 in. of R fell on 14th; only 2 days overcast. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL,  
NOVEMBER, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | 2·12        | XI.    | Carno, Tybrith .....     | 3·15        |
| „     | Margate, Birchington...   | 1·28        | „      | Corwen, Rhug .....       | 3·02        |
| „     | Littlehampton .....       | 1·11        | „      | Port Madoc .....         | 4·26        |
| „     | Hailsham .....            | 1·40        | „      | I. of Man, Douglas ..... | 4·54        |
| „     | I. of W., St. Lawrence.   | ·50         | XII.   | Stoneykirk, Ardwell Ho.  | 3·38        |
| „     | Alton, Ashdell.....       | 1·48        | „      | Melrose, Abbey Gate...   | 2·72        |
| III.  | Winslow, Addington...     | 1·41        | XIII.  | N. Esk Res. [Penicuik]   | 2·30        |
| „     | Oxford, Magdalen Col..    | 1·74        | XIV.   | Ayr, Cassillis House ... | 3·53        |
| „     | Northampton .....         | 1·36        | „      | Glasgow, Queen's Park.   | 3·80        |
| „     | Cambridge, Beech Ho..     | 1·13        | XV.    | Islay, Gruinart School.. | 6·81        |
| IV.   | Southend .....            | ·75         | XVI.   | St. Andrews, NewtonBk    | 1·78        |
| „     | Harlow, Sheering ...      | 1·93        | „      | Balquhider, Stronvar..   | 10·08       |
| „     | Diss .....                | 1·67        | „      | Dunkeld, Inver Braan..   | 2·96        |
| „     | Swaffham .....            | 2·37        | „      | Dalnaspidal H.R.S. ...   | 7·59        |
| „     | Hindringham .....         | ...         | XVII.  | Keith H.R.S. ....        | 4·05        |
| V.    | Salisbury, Alderbury...   | 1·92        | „      | Forres H.R.S. ....       | 2·45        |
| „     | Warminster .....          | 1·85        | XVIII. | Strome Ferry H.R.S....   | 9·89        |
| „     | Calne, Compton Bassett    | 1·71        | „      | Lochbroom .....          | 8·64        |
| „     | Ashburton, Holne Vic..    | 3·15        | „      | Tain, Springfield.....   | 3·20        |
| „     | Holsworthy, Clawton...    | 3·17        | „      | Loch Shiel, Glenaladale  | 15·92       |
| „     | Lynmouth, Glenthorne.     | 2·69        | „      | Invergarry .....         | 9·52        |
| „     | Probus, Lamellyn .....    | 2·91        | XIX.   | Lairg H.R.S. ....        | 4·26        |
| „     | Wincanton, Stowell Rec.   | 1·89        | „      | Forsinard H.R.S. ....    | 5·29        |
| „     | Taunton, Fullands .....   | 1·23        | „      | Watten H.R.S. ....       | 3·61        |
| VI.   | Bristol, Clifton .....    | 1·69        | XX.    | Dunmanway, Coolkelure    | 6·43        |
| „     | Ross .....                | 1·90        | „      | Fermoy, Gas Works ...    | 3·10        |
| „     | Wem, Sansaw Hall.....     | 1·70        | „      | Tralee, Castlemorris ... | 4·91        |
| „     | Cheadle, The Heath Ho.    | 1·85        | „      | Tipperary, Henry Street  | 2·96        |
| „     | Worcester, Diglis Lock    | 1·82        | „      | Newcastle West .....     | 3·01        |
| „     | Coventry, Coundon .....   | 1·74        | „      | Miltown Malbay.....      | 3·75        |
| VII.  | Melton, Coston .....      | 1·28        | „      | Corofin .....            | ...         |
| „     | Ketton Hall [Stamford]    | 1·46        | XXI.   | Carlow, Browne's Hill..  | 2·13        |
| „     | Horncastle, Bucknall ...  | 1·39        | „      | Navan, Balrath .....     | 2·16        |
| „     | Mansfield, St. John's St. | 1·62        | „      | Mullingar, Belvedere ..  | 3·12        |
| VIII. | Macclesfield, The Park.   | 1·87        | „      | Athlone, Twyford .....   | 4·58        |
| „     | Walton-on-the-Hill.....   | ...         | XXII.  | Galway, Queen's Col....  | 4·63        |
| „     | Lancaster, South Road.    | 1·85        | „      | Clifden, Kylemore .....  | 8·96        |
| „     | Broughton-in-Furness ..   | 2·31        | „      | Crossmolina, Enniscoe..  | 5·24        |
| IX.   | Wakefield, Stanley Vic.   | ·85         | „      | Carrick-on-Shannon ...   | 3·93        |
| „     | Ripon, Mickley .....      | 1·60        | XXIII. | Dowra .....              | ...         |
| „     | Scarborough.....          | 2·19        | „      | Rockcory.....            | 2·50        |
| „     | East Layton [Darlington]  | 1·55        | „      | Warrenpoint .....        | 2·89        |
| „     | Middleton, Mickleton..    | 2·37        | „      | Newtownards .....        | 2·81        |
| X.    | Haltwhistle, Unthank..    | 1·72        | „      | Belfast, New Barnsley..  | 3·51        |
| „     | Shap, Copy Hill .....     | 4·39        | „      | Cushendun .....          | 4·88        |
| XI.   | Llanfrechfa Grange .....  | 2·71        | „      | Bushmills .....          | 4·49        |
| „     | Llandoverly .....         | 2·92        | „      | Stewartstown .....       | 3·10        |
| „     | Lower Solva .....         | 3·05        | „      | Donegal, Revelin Ho....  | ...         |
| „     | Castle Malgwyn .....      | 4·55        | „      | Buncrana .....           | 5·59        |
| „     | Rhayader, Nantgwillt..    | 3·27        | „      | Carndonagh .....         | ...         |

NOVEMBER, 1884.

| Div.     | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL.   |                                |                            |       |   | TEMPERATURE. |       |      |      | No. of Nights below 32° |          |
|----------|---|-------------|--------------------------------|----------------------------|-------|---|--------------|-------|------|------|-------------------------|----------|
|          |   | Total Fall. | Difference from average 1870-9 | Greatest Fall in 24 hours. |       | Days on which <sup>°</sup> 01 or more fell. | Max.         |       | Min. |      | In shade                | On grass |
|          |   |             |                                | Dpth.                      | Date. |   | Deg.         | Date  | Deg. | Date |                         |          |
|          |   | inches      | inches.                        | in.                        |       |   |              |       |      |      |                         |          |
| I.       | London (Camden Square) ...  | 1·92        | — ·52                          | ·79                        | 30    | 12  | 60·2         | 7     | 25·3 | 25   | 7                       | 18       |
| II.      | Maidstone (Hunton Court)...   | 1·15        | — 1·75                         | ·43                        | 21    | 7   | ...          | ...   | ...  | ...  | ...                     | ...      |
| III.     | Strathfield Turgiss .....   | 1·49        | — 1·26                         | ·42                        | 5     | 14  | 60·6         | 5     | 21·2 | 24   | 13                      | 21       |
| IV.      | Hitchin .....   | 1·92        | — ·69                          | ·80                        | 30    | 12  | 56·0         | 2     | 22·0 | 24   | 16                      | ...      |
| V.       | Banbury .....   | 1·41        | — 1·30                         | ·47                        | 30    | 11  | 59·0         | 2     | 23·5 | 30   | 14                      | ...      |
| VI.      | Bury St. Edmunds (Culford)  | 1·51        | — 1·32                         | ·43                        | 30    | 14  | 59·0         | 7, 8a | 23·0 | 23   | 18                      | ...      |
| VII.     | Norwich (Cossey) .....  | 2·31        | — 1·00                         | ·26                        | 20    | 17  | 59·0         | 7     | 23·0 | 30   | 8                       | 18       |
| VIII.    | Weymouth(LangtonHerring)  | 1·82        | ...                            | ·66                        | 30    | 14  | ...          | ...   | ...  | ...  | ...                     | ...      |
| IX.      | Barnstaple .....  | 3·18        | — ·97                          | ·66                        | 5     | 20  | 61·0         | 1     | 29·0 | 30   | ...                     | ...      |
| X.       | Bodmin .....  | 3·20        | — 2·12                         | ·48                        | 5     | 20  | 57·0         | 5     | 30·0 | 18e  | 6                       | 11       |
| XI.      | Cirencester .....   | 1·65        | — 1·33                         | ...                        | ...   | ...   | ...          | ...   | ...  | ...  | ...                     | ...      |
| XII.     | ChurchStretton(Woolstaston)   | 1·51        | — 1·93                         | ·32                        | 2     | 19  | 54·0         | 1, 6b | 27·0 | 30   | 6                       | 15       |
| XIII.    | Tenbury (Orleton) .....   | 1·85        | — 1·01                         | ·47                        | 2     | 15  | 60·2         | 1     | 22·0 | 30   | 11                      | 15       |
| XIV.     | Leicester .....   | 1·57        | ...                            | ·36                        | 5     | 13  | 59·5         | 2     | 23·5 | 30   | 7                       | 20       |
| XV.      | Boston .....  | 1·87        | — ·50                          | ·58                        | 30    | 13  | 58·0         | 2     | 26·0 | 26   | 6                       | ...      |
| XVI.     | Grimsby (Killingholme).....   | 1·62        | — 1·48                         | ·46                        | 30    | 17  | 48·5         | 2     | 25·0 | 30   | 5                       | ...      |
| XVII.    | Hesley Hall [Tickhill].....   | ·94         | ...                            | ·40                        | 30    | 12  | 60·0         | 1     | 24·0 | 30   | 11                      | ...      |
| XVIII.   | Manchester (Ardwick).....   | 1·66        | — 1·31                         | ·38                        | 4, 30 | 11  | 55·0         | 6     | 26·0 | 30   | 7                       | ...      |
| XIX.     | Wetherby (Ribston Hall) ...   | 1·19        | — 1·57                         | ·42                        | 5     | 9   | ...          | ...   | ...  | ...  | ...                     | ...      |
| XX.      | Skipton (Arncliffe) .....   | 3·23        | — 2·52                         | ·81                        | 4     | 17  | 58·0         | 8     | 22·0 | 29   | ...                     | ...      |
| XXI.     | North Shields .....   | 1·62        | — 1·83                         | ·23                        | 4     | 17  | 60·0         | 1     | 18·2 | 30   | 7                       | 8        |
| XXII.    | Borrowdale (Seathwaite).....  | 6·70        | — 5·12                         | 1·46                       | 1     | 15  | 54·8         | 6     | 22·8 | 30   | ...                     | ...      |
| XXIII.   | Cardiff (Ely) .....   | 2·21        | — 1·99                         | ·53                        | 30    | 13  | ...          | ...   | ...  | ...  | ...                     | ...      |
| XXIV.    | Haverfordwest .....   | 3·75        | — 1·59                         | 1·00                       | 29    | 14  | 57·5         | 1     | 25·0 | 25   | 6                       | 12       |
| XXV.     | Plinlimmon (Cwmsymlog) ...  | 3·72        | ...                            | ·73                        | 4     | 16  | ...          | ...   | ...  | ...  | ...                     | ...      |
| XXVI.    | Llandudno .....   | 2·23        | — 1·68                         | ·46                        | 28    | 17  | 61·0         | 1     | 29·2 | 30   | 1                       | ...      |
| XXVII.   | Cargen [Dumfries] .....   | 2·40        | — 1·51                         | ·78                        | 6     | 9   | 56·6         | 1     | 21·8 | 30   | 13                      | ...      |
| XXVIII.  | Hawick (Wilton Hill) .....  | 1·64        | ...                            | ·83                        | 4     | 8   | ...          | ...   | ...  | ...  | ...                     | ...      |
| XXIX.    | Douglas Castle (Newmains)   | 2·69        | — ·86                          | ·89                        | 4     | 11  | ...          | ...   | ...  | ...  | ...                     | ...      |
| XXX.     | Lochgilphead (Kilmory).....   | 6·92        | + 1·56                         | 1·22                       | 8     | 15  | ...          | ...   | ...  | ...  | ...                     | ...      |
| XXXI.    | Oban (Craigvarren) .....  | 7·57        | ...                            | 2·65                       | 8     | 16  | 55·5         | 6, 7c | 29·0 | 24   | 2                       | ...      |
| XXXII.   | Mull (Quinish) .....  | 9·52        | ...                            | 2·05                       | 11    | 19  | ...          | ...   | ...  | ...  | ...                     | ...      |
| XXXIII.  | Loch Leven Sluices .....  | 2·90        | — ·65                          | ·70                        | 9     | 8   | ...          | ...   | ...  | ...  | ...                     | ...      |
| XXXIV.   | Arbroath .....  | 1·47        | — 1·68                         | ·40                        | 6     | 7   | 54·0         | 1     | 21·0 | 30   | 7                       | ...      |
| XXXV.    | Braemar .....   | 4·03        | + ·26                          | ·66                        | 3     | 20  | 52·2         | 1     | 15·4 | 30   | 13                      | 24       |
| XXXVI.   | Aberdeen .....  | 3·22        | ...                            | ·78                        | 4     | 20  | 55·0         | 1     | 14·0 | 30   | 8                       | 24       |
| XXXVII.  | Skye (Sligachan) .....  | 21·51       | ...                            | 6·20                       | 8     | 20  | ...          | ...   | ...  | ...  | ...                     | ...      |
| XXXVIII. | Culloden .....  | 2·93        | + ·23                          | ·83                        | 8     | 7   | 55·0         | 11d   | 22·0 | 30   | 7                       | 22       |
| XXXIX.   | Dunrobin .....  | 3·63        | ...                            | 1·24                       | 26    | 15  | 55·0         | 1     | 22·5 | 30   | 8                       | ...      |
| XL.      | Orkney (Sandwick).....  | 3·94        | — ·50                          | ·50                        | 7     | 23  | 57·8         | 11    | 23·6 | 30   | 3                       | 9        |
| XLI.     | Cork (Blackrock) .....  | 3·68        | — ·93                          | 1·14                       | 6     | 14  | 57·0         | 1c    | 24·0 | 24   | 14                      | ...      |
| XLII.    | Dromore Castle .....  | 2·94        | ...                            | ·85                        | 8     | 11  | 58·0         | 4     | 31·0 | 17   | ...                     | ...      |
| XLIII.   | Waterford (Brook Lodge) ...   | 2·73        | ...                            | 1·11                       | 6     | 11  | 56·2         | 4     | 28·0 | 25   | 6                       | 19       |
| XLIV.    | Killaloe .....  | 3·98        | ...                            | 1·06                       | 11    | 13  | 58·0         | 12    | 26·0 | 22f  | ...                     | ...      |
| XLV.     | Portarlington .....   | 2·27        | — ·13                          | ·70                        | 1     | 19  | 57·0         | 1     | 28·0 | 22   | 13                      | ...      |
| XLVI.    | Dublin (FitzWilliam Square)   | 1·41        | — ·87                          | ·55                        | 1     | 14  | 58·6         | 1     | 31·1 | 16   | 3                       | 19       |
| XLVII.   | Ballinasloe .....   | 3·81        | + ·81                          | ·84                        | 11    | 19  | 54·0         | 1     | 25·0 | 22   | 17                      | ...      |
| XLVIII.  | Waringstown .....   | 2·16        | — ·55                          | ·48                        | 6     | 14  | 57·0         | 11    | 26·0 | 21   | 15                      | 21       |
| XLIX.    | Londonderry (Creggan Res.)  | 5·30        | ...                            | ·95                        | 4     | 24  | ...          | ...   | ...  | ...  | ...                     | ...      |
| L.       | Omagh (Edenfel) .....   | 3·75        | + ·70                          | ·60                        | 11    | 20  | 52·0         | 11    | 27·0 | 13   | 12                      | 17       |

a And 9. b And 7. c And 11. d And 12. e And 25, 30. f And 25.  
+ Shows that the fall was above the average; — that it was below it.

## METEOROLOGICAL NOTES ON NOVEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

## ENGLAND.

STRATHFIELD TURGISS.—The early part of the month was warm and bright; insects were out, and flowers abundant. The last fortnight was cold, with haze by day and frosts by night; land as dry as at Midsummer.

BANBURY.—Mean temp.  $42^{\circ}0$ ; high wind on 3 days; fog on 2 days; S on 3 days.

CULFORD.—A very changeable month, showers occurring suddenly, but not delaying out-door work.

LANGTON HERRING.—The fourth very dry month in succession, the total rainfall for the four months, August to November inclusive, being only 5'38 in., while the average is 13'80 in. The first 12 days were mild, but the mean temp. is  $2^{\circ}8$  below the average of 12 years. The continued absence of storms was noticeable.

BODMIN.—A remarkably fine month, with little wind, and a rainfall of little more than half the average. Springs lower than they have been at any other time during at least 80 years. Mean temp.,  $43^{\circ}8$ .

WOOLSTASTON.—The first fortnight was mild and genial, and several primroses were seen in blossom. After the 14th, a cold period set in, with sharp frost at night. S fell on 27th and 30th. Mean temp.,  $41^{\circ}0$ .

TENBURY.—During the first week R fell daily, and the temp. was high, with the exception of two frosty nights; little R fell afterwards, till the 30th, when a steady fall of S for six hours occurred after a severe frost, covering the ground to a depth of two-and-a-half inches. After the 14th, the temp. was much below the average, with many frosty nights; but the mean for the month was nearly  $0^{\circ}5$  above the average of 23 years: the bar. was generally high and steady. A favourable time for wheat planting on the strong clay lands.

LEICESTER.—The month was very misty, with several sharp frosts and snow on 23rd, 24th and 30th, the fall on the latter day lasting from 2 p.m. until late at night.

KILLINGHOLME.—Scarcity of water seriously felt both in town and country. Three inches of snow on the ground when the month closed, and more was falling.

ARDWICK.—November was a fine, open month; there was comparatively little fog, and little frost. A fall of about three inches of S occurred on the afternoon of the 30th, but it only remained on the ground about 24 hours.

NORTH SHIELDS.—TS on 20th; S on 24th, 29th, and 30th.

## WALES.

HAVERFORDWEST.—An unusually fine dry month. Considerable rainfall during the first 10 days, principally at night; but from 10th to 24th it was fine, with cold days and frosty nights. Towards the end the air was bleak and stormy, with cold R and sleet.

LLANDUDNO.—A mild, but dull month. It began with a high temp., and ended with a snowstorm and slight frost, both of which, however, disappeared the following day. The mean temp. was about half a degree above the average, the total range being slightly above, and the mean daily range slightly below, the average. Duration of bright sunshine only 42 hours.

## SCOTLAND.

CARGEN.—Temp. of the month  $1^{\circ}$  below, and duration of sunshine 20 hours below the average. L on 4th and 20th; S on 30th.

HAWICK.—A most genial month, with the exception of the last five nights, which were frosty; very windy on 4th, 5th, 6th and 16th; much L at night on 20th.

OBAN.—A remarkable month. The early part was stormy, and on the 5th the heaviest known rainfall (2'65 in.) occurred here and throughout the west coast. The town was flooded, and much damage done. The remainder of the

month was unusually fair, cold, and calm, with a prevalence of N. winds. H on 2nd, 9th and 28th, L on 9th; S on 24th.

QUINISH.—The rainfall of the first 11 days (8·49 in.) is quite unprecedented. The rest of the month was fine with slight frosts.

ABERDEEN.—Rainfall exactly the average. Till the 17th, the prevailing winds were S. to S.W., with showery weather; thereafter the wind veered to N.W., with lower temp. S set in on 28th, and the temp. fell to 14° on the forenoon of the 30th. Strong gale on the 9th; much L on 20th; lunar halos on 27th and 28th: S and H on 30th.

CULLODEN.—The month was favourable for work generally. A dry period with a steady bar. prevailed between the 8th and 26th.

SANDWICK.—Aurora on 2nd; L on 9th; S on 27th.

#### IRELAND.

DROMORE.—The month was very fine, with light winds now and again, and slight frosts.

WATERFORD.—Rainfall an inch below the average, and but for the heavy falls during the first week, it would have been a very dry month; N.E. winds prevailed during the latter half; S.W. gale on the 4th; thick fog on the 14th.

KILLALOE.—The amount of R was nearly the average, but the number of rainy days was much below the average. From the 11th to the 25th clear, bright, frosty days. Mean temp. 42°·4.

DUBLIN.—At first unsettled and rainy, the month ultimately proved fine and quiet, and at the close cold and wintery. The mean temp. (43°·0) was 0°·7 below the average of 20 years. During the last 20 years there have been five Novembers with a smaller rainfall than that of the present month, the smallest being 1870, 1·22 in. Solar halo on 2nd, lunar halo on 29th; fog on five days; H on two days; S on one day. Mean humidity 86; mean amount of cloud 5·9.

EDENFEL.—With the exception of the first week, and a few days at the end, the weather of the month was settled and fine, with sunshiny days and slight frost at night; S on 28th and 29th.

### THE BROCKEN SPECTRE IN SCOTLAND.

*To the Editor of the "Scotsman."*

SIR,—Such of your readers as care for mountain phenomena, may be interested to learn that the appearance known as the "Spectre of the Brocken" was developed on Ben More, Perthshire, on Sunday evening.

Along with a friend, I arrived on the top of the mountain about 5 p.m. and we had not enjoyed the fine view for more than a few minutes before the wind brought up a chill mist that very shortly enveloped the whole summit. Looking into the west, where the sun was now declining, the appearance was very peculiar, the mist assuming a greenish hue, while lower down the mountain, where not so dense, it was shaded into a lovely rose colour. But it was in the east that the great surprise awaited us. Slightly above our level, and within a hundred yards, as it seemed, was a nimbus of pale light, on which the shadow of the cairn and of ourselves standing upon it were projected. Sometimes the images were quite faint, sometimes so strong that all our movements and the minutest details—such even as the spiked end of a walking stick—were depicted. There are two cairns on the top of Ben More, within forty yards of each other, and while from the one both halo and figures were visible, from the other it was the halo only. The picture lasted about five minutes, and then faded away.

I believe this phenomenon is very rarely witnessed in Scotland; for my own part, I have climbed a great number of mountains, and never saw it till the present occasion.

I may mention that while walking down from Lochearnhead about five o'clock this morning, I saw a very perfect lunar fog-bow. The moon was bright at the time, and heavy wreaths and banks of vapour were resting in all the hollows and watercourses. This, too, I think is an appearance that is uncommon.—I am, &c.,

*Edinburgh, Oct. 6, 1884.*

J. G. S.

S Y M O N S ' S  
M O N T H L Y  
M E T E O R O L O G I C A L M A G A Z I N E .

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CCXXVIII.]

JANUARY, 1885.

[PRICE FOURPENCE,  
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THE NEW TIME.

THE English always were a rather peculiar people, and just at present we think that they are affording a striking proof of it.

In accordance with a decision arrived at by the International Geodetic Association at Rome in 1883, and with a resolution of Congress, the President of the United States issued invitations to the governments of all nations in diplomatic relation with his own, to send delegates to a conference to be held at Washington in October last, for the purpose of discussing, and if possible fixing upon, a meridian proper to be employed as a common zero of longitude, and standard of time-reckoning throughout the world. The conference was held; twenty-five nations (including Great Britain) were represented. It was resolved by an overwhelming majority that the meridian passing through the Observatory of Greenwich should be adopted as the zero of longitude. Subsequently it was resolved, without a dissentient vote, "that a universal day be adopted for all purposes, for which it may be found convenient, and which shall not interfere with local or other standard time where desirable. Finally it was resolved, by 15 votes in favour, 2 negatives, and 7 not voting, that this universal day be a mean solar day, beginning for all the world at the moment of mean midnight of the initial meridian, coinciding with the civil day and date of that meridian, and be counted from 0 up to 24 hours.

Put into popular language, these resolutions amount to this:—

The introduction into the maps published in every country of the world, of lines of longitude reckoned from Greenwich instead of, as hitherto, lines reckoned from the capital of each country.

The adoption of Greenwich time (modified for local purposes) throughout the world. (This is especially needed when, as now, telegrams arrive before the time at which they are sent off—that absurdity would vanish.)

The abolition of the a.m. and p.m., which, though defended by many, are often sadly misused; for instance, not long since we had a record of thunder at "12.15 a.m.," if the writer

meant what he wrote, the thunder must have been shortly after midday, and should have been 0.15 p.m., but what the observer really did mean was 15 minutes after midnight, *i.e.*, 0.15 a.m. A very amusing illustration of some of the inconveniences of the reckoning twice up to 12, occurred recently. There was an earthquake at 5.15 p.m., a telegram was sent (very much condensed) to a far distant newspaper, the magic letters p.m. were omitted; the editor jumped at the conclusion that it happened in the early morning, and printed a highly coloured description of the citizens rushing about in *déshabille*, &c. If the telegram had said 17.15 the editor's subsequent feelings would have been more pleasant than they were when it was found that the earthquake occurred in the afternoon, and that his graphic description was entirely untrue.

This, however, is by no means the strongest argument for the change. The representatives of the American railways felt so strongly the importance of the whole subject, that they obtained permission to lay their views before the conference. Those who have to plan long cross journeys in accordance with *Bradshaw*, know how difficult it is to distinguish night trains from day ones.

Looking at the question from a meteorological point of view, we are certain that the carrying out of the proposal of the Conference, and the reckoning throughout the British Isles in Greenwich time, and in a single series from 0 h. at midnight, through 12 at noon to 23 h. 59 m. at midnight would (though troublesome for a week or two) be a saving of time, and of trouble, and a great help towards accuracy.

It may be asked what all this has to do with our opening assertion that the English are a rather peculiar people. We think that it is peculiar that *when the representatives of the whole world, in conference assembled, have decided upon adopting the Greenwich meridian, and Greenwich time, Englishmen forthwith act as if they took no interest in the matter.*

The movement for adopting the 24 hour notation was going forward rapidly, the press teemed with articles on the new time, a good deal of ingenuity and of banter was bestowed on designs for altering the dials of watches and clocks, and the striking of large ones. Twenty-four hour watches and clocks by the dozen, if not by the hundred, were made and exposed in the shop windows of London and of Provincial towns, about a score of patents were taken out for new forms of 24 hour clocks, and January 1st, 1885, was looked forward to as the date of the inauguration of the new system. But all of a sudden, the subject is dropped. The Astronomer Royal shifts the clock at the Observatory gates, one London clergyman announces a service for 19 h., the Isle of Wight Railway Company (all honour to it) prints its time tables on "the only rational plan," and *Voilà tout!*—*Bradshaw* comes out as puzzling as ever, and even takes the trouble to snub the Isle of Wight people by converting their

figures back to "a.m." and "p.m.," except that *Bradshaw* does not condescend to put either "a.m." or "p.m.," but leaves us to guess, according to the position of the figures on the page, which ought to be there.

The addition of 12 to the ordinary name of every afternoon and evening hour, is so simple an operation that everybody would have learned it in a fortnight, but the "cold water," which some persons have thrown upon the scheme seems to have been wonderfully effective.

We await with considerable interest a statement of the reasons for checking the movement.

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### ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on Wednesday evening, the 17th instant, at the Institution of Civil Engineers, Mr. R. H. Scott, F.R.S., president, in the chair.

Mr. C. H. Cotton, Mr. S. A. Jolly, L.R.C.P., and Rev. C. J. Taylor, M.A., were elected Fellows of the Society.

The following papers were read :—

(1). "On the reduction of Temperature Means from short series of observations to the equivalents of longer periods," by Dr. Julius Hann, Hon. Mem.R.Met.Soc. The author has recently carried out an investigation into the climate of the Alpine districts of Austria, and in doing so he has endeavoured to reduce the monthly and annual means of all the temperature observations from the districts in question during the interval from 1848 to 1880 (and in some places to 1884) to the mean for the thirty years' period 1851 to 1880. In this paper, Dr. Hann described the methods he adopted to reduce observations at mountain stations for short periods to the equivalents of longer periods.

(2). "The diversity of Scales for registering the force of Wind," by Charles Harding, F.R.Met.Soc. The object of this paper is to call attention to the confusion that exists in the systems in use by various countries for registering wind force, whether instrumentally or otherwise, and to show the need of action for improvement. (See *Met. Mag.*, Vol. I., No. iii., April, 1866, page 19.)

(3). "Report on the Phenological Observations for the year 1884," by the Rev. T. A. Preston, M.A., F.R.Met.Soc. The salient features of the weather during the period embraced in this report, viz., October 1883 to September 1884, were :—The mild winter ; the cold April ; the hot August, and the long period of drought, which at the end of September began to be seriously felt. The general effects on vegetation have been the prolonged existence of many of the autumn species ; the great loss of wall fruit ; the failure of bush fruits ; the plentiful supply of strawberries as long as they lasted, but the time was short ; the good hay harvest, although it was light in quantity ; the good corn crop ; the unusually plentiful potato crop ; and the great abundance of wild fruits.

## THE AMERICAN METEOROLOGICAL JOURNAL.\*

IN our April number we announced the probable commencement of the above-named journal. Now that eight numbers, amounting in the aggregate to 340 pages, have appeared, we may appropriately offer a few remarks upon its contents. Quantity and price are very secondary considerations; they may, therefore, as well be disposed of at once. Each number is about three times the bulk of one of ours, and nearly three times the price.

In No. 1 the formation of an American Meteorological Society is suggested, on a later page we have, in the efforts of the American Ornithologists' Union, a partial equivalent to the phenological work of the Royal Meteorological Society. Tornadoes being so much more violent and frequent in the States than in Europe, much attention is devoted to them. A full account is given of the organization of the Ohio Meteorological Bureau by its president, Prof. T. C. Mendenhall (who if we mistake not was formerly in charge of the meteorological observations in Japan) and of the commencement of distributing weather forecasts by attaching large symbols to the luggage trains. The extremely good paper by M. Radau in the *Bulletin Astronomique* for January 1884, is translated, and in five pages of small type gives the best summary of the twilight phenomena of 1883-4 which we have seen in English.

In No. 2 there is a well founded complaint of the application of the word cyclone, which is the proper term for a gyrating body of air hundreds of miles in diameter, to small circular storms of little more than as many yards; these it is urged should be designated tornadoes. There is also a careful paper on, with original maps of, the Winds and Currents of the Equatorial Atlantic, by Prof. W. M. Davis. The paper on the rainfall of Nebraska is interesting and valuable, but would have been far more so had a page of tabular values been added. If the returns are all correct, the fluctuation of rainfall is excessive, as may be judged by the following:—"For example, Bellevue had 59.92 (should be 50.92) inches in 1858, and but 18.57 in. in 1859." The one is about 78 per cent. above, and the other about 43 per cent. below the mean, a fluctuation of 121 per cent. in two consecutive years. In the British Isles it is very rare for one of two consecutive years to have twice the fall of the other, but these records would make that in 1858 two and three quarter times that in 1859. Many useful translations are given, *e.g.*, those of the paper by Dr. Schwirkus, on the construction of Aneroid Barometers, originally published in the *Zeitschrift für Instrumentenkunde*, and by Dr. Assmann, on the Sling Thermometer (from the *Zeitschrift d. Oesterr. Gesell. f. Met.*) but as altogether the numbers before us must contain nearly 100 articles, besides three or four times that number of short notes, it is obviously inexpedient for us

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\* W. H. Burr & Co., Detroit, Michigan.

to attempt to enumerate them. The *American Meteorological Journal* has an important future before it, and we are glad to note that it has already appointed as European publishers the great firm of Brockhaus, of Leipsic, Berlin and Vienna. Englishmen would probably prefer getting it through the post, by remitting direct to the publishers at Detroit.

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POPULAR PROGNOSTICS.

*To the Editor of the Meteorological Magazine.*

SIR,—I cannot resist giving a “random reading,” which I fell in with in an old “Description of England and Wales,” by “Herman Moll, Geographer.” Folio : MDCCXXIV.

Of course I do not claim to have made any mighty discovery, or to throw any light on a mysterious subject, but under “Staffordshire,” p. 222, occurs the following :—

“The Dove . . . runs through a Lime-Stone Soil, and sucks in such Fertility from it, that the Meadows on every Side appear fresh and green in the dead of Winter ; and when it happens to overflow them in April, it fructifies them so much, that the Inhabitants hereabouts joyfully apply the following Rhime to it :—

“ In April, Dove’s Flood,  
Is worth a King’s Good.”

In Dr. Clouston’s “Popular Weather Prognostics,” p. 50 :—

(22) “ In April a dove’s flood  
“ Is worth a King’s good.

“(22). I never met with this saying before, and I know not in what district it prevails. As a dove is not fond of water, and a real flood would be no blessing in April, I am inclined to interpret the ‘flood’ negatively as dry weather, and in this sense, it is of great value for sowing the seed that has not been got into the soil in March.”

I confess I felt highly tickled as I pictured the worthy doctor puzzling his brain as to the literal interpretation of the enigma, and in his despair ignoring the literal and affirmative side, and rushing to a negative solution, and pointing out its great value in this sense. It must have been a great puzzle. Doves certainly are not aquatic birds—as a rule—if so, nature would have made them web-footed. Noah’s dove had considerable experience of the water, but didn’t take kindly to it. I don’t know any other flood that could be more appropriately termed “dove’s flood.” Unfortunately the big “D” had dropped in transition from Staffordshire to the Orkneys, without being at all aware of the perplexity it was causing by so doing, and so recently as 1867 big “D” had never been replaced out there. This is a very harmless joke of mine, and probably no one would have enjoyed it more than the worthy doctor himself. By your “In

Memoriam" I learn that his observations are for ever ended, and he seems to have been a most worthy, intelligent, and useful man, and to have justly merited the esteem of his countrymen.

What would you call this joke, a Clerical error, or a Capital blunder?

G. W. ATKINSON.

*Culgaith Vicarage, Penrith.*

[This letter is so interesting, that we are afraid that in adding a few lines we shall spoil it. Still, to be accurate is our first duty, and we have to add a little to the history of the Dove, which Mr. Atkinson has so happily corrected. Dr. Arthur Mitchell was, as far as we can trace, the original source of this droll muddle, for he gives the proverb in his *Popular Weather Prognostics of Scotland*, and spells it "a dove's." What authority Dr. Mitchell had for taking the bird to Scotland, and for entering it in a Scotch collection, remains to be seen; but Dr. Clouston might well say as he did, "I never met with this saying before, and I know not in what district it prevails.—ED.]

### THE THUNDERSTORMS OF 1884.

*To the Editor of the Meteorological Magazine.*

SIR,—I was not aware you had intended to prolong your account of the July thunderstorms to August, or I would have reported that on August 9th there was here perhaps the most awfully grand one I ever witnessed. There were 14 flashes per minute about 9 p.m.; many were multiple, and an unusually large proportion forked. No. 65, Coronation-street, and No. 4, Herrington-street were struck; but the damage was small. A young woman in a house in Ward-street was struck, though the house was not; she was dangerously ill for a week or two, but ultimately recovered.—Yours truly,

T. W. BACKHOUSE.

*West Hendon House, Sunderland, Dec. 19, 1884.*

[It appeared to us so remarkable for any one in a house to be struck while the house was not, that we asked Mr. Backhouse if it was not a nervous derangement caused by fright. He has favoured us with the reply which we append.—ED.]

SIR,—On enquiry, the illness of the young woman reported does not appear to be at all attributable to fright. She was near the window, which at the time was shut; and felt a sudden pain in her head, but the unconsciousness and severe effects were not at once produced, for she was able to walk to a neighbouring house. She saw the flash, but did not hear the thunder, which seems strange if she really was struck; I understand, however, that her medical attendant considered she had been.

Yours truly,

T. W. BACKHOUSE.

## SCRAPS.

THE NEW MOUNTAIN STATION IN SOUTH AUSTRALIA.—Encouraged by the tentative results of the past month, Mr. Clement L. Wragge has now extended his plan of operations on Mount Lofty (2,350 ft. above sea), and has established, as a further experiment, a substantially equipped meteorological observatory there. The barometer is a fine instrument on the Kew pattern, with an extended scale for special use at high level stations, made to Mr. Wragge's order by Adie & Wedderburn, of Edinburgh. It is protected by a stout, double-sided box, screwed to an angle-post of the Government fence. The aneroid-barograph is set by this instrument, and works admirably, and being checked at intervals, there is a continuous and faithful record of every variation of pressure. The hygrometer and self-registering thermometers are now exposed in an improved and enlarged pattern of Stevenson's double-louved screen, fixed in position on October 31st, and specially constructed to suit the conditions of the Australian climate. Earth thermometers, and another rain-gauge, have also been added. The instruments of the Torrens Observatory are similarly exposed; and readings are taken there in direct connection with the observations on the Mount.—*Adelaide Evening Journal*, Nov. 3rd, 1884.

CURIOUS CASE OF CAUSE AND EFFECT.—During the storm at Greenville, Rhode Island, May 9th, the lightning ran by the telephone wire to the Windsor Mill, where there is no telephone, but the wire is disconnected just outside the building. The lightning was led by the wire to the corner of the mule and weaving-rooms, and entered the building under the jet. It followed the water pipe, and set the sprinklers going, and at the same time fired the stock in the mules. By this singular provision of an active extinguishing agent at the moment the fire started, serious loss was prevented, as the fire was soon drowned out. Many of the spindles in the mules lost their temper, and some of the belts were burned, but the mill was saved.

[We remember a parallel case in which the lightning followed a telegraph wire into a post-office, jumped across to a composition gas-pipe, ignited the gas, and by the heat of the gas, a water-pipe above it was fused, and the water escaping saturated everything, and prevented further damage.—ED.]

JAPANESE WEATHER MAPS.—Mr. E. Knipping, meteorologist of the Imperial Meteorological Observatory at Tokio, describes in the September number of the *Mittheilungen der deutschen gesellschaft für natur-und völkerkunde Ostasiens*, the rapid development of weather telegraphy in Japan. There are now twenty-four stations in the empire connected by telegraph; and on the basis of their observations, supplemented by despatches from China, three daily synoptical maps are published in Japanese and English characters. Observations are taken at six a.m., and two and nine p.m. "Japan" time, which is about that of the Kyoto meridian; so that the evening observation corresponds to eight o'clock, "China coast" time, six o'clock "Bengal" time, four o'clock "Persian" time, one o'clock "German" time, and noon in "English" (Greenwich) time. The director of the service is Mr. J. Arai; and the observers, telegraphers, draughtsmen, and printers, are all Japanese. The first weather-map was printed on March 1st, 1883, and the tri-daily issue began a month later. The chief need of the service at present, is the addition of the fifty-six lighthouses to the other stations, and the construction of a sub-marine cable to the Linkin (Loo Choo) Islands.—*Science*, Cambridge, Mass. Dec. 5th).

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1884.

| STATIONS.<br><br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |      |            |           | Absolute.    |                | Total Rain. |       | Aver.<br>Cloud. |
|--|-----------|-------|----------|-------|----------|------|------------|-----------|--------------|----------------|-------------|-------|-----------------|
|  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.      | Days. |                 |
|  | Temp.     | Date. | Temp.    | Date. |          |      |            |           |              |                |             |       |                 |
|  | °         |       | °        | °     | °        | °    | 0.100      | °         | °            | inches         |             |       |                 |
| England, London .....  | 81.3      | 24    | 35.0     | 1     | 66.3     | 44.7 | 44.2       | 67        | 102.2        | 40.9           | .78         | 11    | 5.2             |
| Malta.....   | 78.8      | 5     | 53.0     | 5     | 72.4     | 59.4 | 58.7       | 80        | 142.5        | 46.5           | .64         | 5     | 3.0             |
| <i>Mauritius</i> .....   | 79.9      | 6     | 58.6     | 13    | 77.6     | 66.9 | 64.0       | 77        | 127.7        | 48.3           | 12.81       | 14    | 5.2             |
| Calcutta.....  | 96.3      | 19    | 68.3     | 6     | 92.0     | 76.3 | 76.2       | 78        | 156.4        | 62.9           | 5.86        | 14    | 4.4             |
| Bombay.....  | 91.3      | 29    | 76.2     | 2     | 89.4     | 79.2 | 75.3       | 74        | 143.8        | 67.4           | 0.00        | 0     | 2.2             |
| Ceylon, Colombo .....  | 87.0      | 9     | 73.3     | 12    | 86.1     | 77.8 | 73.8       | 77        | 143.0        | 66.0           | 10.31       | 25    | 7.0             |
| <i>Melbourne</i> .....   | 77.0      | 9     | 38.0     | 21    | 62.0     | 45.8 | 46.1       | 79        | 124.3        | 30.3           | 2.15        | 10    | 6.6             |
| <i>Adelaide</i> .....  | 78.2      | 2     | 40.3     | 25    | 64.1     | 50.1 | 47.3       | 70        | 136.3        | 31.9           | 2.39        | 16    | 6.0             |
| <i>Wellington</i> .....  | 62.0      | 18*   | 39.3     | 9     | 57.9     | 48.4 | ...        | ...       | 119.0        | 35.0           | 8.02        | 17    | ...             |
| <i>Auckland</i> .....  | 65.5      | 7     | 37.5     | 31    | 60.3     | 48.6 | 45.2       | 70        | 123.0        | 30.0           | 4.19        | 16    | 5.6             |
| Jamaica, Kingston.....   | 87.2      | 21    | 67.3     | 3     | 85.5     | 71.5 | 72.5       | 82        | ...          | ...            | 3.09        | ...   | 5.2             |
| Barbados .....   | 84.0      | var.  | 70.0     | var.  | 81.0     | 72.0 | 73.2       | 81        | 143.0        | 69.0           | 4.70        | 17    | 6.0             |
| Toronto .....  | 75.7      | 23    | 28.0     | 3     | 59.9     | 41.9 | 42.8       | 71        | 131.8        | 19.8           | 2.26        | 17    | 6.4             |
| New Brunswick,<br>Fredericton .....                                  | 79.6      | 26    | 28.5     | 6     | 58.4     | 37.1 | 37.3       | 71        | ...          | ...            | 4.99        | 18    | 6.3             |
| Manitoba, Winnipeg ...   | 85.4      | 17    | 24.7     | 13    | 66.6     | 38.5 | 40.7       | 63        | ...          | ...            | .34         | 4     | 2.8             |
| British Columbia,<br>Spence's Bridge ... }                           | ...       | ...   | ...      | ...   | ...      | ...  | ...        | ...       | ...          | ...            | ...         | ...   | ...             |

\* And 27, 28.

REMARKS, MAY, 1884.

MALTA.—Mean temp., 64°·9; mean hourly velocity of wind, 9·3 miles; sea temp. rose from 65° to 71°. TS on the 22nd. J. SCOLLES.

*Mauritius*.—Rainfall 7·87 in. above, and mean temp. 1°·2 below average; max. velocity of wind 26·2 miles on 27th, min. 1·6 miles on 19th, prevailing direction S.E. by S., to E. Heavy floods on night of 6th, with T and L. Coloured skies before sunrise and after sunset throughout, but not so intense as in 1883. C. MELDRUM, F.R.S.

CEYLON.—Thunderstorms occurred on eight days. J. H. SYMONDS.

*Melbourne*.—Mean temp. of air 0°·3 below average. Temp. of dew-point, humidity, amount of cloud, pressure, and rainfall all remarkably near their respective averages. Prevailing winds N. and W., strong breezes on five days. Heavy dew on nine days, dense fog on three days, T and L on 10th. R. L. J. ELLERY, F.R.S.

*Adelaide*.—Mean pressure ·069 in. above, and mean temp. slightly below average; max. temp. the highest in May since 1868; total range unusually large. Rainfall 0·80 in. below average; amount of cloud average. The weather was fine and warm during the first week, then showery until the 23rd, then again fine and pleasant to the end of the month. The "red glow" increased in intensity, presenting a beautiful spectacle on each clear evening during the latter half of the month. C. TODD.

*Wellington*.—Generally showery, unpleasant weather till 13th, 1·95 in. of R being recorded on that date; from the 14th to the 21st fine with N. wind; from the 22nd to the 28th showery, with at times heavy R and very unpleasant weather; the remainder of the month was fine. Strong S.E. gale on 12th and 13th; fog on 3 days. Mean pressure and temp. very near their respective averages. R. B. GORE.

*Auckland*.—Rather wet and showery, with heavy rain on 16th and 21st. Bar. fluctuating greatly. T. F. CHEESEMAM.

BARBADOS.—Mean temp., 75°·6, 1°·4 below the average. N.E. winds prevailed on 29 days, and E. on 2 days; mean hourly velocity 11 miles, the same as the average; extremes 16·4 miles and 5 miles. Rainfall 5 per cent. above the average; six days were overcast. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL,  
DECEMBER, 1884.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

| Div.  | STATION.                  | Total Rain. | Div.   | STATION.                 | Total Rain. |
|-------|---------------------------|-------------|--------|--------------------------|-------------|
|       |                           | in.         |        |                          | in.         |
| II.   | Dorking, Abinger .....    | 2·80        | XI.    | Carno, Tybrith .....     | 8·25        |
| „     | Margate, Birchington...   | 2·85        | „      | Corwen, Rhug .....       | 5·04        |
| „     | Littlehampton .....       | 4·34        | „      | Port Madoc .....         | 6·06        |
| „     | Hailsham .....            | 4·37        | „      | I. of Man, Douglas ..... | 5·26        |
| „     | I. of W., St. Lawrence.   | 4·84        | XII.   | Stoneykirk, Ardwell Ho.  | 4·05        |
| „     | Alton, Ashdell.....       | 4·13        | „      | Melrose, Abbey Gate...   | 2·92        |
| III.  | Winslow, Addington ...    | 2·65        | XIII.  | N. Esk Res. [Penicuik]   | 5·15        |
| „     | Oxford, Magdalen Col...   | 2·07        | XIV.   | Ayr, Cassillis House ... | 5·77        |
| „     | Northampton .....         | 1·80        | „      | Glasgow, Queen's Park.   | 6·12        |
| „     | Cambridge, Beech Ho...    | 1·75        | XV.    | Islay, Gruinart School.. | 6·67        |
| IV.   | Southend .....            | 1·90        | XVI.   | St. Andrews, Newton Bk.  | 2·60        |
| „     | Harlow, Sheering ...      | 2·09        | „      | Balquhider, Stronvar...  | 12·29       |
| „     | Diss .....                | 2·64        | „      | Dunkeld, Inver Braan..   | 4·51        |
| „     | Swaffham .....            | 2·19        | „      | Dalnaspidal H.R.S. ...   | 9·32        |
| „     | Hindringham .....         | ...         | XVII.  | Keith H.R.S. ....        | 1·67        |
| V.    | Salisbury, Alderbury ...  | 2·81        | „      | Forres H.R.S. ....       | 1·59        |
| „     | Warminster .....          | 3·84        | XVIII. | Strome Ferry H.R.S....   | 6·39        |
| „     | Calne, Compton Bassett    | 2·89        | „      | Lochbroom .....          | 7·22        |
| „     | Ashburton, Holne Vic..    | 10·14       | „      | Tain, Springfield.....   | 2·07        |
| „     | Holsworthy, Clawton...    | 4·84        | „      | Loch Shiel, Glenaladale  | 15·93       |
| „     | Lynmouth, Glenthorne.     | 7·69        | „      | Invergarry .....         | 10·14       |
| „     | Probus, Lamellyn ...      | 3·95        | XIX.   | Lairg H.R.S. ....        | 3·09        |
| „     | Wincanton, Stowell Rec.   | 3·33        | „      | Forsinard H.R.S. ....    | 3·19        |
| „     | Taunton, Fullands .....   | ...         | „      | Watten H.R.S. ....       | 2·03        |
| VI.   | Bristol, Clifton .....    | 5·29        | XX.    | Dunmanway, Coolkelure    | 9·65        |
| „     | Ross .....                | 2·59        | „      | Fermoy, Gas Works ...    | 2·80        |
| „     | Wem, Sansaw Hall.....     | 1·60        | „      | Tralee, Castlemorris ... | 4·09        |
| „     | Cheadle, The Heath Ho.    | 2·92        | „      | Tipperary, Henry Street  | 4·65        |
| „     | Worcester, Diglis Lock    | 1·72        | „      | Newcastle West .....     | 6·75        |
| „     | Coventry, Coundon ....    | 2·04        | „      | Miltown Malbay.....      | 5·48        |
| VII.  | Melton, Coston .....      | 2·06        | „      | Corofin .....            | 3·10        |
| „     | Ketton Hall [Stamford]    | 1·96        | XXI.   | Carlow, Browne's Hill..  | 3·77        |
| „     | Horncastle, Bucknall ...  | 2·10        | „      | Navan, Balrath .....     | 3·03        |
| „     | Mansfield, St. John's St. | 2·24        | „      | Mullingar, Belvedere...  | 4·76        |
| VIII. | Macclesfield, The Park.   | 3·57        | „      | Athlone, Twyford ....    | 5·72        |
| „     | Walton-on-the-Hill.....   | ...         | XXII.  | Galway, Queen's Col....  | 5·92        |
| „     | Lancaster, South Road.    | 4·44        | „      | Clifden, Kylemore .....  | 10·34       |
| „     | Broughton-in-Furness ..   | ...         | „      | Crossmolina, Enniscoe..  | 6·56        |
| IX.   | Wakefield, Stanley Vic.   | 1·49        | „      | Carrick-on-Shannon ...   | 4·21        |
| „     | Ripon, Mickley .....      | 4·38        | XXIII. | Dowra .....              | 2·73        |
| „     | Scarborough.....          | 2·05        | „      | Rockcorry.....           | 3·67        |
| „     | East Layton [Darlington]  | 2·66        | „      | Warrenpoint .....        | 4·81        |
| „     | Middleton, Mickleton ...  | 6·36        | „      | Newtownards .....        | 2·73        |
| X.    | Haltwhistle, Unthank..    | 5·08        | „      | Belfast, New Barnsley .  | 4·71        |
| „     | Shap, Copy Hill .....     | 9·92        | „      | Cushendun .....          | 5·54        |
| XI.   | Llanfrechfa Grange . ...  | 6·14        | „      | Bushmills .....          | 4·79        |
| „     | Llandoverly .....         | 8·45        | „      | Stewartstown .....       | 3·63        |
| „     | Lower Solva .....         | 5·03        | „      | Donegal, Revelin Ho....  | ...         |
| „     | Castle Malgwyn .....      | 4·62        | „      | Buncrana .....           | 4·87        |
| „     | Rhayader, Nantgwilt..     | 9·23        | „      | Carndonagh .....         | ...         |

DECEMBER, 1884.

| Div.   | STATIONS.<br>[The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL.   |                                |                            |       |                                 | TEMPERATURE. |       |      |       | No. of Nights below 32° |          |
|--------|---|-------------|--------------------------------|----------------------------|-------|---------------------------------|--------------|-------|------|-------|-------------------------|----------|
|        |   | Total Fall. | Difference from average 1870-9 | Greatest Fall in 24 hours. |       | Days on which .01 or more fell. | Max.         |       | Min. |       | In shade.               | On grass |
|        |   |             |                                | Dpth                       | Date. |                                 | Deg.         | Date  | Deg. | Date. |                         |          |
| I.     | London (Camden Square) ...  | 2.57        | + .40                          | .41                        | 5     | 17                              | 55.7         | 8     | 28.5 | 31    | 5                       | 11       |
| II.    | Maidstone (Hunton Court)...   | 2.65        | + .25                          | .37                        | 11    | 20                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| III.   | Strathfield Turgiss .....   | 2.27        | + .25                          | .32                        | 11    | 18                              | 54.8         | 13    | 20.8 | 31    | 10                      | 16       |
| III.   | Hitchin .....   | 2.26        | + .21                          | .49                        | 7     | 18                              | 59.0         | 6     | 24.0 | 30b   | 19                      | ...      |
| IV.    | Banbury .....   | 2.10        | - .05                          | .27                        | 2, 3  | 19                              | 53.5         | 13    | 25.0 | 31    | 16                      | ...      |
| IV.    | Bury St. Edmunds (Culford)  | 2.64        | + .49                          | .50                        | 7     | 18                              | 54.0         | 6, 7  | 23.0 | 30    | 10                      | ...      |
| V.     | Norwich (Cossey) .....  | 2.45        | + .13                          | .35                        | 19    | 19                              | 55.0         | 6, 7  | 23.0 | 31    | 5                       | 8        |
| V.     | Weymouth (Langton Herring)  | 4.29        | ...                            | .68                        | 16    | 17                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| V.     | Barnstaple .....  | 4.97        | + 1.21                         | .74                        | 5     | 20                              | 56.0         | 8     | 32.0 | 25    | 1                       | ...      |
| V.     | Bodmin .....  | 5.34        | - .11                          | .80                        | 5     | 21                              | 54.0         | 7     | 27.0 | 29    | 10                      | 14       |
| VI.    | Cirencester .....   | 3.74        | + 1.13                         | ...                        | ...   | ...                             | ...          | ...   | ...  | ...   | ...                     | ...      |
| VI.    | Church Stretton (Woolstaston)   | 3.65        | + .86                          | .53                        | 16    | 17                              | 53.5         | 13    | 26.0 | 24b   | 16                      | 18       |
| VI.    | Tenbury (Orleton) .....   | 2.24        | - .27                          | .37                        | 14    | 17                              | 56.5         | 6     | 25.5 | 31    | 7                       | 16       |
| VII.   | Leicester .....   | 2.40        | ...                            | .31                        | 3     | 19                              | 54.0         | 6     | 23.2 | 1     | 8                       | 27       |
| VII.   | Boston .....  | 1.91        | - .16                          | .46                        | 3     | 13                              | 55.0         | 13    | 26.0 | 1     | 8                       | ...      |
| VII.   | Grimsby (Killingholme) .....  | 2.63        | + .20                          | .39                        | 19    | 19                              | 54.0         | 13    | 30.0 | 1b    | 3                       | ...      |
| VII.   | Hesley Hall [Tickhill] .....  | 1.35        | ...                            | .26                        | 4     | 17                              | 57.0         | 13    | 24.0 | 31    | 8                       | ...      |
| VIII.  | Manchester (Ardwick) .....  | 3.64        | + 1.11                         | .54                        | 14    | 16                              | 56.0         | 13    | 27.0 | 27    | 15                      | ...      |
| IX.    | Wetherby (Ribston Hall) ...   | 2.46        | + .25                          | .42                        | 20    | 10                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| IX.    | Skipton (Arncliffe) .....   | 10.11       | + 4.83                         | 1.30                       | 7     | 19                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| X.     | North Shields .....   | 1.68        | - 1.41                         | .32                        | 4     | 21                              | 57.5         | 3     | 27.5 | 24    | 12                      | 14       |
| X.     | Borrowdale (Seathwaite) .....   | 19.22       | + 5.49                         | 2.76                       | 12    | 21                              | 52.0         | 13    | 21.5 | 29    | 5                       | ...      |
| XI.    | Cardiff (Ely) .....   | 6.53        | + 2.62                         | .83                        | 5     | 20                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| XI.    | Haverfordwest .....   | 4.65        | - .48                          | .99                        | 5     | 17                              | 54.0         | 13    | 24.5 | 28    | 11                      | 14       |
| XI.    | Plinlimmon (Cwmsymlog) ...  | 7.15        | ...                            | 1.02                       | 5     | 19                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| XI.    | Llandudno .....   | 2.92        | + .07                          | .65                        | 14    | 17                              | 55.0         | 14    | 27.0 | 29    | ...                     | ...      |
| XII.   | Cargen [Dumfries] .....   | 4.40        | - .13                          | .67                        | 10    | 18                              | 51.8         | 13    | 20.8 | 23    | 13                      | ...      |
| XII.   | Hawick (Wilton Hill) .....  | 1.99        | ...                            | .40                        | 9     | 17                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| XIV.   | Douglas Castle (Newmains) .....   | 7.29        | + 3.20                         | 1.12                       | 18    | 19                              | ...          | ...   | 22.0 | 21    | 12                      | ...      |
| XV.    | Lochgilphead (Kilmory) .....  | 9.14        | + 2.96                         | .92                        | 12    | 23                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| XV.    | Oban (Craigvarren) .....  | 6.59        | ...                            | .80                        | 9     | 21                              | 57.0         | 14    | 31.5 | 29    | 1                       | ...      |
| XV.    | Mull (Quinish) .....  | 8.03        | ...                            | .99                        | 1     | 24                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| XVI.   | Loch Leven Sluices .....  | 6.20        | + 2.54                         | .80                        | 16    | 18                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| XVI.   | Arbroath .....  | 2.64        | - .26                          | .51                        | 7     | 14                              | 51.0         | 14    | 22.0 | 23    | 18                      | ...      |
| XVII.  | Braemar .....   | 2.44        | - .99                          | .59                        | 9     | 15                              | 45.8         | 12    | 15.3 | 22    | 23                      | 26       |
| XVII.  | Aberdeen .....  | 1.84        | ...                            | .50                        | 2     | 17                              | 53.0         | 14    | 25.0 | 23    | 14                      | ...      |
| XVIII. | Skye (Sligachan) .....  | 18.81       | ...                            | 2.68                       | 14    | 23                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| XVIII. | Culloden .....  | 2.66        | + .82                          | .86                        | 8     | 8                               | 53.0         | 14    | 21.0 | 1     | 11                      | 29       |
| XIX.   | Dunrobin .....  | 2.03        | ...                            | .40                        | 13    | 17                              | 52.0         | 14    | 24.2 | 23    | 13                      | ...      |
| XIX.   | Orkney (Sandwick) .....   | 4.31        | - .08                          | .51                        | 13    | 20                              | 49.0         | 14    | 25.6 | 1     | 2                       | 16       |
| XX.    | Cork (Blackrock) .....  | 3.64        | - 1.12                         | .44                        | 3     | 20                              | 57.0         | 13    | 26.0 | 21d   | 9                       | ...      |
| XX.    | Dromore Castle .....  | 7.58        | ...                            | 1.50                       | 5     | 21                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| XX.    | Waterford (Brook Lodge) ...   | 2.96        | ...                            | .45                        | 1     | 20                              | 53.0         | 2, 13 | 25.5 | 22    | 10                      | 18       |
| XX.    | Killaloe .....  | 7.50        | ...                            | .85                        | 18    | 23                              | 51.0         | 1     | 24.0 | 24    | 8                       | ...      |
| XXI.   | Portarlington .....   | 3.54        | + .68                          | .32                        | 18a   | 23                              | 55.0         | 13    | 26.0 | 22    | 13                      | ...      |
| XXI.   | Dublin (Fitz William Square)  | 2.01        | - .57                          | .37                        | 7     | 20                              | 56.4         | 13    | 27.3 | 22    | 5                       | 15       |
| XXII.  | Ballinasloe .....   | 5.44        | + 1.96                         | .56                        | 8     | 24                              | 49.0         | 2, 12 | 22.0 | 24    | 15                      | ...      |
| XXIII. | Waringstown .....   | 3.31        | + .35                          | .44                        | 19    | 21                              | 57.0         | 25    | 22.0 | 21    | ...                     | ...      |
| XXIII. | Londonderry (Creggan Res.) ..   | 4.71        | ...                            | .52                        | 18    | 25                              | ...          | ...   | ...  | ...   | ...                     | ...      |
| XXIII. | Omagh (Edenfel) .....   | 4.40        | + 1.00                         | .55                        | 7     | 23                              | 52.0         | 13    | 26.0 | 21c   | 6                       | 12       |

a And 29. b And 31. c And 23. d And 23, 25, 26.

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

METEOROLOGICAL NOTES ON DECEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The weather of the first part of the month was very mild; but it became colder later. As late as the 14th over 30 varieties of wild flowers in their second or autumn blossoms could be gathered.

BANBURY.—A windy month, with very little fog. Temp. about the average, and varying but little between night and day during the last week; mean, 39°·8. High wind on 11 days; S six days; L and H on 18th.

LANGTON HERRING.—The wet weather which set in on November 30th, continued without intermission until December 11th, and heavy R fell at intervals till 19th, making it the wettest month of the year; on only one of the 17 days on which R fell was less than ·08 in. recorded. Mean temp. about 1° above the average; from 21st to 30th the wind kept steadily in the N.E., the days were very cold, and the range of temp. remarkably small. Gale on 4th.

BODMIN.—A very genial month.

WOOLSTASTON.—The first part of the month was very wet, R falling almost daily till the 19th; the latter part was cold and dry, with sharp frost at night. A severe gale blew on the 4th, and high winds and sharp squalls prevailed between the 10th and 19th; T and L, with a violent storm of H, on 18th; mean temp. 37°·7.

ORLETON.—The temp. of the first 15 days was much above, and that of the remainder of the month was below the average; the mean for the month being about 2° above the average. The sky was generally covered with cloud, and R was registered on almost every day till the 20th, but it fell mostly in small quantities, so that the total fall in the month was less than the average. On the night of the 18th frequent L was seen from S.W. to N.W., but very distant. This was followed on the night of the 19th by a great gale of wind, and heavy R on the morning of the 20th. The weather was afterwards very cloudy and cold, with N. and E. winds, but no severe frosts.

BOSTON.—A very severe gale, accompanied by T, occurred on 18th, and in a garden in the outskirts of the town a whirlwind did very considerable damage by destroying the glasshouses, uprooting fruit trees, and tearing the stems of the vines in the vinery off near the ground.

KILLINGHOLME.—A seasonable month, cold but not severe; dark mornings.

MANCHESTER.—The early part of the month was wet, the R being most welcome, as fears of a water famine prevailed in Lancashire and some parts of Yorkshire. The latter half of the month was generally fine, with frosty mornings, with a fair amount of ice during the last week, to the great delight of skaters.

ARNCLIFFE.—R fell daily from 1st to 19th inclusive, and none afterwards, and there were four days on which the fall exceeded 1·00 in.

SEATHWAITE.—During the first 19 days of the month more than 19 inches of R fell; nine days had falls exceeding 1·00 inch, and two days falls exceeding 2·50 inches. H on 5 days. T and L on 3 days.

WALES.

HAVERFORDWEST.—The commencement of the month was gloomy, with much cold R, and at times stormy with H. The period from the 18th to the 26th was very stormy, with L and H. The wind on the 19th increased to a gale, exceeding, in violence and in amount of damage done, any gale which has of late years visited this place. Houses were unroofed, scores of trees blown down, and farm-yards much torn by its violence. From the 21st to the 31st, there was a hard frost, with E. wind steadily prevailing. No S fell during the month, which was,

on the whole, a very seasonable December. Scarletina prevailed rather extensively.

LLANDUDNO.—December was very near the average, both in regard to mean temp. and range, diurnal and monthly.

#### SCOTLAND.

CARGEN.—Very stormy and wet from 1st to 19th; subsequently generally very fine and frosty; mean temp.  $1^{\circ}$  below average; L on 4th and 6th. Remarkable and beautiful phenomena occurred at sunrise on the 8th and 11th. The sky was generally covered with an even layer of darkish cloud, with several openings in it. Towards the S.E. these openings were edged with three distinct narrow bands of the prismatic colours, the remainder of the space being filled in with gorgeous colouring, exactly resembling a sheet of fine mother-of-pearl shell. The phenomenon lasted about an hour on each occasion, the colours fading and getting brighter at times. Small nimbus clouds at a low level were moving rapidly from the W. The higher strata of cloud, in which the phenomenon appeared, had little apparent motion. The openings, in which the colouring appeared, changed their shape and size very slowly.

HAWICK.—Heavy falls of snow occurred on 4th, 14th, and 15th. Much L of a curious blue colour was seen on nights of 13th and 14th. From the 20th to the end of the month the weather was dry and frosty.

OBAN.—The first part of the month was stormy with daily B and some gales, especially on 14th and 19th. Thereafter the weather cleared up and remained very fair to the end of the month, with occasional frost and mists resembling October. The sunsets, when seen, were very fine, with the usual high refraction. T and L on the 3rd, 7th, and 8th; H on seven days; S on the 15th.

QUINISE.—Cold, wet, and stormy until the 19th, thereafter fine and dry with occasional slight frost.

ABERDEEN.—Altogether the month was fine and open, with a rainfall greatly below the average. Aurora was observed only once, L twice, but hoar frost was very frequent. Lunar halos on 3rd and 30th, and brilliant "after glow" on the 21st. Not much S. On the morning of the 7th transparent cloudlets to southeastward (about  $30^{\circ}$  above the horizon) became prismatic at 8 a.m., and continued so until sunrise.

CULLODEN.—Weather open with frequent B till 15th. The latter part of the month frosty and fair.

#### IRELAND.

WATERFORD.—Rainfall rather more than half-an-inch below the average of ten years.

KILLALOE.—Very wet and wintry for the first three weeks, but the closing portion of the month was fine and dry, with slight frosts. Brilliant aurora appeared in the N.W. on the night of the 22nd.

DUBLIN.—Wet, stormy, and open during the first three weeks, the weather changed about the 20th, from which day to the close, it was quiet, cold, and often foggy. The mean temp. ( $40^{\circ}8$ ) was  $0^{\circ}3$  above the average. Mean humidity 85; mean amount of cloud, 6.0; prevailing winds, W. and S.W. Lunar halo on 5th; a little S on 17th; H on two days; and more or less fog on four days. Strong winds occurred on 16 of the first 20 days.

EDENFEL.—Up to the 20th the weather was extremely wet and unsettled with S on 15th, 16th, and 17th; the last ten days were calm and damp, but almost without B, and with but little frost, a thick canopy of cloud rendering them preternaturally murky and dark even for December.