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BRITISH LOCAL METEOROLOGICAL PUBLICATIONS.

(Continued from p. 105.)

THANKS to the help of several correspondents, but especially to that of Mr. Baxendell, of Southport, we are able to make important additions to the list given in our last number; but our impression is that unless some hard line of definition be drawn, the list may be extended almost indefinitely—certainly to several hundred publications per annum. Perhaps it would be better to state our reasons for this belief. Although neither the previous M.O.H. to the County Council of the West Riding of Yorkshire (Dr. Whitelegge), nor the present (Dr. Kaye), is a rainfall observer, we have had the pleasure of corresponding with them and receiving copies of their annual reports. In these reports are summaries of those of the Medical Officers of more than one hundred urban and rural sanitary authorities; and we found that several of these local reports contained meteorological data; and Dr. Kaye tells us that for 1897 they are even more numerous. Suppose there are 30. There are also in Yorkshire, the N. and the E. Ridings; if we take them each at one-third of the W. Riding, we have for this one county 50 such reports per annum; and although Yorkshire is the largest and probably most populous of the counties, we must remember that there are 39 others; and if we take each (including Lancashire, Devonshire, &c.) at even one-tenth as many as Yorkshire, we have $39 \times 5 = 195 + 50 = 245$ such reports.

Moreover, in our list we did not quote the report from any lunatic asylum, because we do not now receive any, but we know that meteorological records are kept at many of them, and abstracts used to be given in their reports.

For these reasons we think it probable that if all local publications (irrespective of newspapers) which are issued annually and which contain meteorological data are to be catalogued, the number of entries would reach, or exceed, 200.

However, we give a few more, and we hope that this enquiry will continue (as it has begun) to lead to the discovery of some observers of whom we had not previously heard.

WEST SUSSEX.

In his annual report for 1897, Dr. Kelly, M.O.H. for the combined district of West Sussex, gives a few meteorological tables and remarks for Worthing, and monthly sunshine values for Westbourne and for Brighton.

SUFFOLK.

Lowestoft.—A summary entitled, "Meteorology of Lowestoft in 1896," by Mr. S. H. Miller, F.R.Met.S., F.R.A.S., was printed by the Corporation.

DEVONSHIRE.

Torquay.—A full annual report of about 30 pages, by Mr. A. Chandler, F.R.Met.S., Borough Meteorologist, was published in pamphlet form by the Corporation.

The "Fifteenth Report (third series) of the Committee on the Climate of Devon, edited by Alfred Chandler, F.R.Met.S., Honorary Secretary, reprinted from the Transactions of the Devonshire Association for the Advancement of Science, Literature and Art," giving full monthly results for 1896 for 17 stations, also was published separately.

Barnstaple Athenæum.—We have received copy of the tables for several months printed in the "North Devon Herald"; rainfall totals and max. fall at 19 stations, temperature extremes at 7 stations. Monthly rainfall tables are also printed in the "Devon and Exeter Gazette."

CORNWALL.

Newquay.—Dr. Hardwick, the local M.O.H., now appends to his annual report a summary of the work of the Urban District Council's Climatological Station.

GLOUCESTER.

Cheltenham.—An "Annual Report upon the Meteorology of Cheltenham," by Mr. Richard Tyrer, B.A., F.R.Met.S., Borough Meteorologist, appeared as an appendix to the annual report for 1897 of Dr. Garrett, M.O.H. for Cheltenham. Mr. Tyrer's report is also published separately as a broadsheet, printed in smaller type than the foregoing. He recently prepared for a local society an interesting paper on the climate of Cheltenham, which has probably by this time been published.

YORKSHIRE, WEST RIDING.

Bradford (The Exchange).—An elaborate tabular broadsheet is published annually by Messrs. McLandsborough and Johnson.

Reports of M.O.H.—These have already been mentioned, and it does not seem worth while to set out the list *in extenso*.

York (Phil. Soc.)—Mr. J. E. Clark says that he drew up the reports for 1896 and 1897, and the Secretary has promised to send us

copies of the Society's annual reports containing them. Mr. Clark's successor in the meteorological curatorship of the Society is the Rev. — Johnson.

MONMOUTH AND GLAMORGAN.

Marshfield.—We regret to hear that Dr. Evans has been obliged to discontinue the valuable reports which we mentioned. Our own set is, we regret, very incomplete, but we are glad to hear that there has been no interruption, and that the Society has succeeded in finding another volunteer to carry on Dr. Evans' work.

CARNARVONSHIRE.

At the end of the 1897 report of Dr. Fraser, M.O.H. for the combined sanitary district, appear some monthly climatological results for the year at Carnarvon and Llandudno.

ISLE OF MAN.

A valuable summary of all Manx meteorological observations, read by Mr. A. W. Moore, H.K., before the Manx Antiquarian Society, has been reprinted from the "Manx Sun" of April 30, 1898.

GUERNSEY.

Two 8vo papers, one upon "The Rainfall of Guernsey for the year 1897" at various stations, and the other upon "The Sunshine of Guernsey for the year 1897," by Mr. A. Collenette, F.C.S., have been reprinted from the "Transactions of the Guernsey Society of Natural Science" and circulated by the author.

ROXBURGH.

Hawick (Ladylaw).—A neat sheet of monthly results is published privately annually.

BUTE.

Rothesay.—A pamphlet entitled "Abstract of Meteorological Observations made at Barone Cottage, Rothesay, by James Kay," has been issued annually at least as far back as 1889 by the Archæological and Physical Society of Bute.

ARGYLL (MAINLAND).

Oban.—Some remarks on the climate, accompanied by a table containing meteorological averages for the 10 years 1887-96, are included in a 48 pp. pamphlet entitled, "Oban: a Health and Holiday Resort," by Dr. Baily, M.O.H.

DUBLIN.

Dublin (FitzWilliam Square).—Observations published in the "Dublin Journal of Medical Science."

ABSOLUTE DROUGHT IN JULY.

To the Editor of the Meteorological Magazine.

SIR,—An absolute drought has held here for 16 days. The rainfall on the 1st instant was $\cdot 21$ in., measured at 9 a.m. on the 2nd; since then no rain whatever has fallen till the 18th, $\cdot 05$ in. fell on that day and $\cdot 03$ in. on the 19th. Until the present one, there has been no absolute or partial drought since I commenced recording here in October, 1896.

JAMES WATKINS.

*13, Park Crescent, Southport, July 20th, 1898.**To the Editor of the Meteorological Magazine.*

SIR,—I fancy from what I hear from various correspondents that the drought here must be somewhat in excess of the average. My record for this month is:—

July 1	.....	in.	July 7	.....	in.	July 13	.....	in.
.....		$\cdot 03$	.....		—	.....		—
„ 2	.....	—	„ 8	.....	—	„ 14	.....	—
„ 3	.....	—	„ 9	.....	—	„ 15	.....	—
„ 4	.....	—	„ 10	.....	—	„ 16	.....	—
„ 5	.....	—	„ 11	.....	—	„ 17	.....	—
„ 6	.....	—	„ 12	.....	—	„ 18	.....	$\cdot 02$

and, in point of fact, the $\cdot 02$ in. which I record this morning all fell between 7 and 7.15 this day, though, according to our rules, it appears under the 18th.

Faithfully yours,

W. C. PLENDERLEATH.

Mamhead Rectory, Exeter, July 19th, 1898.

EVAPORATION AND TEMPERATURE.

WE have in a previous volume of the *Weather Review* explained how difficult, if not impossible, it must ever be to determine from ordinary observations of the evaporimeter the quantity of water added to the atmosphere daily by evaporation from the oceans, lakes and continents. One of the principal elements of uncertainty in determining *a priori* the quantity of evaporation from a given surface of water consists in our uncertainty as to the temperature of the surface water and the velocity of the wind at the surface. If the evaporation observations are made in a shallow tank of quiet water, we have then the still further difficulty of computing what the results would be on the surface of a flowing stream or lake of much greater depth. Professor Carpenter says:—

“It will be noticed that the evaporation from the tanks floating in the various lakes is much greater than that from the corresponding

tank on the grounds of the Agricultural College, which latter tank is of galvanized iron, 3 feet square and 3 feet deep, set in the ground at Fort Collins, so that its rim is flush with the surface of the ground. The elevation is 4,990 feet above the sea level, latitude $40^{\circ} 34'$, longitude 105° . The rain which falls into the tank is allowed for in accordance with the readings of a standard rain gauge near by.

"The excess of evaporation from the tanks floating in the lakes, over that from the tank sunk in the ground is partially, but not entirely, due to temperature. The tanks in the lakes are more freely exposed to the wind than the standard tank, and this would, therefore, make a great difference. The floating tanks are more or less agitated by the waves, and, consequently, the water surface exposed to the air is larger than the cross section of the tank. A film of water is also left on the metal side with every movement of the floating tanks, and this water is apt to be of a higher temperature than the water in the lake or in the tank, and evaporates more rapidly. This influence was noticed by Mr. Trimble, who suggested it as a cause of some of the excess of evaporation observed from the lakes. The effect may be considerable, but how much is uncertain. The wave action differs in the different lakes. As the waves also increase the area of the surface of the lakes, which is exposed to the wind, the resulting measurement in the tank is possibly closer to the loss from the lake than if the tank had been stationary. The effect of increase of surface was an increase of 33 per cent., as deduced from the observations by Aymard in 1849.

"Professor Carpenter gives the following estimate of evaporation from the surface of an open reservoir, at Fort Collins, as based on ten years of observations and corresponding, therefore, to the average cloudiness, windiness, and relative humidity of that location:—

	Evaporation, in inches.
January	1.5
February.....	2.0
March	3.5
April ..	5.0
May	6.5
June.....	8.0
July	9.5
August	8.5
September	6.5
October	4.5
November	2.5
December	1.5
Total	59.5 "

Special attention has been given by Professor Carpenter to the temperature of the water in the standard evaporation tank and also in the reservoirs and lakes. As regards the tank, temperatures were observed at 7 a.m. and 7 p.m. as also by self-recording maximum

and minimum thermometers, all near the surface. The mean of the 7 a.m. and 7 p.m. [one hundred and fifth meridian time] is less than the mean of the maximum and minimum by about $3^{\circ}\cdot 5$, and the latter is probably much closer to the true average. The difference is attributable to the fact that during the daytime the surface heats rapidly and the lower layers slowly, but during the night-time the whole mass cools more uniformly. On the average of ten years the surface temperature in the tank, namely, the average of the 7 a.m. and the 7 p.m., is as follows :—

April	49° 0
May	58·9
June	67·9
July	72·7
August	70·8
September.....	63·4
October.....	51·2
November.....	41·6

During the other months of the year the tank, of course, is frozen.

The temperature of the free water in Lake Lee, at the surface and at the bottom 6 feet below, as also the temperature of the water in a small tank floating at the surface of Lake Lee, was read every fifteen minutes on August 6th, 1896. Lake Lee is a small reservoir four miles from the college, shallow, exposed to the wind, and full of weeds that greatly hinder the formation of waves. The following is the temperature record :—

Time of Observation.	Clouds, tenths.	Wind.	Temperature of Water.		
			Tank.	Lake.	
				Surface.	Bottom.
9.00 a.m. ....	.....	.....	71° 0	70° 2	68° 8
9.30 „	Few	Lt. S.E.	72° 0	70° 7	68° 0
10.00 „	Few	E.	72° 0	71° 0	68° 0
10.30 „	1	Lt. S.E.	73° 7	72° 2	69° 0
11.00 „	2	Lt. S.E.	74° 0	73° 0	68° 5
11.30 „	3	Lt. S.E.	73° 2	72° 9	68° 5
12.00 noon.....	2	Lt. S.E.	74° 2	73° 2	69° 2
12.30 p.m.	2	Lt. S.E.	74° 4	74° 0	68° 8
1.00 „	4	Lt. S.E.	74° 0	73° 9	68° 3
1.30 „	7	Brisk N.	73° 8	73° 8	69° 1
2.00 „	4	Lt. S.	74° 9	74° 7	69° 8
2.30 „	2	W.	75° 5	76° 0	69° 5
3.00 „	1	S.E.	76° 6	77° 2	69° 3
3.30 „	2	S.E.	76° 2	76° 0	69° 0
4.00 „	1	S.E.	76° 0	76° 0	68° 8
4.30 „	3	None	76° 0	76° 2	69° 0
5.00 „ .....	.....	.....	75° 5	76° 8	68° 6

In reference to this table Professor Carpenter writes to the Editor as follows :—

“At different times we have carried on observations throughout the twenty-four hours on the evaporation tanks, measuring the temperature at the surface, and at one foot below the surface. One of the most marked results was that the average temperature, as determined by observations at twelve hours' interval, was less than the true average by several degrees. The increase in temperature during the day at the surface is quite rapid, and the surface temperature becomes much warmer than the water below the surface. On cooling, however, convective currents form, and the whole mass of water practically cools together.

“I had observations carried on at hourly intervals for several days, at the surface and 1 foot below, which showed this fact clearly. For the last three or four years I determined the average temperature from the maximum and minimum temperatures instead of from the observations at 12-hour intervals, as had been done before.”—*Abridged from the Monthly Weather Review, May, 1898.*

ROCKALL.

MR. MILLER CHRISTY, F.L.S., has long been deeply interested in this N.W. outpost of the British Isles ; so far away, about 300 miles W. of Scotland, and 260 miles N.W. of Donegal, and so small (only about 80 ft. across) that few persons know it, and no map can show its true size. Most persons regard St. Kilda as practically out of the world, 130 miles W. of Scotland, and severely beaten by Atlantic waves, but St. Kilda is not half way to Rockall ; St. Kilda is inhabited, and St. Kilda can be landed upon many days in a year. The August number of *The Scottish Geographical Magazine* gives the best history and account of Rockall that we have ever seen, with two excellent photos, maps, &c. ; in fact, Mr. Miller Christy has given a monograph which in every way redounds to his credit, and which we have read through and through with keen enjoyment.

Of course, in these pages we are concerned with it solely as a possible base on which to build a lighthouse and observatory. Mr. Christy quotes upon this subject the high authority of Dr. R. H. Scott, F.R.S. :—

“If a station on Rockall could possibly be established and maintained, its value to weather-telegraphy would be incalculable ; but [he adds] there are one or two fearful *ifs* :—

- “(1). *If* the place can be built upon ;
- “(2). *If* the communication by wire can be kept up ;
- “(3). *If* anyone will live there.”

Mr. Christy puts the cost of the cable alone at £35,000 to £40,000, and evidently considers that no building could be erected

on the rock, but we cannot see why the seas should be worse than at Skerryvore; and with a basalt needle about 2000 square feet in area sloping up to 70 ft. above sea level, we should have thought that once get the mortices cut in its upper face, it would be only a question of patience to build another Skerryvore, and at Skerryvore, unless we are mistaken, the builders had to begin almost at sea level, not with a rock from 20 ft. to 70 ft. above it. However, Skerryvore cost £87,000, and therefore with the telegraph cable there would be a capital expenditure of £125,000, which at 6% (to provide for redemption) would require £9000 a year, and there would be probably £3000 more for salaries and expenses, or £12,000 a year. This looks alarming, but we are inclined to agree with Mr. Christy that, "Without doubt, however, the time will come when this difficulty will be successfully overcome."

THE AMERICAN ASSOCIATION.

FROM *Science*, N.Y., of August 19th we see that the following papers are among those to be read at the Boston meeting. We hope that eventually we may be able to give some notice of them:—

Second Report on the Magnetic Survey of Maryland. By Professor L. A. Bauer, Cincinnati, Ohio.

Meteorology from a Mathematical and Physical Point of View. By Professor Cleveland Abbe, Weather Bureau, Washington, D.C.

Lightning Photographed on Moving Plates.

The Structure of Cyclones and Anticyclones.

Temperature and Vapor Gradients in the Atmosphere. By Professor F. H. Bigelow, Washington, D.C.

THUNDERSTORMS OF JULY AND AUGUST.

WE have not space here to treat of this subject fully—in fact, we mention it chiefly in the hope that someone with the necessary time may be induced to volunteer to collect and consider the facts and prepare a paper thereupon. We will gladly lend, or supply, copy of the data in our possession.

The first step will be to collect and reduce to a uniform scale all the records of barometric pressure over the S. of England which can be procured. We have seen several and their agreements and differences seem equally indicative that careful study will probably be fruitful. As it is the type of the curve on August 18th and the time of the occurrence of certain marked features in it which will be the leading characteristics to be determined, the fact of a curve being a tenth-of-an-inch too high or too low will be of no consequence, and therefore probably nearly every sheet from a recording aneroid for that week would be useful.

We are not here trying to give an account of the storms, but merely arrange in chronological sequence a few notes which appear to us important or suggestive.

JULY 22ND.

On the morning of the 23rd I measured 3·18 in. as the fall of the previous night.—REV. J. C. ROSS, *Wadworth Hall, Doncaster.*

AUGUST 6TH.

Heavy shower early, about 7 a.m.; in 8 minutes 0·27 in. fell. Between 1 and 2 p.m. on the same day we had 0·95 in. in 40 minutes.

MR. J. MATHESON, *Addington, Winslow, Bucks.*

The rainfall of the 6th as measured at 9 a.m. on 7th was—

At West Hill, 8 miles S. of Coventry	1·74 in.
„ Priory Row, Coventry	1·19 „
„ The Hospital, „	1·10 „
„ Stoke, 2 miles E. of Coventry	1·61 „
„ Coundon, 2½ miles N.W. of Coventry...	1·40 „

ALDERMAN GULSON, *Coventry.*

Steady R, with a little T, from about noon till 4 p.m.; total 0·50 in. Heavy R, with wind, 4.30 to 6.50 p.m., yielding 1·09 in.; total for the day 1·60 in.

C. B. MULLINS, Esq., *West Deyne, Uppingham.*

Wing Rectory, Oakham.—R 1·68 in.; little or no T.—REV. H. A. BOYS.

Duddington, Stamford.—R 1·22 in., with a little T.

F. COVENTRY, Esq., *Duddington.*

At 6 a.m. at *Aysgarth, Yorks*, the Ure was in the highest flood for 18 years.—J. EDMUND CLARK, Esq., B.A., B.Sc., *Croydon.*

AUGUST 14TH TO 20TH.

This week has been remarkable meteorologically. On Monday, the 15th, from about 9.30 to 10.30 p.m. a heavy thunderstorm occurred, and this left no indication on the barometric curve. On Thursday, the 18th, about 0 hr. 45 min. p.m., a very remarkable black cloud rose on the W. or N.W. horizon, and seemed to fill the landscape with darkness. The effects were very striking; white objects, such as white butterflies and the bellies of the martins and white cows, standing out in startling relief against the black mass. As this rose towards the zenith, a violent wind rose, blowing apparently from every direction, and raising the familiar whirls of dust and leaves. The birds appeared to be greatly alarmed by the condition of things, and flew in troops from bush to bush, as if hoping that each change of position would give them better shelter. At the same time, and as the cloud lifted, there appeared over the horizon a dull red streak of cloud, not so thick as the black cloud, but reminding one of what one has read of sand storms in the East. The cloud passed over without a drop of rain or any lightning. The passage of this storm was marked by a rapid rise and fall in the

barometer. Later in the afternoon—viz., about 4 p.m.—a thunder-storm came on, accompanied by rain, and continued with intermissions late into the evening, accompanied by rapid rises and falls of pressure. About 11 p.m. the wind rose to violence for a short time, accompanied by an almost perpendicular fall in the barometric curve. The comparison of Monday and Thursday in this week seems to afford a striking evidence of the difference between two kinds of storms—those accompanied with disturbances of pressure, and those without such accompaniment.

THE RT. HON. SIR G. FRY, *Failand House, Bristol.*

AUGUST 15TH-16TH.

Wing Rectory, Oakham.—Another great R; 1·80 in. here at 9 a.m. on 16th, and 1·06 in. at *Duddington*; much T and L, but not near.

REV. H. A. BOYS.

AUGUST 18TH.

Violent TS, with almost incessant L in early morning. It began about 1 a.m., and was worst between 2 and 4, with a gale from the S. My old (rather sheltered) gauge gave at 9 a.m. 2·35 in.; the new one gave 2·50 in. The 17th was *very hot*.

R. E. LONGFIELD, Esq., *Longueville, Mallow, co. Cork.*

Heavy TS, with much wind, 7 to 11 p.m.; road about 3 miles S. of *Street, Somersetshire*, much obstructed by fallen trees and branches.

J. EDMUND CLARK, Esq., B.A., B.Sc., *Croydon.*

AUGUST 19TH.

Sharp TS in *Leicester*; the storm began at 6.40 p.m., and in 20 minutes 1·00 in. fell, the total was 1·05 in. in 35 minutes.

E. G. MAWBAY, Esq., M.I.C.E. (Borough Engineer).

AUGUST 21st.

The sky was clear till afternoon, and the max. temp., 83°·2, occurred about 1 p.m. About 3 p.m. there were signs of an approaching TS, and about 6 p.m. thunder clouds with low rumbling were a few miles to S. or S.E. About sunset another storm was seen approaching from S.E. to S.W., and it was a very fine sight to behold the constant brilliance of the flashes, so constant and continuous that probably for three hours there must have been at least one per second! Apparently most of them moved horizontally, from cloud to cloud. The thunder was loud and continuous, and seemed almost perpetual. The centre passed over a little before 10 p.m., but I think no flash of any consequence was within a mile. It seemed as if there would be no accompanying rain, but for 40 mins., from 9.25 p.m., rain and then hail fell, yielding ·90 in.

H. SOUTHALL, Esq., *The Graig, Ross, Herefordshire.*

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

AUGUST.

ELEMENTS.	MONTHLY MEANS OR TOTALS.										ABSOLUTE READINGS.									
	Mean, 40 years.	Highest Month and Date.	Lowest Month and Date.	MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.				Mean of all Highest.	Mean of all Lowest.					
				Mean.	Highest Month.		Lowest Month.		Highest.	Lowest.										
					Value.	Date.	Value.	Date.		Value.	Date.									
Barometer (cor. & red.)	1 29.946	2 30.156 1869	3 29.720 1860	4 9 a.m. 9 p.m.	5 29.947 29.945	6 30.149 30.163	7 1869 1869	8 29.716 29.724	9 1860 1860	10 30.480 30.488	11 14th, 1864 27th, 1871	12 29.149 29.010	13 31st, 1876 31st, 1864	14 30.285 30.272	15 29.506 29.501					
(Dry Bulb.....)	61.3	65.6 1884	57.8 1885	9 a.m. 9 p.m.	62.8 59.7	67.4 64.4	1871 1884	59.4 56.1	1860 1885	84.3 76.3	18th, 1893 11th '84, 17th '93	45.2 47.0	3rd, 1865 2nd, 1867	71.6 68.1	54.8 52.0					
Max.	72.6	..	..	..	..	77.9	1871	66.6	1860	93.6	18th, 1893	58.5	18'60, 2'67 24 '68	84.0	62.7	
Min.	53.4	..	..	..	..	56.4	1893	49.0	1864	67.0	18th, 1858	38.2	27th, 1864	61.1	44.3	
Wet Bulb.....	57.4	60.0 1871	53.6 1885	9 a.m. 9 p.m.	58.1 56.6	61.3 59.1	1871 '80, '84	54.5 52.7	1885 1885	69.5 69.8	13th, 1870 14th, 1867	45.2 45.0	3rd, 1865 30th, 1869	65.5 64.0	51.0 49.0					
Solar Rad., black...	113.6	..	..	..	..	120.2	1873	105.4	1885	134.0	13th, 1870	62.9	12th, 1881	127.9	80.3	
Solar Rad., bright..	82.8	..	..	..	..	88.8	1893	77.2	1879	104.2	18th, 1893	60.5	17th, 1879	94.8	66.7	
Grass Minimum ...	49.8	..	..	..	..	53.8	1880	44.2	1866	65.0	7th, 1868	31.9	27th, 1864	58.6	39.5	
Soil, 1 foot	61.7	..	..	..	..	64.8	1876	58.7	1891	70.3	16th & 18th, '76	56.2	31st, 1890	65.0	58.8	
Cloud	5.6	7.4 1860	2.0 1871	9 a.m. 9 p.m.	6.0 5.2	8.0 7.2	1880 1860	2.0 2.0	1871 1871	10 10	Every year Every year	0 0	Various Every yr. but '61	10.0 10.0	0.3 0.0					
Rainfall	2.39	6.72 1878	.45 1880	9 a.m. 9 p.m.	1.00 1.39	2.85 3.87	1878 1878	.01 .10	1880 1871	1.10 1.41	28th, 1892 17th, 1887	.00 .00	Every year Every year	.44 .48	.00 .00					

Max. Rainfall in 24 hours, 1.71 in., 27th, 1892. Mean max. daily fall, .68 in.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1898.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London	59·1	18	25·1	13	47·9	33·8	34·8	82	92·1	22·6	1·46	10	6·8
Malta.....	74·4	26	45·4	3	64·1	51·1	50·3	82	145·4	38·9	1·35	9	4·9
Cape of Good Hope ...	95·6	12	46·7	8	76·1	57·7	57·3	80	...	...	1·11	4	3·4
Mauritius.....	84·7	4, 12	70·0	2	83·0	74·0	71·5	83	136·3	62·1	6·53	26	7·6
Calcutta	100·1	19	50·2	5	92·9	65·9	56·4	49	155·6	41·7	·00	0	0·8
Bombay	88·9	4	62·3	3	86·5	73·3	68·9	70	137·1	56·3	·00	0	0·6
Ceylon, Colombo ...	94·5	30	70·0	10	90·9	73·8	72·0	75	155·0	65·0	4·21	6	2·3
Melbourne.....	96·0	8	41·2	22	75·5	55·5	50·2	59	149·4	35·0	·37	4	3·7
Adelaide	100·4	8	49·6	22	82·9	58·6	49·4	49	160·8	36·8	·06	3	1·6
Sydney	83·8	2	55·6	16	76·3	64·1	60·5	70	146·4	43·1	1·29	14	5·4
Wellington	75·0	8	42·0	31	65·4	51·5	50·6	75	131·0	30·0	2·47	13	4·1
Auckland	73·0	7	47·0	27	69·2	54·9	53·5	74	137·0	43·0	3·02	11	4·4
Jamaica, Kingston.....	89·6	29	64·0	14c	85·7	67·4	64·6	72	...	...	1·31	2	2·2
Trinidad	89·0	2a	64·0	7, 22	85·9	69·5	69·0	76	168·0	60·0	2·10	11	...
Grenada.....	88·2	14b	70·0	17d	84·3	72·1	66·3	67	154·0	...	1·41	13	2·1
Toronto.....	61·7	19	9·0	1	44·4	29·0	30·8	77	72·5	6·0	2·40	11	5·7
New Brunswick, Fredericton	52·8	9, 13	1·0	4	44·4	20·4	21·8	60	...	...	2·27	11	4·2
Manitoba, Winnipeg }	40·2	7	21·5	22	27·3	4·7	...	...	...	...	2·56	13	6·0
British Columbia, Esquimalt	55·1	1	26·2	26	48·6	34·3	35·8	84	...	...	1·66	17	5·8

a—and 3, 21. b—and 28. c—and 15. d—and 22, 28, 29.

REMARKS.

MALTA.—Mean temp. 56°·4, or 0°·6 above average. Mean hourly velocity of wind 9·3 miles, or 1·7 below average. Mean sea temp. 61°·0. TSS on 6th, 11th and 23rd; L on 13th and 14th; H on 11th. J. F. DOBSON.

Mauritius.—Mean temp. of air equal to, dew point 1°·7 above, and rainfall 1·56 in. below, their respective averages. Mean hourly velocity of wind 9·7 miles or 0·3 below average; extremes, 25·8 on 21st, and 2·1 on 17th; prevailing direction E.S.E. to E. T on 10 days; L on 6 days. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·2, or 0°·3 above, of dew point 0°·8 below, and rainfall 73 in. below, their respective averages. Mean hourly velocity of wind 5·8 miles; prevailing direction W. to S.W. TSS on 7 days; L on 7th and 14th. H. O. BARNARD.

Adelaide.—An exceedingly clear, dry month, the mean amount of cloud being 24 per cent. below the average of 30 years. Mean temp. 0°·4 below, and rainfall 98 in. below, the average. C. TODD, F.R.S.

Sydney.—Temp. 1°·0 above, humidity 5·9 below, and rainfall 4·01 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine; light showers during the middle and end. Prevailing winds from N.W. and S.E., and frequently strong from the former quarter. Some very fine warm weather in the early part. Slight earth-shock on 10th. Temp. 3°·7 below, and rainfall 1·07 in. below, their respective averages. R. B. GORE.

Auckland.—Rainfall about 75 in. above the average of 31 years. Mean temp. 3° below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind in Kingston 1·7 miles. Rainfall for the month about the average, and for the three months a little over the average; the Island rainfall for the same periods being one-third, and two-thirds of the average. Hail at Appleton on the 4th. R. JOHNSTONE.

TRINIDAD.—Rainfall 23 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
AUGUST, 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..	1·08	XI.	Builth, Abergwesyn Vic.	7·60
II.	Dorking, Abinger Hall .	1·15	„	Rhayader, Nantgwillt ...	5·07
„	Birchington, Thor	1·47	„	Lake Vyrnwy	8·07
„	Hailsham	1·92	„	Corwen, Rhug	5·56
„	Ryde, Thornbrough	1·77	„	Criccieth, Talarvor	6·02
„	Emsworth, Redlands ...	1·31	„	I. of Man, Douglas	6·41
„	Alton, Ashdell	1·70	XII.	Stoneykirk, Ardwell Ho.	4·50
III.	Oxford, Magdalen Col..	1·61	„	New Galloway, Glenlee	6·68
„	Banbury, Bloxham	2·36	„	Moniaive, Maxwelton Ho.	5·49
„	Northampton, Sedgebrook	2·39	„	Lilliesleaf, Riddell	1·89
„	Duddington [Stamford].	2·97	XIII.	N. Esk Res. [Penicuik]	5·60
„	Alconbury	2·96	XIV.	Glasgow, Queen's Park..	4·77
„	Wisbech, Bank House...	2·92	XV.	Inverary, Newtown	6·89
IV.	Southend	·82	„	Ballachulish, Ardsheal...	8·28
„	Harlow, Sheering.....	1·45	„	Islay, Gruinart School...	2·71
„	Colchester, Lexden	1·11	XVI.	Dollar.....	5·04
„	Rendlesham Hall .....	...	„	Balquhidder, Stronvar...	6·91
„	Scole Rectory	1·58	„	Coupar Angus Station...	2·61
„	Swaffham	2·12	„	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	1·35	XVII.	Keith H.R.S.....	3·65
„	Bishop's Cannings	1·87	„	Forres H.R.S.	1·82
„	Blandford, Whatcombe .	1·27	XVIII.	Fearn, Lower Pitkerrie..	2·37
„	Ashburton, Holne Vic...	3·18	„	N. Uist, Loch Maddy ...	...
„	Okehampton, Oaklands.	4·31	„	Invergarry.....	2·54
„	Hartland Abbey	3·87	„	Aviemore H.R.S.	1·78
„	Lynton, Glenthorne ...	2·73	„	Loch Ness, Drumnadrochit	2·45
„	Probus, Lamellyn	2·82	XIX.	Invershin	3·05
„	Wellington, The Avenue	3·09	„	Durness	4·53
„	North Cadbury Rectory	1·58	„	Watten H.R.S.....	2·45
VI.	Clifton, Pembroke Road	3·46	XX.	Dunmanway, Coolkelure	8·94
„	Ross, The Graig	2·86	„	Cork, Wellesley Terrace	4·21
„	Wem, Clive Vicarage ...	3·91	„	Killarney, Woodlawn ..	5·23
„	Wolverhampton, Tettenhall	2·28	„	Caher, Duneske	6·88
„	Cheadle, The Heath Ho.	4·36	„	Ballingarry, Hazelfort...	5·00
„	Coventry, Priory Row ..	3·88	„	Limerick, Kilcornan ...	5·41
VII.	Grantham, Stainby	3·30	„	Broadford, Hurdlestown	6·36
„	Horncastle, Bucknall ...	2·39	„	Miltown Malbay	6·28
„	Worksop, Hodsock Priory	3·29	XXI.	Gorey, Courtown House	4·01
VIII.	Neston, Hinderton	4·10	„	Athlone, Twyford	5·80
„	Southport, Hesketh Park	5·14	„	Mullingar, Belvedere ...	6·05
„	Chatburn, Middlewood.	6·55	„	Longford, Currygrane...	4·52
IX.	Melmerby, Baldersby ...	2·64	XXII.	Woodlawn .....	...
„	Scarborough, Observat'y	2·85	„	Crossmolina, Enniscoe ...	4·89
„	Middleton, Mickleton ...	4·42	„	Collooney, Markree Obs.	4·15
X.	Haltwhistle, Unthank...	4·45	„	Ballinamore, Lawderdale	5·41
„	Bamburgh	1·75	XXIII.	Warrenpoint.....	4·71
„	Duddon Valley, Ulpha School	12·53	„	Seaforde.....	4·48
„	Keswick, The Bank	5·88	„	Belfast, Springfield .....	...
XI.	Llanfrechfa Grange	3·81	„	Bushmills, Dundarave..	5·27
„	Llandovery	6·10	„	Stewartstown	4·02
„	Castle Malgwyn	4·16	„	Killybegs	7·92
„	Brecknock, The Barracks	3·02	„	Horn Head	4·24

AUGUST, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which "0" or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		Max.		Min.					
				Depth	Date				Deg.	Date	Deg.	Date.	
		inches.	inches.	in.				Deg.	Date	Deg.	Date.	In shade.	On grass.
I.	London (Camden Square) ...	1·18	—	·70	·69	7	10	87·9	22	45·9	8	0	0
II.	Tenterden	1·66	—	·20	·98	7	8	85·0	14	46·0	29	0	0
	Hartley Wintney	1·07	—	...	·31	7	12	88·0	15	46·0	28	0	0
III.	Hitchin	1·39	—	·43	·51	15	12	86·0	22	42·0	7	0	...
	Winslow (Addington)	2·03	+	·06	1·14	6	12	85·0	22	43·0	8	0	0
IV.	Bury St. Edmunds (Westley) ..	1·80	—	·40	·51	7	14	79·0	14	47·0	7, 8	0	...
	Norwich (Brundall)	1·68	—	...	·47	6	12	86·0	13	44·2	29	0	0
V.	Winterbourne Steepleton ...	1·35	—	...	·34	6	14	81·0	15	41·0	9	0	0
"	Torquay (Cary Green) ...	2·10	—	...	1·00	18	13	78·9	16	48·2	9	0	0
"	Polapit Tamar [Launceston]..	3·22	+	·74	1·43	18	15	78·8	17	40·4	25	0	0
VI.	Stroud (Upfield)	2·97	+	·88	1·31	6	15	81·0	12 ^a	49·0	31	0	...
"	ChurchStretton (Woolstaston) ..	2·88	+	·12	·52	21	18	77·5	21	46·0	7, 29	0	0
"	Worcester (Diglis Lock)	2·34	+	·37	·66	6	17	...	...	...	...	...	...
VII.	Leicester (Rotherby Hall) ...	2·26	—	...	·99	6	15	83·0	13 ^b	41·0	8	0	0
"	Boston	3·62	+	1·50	1·67	6	14	86·0	14	42·0	2	0	...
"	Hesley Hall [Tickhill].....	3·55	+	1·39	1·47	3	14	85·0	12	44·0	24	0	...
VIII.	Manchester (Plymouth Grove) ..	6·00	+	2·91	1·04	8	20	83·0	21	44·0	24 ^f	0	0
IX.	Wetherby (Ribston Hall) ...	3·45	+	1·11	·77	3	14	...	...	...	...	...	...
"	Skipton (Arneliffe)	8·57	+	4·24	1·91	5	16	...	...	...	...	...	...
"	Hull (Pearson Park)	3·71	+	1·07	1·10	3	14	81·0	12	44·0	9, 29	0	0
X.	Newcastle (Town Moor)	1·78	—	·93	·33	5	12	...	...	...	...	...	...
"	Borrowdale (Seathwaite).....	19·65	+	11·20	4·79	26	17	...	...	...	...	...	...
XI.	Cardiff (Ely)	3·64	+	·03	·74	18	15	...	...	...	...	...	...
"	Haverfordwest	5·06	+	1·88	1·10	21	17	77·2	21	45·0	7	0	0
"	Aberystwith (Gogerddan) ...	7·40	—	...	2·20	3	15	82·0	21	...	...	...	...
"	Llandudno	4·92	+	2·56	·83	8	17	79·5	21	46·0	25	0	...
XII.	Cargen [Dumfries]	6·77	+	3·78	·96	5	16	79·4	12	40·0	7	0	...
XIII.	Edinburgh (Blacket Place)...	3·30	—	...	1·58	30	18	76·9	12	44·0	31	0	0
XIV.	Colmonell	4·52	—	...	·68	2	18	80·0	16	36·0	6	0	...
XV.	Tighnabruaich	6·75	—	...	1·24	9	18	69·0	22	44·0	8, 30	0	...
"	Mull (Quinish)	6·45	+	2·30	·86	30	22	...	...	...	...	...	...
XVI.	Loch Leven Sluices	3·70	+	·76	1·00	30	14	...	...	...	...	...	...
"	Dundee (Eastern Necropolis) ..	3·30	+	·73	·75	30	17	76·0	14	43·0	24	0	...
XVII.	Braemar	3·33	—	·00	·78	12	21	74·3	12	32·3	25	0	2
"	Aberdeen (Cranford)	2·95	—	...	·63	30	18	75·0	11	39·0	24	0	...
"	Cawdor (Budgate)	3·11	+	·86	·86	30	19	...	...	...	...	...	...
XVIII.	Strathconan [Beaully]	5·95	+	2·65	1·45	28	14	...	...	...	...	...	...
"	Glencarron Lodge	9·33	—	...	2·41	1	23	78·1	22	39·6	9	0	...
XIX.	Dunrobin .....	...	—	...	...	...	...	...	...	...	...	...	...
"	S. Ronaldshay (Roeberry) ...	5·17	+	2·61	1·30	27	20	68·0	13 ^c	44·0	30	0	...
XX.	Darrynane Abbey	4·42	—	...	·89	11	24	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	4·75	+	1·33	·89	12	19	73·0	2, 16	44·0	9	0	...
"	O'Brien's bridge (Ross)	6·00	—	...	·76	18	20	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	5·28	+	2·31	·77	25	20	...	...	...	...	...	...
"	Dublin (Fitz William Square) ..	3·46	+	·94	·99	25	18	75·4	5	47·2	9	0	0
XXII.	Ballinasloe	6·84	+	3·66	·93	9	22	69·0	17 ^d	48·0	31	0	...
"	Clifden (Kylemore)	8·67	—	...	1·95	9	19	...	...	...	...	...	...
XXIII.	Waringstown	4·39	+	1·28	·80	9	19	76·0	16 ^e	41·0	31	0	0
"	Londonderry (Creggan Res.) ..	4·23	+	·11	·69	30	24	...	...	...	...	...	...
"	Omagh (Edenfel)	5·28	+	1·79	·90	9	21	72·0	21	41·0	8	0	0

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

a—and 22. b—and 15. c—and 14. d—and 21, 25. e—and 21. f—and 28.

METEOROLOGICAL NOTES ON AUGUST, 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.

CAMDEN SQUARE.—In the 52 weeks ending September 3rd there was no week in which the rainfall reached a total of 1·00 in., while in the preceding year there were 9 weeks with a fall of more than 1·00 in.

TENTERDEN.—A splendid harvest month, but water was again much needed, for although the heavy R of the 7th was of great service, the slight showers of 18th and 27th to 29th were very little good. It was very hot from 11th to 22nd, the temp. on 8 days being over 80° or only 2 days less than in the hot Augusts of 1884 and 1893. Hardly any T. A good deal of wind in the first and last weeks. Duration of sunshine 249 hours. TS on 18th; T on 22nd. The rainfall of the past 16 months is only 27·05 in., or ten inches less than the average.

HARTLEY WINTNEY.—The great drought which had continued through June and July did not terminate in August, this being the driest August since 1886. A great wave of heat prevailed from 12th to 22nd, and rough S.W. winds from 27th to 29th. TSS on 15th and 18th, and L on 21st and 22nd. Ozone registered on 16 days. Great dearth of wild flowers. Rainfall of the first 8 months of the year 6·64 in. below the average.

HITCHIN.—In the 12 months ending August 31st, only 17·27 in. of R fell, against 30 inches in the same months in 1896-7. There has been only one hotter August since the record began in 1849.

ADDINGTON.—A very fine month. A sharp TS with very heavy R occurred on the 6th, and T and L, without R, on the 21st; T on 15th and 16th also. Foggy on 17th. Wasps were very plentiful, and did much injury to fruit.

BURY ST. EDMUNDS, WESTLEY.—The month was cold and wet till the 10th, after that date summer-like and very favourable for the harvest. T on 15th, 19th, 21st and 22nd.

NORWICH, BRUNDALL.—The bulk of the R fell during the week ending 10th. Harvest commenced on 16th, and was favoured with splendid weather, the crops being unusually good. There were great variations of temp.; the max. being above 80° on four days, while 86°·0 on 13th is the highest recorded since 1893. On the 7th the max. did not exceed 58°, but the min. exceeded 60° on 3 nights. Great darkness occurred at 4 p.m. on 6th, with T, L and H: L was seen on 21st, 22nd and 27th, and T heard on 22nd and 23rd. N.W. gale in early morning on 31st.

WINTERBOURNE STEEPLTON.—Another dry month, very similar to August, 1896, when the rainfall was 1·75 in. on 11 days. In June, July and August this year the fall amounted to only 2·65 in., and the shortness of R caused the corn crops to ripen all together. The total R for the first 8 months of the year is 13·61 in., while in 1896 only 12·87 in. fell, but in the September following 8·80 in. fell. The only TS was on the 18th, when vivid L and heavy T occurred, followed by heavy R for a short time between 2 and 3 p.m. L on 21st. Fog at night on 19th and early on 20th.

TORQUAY, CARY GREEN.—Rainfall for August ·68 in. below the average of 22 years, and for the first 8 months of the year 7·25 in. deficient. Mean temp. 63°·6, or 2°·2 above the average. Duration of sunshine 193 hours 35 mins., being 1 hour above the average; no sunless day.

POLAPIT TAMAR.—An average rainfall: a very heavy TS occurring on 18th, with vivid L and heavy showers from 10 a.m. till midnight. T and L on 15th and 21st; distant T on 17th. Thick fog on 1st.

STROUD, UPFIELD.—T and L from 8 p.m. to 11.30 p.m. on 15th; T, L and heavy storm to S. from 8 to 10.30 p.m. on 18th. A small TS about 6 p.m. and a heavy TS to E. at the same time on 21st.

WOOLSTASTON.—The first 9 days were wet and chilly; it then became very

warm and sultry and most favourable for harvest work. Mean temp. $60^{\circ}8$. A violent storm of T and L occurred from 7 p.m. on 21st to 2.30 a.m. on 22nd; the L was intensely vivid and almost continuous.

MANCHESTER, PLYMOUTH GROVE.—The wettest August for 31 years excepting 1891, when 6.13 in. of R fell. Mean temp. $61^{\circ}8$.

WALES.

HAVERFORDWEST.—Another wet August, but characterised by bright sunshine and uniform high day and night temp. R fell principally at night or before 11 a.m. and in the two TSS. The TS of 18th commenced between 2 and 3 a.m., with incessant T and L till 6 a.m., but no R. The storm recommenced at 8.30 a.m. and continued till noon, .50 in. of R falling in 15 mins. from 10.30 a.m. The two following days were fine and sultry. On 21st, at 1 p.m., there were violent gusts of wind, lurid haze, disturbed action of the clouds and sudden darkness; the storm burst at 2 p.m. with heavy R and inky blackness at 3 p.m. At 7.45 a grand storm commenced with a whirlwind, followed by every variety of L, with continuous T. The storm lasted till 10 p.m., but L was visible all night. No storm of similar magnitude has occurred since the great TS of July 19th, 1878. This, as an electrical display, was magnificent and grand but far less destructive, and the absence of H was extraordinary. Crops of every kind are plentiful, and harvest operations were carried on almost without a hitch.

GOGERDDAN.—On the 22nd occurred the most violent TS ever remembered, lasting for 8 hours.

LLANDUDNO.—T and L on 8th, 19th and 21st.

SCOTLAND.

EDINBURGH, BLACKET PLACE.—Temp. $1^{\circ}2$ above the average; pressure, rainfall, sunshine and humidity normal. TS with heavy R at 7.55 a.m. on 16th; TS with heavy R at 8.30 p.m. on 30th, when 1.42 in. of R fell in 4 hours; H on 28th. Solar halos on 9th and 15th.

COLMONELL.—R .42 in., and temp. $1^{\circ}6$, above the average of 22 years. T and L on 27th; T on 22nd.

TIGHNABRUACH.—Very nearly a repetition of August, 1897, the amount of R being only .16 in. in excess and the number of rainy days the same. Mean temp. $2^{\circ}3$ lower than in August, 1897.

S. RONALDSHAY, ROEBERRY.—A very wet month. Mean temp. $55^{\circ}1$, or $0^{\circ}9$ above the average of 8 years. A heavy TS occurred on the evening of the 12th.

IRELAND.

DARRYNANE ABBEY.—A rather wet month and the early part very hot. T and L from 8 p.m. on 17th to 4 a.m. on 18th; the longest and one of the heaviest thunderstorms for certainly 30 years. Summer TSS are very rare here.

WATERFORD, BROOK LODGE.—Very broken weather all the month, with heavy TSS on 19th and 21st, and gales from N.N.W. on 23rd and S.W. on 30th.

DUBLIN, FITZWILLIAM SQUARE.—Like August, 1897, this was a changeable, showery and windy, but warm month. Mean temp. $61^{\circ}4$ or $1^{\circ}7$ above the average. High winds were noted on 13 days, reaching the force of a gale on four. L on 7th, 15th and 21st; T on 21st. The temp. in shade reached 70° on 9 days. Solar halos were seen on 7th and 9th. The air was foggy on 19th to 21st and 26th.

BALLINASLOE.—L and T on 17th and 21st; L on 16th.

OMAGH, EDENFEL.—August was a much finer and pleasanter month than the record would seem to indicate. The rainfall was considerably above the average, but a large proportion fell at night, and there were many fine bright days with warm air, but without any of the fierce heat of the English stations. The grain harvest was earlier and better than the average, added to a promise of equal abundance in all green crops.