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## THE BRITISH ASSOCIATION AT BRISTOL, 1898.

WE have added the date to the above title because we have already (Vol. X., p. 117 *et seq.*) chronicled one Bristol meeting, and there must not be confusion between the meetings of 1875 and of 1898.

Although the total number of persons attending the recent meeting was considerably above that in 1875, the number of meteorologists present was about the same as in that year.

The majority of the papers were taken in Section A (*President*, Prof. Ayrton, F.R.S.), and on the Saturday, but a few were taken in E (Geography).

### *Report of the Committee on the Climate of Tropical Africa.*

This report contained, as usual, abstracts of observations from various stations, which had been received by the Committee; but it was noteworthy in that the Committee appear to have decided that in future, observers must provide their own instruments. Several large organizations for the collection of meteorological data in Central Africa having been started, the pioneer work of this Committee seems to have brought forth excellent fruit, the credit of which is largely due to the Chairman, Mr. E. G. Ravenstein, F.R.G.S., and to Mr. H. N. Dickson, the Secretary.

### *Report of the Committee on Ben Nevis Observatory.*

The Committee was appointed, as in former years, for the purpose of co-operating with the Scottish Meteorological Society in making meteorological observations at the two Ben Nevis Observatories.

The hourly eye observations by night as well as by day, which are a speciality of the Ben Nevis Observatory, were made with complete regularity during the year 1897 by Mr. Angus Rankin, the superintendent, and his assistants.

As stated in our last Report, the observations at the intermediate station on Ben Nevis, at a height of 2,322 feet, were resumed in the summer months. The observations were made from July 19th to September 30th, by Messrs. T. S. Muir of the Royal Hill School of Edinburgh, Alexander Drysdale, B.Sc., Dollar, and A. Aitken. By

the great enthusiasm and self-denial of the observers, aided by several self-recording instruments the gift of Mr. J. G. Buchanan, a valuable, complete series of hourly observations has been obtained. Hence, for the first time, complete series of hourly observations have been secured at heights of 42 feet, 2,322 feet, and 4,407 feet, the three places being in the same line, and differing but little in horizontal distance from each other. These hourly observations from the three Observatories on Ben Nevis are really indispensable data in investigating the problems relating to the vertical gradients of the temperature, pressure, and humidity of the atmosphere and its movements.

Messrs. Muir and Drysdale have undertaken, under the superintendence of the Directors, the laborious work of discussing these observations, and at the Meeting of the Scottish Meteorological Society, Mr. Muir submitted an exhaustive preliminary report. Among the important results either disclosed or indicated in the discussion, may be noticed the relations which prevail between different vertical distributions of temperature and pressure on the one hand, and cyclones and anticyclones on the other, thus:—When the reduced barometer at the Ben Nevis Observatory, for a series of observations, comes out higher than that of Fort William, then the accompanying disturbance of temperature takes place in the lower half of the mountain, that is, below the intermediate station, and denotes the approach of an anticyclone. Conversely, when the reduced Ben Nevis Observatory barometer reads lower than that of Fort William, then the disturbance of temperature takes place in the upper half of the mountain, and denotes the approach of a cyclone.

In the further prosecution of this line of research, it has been arranged that in the summer of 1898, in addition to the hourly observations, the observers make out-door temperature and eye observations at different heights above and below the level of the intermediate station. The observer takes with him a dry and a wet bulb sling thermometer with which the temperature and humidity are observed. Special attention is given to the particular height where at the time the more rapid changes of temperature and humidity occur, which are such striking features on the slopes of Ben Nevis, of the cyclones and anticyclones as they sweep past the mountain These observations will continue to be made for some time at short intervals, to which are added eye observations, such as mist and haze as they appear or disappear; of marked changes of wind, both direction and force; of the heights of the clouds on the neighbouring heights and mountains, of the rainfall, &c.

Mr. Omond has undertaken a discussion of the hourly observations at the three observatories, carried out in sequence from day to day, with the view of ascertaining, among other points, the times which elapse between the first appearance of the indications of a cyclone or anticyclone, and its actual arrival in the British Islands.

*Report of the Committee on Meteorological Photography.*

Mr. A. W. Clayden stated that the work of previous years on the photographic determination of cloud altitudes had been continued, using two cameras, one at each end of an east-west line 200 ft. long, and taking simultaneous photographs of clouds near the sun, each negative containing an image of the sun itself. The results show the existence of greater cloud altitudes in hot weather under thunderstorm conditions than at other times. In such circumstances clouds may occur at five or six different levels, extending as high as 17 miles. Alto-cumulus and cirro-cumulus clouds are much higher at the margins of anticyclones than generally supposed. A rise of cloud planes takes place in hot weather, also during the morning and early afternoon, while the lowest altitudes are found during cyclones. The Committee purpose to move the present installation to a neighbouring site, with a north to south base, so that observations may be taken in the early morning and late afternoon.

In the discussion which followed, Mr. G. J. Symons reminded the Section that the Committee would be glad to receive any photographs of exceptional meteorological phenomena.

*Report of the Committee on Seismological Investigations.*

A voluminous report on this subject was presented by Professor John Milne. It showed the great progress made by the establishment of earthquake-observing stations round the world, and some of the results of the observations made. There was an interesting chapter on the effect of earthquake disturbances on magnetic instruments. It was found that when a great earthquake has originated, for example, in Japan, seismographic records indicate that about 16 minutes later Europe has felt the shock, and it might be imagined that one observatory has practically been subjected to as much movement as any other. The effect on magnetic needles at various observatories has, however, been very different. This could be accounted for in various ways, which were discussed at length. To explain the fact that magnetic storms and perturbations often precede large earthquakes and appear rarely to precede small ones, we may assume that the earthquake is preceded by chemical, physical, or mechanical changes in the constitution of the materials where it originates. All that we are certain about is, that with many earthquakes there have been enormous mechanical displacements of material, sufficiently large to disturb the Pacific Ocean for a period of twenty-four hours. Other earthquakes from submarine centres which have not disturbed oceans, but have created equally large earth waves, indicate equally large subterranean reliefs in strain, and material readjustments. These large earthquakes, originating beneath the bottom of the steeper slopes of the earth's surface, suggest that at such places a secular flow in subterranean material may be in progress, accelerations in which result in violent shaking,

which, as it radiates, is transformed into slow earth waves. Near to the scene of such subterranean changes, prior to and at the time of the same, magnetic perturbations should be observable. In Japan such appears to have been the case. In regard to the velocity with which preliminary tremors may be supposed to be transmitted through the earth, such data as have been collected apparently show that this varies with the square root of the average depth of the chord along which we may suppose them to have travelled. In conclusion, Prof. Milne showed photographs of many Continental seismological observatories, and contrasted the splendid provision made for seismological observations by Italy and Germany, with the damp and unhealthy stable which alone he was able to provide in the Isle of Wight.

Mr. G. J. Symons, F.R.S., said the absence of any provision by the Government for these important observations was disgraceful, and subsequently Professor Barrett moved and Mr. Symons seconded, "That the Committee of the Section be requested to consider the advisability of urging her Majesty's Government to place at the disposal of the Seismological Committee of the British Association a suitable building for housing the apparatus for continuous seismological observations." This was agreed to. In the course of the discussion great credit was given to Professor Milne for the enthusiastic and able way in which he conducted these investigations. One speaker thought that the result of the investigations was very important to geologists. If a vibration originating in Japan was so soon felt in Europe it would show that the earth was composed of very dense material, that the earth must be tolerably solid, and that the cavernous theory was not tenable. In proposing a vote of thanks, the President mentioned that Professor Milne was devoting his life to the solution of a problem which was of world-wide importance.

*Report of the Committee for the Establishment of a Meteorological Observatory on the Top of Mount Royal, Montreal.*

The Committee desire this year to present an *interim* report, and to ask for re-appointment, with a further grant of £50. The object of the establishment of the observatory on the top of the mountain was to obtain simultaneous records of temperature, humidity, &c., for comparison with those taken at the College Observatory at the foot. The distance between the two stations is rather more than a mile, and the difference of altitude nearly 600 feet. A line consisting of four insulated copper wires was erected to connect the two observatories. As a preliminary experiment, an electrical thermometer was set up on the wooden tower on the summit of the mountain, and connected through the line to a recording instrument in the College Observatory. No difficulty was encountered in obtaining continuous records of the temperature on the summit in this manner.

It is hoped that interesting results may be obtained by comparing continuous records of temperature at stations differing so considerably in altitude within a short distance of each other. The work has not yet progressed for a sufficient length of time to enable the Committee to report any general results, but the success of the method has been established, and it is intended, if possible, to extend further the method to the recording continuously at a distance of wind velocity and direction, barometric pressure and humidity. The intensity of sunshine has been recorded for some months at the observatory by means of similar instruments, and it is hoped to demonstrate the possibility of obtaining complete and accurate records of *all* necessary meteorological data from a distant observatory in a more or less inaccessible situation (such as that on the summit of Ben Nevis), without the necessity of employing a special observer to make daily visits to the station.

*A Quantitative Bolometric Sunshine Recorder.* *By* Professor H. L. CALLENDAR, M.A., F.R.S.

This instrument is essentially a recording bolometer, in which the difference of temperature between a blackened and a bright platinum thermometer of equal resistance is recorded in pen and ink in the form of a continuous curve on a revolving drum. It differs from ordinary sunshine recorders in giving a strictly quantitative record of the quantity of heat received by the earth's surface, and not merely the number of hours of bright sunshine.

The sensitive part of the instrument, which is exposed to the radiation to be measured, consists of a pair of differential platinum thermometers wound on flat plates of mica, the one black and the other bright, and placed side by side in a horizontal plane so as to record the vertical component of the sunshine, on which the quantity of heat received by the surface of the earth mainly depends. The instrument gives a complete record of the character of the sunshine, as well as of its intensity. The passage of small clouds, which would leave no trace on an ordinary burning glass or photographic record, is very clearly shown. It is also found that, when the sky is obscured by clouds of sufficient thickness to prevent any trace of burning on the ordinary cards, a very considerable percentage of the sun's heat may still penetrate.

The recording apparatus used is identical with that required for records of temperature, pressure, voltage, &c., and may be located in any convenient situation, at any required distance from the bolometer. It has been in use for more than a year at McGill College, Montreal, for obtaining records of sunshine, temperature, &c., and has been in regular operation at a distance of more than a mile from the Observatory, where the recording apparatus is kept under the charge of the usual observatory assistants.

*Exploration of the Upper Air by Means of Kites at Blue Hill Observatory, Mass., U.S.A. By* DR. A. LAWRENCE ROTCH.

Since the account presented at Toronto great progress has been made. The Hargrave kite has been perfected by making it larger, more rigid, and relatively lighter, and by concaving the surfaces exposed to the wind the vertical component of the latter has been increased. In general, these kites, with a short line, rise from 50 to 60 degrees above the horizon, and pull about one pound per square foot of lifting surface in a wind blowing 20 miles an hour. Elastic bridles diminish the angle of incidence of the wind as its pressure increases, and thereby enable the kites to fly in gales. A meteorograph made by Mr. Fergusson, which records the pressure, temperature, and humidity of the atmosphere and the velocity of the wind, weighs but three pounds. Since the use of wire and more efficient kites, the mean height of the flights has been increased to more than 7,000 ft. during the past few months. On six occasions 10,000 ft. was reached, the *maximum* altitude attained being 11,440 ft. on August 26th, 1898.

Mr. Shaw remarked that it was a pity that this subject was not more taken up in England. Professor Boys said he had used kites both in Ireland and England, and had now one at the Victoria Rooms, which he should be glad to exhibit in suitable weather. The President suggested that Professor Boys should fly his kite at the garden party at Clifton College on Monday afternoon.

*A new form of American kite by* Professor SCHUSTER, F.R.S.

(No abstract received).

*Analogies between the Yearly Ranges of some Meteorological and Magnetic Phenomena. By* Dr. VAN RIJCKEVORSEL.

This is the second part of a paper read at the Toronto meeting, in which it was shown how similar the yearly temperature curves are for a large part of Europe, and how the anomalies which these curves show may contribute in a large degree to the discovery of their origin.

In the diagram accompanying the present paper are plotted down six annual curves for temperature, air-pressure, rainfall, magnetic declination, and for the vertical and horizontal components of the earth's magnetic force. A portion of these curves are for Greenwich, others for two different stations in the Netherlands. It is now shown that all these curves, however dissimilar in their general directions, are exactly alike in their anomalies. Except in a very small number of instances, where the data at hand were not yet sufficient to make the phenomenon appear, every maximum or minimum in one curve seems to have its exact counterpart in every other curve, be it meteorological or magnetic. This is even the case for very small accidents of a curve, so that it is probable that it will ultimately prove to be true for every single feature of these curves, however insignificant.

These facts, in the first place, show once more how all the phenomena on the earth must be, to a large extent, governed by one and the same potent cause. But they also seem to give a valuable method for discovering, if not always the cause of meteorological phenomena, yet of the centre on the globe from which such a cause emanates.

It is also shown how the cause of a certain minimum in the temperature curves, indicating a sudden cooling in the last days of June all over the British Isles and part of western Europe, what ever it may be, must have its seat to the west or north-west of the coast of Scotland, and at no great distance.

*The Rainfall of the South-Western Counties of England. By* JOHN HOPKINSON, F.R.Met.Soc., Assoc.Inst.C.E.

The counties here considered as south-western are Monmouth, Hereford, Worcester, Gloucester, Wilts, Dorset, Somerset, Devon, and Cornwall. They cover an area of 11,273 square miles, which is between one-fourth and one-fifth that of England, and nearly one-tenth that of the British Isles. The mean monthly rainfall for the ten years 1881 to 1890 at 72 stations in these counties has been calculated, and the mean annual rainfall at 113 stations, being one to the nearest 100 square miles in each county. Thus, for example, the annual rainfall of the smallest county, Monmouth (496 square miles), is deduced from the records of five stations, and that of the largest, Devon (2,586 square miles), from the records of twenty-six stations.

The annual means at the 113 stations are :—

| | | | |
|---|---|---|---|
| Monmouth | (5 | stations) | 36·19 in. |
| Hereford | (9 | ,, ) | 28·64 ,, |
| Worcester | (7 | ,, ) | 27·02 ,, |
| Gloucester | (13 | ,, ) | 29·39 ,, |
| Wilts | (14 | ,, ) | 29·71 ,, |
| Dorset | (10 | ,, ) | 33·53 ,, |
| Somerset | (16 | ,, ) | 35·54 ,, |
| Devon | (26 | ,, ) | 37·24 ,, |
| Cornwall | (13 | ,, ) | 42·48 ,, |

The mean for the whole area being 34·08 in.

The mean annual rainfall at 12 stations (every county being represented by one or two) was as follows :—

| | | | |
|---|---|---|---|
| 1866-70 | 35·76 in. | 1881-85 | 38·25 in. |
| 1871-75 | 39·02 ,, | 1886-90 | 33·07 ,, |
| 1876-80 | 40·15 ,, | 1891-95 | 34·84 ,, |

*(To be continued.)*

## WRAGGE'S AUSTRALASIAN WEATHER GUIDE.

*To the Editor of the Meteorological Magazine.*

SIR,—While thanking you for your very kind notice with reference to my "Almanac," I nevertheless regret that you should have done me an injustice by intimating that no reports have been issued from

this office except charts. I also much deplore your remarks *re* high level stations, and honestly tell you that I consider that you have not been by any means fair to my old friend Dr. Buchan. Our publications are issued monthly, and you will find them all in the rooms of the Royal Meteorological Society, the Royal Society, Burlington House, London, the Royal Geographical, and kindred Societies. Although I should be willing to supply you with our publications privately, I cannot do so, since our funds are limited, and I am not authorised to incur more than a certain amount of postage. Kindly publish this letter in the *Meteorological Magazine.*

Yours faithfully,

CLEMENT L. WRAGGE,

*Brisbane, August 30th, 1898.* Govt. Meteorologist for Queensland.

[We print the above as requested, though we doubt its utility, as there is not a word in it which contradicts anything stated on p. 87, as Mr. Wragge would have seen had he done us the honour of reading the review carefully. Dr. Buchan was not even mentioned, and certainly would not be, in these pages, without the respect due to his life-long work; but we have no wish to occupy space upon the subject, and therefore afford Mr. Wragge the above last word.—ED.]

## LUNAR RAINBOW.

*To the Editor of the Meteorological Magazine.*

SIR,—The weather on Sunday evening, October 30th, 1898, was wild and squally in this district, and there was heavy rain between 6 and 6.40 p.m. The moon then came out in a clear opening between passing clouds, and on looking up I thought, from the stormy appearance of the sky, and the fact that a little rain still continued falling, that the conditions were favourable to the production of a lunar rainbow. I got on higher ground and scanned the western sky, where I immediately saw a bright, though incomplete bow. Only the right side of the arch was visible, and there was a faint supplementary fragment. The appearance reminded me forcibly of the curved train of a bright comet. After a duration of about five minutes, the phenomenon disappeared, the moon became hidden by clouds, and further showers of rain ensued.

About two miles west of my position, viz.: at Clifton Down, the rainbow appears to have been much better seen by Mr. A. H. Parkinson, who says that at 6.40 p.m. his attention was arrested by a small portion of a lunar rainbow, which in about three minutes had developed into a complete arch, and remained visible in that form for about three-quarters of a minute. The right side of it was the more conspicuous, displaying the prismatic colours, while the remainder was almost white. The secondary bow also appeared, but was exceedingly faint.—Yours sincerely,

W. F. DENNING, F.R.A.S.

*Bishopston, Bristol, November 5th, 1898.*

## THE DROUGHT.

*To the Editor of the Meteorological Magazine.*

SIR,—Five months ago (p. 55) you were good enough to publish in your Magazine the rainfall for Worthing, showing the great deficiency which was manifest up to the end of April last. The decess is now much more marked, and the past twelvemonths form the driest period since observations were begun here in 1852.

There have been drier months in previous years—as in September, 1865, when only 0·10 in. of rain was registered.

There have been drier quarters—as in the second quarter of 1893, when only 0·95 in. of rain was recorded; but for the past 47 years there has never been so long a period during which dry weather has prevailed.

The mean rainfall for Worthing in the first nine months of the year is 18·47 in. In six of these years the fall has been less than 13·5 in., and in six other years the fall has been over 21 in. :—

| Six Dry Years, Jan. 1st to Sept. 30th. | Fall in inches. | Six Wet Years. Jan. 1st to Sept. 30th. | Fall in inches. |
|---|---|---|---|
| 1854 ..... | 12·60 | 1852 ..... | 21·83 |
| 1855 ..... | 11·60 | 1856 ..... | 22·10 |
| 1858 ..... | 12·00 | 1860 ..... | 25·90 |
| 1870 ..... | 13·11 | 1877 ..... | 21·30 |
| 1887 ..... | 13·15 | 1879 ..... | 29·55 |
| 1898 ..... | 11·45 | 1894 ..... | 25·01 |

Thus 1898 not only stands out prominently with the lowest fall, but it followed upon the dry autumn of 1897, so that the past twelvemonths show the fact more clearly when thus compared :—

| Last 3 months of | Fall. in. | First 9 months of | Fall. in. | Total fall in 12 consecutive months. in. |
|---|---|---|---|---|
| 1853 ... | 9·30 | 1854 ... | 12·60 | 21·90 |
| 1854 ... | 7·50 | 1855 ... | 11·60 | 19·10 |
| 1857 ... | 7·60 | 1858 ... | 12·00 | 19·60 |
| 1869 ... | 7·38 | 1870 ... | 13·11 | 20·49 |
| 1886 ... | 11·89 | 1887 ... | 13·15 | 25·04 |
| 1897 ... | 5·58 | 1898 ... | 11·45 | 17·03 |

This amount of 17·03 in. is 10·92 in. below the mean of 1852-96; and as there was also a decess from May 1st to September 30th last year, the actual loss in the past 17 months is equal to nearly 13 in. :—

| | | Fall. in. | Mean Fall. in. | Decess at end of each period. in. |
|---|---|---|---|---|
| 1897. | May 1st to Sept. 30th ..... | 8·82 | 10·86 | 2·04 |
| ,, | Oct. 1st to Dec. 31st ..... | 5·58 | 9·48 | 5·94 |
| 1898. | Jan. 1st to March 31st..... | 3·18 | 6·05 | 8·81 |
| ,, | April 1st to June 30th ..... | 5·90 | 5·28 | 8·19 |
| ,, | July 1st to Sept. 30th ..... | 2·36 | 7·14 | 12·97 |
| | Total for 17 months | 25·84 | 38·81 | 12·97 |

Yours faithfully,

*Worthing, October 15th, 1898.* C. KELLY, M.D.

P.S.—The fall in October was 4·26 in., or 0·37 in. above the average, but this still leaves a decess of 12·60 in.

## THE EFFECT OF LIGHTNING ON AN OAK TREE.

*To the Editor of the Meteorological Magazine.*

SIR,—Mr. Wood's interesting letter of September 9th led me to seek for the oak in question, which he mentioned in your last number (p. 136) as having been struck by lightning during one of the August storms. Although I was unaware of the occurrence, in spite of the fact that I live in the immediate vicinity, I soon found it, and was surprised to find that though a fine tree, yet it was not the highest tree around, for there were others taller in close proximity; neither was it isolated in any way, for it was growing on the side of a ditch, with other trees. It stood therefore considerably lower than other solitary trees in the adjoining field. There is more than one solitary oak in that field larger than the one struck, and standing on higher ground, and therefore one would have thought more likely to attract the lightning. I mention these facts only for what they are worth, and as illustrating the apparently extraordinary capriciousness of the electric discharge in the objects on which it strikes.

Yours faithfully,

LLEWELLYN EVANS.

*Cheltenham, November 10th, 1898.*

[Possibly there was more water in the ditch near that tree than near the others.—ED.]

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## SOME HEAVY RAINS—OCTOBER 15TH–18TH, 1898.

[No returns quoted unless the aggregate for the four days reached 4·00 in., or the fall on some one day exceeded 2·00 inches.]

| COUNTY. | STATION. | Fall on the 15th. in. | 16th. in. | 17th. in. | 18th. in. | Total. in. |
|---|---|---|---|---|---|---|
| *Devon* ..... | Druid House, Ashburton ..... | 1·19 | 1·62 | 1·36 | ·37 | 4·54 |
| ,, | Mamhead Rectory, Dawlish... | 1·70 | 1·65 | 1·72 | ·48 | 5·55 |
| ,, | Polapit Tamar, Launceston... | ·30 | 1·50 | 1·61 | ·92 | 4·33 |
| ,, | Oaklands, Okehampton ..... | ·44 | ·87 | 1·62 | 1·42 | 4·35 |
| ,, | Horwood, Bideford ..... | — | — | 2·25 | — | — |
| ,, | Athenæum, Barnstaple..... | ·02 | ·58 | 2·13 | 1·46 | 4·19 |
| *Cornwall*... | Lamellyn, Probus ..... | ·61 | 1·65 | 1·82 | ·14 | 4·22 |
| ,, | Green Bank, Liskeard ... ..... | ·23 | 1·16 | 2·85 | ·24 | 4·48 |
| ,, | Penleat, Altarnon..... | ·27 | 1·61 | 2·44 | 1·42 | 5·74 |
| *Gloucester*.. | Wickwar Rectory ..... | — | ·60 | 1·22 | 2·21 | — |
| *Monmouth.* | Shirenewton Hall, Chepstow | — | 1·62 | 1·74 | 2·01 | — |
| ,, | Llanfrechfa..... | ·11 | 1·73 | 1·10 | 1·52 | 4·46 |

N.B. — indicates no information, *not* no rain.

# RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

## OCTOBER.

| ELEMENTS. | MONTHLY MEANS OR TOTALS. | | | | | | | | | ABSOLUTE READINGS. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MEANS 9 A.M. AND 9 P.M. | | | | | | EXTREMES AT 9 A.M. AND 9 P.M. | | | | | |
| | | | | | | Highest Month. | | Lowest Month. | | Highest. | | Lowest. | | | |
| | Mean, 40 years | Highest Month and Date. | Lowest Month and Date. | | Mean. | Value. | Date. | Value. | Date. | Value. | Date. | Value. | Date. | Mean of all Highest | Mean of all Lowest. |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Barometer (cor. & red.) | 29·906 | 30·189 | 29·576 | 9 a.m. | 29·906 | 30·188 | 1897 | 29·597 | 1859 | 30·683 | 31st, 1891 | 28·640 | 16th, 1886 | 30·447 | 29·247 |
| | | 1897 | 1859 | 9 p.m. | 29·906 | 30·191 | 1897 | 29·554 | 1859 | 30·662 | 30th, 1891 | 28·774 | 31st, 1859 | 30·428 | 29·274 |
| Shade Temp. Dry Bulb | 49·2 | 54·4 | 44·6 | 9 a.m. | 49·6 | 54·8 | 1861 | 44·7 | 1887 | 67·5 | 15th, 1862 | 29·6 | 28th, 1890 | 60·5 | 36·9 |
| | | 1861 | 1887 | 9 p.m. | 48·8 | 53·9 | 1861 | 44·0 | 1881 | 64·5 | 19th, 1864 | 30·9 | 27th, 1895 | 59·2 | 37·9 |
| Shade Temp. Max. | 57·5 | .. | ... | ... | ... | 64·4 | 1861 | 52·6 | 1881 | 80·9 | 4th, 1859 | 37·2 | 24th, 1859 | 68·1 | 47·3 |
| Shade Temp. Min. | 43·3 | ... | ... | ... | ... | 48·1 | 1861 | 38·9 | 1888 | 60·5 | 15th, 1862 | 23·8 | 28th, 1890 | 54·5 | 31·4 |
| Shade Temp. Wet Bulb | 47·4 | 53·0 | 42·3 | 9 a.m. | 47·7 | 53·4 | 1861 | 42·4 | 1887 | 62·1 | 4th,'59; 15th,'62 | 28·6 | 28th, 1890 | 58·1 | 35·8 |
| | | 1861 | 1887 | 9 p.m. | 47·1 | 52·5 | 1861 | 42·1 | 1887 | 62·1 | 1st, 1861 | 30·5 | 26th, 1869 | 57·2 | 36·7 |
| Solar Rad., black | 81·3 | ... | ... | ... | ... | 89·1 | 1877 | 75·5 | 1875 | 116·9 | 4th, 1879 | 46·0 | 20th, 1880 | 107·4 | 53·7 |
| Solar Rad., bright | 62·3 | ... | ... | ... | ... | 67·0 | 1893 | 58·3 | 1880 | 86·8 | 1st, 1886 | 42·0 | 26th, 1895 | 76·5 | 49·1 |
| Grass Minimum | 39·0 | ... | ... | ... | ... | 44·3 | 1874 | 33·1 | 1888 | 58·3 | 3rd, 1862 | 16·8 | 28th, 1890 | 52·0 | 26·6 |
| Soil, 1 foot | 50·2 | ... | ... | ... | ... | 53·2 | '76,'86 | 46·8 | 1888 | 59·8 | 2nd, 1895 | 41·0 | 30th, 31st, '95 | 55·3 | 45·0 |
| Cloud | 6·1 | 7·5 | 5·0 | 9 a.m. | 6·4 | 8·5 | 1894 | 4·0 | 1893 | 10 | Every year | 0 | Various | 10·0 | 0·1 |
| | | '82, '94 | 1893 | 9 p.m. | 5·8 | 7·4 | 1889 | 4·0 | 1892 | 10 | Every year | 0 | Various | 10·0 | 0·1 |
| Rainfall | 2·71 | 6·22 | ·56 | 9 a.m. | 1·26 | 3·59 | 1880 | ·23 | 1884 | 1·09 | 31st, 1892 | ·00 | Every year | ·42 | ·00 |
| | | 1865 | 1897 | 9 p.m. | 1·45 | 3·33 | 1865 | ·07 | 1897 | ·91 | 12th, 1873 | ·00 | Every year | ·46 | ·00 |

Max. Rainfall in 24 hours, 1·35 in., 30th, 1894. Mean max. daily fall, ·66 in.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1898.

| STATIONS. (*Those in italics are South of the Equator.*) | Absolute. Maximum. Temp. | Date. | Minimum. Temp. | Date. | Average. Max. | Min. | Dew Point. | Humidity. | Absolute. Max. in Sun. | Min. on Grass. | Total Rain. Depth. | Days. | Aver. Cloud. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | | ° | | ° | ° | ° | 0-100 | ° | ° | inches | | |
| England, London | 75·2 | 23 | 34·6 | 13 | 61·1 | 45·4 | 44·0 | 74 | 118·1 | 30·8 | 2·27 | 21 | 7·1 |
| Malta | 83·1 | 26 | 52·8 | 3 | 73·5 | 58·2 | 55·1 | 71 | 144·7 | 45·4 | ·05 | 1 | 3·1 |
| *Cape of Good Hope* | 79·9 | 20 | 41·1 | 17 | 64·3 | 50·2 | 48·4 | 83 | ... | ... | 4·06 | 14 | 5·8 |
| *Mauritius* | 80·0 | 14 | 64·4 | 31 | 76·8 | 69·0 | 65·6 | 80 | 125·7 | 57·0 | 8·32 | 15 | 6·6 |
| Calcutta | 103·2 | 18 | 70·8 | 27 | 96·0 | 77·9 | 73·4 | 66 | 157·8 | 68·7 | 4·06 | 5 | 3·7 |
| Bombay | 94·9 | 28 | 79·4 | 12 | 91·1 | 81·5 | 76·2 | 73 | 145·5 | 72·8 | ·16 | 2 | 2·7 |
| Ceylon, Colombo | 90·6 | 13 | 72·0 | 3 | 88·0 | 78·4 | 75·3 | 81 | 154·0 | 69·5 | 5·80 | 22 | 6·1 |
| *Melbourne* | 69·4 | 30 | 35·0 | 26 | 60·0 | 43·7 | 44·1 | 75 | 131·0 | 30·2 | 2·09 | 10 | 6·3 |
| *Adelaide* | 70·4 | 29 | 37·9 | 25 | 62·0 | 46·3 | 44·3 | 73 | 132·4 | 29·2 | 3·80 | 13 | 4·2 |
| *Sydney* | 66·8 | 22 | 42·4 | 25 | 61·7 | 51·0 | 47·2 | 80 | 114·1 | 34·9 | 10·52 | 19 | 5·3 |
| *Wellington* | 71·0 | 9 | 36·5 | 27 | 58·6 | 47·7 | 46·7 | 79 | 105·0 | 26·0 | 5·96 | 17 | 5·0 |
| *Auckland* | 68·0 | 2 | 40·0 | 31 | 63·6 | 51·1 | 47·4 | 70 | 120·0 | 36·0 | 3·67 | 18 | 5·3 |
| Jamaica, Kingston | 89·1 | 5 | 69·2 | 7 | 86·0 | 72·4 | 71·3 | 75 | ... | ... | 9·66 | 8 | ... |
| Trinidad | 95·0 | 11 | 63·0 | 10*a* | 92·3 | 71·1 | 70·2 | 71 | 165·0 | 60·0 | 1·49 | 6 | ... |
| Grenada | 87·6 | 30 | 71·2 | 10 | 84·4 | 75·2 | 70·1 | 69 | 148·0 | ... | ·77 | 9 | 2·5 |
| Toronto | 74·0 | 31 | 37·4 | 6 | 64·3 | 46·4 | 46·6 | 72 | 97·5 | 28·0 | 2·31 | 7 | 5·4 |
| New Brunswick, Fredericton | 76·8 | 22 | 25·2 | 4 | 64·3 | 41·4 | 38·3 | 53 | ... | ... | 1·53 | 7 | 6·0 |
| Manitoba, Winnipeg | 82·7 | 24 | 25·8 | 5 | 68·4 | 37·9 | ... | ... | ... | ... | ·89 | 3 | 4·8 |
| British Columbia, Esquimalt | 82·5 | 25 | 30·5 | 6 | 63·1 | 44·3 | 44·8 | 76 | ... | ... | ·60 | 8 | 5·2 |

*a*—and 11.

### REMARKS.

MALTA.—Mean temp. 64°·5, or 0°·5 above average. Mean hourly velocity of wind 11·0 miles, or 1·0 above average. Mean temp. of sea 67°·0. L on 9th. J. F. DOBSON.

*Mauritius.*—Mean temp. of air 0°·2 below, of dew point 1°·3 above, and rainfall 3·88 in. above, their respective averages. Mean hourly velocity of wind 12·9 miles, or 2·6 above average; extremes, 27·8 on 3rd and 0·0 on 1st; prevailing direction E.S.E. and E. by S. T on 23rd; L and T on 24th. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·7, or 0°·2 above, of dew point 0°·2 above, and rainfall 6·31 in. below, the averages. TSS on 6 days. H. O. BARNARD.

*Adelaide.*—Mean temp. 3°·4 below the average, and the lowest on record for May. Rainfall ·97 in. above the average. C. TODD, F.R.S.

*Sydney.*—Temp. 2°·0 below, rainfall 5·36 in. above, and humidity 4·9 above, their respective averages. Weather still dry in the S.W. districts.—H. C. RUSSELL, F.R.S.

*Wellington.*—Fine weather up to the 8th, then wet to the 15th, and showery from the 21st to the end of the month; altogether a wet month. T on 3 days; H on 3 days; foggy on 4 days. Earthquakes on 3rd, 8th, and 16th. R. B. GORE.

*Auckland.*—A showery month, rain being registered on 18 days, but the total more than ·50 in. below the average of 31 years. Mean temp. almost exactly the same as the average. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 2·16 in. below the average of 30 years. J. H. HART.

# SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1898.

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. |
| I. | Uxbridge, Harefield Pk.. | 2·86 | XI. | Builth, Abergwesyn Vic. | 8·77 |
| II. | Dorking, Abinger Hall . | 3·83 | ,, | Rhayader, Nantgwillt ... | 8·55 |
| ,, | Birchington, Thor ..... | 1·74 | ,, | Lake Vyrnwy ..... | 5·79 |
| ,, | Hailsham ..... | 3·35 | ,, | Corwen, Rhug ..... | 5·24 |
| ,, | Ryde, Thornbrough ..... | 3·94 | ,, | Criccieth, Talarvor ..... | 5·77 |
| ,, | Emsworth, Redlands ... | 3·75 | ,, | I. of Man, Douglas ..... | 4·58 |
| ,, | Alton, Ashdell ..... | 4·74 | XII. | Stoneykirk, Ardwell Ho. | 2·64 |
| III. | Oxford, Magdalen Col.. | 4·33 | ,, | New Galloway, Glenlee | 4·26 |
| ,, | Banbury, Bloxham ..... | 4·02 | ,, | Monaive, Maxwelton Ho. | 3·75 |
| ,, | Northampton, Sedgebrook | 2·35 | ,, | Lilliesleaf, Riddell ..... | 4·09 |
| ,, | Stamford Duddington... | 2·63 | XIII. | N. Esk Res. [Penicuick] | 5·15 |
| ,, | Alconbury ..... | 2·27 | XIV. | Glasgow, Queen's Park.. | 3·97 |
| ,, | Wisbech, Bank House... | 2·78 | XV. | Inverary, Newtown ..... | 5·79 |
| IV. | Southend ..... | 1·67 | ,, | Ballachulish, Ardsheal... | 5·20 |
| ,, | Harlow, Sheering..... ... | 4·32 | ,, | Islay, Gruinart School... | 2·44 |
| ,, | Colchester, Lexden ..... | 1·97 | XVI. | Dollar..... | 5·36 |
| ,, | Rendlesham Hall ..... | 1·39 | ,, | Balquhidder, Stronvar... | 6·84 |
| ,, | Scole Rectory ..... | 1·81 | ,, | Coupar Angus Station... | 5·21 |
| ,, | Swaffham ..... | 2·38 | ,, | Dalnaspidal H.R.S..... | ... |
| V. | Salisbury, Alderbury ... | ... | XVII. | Keith H.R.S..... | 3·38 |
| ,, | Bishop's Cannings ..... | 4·73 | ,, | Forres H.R.S. ... ..... | 2·21 |
| ,, | Blandford, Whatcombe . | 4·07 | XVIII. | Fearn, Lower Pitkerrie.. | 2·97 |
| ,, | Ashburton, Holne Vic... | 7·26 | ,, | N. Uist, Loch Maddy ... | ... |
| ,, | Okehampton, Oaklands. | 8·17 | ,, | Invergarry..... | 4·08 |
| ,, | Hartland Abbey ..... | 6·11 | ,, | Aviemore H.R.S. ..... | 1·81 |
| ,, | Lynton, Glenthorne ... | 9·40 | ,, | Loch Ness, Drumnadrochit | 2·68 |
| ,, | Probus, Lamellyn ..... | 7·82 | XIX. | Invershin ..... | 5·47 |
| ,, | Wellington, The Avenue | 4·77 | ,, | Durness ..... | 3·51 |
| ,, | North Cadbury Rectory | 4·02 | ,, | Watten H.R.S..... | 2·77 |
| VI. | Clifton, Pembroke Road | 5·85 | XX. | Dunmanway, Coolkelure | 10·28 |
| ,, | Ross, The Graig ..... | 4·46 | ,, | Cork, Wellesley Terrace | 7·37 |
| ,, | Wem, Clive Vicarage ... | 4·20 | ,, | Killarney, Woodlawn .. | 7·24 |
| ,, | Wolverhampton, Tettenhall | 2·58 | ,, | Caher, Duneske ..... | 3·64 |
| ,, | Cheadle, The Heath Ho. | 2·76 | ,, | Ballingarry, Hazelfort... | 2·41 |
| ,, | Coventry, Priory Row .. | 2·88 | ,, | Limerick, Kilcornan ... | 4·91 |
| VII. | Grantham, Stainby ..... | 2·96 | ,, | Broadford, Hurdlestown | 2·61 |
| ,, | Horncastle, Bucknall ... | 2·26 | ,, | Miltown Malbay ..... | 4·85 |
| ,, | Worksop, Hodsck Priory | 2·40 | XXI. | Gorey, Courtown House | 4·06 |
| VIII. | Neston, Hinderton ..... | 3·32 | ,, | Athlone, Twyford ..... | 2·59 |
| ,, | Southport, Hesketh Park | 3·46 | ,, | Mullingar, Belvedere ... | 2·85 |
| ,, | Chatburn, Middlewood. | 3·93 | ,, | Longford, Currygrane... | ... |
| IX. | Melmerby, Baldersby ... | 2·69 | XXII. | Woodlawn ..... | 2·99 |
| ,, | Scarborough, Observat'y | 3·87 | ,, | Crossmolina, Enniscoe .. | 3·92 |
| ,, | Middleton, Mickleton ... | 5·43 | ,, | Collooney, Markree Obs. | 2·55 |
| X. | Haltwhistle, Unthank... | 6·72 | ,, | Ballinamore, Lawderdale | ... |
| ,, | Bamburgh ..... | 2·80 | XXIII. | Warrenpoint..... | 4·94 |
| ,, | Duddon Valley, Ulpha School | 6·39 | ,, | Seaforde..... | 4·18 |
| ,, | Keswick, The Bank ..... | 5·69 | ,, | Belfast, Springfield ..... | 3·91 |
| XI. | Llanfrechfa Grange ..... | 7·51 | ,, | Bushmills, Dundarave.. | 2·10 |
| ,, | Llandovery ..... | 5·85 | ,, | Stewartstown ..... | 4·43 |
| ,, | Castle Malgwyn ..... | 6·55 | ,, | Killybegs ..... | 4·08 |
| ,, | Brecknock, The Barracks | 4·66 | ,, | Horn Head ..... | 4·60 |

# OCTOBER, 1898.

| Div. | | STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.] | RAINFALL. Total Fall. | Difference from average 1880-9. | Greatest Fall in 24 hours. Dpth | Date | Days on which ·01 or more fell. | TEMPERATURE. Max. Deg. | Max. Date | Min. Deg. | Min. Date. | No. of Nights below 32°. In shade. | On grass. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | inches. | inches. | in. | | | | | | | | |
| I. | ENGLAND. | London (Camden Square) ... | 2·96 | + ·07 | ·84 | 29 | 13 | 71·1 | 3 | 40·2 | 2 | 0 | 0 |
| II. | | Tenterden ... | 2·54 | — 1·49 | ·84 | 29 | 17 | 66·0 | 3 | 39·0 | 11*a* | 0 | 0 |
| ,, | | Hartley Wintney ... | 3·75 | ... | 1·30 | 17 | 16 | 69·0 | 3 | 43·0 | 11 | 0 | 6 |
| III. | | Hitchin ... | 2·46 | — ·61 | ·53 | 29 | 18 | 68·0 | 3 | 33·0 | 8 | 0 | ... |
| ,, | | Winslow (Addington) ... | 3·17 | + ·08 | ·48 | 16 | 16 | 68·0 | 2, 3 | 33·0 | 1 | 0 | 3 |
| IV. | | Bury St. Edmunds (Westley) | 1·83 | — 1·44 | ·40 | 29 | 18 | 63·0 | 4 | 40·0 | 11 | 0 | ... |
| ,, | | Norwich (Brundall) ... | 2·48 | ... | ·44 | 11 | 15 | 68·0 | 2 | 37·0 | 2 | 0 | 3 |
| V. | | Winterbourne Steepleton ... | 4·93 | ... | ·99 | 18 | 22 | 67·0 | 3 | 31·4 | 13 | 1 | 6 |
| ,, | | Torquay (Cary Green) ... ... | 5·88 | ... | 1·31 | 16 | 18 | 68·9 | 21 | 42·2 | 2 | 0 | 0 |
| ,, | | Polapit Tamar [Launceston].. | 8·37 | + 3·44 | 1·61 | 17 | 25 | 66·0 | 2 | 32·0 | 12 | 1 | 2 |
| VI. | | Stroud (Upfield) ... | 4·50 | + 1·47 | 1·82 | 18 | 16 | 65·0 | 3, 21 | 36·0 | 31 | 0 | ... |
| ,, | | ChurchStretton(Woolstaston) | 6·09 | + 2·32 | 1·36 | 17 | 24 | 66·0 | 2 | 41·0 | 13*b* | 0 | ... |
| ,, | | Worcester (Diglis Lock) ... | 2·90 | + ·07 | ·72 | 18 | 22 | ... | ... | ... | ... | ... | ... |
| VII. | | Leicester (Rotherby Hall) ... | ... | ... | ... | .. | ... | ... | ... | ... | ... | ... | ... |
| ,, | | Boston ... | 2·82 | — ·29 | ·75 | 30 | 17 | 70·0 | 3 | 36·0 | 11 | 0 | ... |
| ,, | | Hesley Hall [Tickhill]... | 2·45 | — ·65 | ·49 | 16 | 19 | 68·0 | 3 | 32·0 | 14 | 1 | ... |
| VIII. | | Manchester(PlymouthGrove) | 3·62 | + ·25 | ·59 | 20 | 18 | 68·0 | 3 | 35·0 | 12 | 0 | 2 |
| IX. | | Wetherby (Ribston Hall) .. | 5·08 | + 1·95 | 1·26 | 18 | 15 | ... | ... | ... | ... | ... | ... |
| ,, | | Skipton (Arncliffe) ... | 7·59 | + 1·56 | 1·41 | 30 | 17 | ... | ... | ... | ... | ... | ... |
| ,, | | Hull (Pearson Park).... ... | 3·19 | — ·46 | ·85 | 18 | 19 | 66·0 | 2, 3 | 33·0 | 11 | 0 | 2 |
| X. | | Newcastle (Town Moor) ... | 4·86 | + 1·74 | 1·58 | 17 | 16 | ... | ... | ... | ... | ... | ... |
| ,, | | Borrowdale (Seathwaite)... | 10·65 | + ·06 | 2·26 | 30 | 15 | ... | ... | ... | ... | ... | ... |
| XI. | WALES. | Cardiff (Ely)... | 6·50 | + 1·96 | 1·10 | 7 | 22 | ... | ... | ... | ... | ... | ... |
| ,, | | Haverfordwest ... ... | 6·58 | + 1·43 | 1·48 | 28 | 23 | 67·6 | 2 | 34·3 | 12 | 0 | 3 |
| ,, | | Aberystwith (Gogerddan) ... | 5·43 | + ·08 | ·78 | 18 | 19 | 69·0 | 3 | ... | ... | ... | ... |
| ,, | | Llandudno... ... | 4·28 | + ·89 | ·83 | 28 | 19 | 67·0 | 3 | 41·0 | 13 | 0 | ... |
| XII. | SCOTLAND. | Cargen [Dumfries] ... ... | 4·48 | + 1·22 | ·84 | 17 | 13 | 75·0 | 4 | 36·0 | 13 | 0 | ... |
| XIII. | | Edinburgh (Blacket Place)... | 3·70 | ... | 1·10 | 17 | 14 | 70·2 | 4 | 40·0 | 24 | 0 | ... |
| XIV. | | Colmonell ... ... | 2·34 | ... | ·47 | 30 | 13 | 77·0 | 4 | 32·0 | 11 | 1 | ... |
| XV. | | Tighnabruaich ... ... | 5·26 | ... | 1·04 | 25 | 18 | 62·0 | 5 | 35·0 | 17*c* | 0 | ... |
| ,, | | Mull (Quinish)... ... | 3·93 | — 1·36 | ·75 | 31 | 16 | ... | ... | ... | ... | ... | ... |
| XVI. | | Loch Leven Sluices ... | 5·70 | + 2·74 | 2·50 | 18 | 14 | ... | ... | ... | ... | ... | ... |
| ,, | | Dundee (Eastern Necropolis) | 5·00 | + 2·76 | 2·50 | 17 | 21 | 70·1 | 2 | 36·7 | 12 | 0 | ... |
| XVII. | | Braemar ... .. | 6·43 | + 2·82 | 1·52 | 17 | 20 | 73·8 | 3 | 29·2 | 11 | 2 | 12 |
| ,, | | Aberdeen (Cranford) ... ... | 3·67 | ... | ·76 | 18 | 18 | 75·0 | 2, 4 | 32·0 | 31 | 1 | ... |
| ,, | | Cawdor (Budgate) ... | 2·04 | — ·69 | ·92 | 30 | 19 | ... | ... | ... | ... | ... | ... |
| XVIII | | Strathconan [Beauly] ... ... | 3·75 | — ·90 | ·70 | 31 | 10 | ... | ... | ... | ... | ... | ... |
| ,, | | Glencarron Lodge... ... | 7·41 | ... | 1·17 | 17 | 18 | 74·5 | 5 | 32·6 | 29 | 0 | ... |
| XIX. | | Dunrobin ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ,, | | S. Ronaldshay (Roeberry) ... | 3·86 | + ·13 | 1·06 | 19 | 19 | 65·0 | 3, 4 | 38·0 | 18*d* | 0 | ... |
| XX. | IRELAND. | Darrynane Abbey... ... | 6·03 | ... | ·89 | 13 | 25 | ... | ... | ... | ... | ... | ... |
| ,, | | Waterford (Brook Lodge) ... | 6·06 | + 2·24 | 1·29 | 13 | 21 | 70·0 | 3 | 32·0 | 12 | 1 | ... |
| ,, | | O'Briensbridge (Ross) ... ... | 2·36 | ... | ·55 | 8 | 18 | ... | ... | ... | ... | ... | ... |
| XXI. | | Carlow (Browne's Hill) ... ... | 3·36 | + ·07 | ·80 | 8 | 22 | ... | ... | ... | ... | ... | ... |
| ,, | | Dublin (FitzWilliam Square) | 3·58 | + ·20 | ·81 | 17 | 19 | 64·8 | 3 | 40·0 | 12 | 0 | 0 |
| XXII. | | Ballinasloe ... ... ... | 2·87 | — ·12 | ·53 | 8 | 21 | 66·0 | 10 | 32·0 | 12 | 1 | ... |
| ,, | | Clifden (Kylemore) ... ... .. | 6·13 | ... | 1·07 | 13 | 25 | ... | ... | ... | ... | ... | ... |
| XXIII | | Waringstown ... ... | 2·79 | + ·08 | 1·32 | 17 | 17 | 72·0 | 4, 5 | 35·0 | 10*e* | 0 | 4 |
| ,, | | Londonderry (Creggan Res.). | 3·42 | — ·25 | 1·23 | 17 | 22 | ... | ... | ... | ... | ... | ... |
| ,, | | Omagh (Edenfel) ... | 3·80 | + ·70 | 1·30 | 17 | 20 | 68·0 | 4 | 34·0 | 10*f* | 0 | 4 |

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

*a*—and 13. *b*—and 14. *c*—and 18. *d*—and 19. *e*—and 11, 12, 13. *f*—and 11, 19, 27.

# METEOROLOGICAL NOTES ON OCTOBER, 1898.

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.

TENTERDEN.—Another warm month; mean max. temp. 59°·6, or 1°·4 higher than in 1897 and 1893; mean min. 48°·7, or 3°·0 above that of last year. There were 14 days with max. temp. above 60°, and like 1897 none under 50°. Duration of sunshine 102 hours 25 mins. The rainfall from 16th to 20th greatly helped the grass and filled up cisterns, but not the ponds or springs, and even the heavy rain of the 29th had no effect on a well, which having fallen 7 inches each month since July, is now down to the same level as before the March snow. Fog on 10th, 11th, 13th, 15th, and 21st. L and distant T on 29th.

HARTLEY WINTNEY.—The great drought which continued through August and September did not terminate until the 9th, after which R fell almost daily; the amount on 17th being the heaviest fall since July 29th, 1894. Total R ·32 in. above the average. Cold E. winds prevailed at the beginning of the month, but the latter half was exceedingly mild. L on 11th, S.S.W. gale on 30th; fog on 10th and 21st; ozone on 10 days. Swallows left on 10th.

WINSLOW, ADDINGTON.—During the month much needed R fell, doing a great deal of good. The weather was mild throughout, and some days were warm and summerlike. The max. temp. rose to, or above, 60° on 14 days.

BURY ST. EDMUNDS, WESTLEY.—Mild and warm, with R in small quantities on 18 days. The want of water continued, many deep chalk wells being nearly dry. Distant T on 29th.

NORWICH, BRUNDALL.—Very mild, the mean temp. being about 5° above the average, while the max. reached, or exceeded, 60° on 17 days. Apparently the mildest October since 1876. Fog, T and L on 11th; L on 17th; sharp TS at 11.30 p.m. on 29th.

WINTERBOURNE STEEPLETON.—The main features of the month were, the break up of the long drought, and the high temperature. Nearly 5 inches of R fell, whereas the average of the previous 9 months is only about 1·75 in. The total for the year is still very deficient, being only 20·34 in., while for the previous 5 years the mean is 28·26 in. In consequence the springs are lower than they have been for many years. The mean temp. was 53°·1, or 5°·0 above the average of five Octobers, while the mean min. is 6°·0 above average. Fog on 7th and 10th.

TORQUAY, CARY GREEN.—Rainfall for the month 1·73 in. above, and for the first 10 months of the year 7·14 in. below, the average. Mean temp. 56°·7, or 5°·5 above the average. Duration of sunshine 89 hours 40 mins., or 24 hours 45 mins. below the average. Eight sunless days.

POLAPIT TAMAR.—Exceptionally wet throughout, and the heaviest total R for any month in 18 years. General absence of stormy or frosty weather. Fog on 5 days.

WOOLSTASTON.—Very wet, with no frost. Mean temp. 51°·3.

MANCHESTER, PLYMOUTH GROVE.—For the first ten days fine autumn weather prevailed; dense fog occurred on 12th, and the last fortnight was unsettled and mostly wet and stormy. Mean temp. 52°·8.

ARNCLIFFE VICARAGE.—Unusually mild, with no frost. Dahlias in bloom on 31st.

## WALES.

HAVERFORDWEST.—The fine weather of September continued to October 12th; on 13th a wet, stormy period set in, and continued to the end of the month. Very heavy R fell on 28th and 29th, 2·18 in. Great absence of sunshine from 13th to 31st. The month was generally mild, and there was abundance of grass.

ABERYSTWITH, GOGERDDAN.—The last fortnight was very wet, sunless and close.

## SCOTLAND.

CARGEN [DUMFRIES].—The month was remarkable for exceptionally high mean temp., 51°·4, which is 2°·4 higher than the average for May, and has only once been exceeded in October in 39 years. From the 1st to 16th R fell on only one day; while out of the remaining 15 days, 12 were wet. The duration of sunshine was slightly below the average. The absolute absence of frost during the autumn had an extraordinary effect on vegetation, blossom appearing on pear trees, rhododendrons, &c., while dahlias and begonias are still in full bloom. The R of the first 10 months of the year exceeds the average by 1·08 in.

EDINBURGH, BLACKET PLACE.—Very mild. The mean of the day temp. is 2°·5 above, and of the night temp. 5°·1 above, the average. The mean temp., 51°·0, is the highest in October since 1857, and has been surpassed in only 6 years since 1764. Sunshine below the average, and rainfall 54 per cent. above the average. Dense fog on 5th and 29th. The max. temp., 70°·2, on 4th, is the highest in October since 1845.

COLMONELL.—Rainfall 2·49 in. below the average of 22 years. Mean temp. 52°·2, or 6°·2 above the average of 22 years, and the highest in that period.

TIGHNABRUAICH.—The first half of the month was anticyclonic, the latter half cyclonic, with heavy rainfall. A severe N.E. gale did much damage in the middle of the month.

ABERDEEN, CRANFORD.—A severe gale from 15th to 20th caused many shipwrecks on the N.E. coast.

S. RONALDSHAY, ROEBERRY.—The first half of the month was very fine, the last half wet and stormy. Mean temp. 49°·5, or 3°·2 above the average of 8 years.

## IRELAND.

DARRYNANE ABBEY.—A wet, but mild month; leaves still on the trees at the end.

WATERFORD, BROOK LODGE.—The wettest October since 1875. Weather very broken all through, and a good deal of fog in the early part. Mean temp. 52°·9.

O'BRIENSBRIDGE, ROSS.—Very cold and stormy from the 13th to the end.

DUBLIN, FITZWILLIAM SQUARE.—Singularly mild. The first 12 days were generally fine and dry; but from the 13th R fell on 18 consecutive days. Mean temp. 52°·8, or 3°·1 above the average. High winds on 10 days, reaching the force of a gale on 15th and 16th. Fog on 8 days. Lunar halo on 26th. L on 11th.

OMAGH, EDENFEL.—The remarkable mildness of the autumn was maintained, practically without interruption, throughout. Neither the max. temp., nor the mean (50°·0) have been reached before in October, since records began in 1864. Mean temp. 4°·1 above the average. Dahlias and begonias were unscathed on November 6th, and although the autumn tints were magnificent, many trees were comparatively green at the close. Swallows did not leave until the 6th.