

Symons's Meteorological Magazine.

No. 463.

AUGUST.

VOL. XXXIX.

THE WETTEST PLACE IN WALES, With some Remarks on the Rainfall of the Year 1903.

By J. R. GETHIN-JONES, Deganwy, Llandudno.

ON looking at a good physical map of the country it is natural to expect that the wettest part of Wales would be found in the Snowdon district, and according to my investigations I find it to be on the eastern side of this mountain at 2500 feet elevation, near Glaslyn Lake. Although the records show, so far, that Snowdon will likely prove to be the wettest spot in the British Isles, I must, owing to the shortness of the period of investigation, apply the phrase, the "wettest spot," to Wales only for the present.

Having been born and lived all my life in Snowdonia, and always taken a deep interest in the physiography of my native surroundings, I saw in the great advancement of electrical science during recent years the possibility of utilizing the natural forces on the Snowdonian range. In order to get a proper idea of the amount of water available, I fixed rain gauges at several places on the range where I thought it would be most suitable to produce a cheap and large constant supply of power. There was another important point which always impressed me—viz., the desirability of knowing the actual rainfall in the heart of this interesting mountain, the surroundings and contour of which appeared exceptionally favourable to produce a high precipitation.

Having often read that certain places in Cumberland recorded the highest rainfall in the British Isles, being nearly double the highest recorded in Wales, and on comparing the surroundings and contour of Snowdon with those of Sca Fell and the Styne, in Cumberland, the more I studied the maps, the more convinced I became that the eastern side of Snowdon—called Cwm Llydaw—ought theoretically to prove as wet as The Styne. As I had previously observed at other places on the range that the greatest rainfall occurs between half-a-mile and a mile from the summit of the hills in line with the most prevalent moisture-bearing winds—the S.W.—on its sheltered side, I fixed a rain gauge of large capacity at a place in Cwm Llydaw called Glaslyn, situated one mile N.E. and 1000 feet below the

summit, in order to record the effect of the maximum condensation on the prevailing wind after passing the highest point.

On examining a good map, such as the one-inch Ordnance Map, it will also be seen that the cwm forming the eastern side of Snowdon is surrounded by ridges over 3000 feet in average height, in the form of a horse shoe, with the outlet or mouth facing the east, or the driest point. The contour of this cwm therefore acts as the sheltered side for the wind blowing from *all the wettest points*—viz., S. by W. to N. Thus the general effect of the condensed moisture, after passing over the ridges, meets in a focus at this cwm, accompanying rainstorms from all the wet points and all wind velocities except (according to my observations on the range) the very high velocities, during the prevalence of which the heaviest precipitation is carried forward a few miles beyond its base. The rule I always find at Snowdon and other places is, that the greater the wind velocity, the further away from the summit will the greatest precipitation take place; but as the frequency of rain with very high wind is small compared to the rest, the great bulk of the Snowdon condensation falls on its own slopes.

Besides the favourable contour of Cwm Llydaw, it will also be seen on the map that Snowdon is situated not only near the western sea coast with steep slopes, but that there are five comparatively low level valleys radiating from its base towards the sea and the wet points, along which the lower strata of the atmosphere is conveyed direct to its base under the most favourable conditions to retain moisture, and is then carried up *steep* slopes and over ridges 3000 ft. high, with the result that the maximum contained moisture is suddenly condensed or the sea level conditions suddenly changed to the discharging point by a vertical lift of 3000 feet and precipitated in a short horizontal distance, which in the case of Snowdon is in the nearest area contained within the surrounding ridges—viz., Cwm Llydaw.

Everybody is aware of the great prevalence of mist at Snowdon, the cause of which can be assumed to be the same as that of rainfall. According to my general observations on the range, I find that the yearly rainfall at different places coincides very remarkably with the height of the mist line—that is, the lower the average elevation of the mist line, the higher will be the average rainfall, and *vice versa*.

Regarding the rainfall at the “Wettest place in Wales” for such a wet year as 1903, I am sorry to state that, owing to my being laid up at the end of 1902, when the gauges should have been emptied in readiness for 1903, and only myself knowing where to find them on the ground, I am unable to give the actual measurement for more than seven months of the year—viz., from May 21st to the end of December; but with the seven months’ records and those of two other places in the vicinity where the conditions are most like those of Snowdon having a full year’s record—viz., Oakley, Blaenau Fes-

tiniog, and Tynddol, Dolwyddelen—I will try to give an estimate for the whole year at the wettest spot.

The Glaslyn gauge (supposed to represent the wettest spot at Snowdon) is situated on a flat piece of ground, covered mainly with grass, one mile N.E. of the summit, near Glaslyn Lake, at 2500 feet elevation. It is 5 inches in diameter, with a long neck and special form in the lower part, so as to hold a large quantity, about 130 inches; sunk well into the ground to prevent the water from freezing. About half-a-mile S.E. of this gauge and 1000 feet lower down, near Llydaw Lake, there is another gauge of similar form. The Glaslyn gauge was fixed on September 1st, 1898, and the amount of rainfall measured from it and the surrounding gauges during the same period was as follows:—

PERIODS.	SNOWDON.		Oakley. B. Festiniog 7 miles S.E. of Snowdon. 1100 ft.	Tynddol Dolwyddelen 5 miles E.S.E. of Snowdon. 600 feet.
	Glaslyn Gauge. 2500 feet.	Llydaw Gauge. 1450 feet.		
	inches.	inches.	inches.	inches.
From September 1st, 1898, to September 30th, 1899 = 13 successive months	217·33	193·36	109·69	119·42
Average per month.....	16·71	14·87	8·43	9·18
Average per 12 months	200·52	178·44	101·16	110·16
From March 1st, 1900, to De- cember 31st, 1901 = 22 suc- cessive months	365·80	331·00	170·29	189·90
Average per month.....	16·60	15·00	7·73	8·63
Average per 12 months	199·20	180·00	92·76	103·56
Result of the two periods = } 35 successive months	583·13	524·36	279·96	309·32
Average per month.....	16·16	14·98	8·0	8·83
Average per 12 months	199·92	179·76	96·0	106·0

It will be noticed that the first period covers one winter and one summer and the second period two summers and practically one winter. The other gauges on Snowdon are omitted owing to unavoidable gaps in the Glaslyn records.

Previous to 1902 the average annual rainfall at Oakley for a long period was about 94 inches, and at Tynddol about 100 inches. On this basis, the average at Glaslyn for a long period would therefore be about 190 inches a year.

The actual rainfall measured at Glaslyn and Llydaw for the seven months, May to December, 1903, was as follows:—

INTERVALS.	Glaslyn gauge. inches.	Llydaw gauge. inches.
From Sept. 30th, 1902, to May 21st, 1903	<i>Full, water emptied</i>	131·34
May 21st, 1903, to Sept. 8th, 1903	60·10	48·30
Sept. 9th, ,,	5·30	...
„ 11th, ,,	4·12	8·46
Oct. 23rd, ,,	30·20	26·60
Jan. 1st, 1904	44·20	37·10
Total for 7 months	143·90	120·46
Total for 15 months (Sept. 30, '02, to Jan. 1, '04)	300·00 (estimate)	251·80 (actual)
Equal for 12 months	240·00	200·40

The rainfall for the last three months of 1902 was about the average, but for the first five months of 1903 it was greatly above the average, so according to this, the total at Glaslyn for the twelve months of 1903 would be considerably above 240 inches.

According to the rainfall at Tynddol for the first 5 months of 1903—equal to 58·55 in.—and the 35 months Glaslyn ratio, the amount at Glaslyn for the same 5 months comes to 110 inches, which with the actual fall of 143·9 in. for the 7 months, makes 254 inches for the whole year at Glaslyn, and according to the same calculation and applying the ratio of Oakley, the total at Glaslyn for the year comes to 246 inches. Also, as the rainfall for 1903 was about 35 per cent. above the average on the whole range, and the average at Glaslyn for a long period is about 190 inches, the net result from the above different estimates gives the rainfall at the wettest spot in Wales for 1903 as at least 250 inches. If this figure is right it seems, as far as I know, to be above the highest ever previously recorded in the British Isles and in Europe. The previous highest was at The Styne, in Cumberland, being 243·98 in. in 1872.

During the autumn of last year I was fortunate to be at Cwm Llydaw, when I experienced very remarkable weather and took the opportunity during the most stormy time to watch the different phenomena.

During a heavy rainstorm, on August 14th, I measured the rate at which the rain fell as ·60 in. per hour, at Llydaw Lake, and higher up, at Glaslyn, as ·75 in. per hour. Considering that it was an ordinary cyclonic rain, this figure seems to be exceptionally high, also the raindrops appeared to me to be of larger size at Glaslyn than those lower down from the effect of their dropping on the lake and the bubbles left behind, giving an appearance as if the water was boiling, the sound from which—a high tone—could be heard quite distinct from that of the wind and the surrounding waterfalls.

When the wind blows over the ridges, the direction of it in the cwm below is very changeable; sometimes it would be quite calm, then sudden squalls, and forming whirlwinds, the track of which could be easily followed on the lakes, especially that of Llydaw; sometimes the parallel vertical rain columns could be seen travelling in reverse directions as if in a circle or following the contour of the cwm, and when the rain would be very thick and during the passing of the whirlwinds there was a tendency for the vertical columns to get closer and form a "solid" waterspout.

On September 9th I noticed that a waterspout had actually been formed during the previous night and burst on the steep slope below Llydaw Lake. It had excavated the ground in a semicircular form to a depth of about 3 feet—rock and boulder bottom—and measuring about 20 feet across, and had carried the material about a quarter of a mile down the hill side. Until lately, I had always been under the impression that such waterspouts were formed above the ridges or among the clouds, especially as the term "cloud-burst" implied something of that nature; but from my observations in Snowdonia, it seems to me that they are formed near the ground and always in the space *below* the ridges over which the wind blows at the time, being the sheltered side, and in places where the ground is in a concave form and the rain very thick; under these conditions, the raindrops are whirled round with the air and come in contact with each other forming a thin water column, and in further travelling through thick rain the whirling draws more rain in contact with the column and therefore grows larger in diameter and length until it has attained a size by which its weight overcomes that of the centrifugal power and then the whole water falls in line with the column, or following the vacuum created in dropping, which I find it *always* does, on a *single spot* a few yards in diameter, and does not burst or get spread about by the wind like a "solid" mass of water thrown out of a bucket during wind from a great height.

While treating on the wettest spot in Wales, and bearing in mind that the most rainy part of England has been so well explored, it seems to me a great pity that the real amount and the position of the highest rainfall in Scotland and Ireland is still unknown, so that it cannot be compared with that of England and Wales. Considering that so much interest is taken in ascertaining the extreme limit of certain things in nature—especially in our own country—and the cheapness and simplicity of work of this kind compared with other scientific explorations, I wish to suggest that something in the nature of a national scientific competition be undertaken by societies or individuals of each of the constituent nations, to ascertain how the countries stand in this matter, and find out the exact place where the greatest number of favourable physical features exist to produce the highest rainfall. It is quite possible that with further exploration in England and Wales, a spot could be found with a higher average than the present records show. Scotland is already

proud of possessing the highest mountain ; Ireland the largest lake ; England the largest river ; and, in my opinion, Wales the finest scenery. The claim of possessing the wettest spot is so far held by England ; but, as a Welshman, I feel with pleasure and am very confident—on scientific grounds—that with further time, Wales will be acknowledged to beat England by at least 20 inches a year. In regard to Ireland the position is rather peculiar. It is generally a wet country, yet one seldom hears of a rainfall exceeding 100 inches a year. Whatever view people take on Irish questions, I am sure that Ireland in this respect is not treated fairly, and it is a question that ought to be solved at once. There are several heights in Ireland over 3,000 ft., and some are situated on the very edge of the Atlantic, viz., Brandon Hill, Kerry, the surroundings of which, apart from its height, seem favourable to produce as high a rainfall as that of Snowdon and The Styne, with a good chance to claim the highest in the British Isles.

Regarding Scotland, the records at the summit of Ben Nevis are, and ought to be, very high ; but I cannot see how the real measurement of moisture at such a high elevation can be accurately gauged, as a large proportion of the moisture must fall in the form of dry snow, which during windy weather—so prevalent at the *summit*—must be mixed with the drifted snow-dust to a height above that of the rain gauge, and even the Observatory itself, and the drift must therefore be collected with the actual snowfall.

If the record at the summit of Ben Nevis represents the true amount of precipitation there—which is practically the same as that of The Styne—viz., about 170 inches, and as the recorded figures at the summit of Scafell, Great Gable and Great End are only half that of The Styne, with the latter place lying to the N. and on the sheltered side of these heights, it seems to me that the sheltered corrie lying to the north of Ben Nevis ought to record considerably over 300 inches, or that the present record at the summit does not represent the true figure. For this reason, I think the records of the wettest spots ought to be taken in the corries where the rainfall is likely to be not only higher, but also more accurately measured.

There are of course very many places in the Western Highlands possessing “points” favourable to the production of high rainfall, especially the Loch Coruisk Valley, Isle of Skye ; the conditions at this place, at the far end of the corrie, look almost ideal to produce the highest rainfall possible for this latitude. Considering the small expense, compared with other explorations, and the addition to our knowledge, to obtain such interesting facts about our own country, I venture to ask, is there not some Scotsman or Irishman who would take this matter in hand and co-operate with English and Welshmen to find out in a thorough and scientific manner which part of the United Kingdom can claim the notoriety of possessing the wettest spot ?

BRITISH RAINFALL, 1903.

WE cannot, of course, profess to give an impartial review of one of our own publications, but there is no reason why the issue of the annual volume* dealing with the rainfall of the British Isles should not be recorded in these pages. The volume now appears under its present title for the forty-third time, but it has grown from a slim pamphlet of 18 pp. to a solid bound book of 368 pp. illustrated with 10 plates and 8 maps and diagrams in the text. The first volume dealt with "about 500 stations," the latest with "nearly 4000." The volume is not published as early as we could wish. This is mainly because a few observers whose records we would be most reluctant to omit cannot be induced to send in their observations ending in December until the month of June. The results cannot be generalised and discussed until they have all been received, checked and compared; hence the delay.

The new volume contains several new features. The two special articles deal with the daily rainfall of June, 1903 (and especially with the three remarkable days from the 13th to the 15th), and with the three wettest years of British rainfall, viz., 1872, 1877 and 1903, of each of which there is a rainfall map. A new section on the duration of rainfall is introduced in Part I. In Part II., in addition to all the old features, there are sections dealing with rainy spells, *i.e.*, periods of more than fourteen consecutive rainy days; with the number of rainy days; and with the intensity of rainfall, classifying the number of daily falls of different amount. The section on monthly rainfall has been made more systematic, and the maps of the relation of the actual monthly rainfall to the average have been greatly improved. A special feature is made of maps of the distribution of rainfall on the wettest days of the year. The number of records dealt with is 3829, which is 193 more than in 1902.

WIRELESS TELEGRAPHY AND METEOROLOGY.

WE have great pleasure in recording the public-spirited enterprise of the *Daily Telegraph* in supplementing its usual weather reports by special telegrams from the Atlantic. In its issue of August 6th it states:—"We have arranged with the Marconi Wireless Telegraph Company and the Atlantic steamship companies to send us, from ships homeward bound, telegrams reporting the readings of barometer and thermometer, description of the weather, force of the wind and state of the sea, and from these data we believe it will become possible, in many cases, to give intimation of coming storms

* On the Distribution of Rain over the British Isles during the year 1903, as observed at nearly 4000 stations in Great Britain and Ireland. With articles upon various branches of Rainfall work. Compiled by Hugh Robert Mill. London: Edward Stanford, 1904.

that it would otherwise be absurd to attempt. . . . We assert, meanwhile, and every meteorologist will bear us out, that whatever may be the value of existing predictions, it will be doubled when the system we inaugurate to-day is fully developed. At present, ships at sea cannot send messages to the land over more than an average of one hundred miles. This arises simply from the want of sufficiently powerful transmitting apparatus, for the same ships can receive messages for over two thousand miles. Improved equipments are being installed and the time is not far distant when we shall be in receipt of wireless telegrams from mid-Atlantic, and when that day comes it will be rare that any great storm shall rush across these storm-swept islands of which we have not as full notice as can possibly be given."

We trust that the proprietors of the *Daily Telegraph* will not forget that these important telegrams from the Atlantic are of value only in connection with the information received daily by the Meteorological Office from the ordinary reporting stations and that it is at the Meteorological Office alone that they can be utilized and raised above the level of interesting items of information. If published in the newspaper without co-ordination, they will, we fear, prove no more valuable than the *New York Herald* storm warnings of years ago.

A HOT DAY IN AUGUST, 1904.

DURING the morning and afternoon of August 4th, the hottest day of 1904 up to August 15th, hourly readings were made of temperature and humidity on the Glaisher screen at Camden Square, with the following results:—

	Dry bulb.	Wet bulb.	Shade Max.	Relative Humidity.
9 a.m.	80·2	68·4	80·2	51
10 a.m.	84·8	70·2	84·8	44
11 a.m.	87·6	72·2	88·1	43
Noon ..	88·3	72·0	89·2	41
1 p.m.	90·1	73·0	90·2	39
2 p.m.	85·5	70·1	91·0	42
3 p.m.	82·2	69·0	91·0	47
4 p.m.	78·7	67·0	91·0	51
5 p.m.	74·0	66·2	91·0	63
9 p.m.	65·8	63·6	91·0	87

Heavy clouds gathered at about 3 p.m., and ·14 in. of rain fell between 5.30 and 7 p.m., with some distant thunder and lightning. It will be observed that the maximum temperature of 91°·0 occurred between 1 and 2 p.m. The minimum temperature of the preceding night was 59°·2, that of the succeeding night 61°·9. The duration of sunshine on the 4th was 7·5 hours, and the amount of evaporation from a freely exposed water-surface ·16 in.

THE YORKSHIRE THUNDERSTORM OF JULY 24th.

IN case you should not receive them from elsewhere, I venture to enclose the accounts published in the Huddersfield papers of the exceptional storm of Sunday evening last. My own station, about four miles from the centre of Huddersfield in a S.W. direction, was outside the worst of it, and there was nothing more than an ordinary heavy thunderstorm, except from 8.41 to 8.51 p.m. (for which see Note 4.) Mr. Woodhead, of Slaithwaite, (see newspaper report) is interested in meteorology and keeps a careful record, and he might be able to give you more information as he was in the thick of it. I enclose a few notes, however, which may be of interest.

CHARLES L. BROOK.

(1) Saturday, July 23rd.—Slight TSS all afternoon; heavy rain at Harewood Lodge from 11.56 a.m. to 0.15 p.m.; .28 in. in 19 min. Rainfall for 24 hours ending 9 a.m. on 24th: Harewood Lodge, .82 in.; Royd Edge (about) 1.00 in.

(2) Sunday, July 24th.—On this afternoon I several times noticed that currents of air were moving in two or three different directions at the same time; the upper current from S.S.W. faster than the lower and more intermittent currents, which were from N.E. to S.E. Little rain, however, fell till 7 p.m.

(3) At 7 p.m. commenced a prolonged and at times severe TS, which lasted till 11.30 p.m., during which time there fell at Harewood Lodge 1.19 in. and at Royd Edge .64 in. There was nothing exceptional here in the T and L, but I noticed that to the N. and N.E. some of the flashes were high up, of long duration, and reddish orange in colour; often only the glare from behind the lowest layer of clouds could be seen.

(4) The only really exceptional rainfall was from 8.41 p.m. to 8.51 p.m., when .53 in. fell in ten minutes. At 8.44 p.m. the wind rose very suddenly from the N.W. and blew with almost hurricane force for one or two minutes, during which time the downpour was so excessive that I have little doubt the rate of fall was double that mentioned above. The wind veered through N. to N.N.E. and it was quite calm before 9 p.m. This was the most sudden and severe squall I recollect and for a few moments I thought some of the trees would go. The barometer did not vary more than .005 during the squall.

(5) The only other rainfall I have recorded which exceeds this was on June 26th, 1895, when 1.13 in. fell in 25 minutes with large hailstones.

(6) Total Rainfall, 24 hours ending 9 a.m. on July 25th:—

Royd Edge85 in. (about). $\frac{2}{3}$ mile S.W. of Harewood Lodge.
Harewood Lodge 1.41 in.

Hudd. Cemetery 3.80 in. about 4 miles N.N.E. of Harewood Lodge.
Slaithwaite 3.97 in. about 3 miles N.W. of Harewood Lodge.

Harewood Lodge, Meltham, July 27th, 1904.

C. L. B.

THE very heavy rainfall on Sunday, July 24th, is, I think, worthy of record in your Magazine.

The total fall for the 24 hours commencing 9 a.m. on that day was 3·97 inches. A fairly heavy thunderstorm commenced about 6 p.m. with one or two very slight showers of rain. Suddenly at 8.10 p.m. it commenced to rain in torrents and continued exactly an hour; the amount of rain during the 60 minutes was 2·36 inches. There was a fine interval of 35 minutes, and then more heavy rain for 1 hour and 20 minutes, when I measured a further 1·33 inches.

JAS. WOODHEAD.

Inglewood, Slaithwaite, Huddersfield, 1st August, 1904.

RAINFALL OF JULY 23-27.

DR. MILL, in his interesting letter to *The Times* on the thunderstorm of July 25th of the present year says:—"Few years pass without the occurrence of such a storm in the S.E. of England between the 23rd and 27th of July." My own experience, extending over a period of 25 years, is, that there are no other consecutive five days in the whole year which yield a larger aggregate of rain, and this mainly owing to the prevalence of thunder. Since 1880 I have gauged on these five days an aggregate of 17·07 inches, rain falling on 68 days. This gives an average of ·25 inch per rainy day. The analysis of these 68 days on which rain was observed shows that there was a fall of 2·00 in. on one day; 1·00 in. on one day; ·50 in. and more on eight days; and ·25 in. and more on fifteen days. On the other 43 days the fall was inconsiderable. The amount gauged last year and this on these five days was almost identical, being 2·22 in. last year against 2·30 in. this year. Thunderstorms occurred on 25th in 1901; and on 27th in 1901 and 1904; and thunder was in evidence in several other years, though no actual storm passed over my station.

C. WIGAN HARVEY.

Throcking Rectory, Buntingford, Herts, August 1, 1904.

The following is the portion of the letter referred to above dealing with the storm of July 25th:—

"The prolonged period of dry weather terminated yesterday with a fine example of a summer thunderstorm. Few years pass without the occurrence of such a storm in the south-east of England between the 23rd and 27th of July; but our knowledge of the distribution of the accompanying heavy rain is still very unsatisfactory. The rainfall day terminating at 9 o'clock this morning brought a fall of 1·71 in. of rain in this locality. In the southern suburbs I hear that not one-third of this amount fell. Perhaps in some districts much more may have been precipitated.

"Speaking for Camden Square alone, yesterday was wetter than any day in last year, and the amount of rain has only been exceeded

in one day five times since the record began in 1858. Those occasions were—July 25, 1867, with 1·82 in.; April 10, 1878, with 2·56 in.; June 23, 1878, with 3·28 in.; December 26, 1886, with 1·82 in.; and July 25, 1901, with 2·85 in. It is a curious point that three out of these six occasions should happen to have been July 25.

“Several gentle showers during the forenoon and afternoon of yesterday yielded ·20 in.; the thunderstorm from 6.45 to 7.30 brought down ·99 in. (of which ·40 in. fell in ten minutes); between 9 and 11 p.m. ·50 in. fell, and a slight shower some time after midnight brought the total for the day up to 1·71 in.

“The capricious local distribution of such heavy rains makes it desirable that their occurrence in such a densely-peopled area as London should be closely studied, and at present this is impossible owing to the large tracts of town which are unprovided with a rain gauge.

HUGH ROBERT MILL.”

62, Camden Square, N.W., 26th July, 1904.

THE RAINFALL OF JULY 25th.

WE have received a large amount of correspondence on this subject, and could easily have filled this issue of the Magazine with letters from most parts of the country. The thunderstorm was a typical one—just the sort of storm that one expects to encounter towards the end of July; but it was in no way exceptionally severe. It is interesting to notice that while no case of rainfall exceeding 2·62 in. was reported, there are several instances of it being the heaviest fall experienced by observers. We quote a few of the more striking letters and refer to the Remarks on pp. 138–139 for others.

The following are the amounts for July 25th observed in London, the first name in each case is that of the Metropolitan Borough in which the station is situated :—

FULHAM	Edith Road, West Kensington.....	·80 in.
BATTERSEA	Battersea Park.....	·78 „
WOOLWICH	Court Road, Eltham	1·40 „
LAMBETH	Denmark Hill	·92 „
HAMPSTEAD	Burrard Road, West Hampstead...	2·24 „
ST. PANCRAS	Camden Square	1·71 „
POPLAR.....	Old Ford	1·13 „

It will interest you to know that the rainfall here from 1 p.m. on 25th to 10 a.m. on 26th was 2·45 in.; ·22 in. fell afterwards before the rain ceased. This is by far the heaviest rainfall I have ever recorded. Of the 2·45 in., ·53 in. fell in less than an hour during a thunderstorm.

HERTFORD.

Ragley Hall, Alcester, 27th July, 1904.

On the 25th of July we had 2·35 in. of rain in a thunderstorm, the largest amount I have registered since beginning in 1895. Unluckily I was on my holiday, and, as often happens, missed the opportunity of detailed observation of an extreme fall.

R. P. DANSEY.

Church Stretton, 2nd August, 1904.

It may, perhaps, interest you to know that the rainfall here on the 25th inst. was 2·13 in.; of this, 1·05 in. fell between 1 p.m. and 7 p.m. and the remainder during the night.

H. TRETHEWY.

Hatton Vicarage, Warwick, 27th July, 1904.

I registered 1·70 in. rain at 9 a.m. to-day. It all fell after 9 p.m. yesterday.

E. T. DOWSON.

Geldeston, Beccles, July 26th, 1904.

Heavy distant thunder and lightning to the E., N. and S. of us last evening from 6.15 to 9.30. The storm did not come over the village. Rain began to fall at 6.10; by 7 o'clock ·07 in. had fallen, by 9 o'clock ·42 in., and at 6.10 this morning 1·45 in. was registered for the 12 hours.

WILLIAM HALL.

Swerford, Oxford, 26th July, 1904.

The heavy rain measured on the morning of the 26th began at 4 p.m. of the 25th and was over before 8 a.m. of 26th, so fell in 16 hours. About an hour after commencement a sharp thunderstorm began, and lasted an hour or two in the closest proximity to this place; the interval between flash and clap being repeatedly almost nil. The total amount of rain was 1·41 in.

Heavy rain fell all around, but I think the amount here was in excess of most parts near.

E. HILL.

The Rectory, Cockfield, Bury St. Edmunds.

EXTREMES OF TEMPERATURE IN JULY.

THE following newspaper extract and letter present a contrast in temperature, rarely if ever recorded before in the British Isles:—

“A JULY FROST IN SUTHERLANDSHIRE. — A correspondent, writing from Thurso, on Tuesday, July 19th, says:—This morning the north coast of Sutherland was visited by the severest frost experienced for a great number of years. In many cases the potato crop is done. Along the Strathnaver settlement the frost was most severe. The potato crop there was cut down on the 28th June, and was only beginning to recover. This second attack, which is fully more severe than that of the 28th June, means complete ruin to the

potato crop there this season. The loss will be a severe one to the settlers."—*Scotsman*.

THE maximum shade temperature recorded here yesterday (Sunday, July 17th) was 91° F., as registered by a thermometer certified at Kew Observatory, and placed in a Stevenson-pattern screen. The day was exceptionally clear, with an almost entire absence of wind until after sunset, when a brisk N.E. breeze sprang up.

This is the highest temperature recorded here since July, 1900, when we had several days over 90° . The previous highest this year was $85\frac{1}{2}^{\circ}$ on Saturday, July 9th; and the absolute maximum reached since observations were started by me here in 1896, was 93° in June, 1897.

HAROLD E. FRIER.

Risegate, Hadley Road, New Barnet, July 18th, 1904.

The range of temperature between the Barnet maximum and the Strathnaver minimum must have exceeded sixty Fahrenheit degrees by a considerable amount, and although the two stations are separated by seven degrees of latitude, summer frosts are very rare phenomena indeed in the north of Scotland near sea-level.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

BALL LIGHTNING.

I HAVE been reading with much interest the correspondence respecting Ball Lightning in the *Meteorological Magazine*, and the note to the letter by Mr. D. W. Horner, induces me to write to you. As a child of about 12, I was in a house which was struck by lightning, and still distinctly remember seeing what appeared like a great ball of fire poised above my bird cages for a few seconds; my belief is that it was, as you say, the "subjective impression of some luminous phenomenon."

On that occasion the electricity behaved with its usual eccentricity, deserting the pipe down which it was travelling to make the circuit of a small box-room, where it twisted a wire bonnet into a strange shape, and riddled a cotton dress with small holes such as might be made with the glowing end of a match; it then returned to the pipe and travelled safely to the ground. I have always been puzzled to think why the large bird cages were spared and the small wire bonnet frame destroyed, neither being in the direct line of communication.

GERTRUDE ELLIOT.

Ardington House, Wantage, Berks, July 19th, 1904.

A WHIRLWIND.

IN the *Daily Mail* of June 29th, appeared accounts of two Whirlwinds, one at Willesden Green, the other near Bristol, occurring on June 28th. I was not myself at home on that day, but from three eye-witnesses, one of whom was the very best person in the parish to give a report of such a thing, I learn that on that same day, at about 3.30 p.m., a whirlwind crossed the paddock in front of my Rectory, belonging to me, and whisked up a lot of hay just ready for carrying, took it up to a great height (200 ft. I should infer), and then let it fall in the Churchyard and on the tower top, 72 ft. from ground, and on Cadbury House roof beyond the Church. From the quantity which I myself saw afterwards on the tower top, and on the tower staircase, and spread about the Churchyard, which it had littered badly, I should judge that there must have been a large quantity carried up by the wind—perhaps a ton. The course of the whirlwind was roughly from N.W. to S.E.

H. A. BOYS.

North Cadbury Rectory, Somerset, July 26th, 1904.

AN OLD SEVERE WINTER.

Is this cutting from the *Dorset County Chronicle*, of 25th Jan., 1838, of any interest to you?

JAMES CROSS.

Bailie House, Wimborne.

“POOLE, 24th Jan., 1838.—The weather we experienced for the fortnight ending on Saturday last was intensely cold. With many fluctuations, but generally increasing in intensity, the cold on Friday night was so excessive as hardly to have been paralleled in the recorded meteorology of the town. On Friday evening it was observed that large crystals of ice were spreading over the waters of the harbour, and on Saturday morning the whole of that vast body of tidal water comprised in the harbour was covered with a sheet of ice, varying from one to three inches in thickness. The freezing of this estuary of the sea, subject as it is to the motion of the tide, &c., has not before occurred for the last forty-nine years. Fortunately, a thaw commenced on the afternoon of Saturday, or a total interruption must have taken place in the navigation of the harbour. During the prevalence of the severe weather, immense numbers of wild fowl frequented the shores and neighbourhood of the harbour, and were shot in unprecedented quantities.

“CHRISTCHURCH.—Such was the intensity of the frost last week, that the Christchurch Serpentine, alias the Stour, bordering on this town, was so completely frozen as safely to admit a very large concourse of persons of the town and neighbourhood to assemble on the ice on Friday last. Beauty and fashion promenaded on one part of the river; whilst a party was playing a most animated game of cricket on a distant part.”

THE SEVEN MONTHS' RAINFALL OF 1904.

Aggregate Rainfall for January—July, 1904.

Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.	Stations.	Total Rain.	Per cent. of Aver.
	in.			in.			in.	
London	12·85	108	Arnccliffe	34·26	108	Braemar	14·58	85
Tenterden	15·18	110	Hull	12·83	101	Aberdeen	16·25	102
Hartley Wintney	15·07	116	Newcastle.....	13·77	104	Cawdor	11·65	74
Hitchin	13·41	111	Seathwaite ...	73·52	110	Glencarron	45·44	96
Winslow	13·93	113	Cardiff	26·20	137	Dunrobin	15·66	98
Westley	12·41	94	Haverfordwest	24·03	114	Killarney ...	31·48	113
Brundall	11·80	91	Gogerddan ...	22·83	106	Waterford ...	24·89	123
Alderbury	17·46	125	Llandudno ...	15·43	106	Broadford... ..	22·51	130
Ashburton	33·90	137	Dumfries	23·44	105	Carlow	19·33	110
Polapit Tamar ...	27·92	155	Lilliesleaf	18·94	121	Dublin	13·92	97
Stroud	17·47	123	Colmonell	21·31	97	Mullingar	21·32	111
Woolstaston	16·92	114	Glasgow	20·80	113	Ballinasloe ...	22·39	118
Boston	12·01	113	Inveraray	37·96	104	Clifden	49·89	122
Hesley Hall	12·99	121	Islay	26·64	119	Crossmolina ...	35·58	135
Derby	12·38	101	Mull	33·27	118	Seaforde	19·86	104
Bolton	18·46	81	Loch Leven ...	19·03	103	Londonderry..	21·14	101
Wetherby	16·51	132	Dundee	13·70	97	Omagh	24·75	123

The aggregate rainfall of the seven months is below the average of the ten years 1890-99 in the east and north-west of England, in the north and south-west of Scotland, and in the neighbourhood of Dublin. It considerably exceeds the average only in the south-west of England; and, bearing in mind the fact that the ten years yielding this average were dry years, it cannot be wrong to say that so far the British Isles have not had more than the average amount of rainfall during the year 1904.

The fineness of the summer months has been a pleasant contrast to the state of matters last year, and complaints, where complaints are heard, deal with droughts rather than floods. Taken as a whole, the rainfall of the British Isles for the first seven months of 1903 showed an excess of 37 per cent., and in 1904 of 9 per cent. above the ten years' average; or an excess of over 25 per cent. of the true average in 1903, and nothing in 1904.

Still, while the greater part of the country has been very much drier this year than last, several stations in the south-west of England and in Ireland have had more rain. The relatively driest part of the country has been the north-east of Scotland; the relatively wettest the peninsula of Devon and Cornwall.

RAINFALL AND TEMPERATURE, JULY, 1904.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables in <i>British Rainfall</i> to which each station belongs.]	RAINFALL.				Days on which 101 or more fell.	TEMPERATURE.						No. of Nights below 32°.	
		Total Fall.	Diff. from average, 1890-9.	Greatest in 24 hours.			Max.		Min.		Shade	Grass		
				Depth	Date.		Deg.	Date.	Deg.	Date.				
		inches	inches.	m.										
I.	London (Camden Square) ...	2·41	+ ·16	1·71	25	10	88·9	17	49·7	4	0	0	0	0
II.	Tenterden.....	2·16	— ·44	·69	30	8	86·0	17	50·0	2	0	0	0	0
	Hartley Wintney	2·06	— ·30	·47	2	9	86·0	17	48·0	1, 21	0	0	0	0
III.	Hitchin ..	3·78	+ 1·37	2·62	25	11	84·0	15	48·0	18	0	0	0	0
	Winslow (Addington)	2·74	+ ·27	1·47	25	12	84·0	10, 17	48·0	4, 8	0	0	0	0
IV.	Bury St. Edmunds (Westley) ..	2·51	— ·40	·59	27	10	86·0	17	47·0	19	0	0	0	0
	Brundall	1·85	— 1·02	·60	25	9	86·8	15	46·2	4	0	0	0	0
V.	Alderbury	2·27	— ·05	·60	25	11	82·0	10	46·0	1	0	0	0	0
	Winterborne Steepleton ..	3·87	...	1·12	29	13	80·8	17	45·8	9	0	0	0	0
	Torquay (Cary Green)	4·62	...	·85	26	16	77·9	17	50·1	4	0	0	0	0
	Polapit Tamar [Launceston] ..	5·73	+ 2·71	1·50	26	23	82·6	10	36·9	8	0	0	0	0
	Bath	2·45	...	·72	25	12	83·5	10	48·2	8	0	0	0	0
VI.	Stroud (Upfield)	3·46	+ ·85	·89	26	12	83·0	10	48·0	28	0	0	0	0
	Church Stretton (Wooltaston) ..	3·06	+ ·73	2·48	25	14	76·0	11, 19	61·0	2	0	0	0	0
	Bromsgrove (Stoke Reformatory) ..	2·49	+ ·70	1·65	25	10	81·0	9	41·0	1	0	0	0	0
VII.	Boston	3·05	+ ·93	1·00	24	10	87·0	9	45·0	2	0	0	0	0
	Bawtry (Hesley Hall)	3·60	+ 1·63	1·02	24	10	82·0	11	40·0	8, 19	0	0	0	0
	Derby (Midland Railway) ..	1·95	— ·36	·91	25	11	88·0	10	47·0	1, 7	0	0	0	0
VIII.	Bolton (The Park)	1·71	— 2·39	·40	4	16	78·4	11	44·4	8	0	0	0	0
IX.	Wetherby (Ribston Hall) ...	2·08	— ·21	·70	24	12	...	...	...	...	...	...	...	...
	Arncliffe Vicarage	2·40	— 2·63	·93	23	15	...	...	...	...	...	...	...	...
	Hull (Pearson Park)	3·35	+ 1·03	1·50	24	12	82·0	15	44·0	19	0	0	0	0
X.	Newcastle (Town Moor) ...	1·49	— 1·20	·32	25	14	...	...	...	...	...	...	...	...
	Borrowdale (Seathwaite) ..	8·51	— ·90	3·00	16	16	82·3	11	46·5	18	0	0	0	0
XI.	Cardiff (Ely)	5·12	+ 1·88	1·80	25	20	...	...	...	...	...	...	...	...
	Haverfordwest (High St.) ..	1·95	— 1·39	·32	30	19	83·6	10	40·2	8	0	0	0	0
	Aberystwith (Gogerddan) ..	2·61	— 1·01	·83	25	13	93·0	10, 11	35·0	29	0	0	0	0
	Llandudno	2·37	— ·21	·66	24	20	80·2	11	49·8	8	0	0	0	0
XII.	Cargen [Dumfries]	3·83	+ ·49	1·78	15	12	83·0	11	43·0	7	0	0	0	0
XIII.	Edinburgh (Royal Observatory) ..	1·19	...	·40	15	13	70·4	29	46·8	4	0	0	0	0
XIV.	Colmonell	3·20	— ·00	·70	14	13	82·0	11	41·0	17	0	0	0	0
XV.	Tighnabruaich	4·08	...	·79	14	18	70·0	11	40·0	16	0	0	0	0
	Mull (Quinish)	2·87	— 1·24	·83	14	19	...	...	...	...	...	...	...	...
XVI.	Loch Leven Sluices	2·02	— 1·05	·90	16	11	...	...	...	...	...	...	...	...
	Dundee (Eastern Necropolis) ..	1·15	— 1·21	·30	3, 15	11	75·8	13	44·0	4	0	0	0	0
XVII.	Braemar	1·73	— 1·04	·37	22	12	74·8	10	38·2	18	0	0	0	2
	Aberdeen (Cranford)	1·32	— 1·31	·60	2	10	71·0	8, 30	43·0	2	0	0	0	0
	Cawdor (Budgate)	·63	— 2·79	·27	20	9	...	...	...	...	...	...	...	...
XVIII.	Glencarron Lodge	2·38	— 4·52	·61	6	19	78·9	12	34·0	31	0	0	0	0
	Bendampf	3·16	— 2·33	·63	6	17	...	...	...	...	...	...	...	...
XIX.	Dunrobin Castle	1·14	— 1·56	·41	3	9	72·0	30	44·0	19	0	0	0	0
	Castletown	1·04	...	·26	2	14	76·0	31	40·0	19, 20	0	0	0	0
XX.	Killarney	5·10	+ ·68	·84	15	23	82·5	11	40·5	7	0	0	0	0
	Waterford (Brook Lodge) ..	3·83	+ ·45	·72	14	18	77·0	11	42·0	7	0	0	0	0
	Broadford (Hurdlestown) ...	4·11	+ 1·13	·56	19	23	77·0	11	42·0	6, 7	0	0	0	0
XXI.	Carlow (Browne's Hill)	3·34	+ ·39	·95	15	17	...	...	...	...	...	...	...	...
	Dublin (Fitz William Square) ..	1·09	— 1·49	·32	15	15	74·7	30	48·0	7	0	0	0	0
XXII.	Ballinasloe	3·78	+ ·51	·70	26	20	80·0	11	44·0	7, 16	0	0	0	0
	Clifden (Kylemore House) ..	8·85	+ 2·26	1·70	25	19	...	...	...	...	...	...	...	...
XXIII.	Seaforde	2·31	— ·88	·34	4, 28	17	76·0	9, 10	47·0	15	0	0	0	0
	Londonderry (Creggan Res.) ..	4·05	+ ·35	·52	19	21	...	...	...	...	...	...	...	...
	Omagh (Edenfel)	4·41	+ ·86	·72	19	22	80·0	11	45·0	15	0	0	0	0

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

SUPPLEMENTARY RAINFALL, JULY, 1904.

Div.	STATION.	Rain. inches	Div.	STATION.	Rain. inches
II.	Dorking, Abinger Hall	1.40	XI.	New Radnor, Ednol	2.75
„	Sheppey, Leysdown	1.15	„	Rhayader, Nantgwilt .....	...
„	Hailsham	1.26	„	Lake Vyrnwy	2.76
„	Crowborough	1.09	„	Ruthin, Plas Drâw	1.65
„	Ryde, Beldornie Tower	1.00	„	Criccieth, Talarvor	2.30
„	Emsworth, Redlands	2.12	„	Anglesey, Lligwy	1.86
„	Alton, Ashdell	1.26	„	Douglas, Woodville	2.31
„	Newbury, Welford Park	2.38	XII.	Stoneykirk, Ardwell House	4.08
III.	Harrow Weald	2.95	„	Dalry, Old Garroch	3.35
„	Oxford, Magdalen College	3.05	„	Langholm, Drove Road	5.34
„	Banbury, Bloxham	3.10	„	Moniaive, Maxwellton House	3.77
„	Pitsford, Sedgebrook	2.61	„	Lilliesleaf, Riddell	2.65
„	Huntingdon, Brampton	1.53	XIII.	N. Esk Reservoir [Penicuik]	2.80
„	Wisbech, Bank House	1.84	XIV.	Maybole, Knockdon Farm	1.77
IV.	Southend	2.74	„	Glasgow, Queen's Park	3.81
„	Colchester, Lexden	2.07	XV.	Inveraray, Newtown	4.11
„	Saffron Waldon, Newport	2.21	„	Ballachulish, Ardsheal	5.31
„	Rendlesham Hall	1.83	„	Campbeltown, Redknowe	3.09
„	Swaffham	2.91	„	Islay, Eallabus	3.77
„	Blakeney	3.37	XVI.	Dollar	2.36
V.	Bishop's Cannings	3.18	„	Balquhider, Stronvar	4.71
„	Ashburton, Druid House	5.04	„	Coupar Angus Station	2.28
„	Okehampton, Oaklands	3.88	„	Blair Atholl	1.77
„	Hartland Abbey	4.10	„	Montrose, Sunnyside	1.09
„	Lynmouth, Rock House	3.27	XVII.	Alford, Lynturk Manse	1.61
„	Probus, Lamellyn	5.25	„	Keith, H.R.S. .....	.86
„	Wellington, The Avenue	3.14	XVIII.	Fearn, Lower Pitkerrie	3.03
„	North Cadbury Rectory	3.80	„	S. Uist, Askernish	2.29
VI.	Clifton, Pembroke Road	4.40	„	Invergarry	2.18
„	Moreton-in-Marsh, Longboro'	3.09	„	Aviemore, Alvie Manse	1.04
„	Ross, The Graig	1.90	„	Loch Ness, Drumnadrochit .....	.87
„	Shifnal, Hatton Grange	1.72	XIX.	Invershin .....	.75
„	Wem Rectory	2.48	„	Altnaharra	1.47
„	Cheadle, The Heath House	2.31	„	Bettyhill	1.28
„	Coventry, Kingswood	2.32	„	Watten, H.R.S.	1.53
VII.	Market Overton	3.57	XX.	Cork, Wellesley Terrace	3.56
„	Market Rasen	3.37	„	Darrynane Abbey	5.27
„	Worksope, Hodsock Priory	2.23	„	Glenam [Clonmel]	4.37
VIII.	Neston, Hinderton	1.74	„	Ballingarry, Hazelfort	3.37
„	Southport, Hesketh Park	1.02	„	Miltown Malbay	6.68
„	Chatburn, Middlewood	1.81	XXI.	Gorey, Courtown House	2.56
„	Duddon Valley, Seathwaite Vic.	5.74	„	Moynalty, Westland	3.54
IX.	Langsett Moor, Up. Midhope	1.81	„	Athlone, Twyford	3.88
„	Baldersby	1.67	„	Mullingar, Belvedere	3.21
„	Scalby, Silverdale	1.66	XXII.	Woodlawn	3.47
„	Ingleby Greenhow	2.61	„	Westport, Murrisk Abbey	6.07
„	Middleton, Mickleton	2.29	„	Crossmolina, Enniscoe	5.60
X.	Beltingham	1.54	„	Collooney, Markree Obsy. ...	4.53
„	Bamburgh	1.15	XXIII.	Enniskillen, Portora	4.27
„	Keswick, The Bank	3.28	„	Warrenpoint	3.43
„	Melmerby Rectory	2.32	„	Banbridge, Milltown	2.96
XI.	Llanfrechfa Grange	4.85	„	Belfast, Springfield	3.75
„	Treherbert, Tyn-y-waun	5.67	„	Bushmills, Dundarave	2.61
„	Llandoverly, Tonn	3.27	„	Stewartstown	4.35
„	Castle Malgwyn	1.95	„	Killybegs	3.99
„	Llandefaelog-fach .....	...	„	Horn Head	3.19

METEOROLOGICAL NOTES ON JULY, 1904.

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

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—A fine, warm and sunny month, which would have been very deficient in R but for a fall of 1·71 in. on the evening of 25th, in the course of which during a severe TS ·61 in. of R fell in 20 minutes. The duration of sunshine 234·8 hours* and of R 20·8 hours. Mean temp. 66°·5 or 3°·2 above the average. Max. above 80° on 11 days.

TENTERDEN.—A glorious summer month. Duration of sunshine 293 hours 25 mins.† Temp. 75° or more on 17 days and on four over 80°. Several TSS, especially in the last week.

CROWBOROUGH.—Fine, dry and warm, with deficient R. TSS on 3rd, 12th and 30th. Mean temp. 62°·9.

HARTLEY WINTNEY.—A “mensis mirabilis.” The first three days were stormy, with R, followed by a spell of glorious summer weather till 25th; hot, dry and dusty. The closing days were showery, with absence of T, and beautiful nights. Ozone on 14 days with a mean of 2·1.

HITCHIN.—Since 1849 there had been only three hotter Julys. The fall of 2·62 in. on 25th was the heaviest in 24 hours since October, 1857.

ADDINGTON MANOR.—Little R until the end, but a heavy TS on 25th, when a large oak tree was struck by L.

PITSFORD.—A month of warmth and sunshine. R 1·00 in. below the average. Mean temp. 63°·8. T, L and heavy R on 25th.

COLCHESTER.—Very dry till 25th, accentuated by E. wind and great heat. Crops and all vegetation except large trees suffered much. On 25th there was a violent TS passing directly over this garden. From 5.55 to 6.6 $\frac{3}{4}$ p.m. ·37 in. of R fell; from 6.6 $\frac{3}{4}$ to 6.13, ·57 in., and from 6.13 to 6.20, ·38 in., making 1·32 in. in 25 minutes.

BURY ST. EDMUNDS.—Very hot and dry till 25th, after which 2·10 in. of R fell.

BRUNDALL.—Very hot, with mean temp. 3°·0 above the average. Severe storms of T and R during the last few days.

WINTERBOURNE STEEPLETON.—Temp. above the average, especially during the second fortnight. The R nearly all fell in the last week. T and L on 12th and 19th.

TORQUAY.—R 2·22 in. above the average, 4·18 in. falling from 22nd to 29th. Duration of sunshine 240·8 hours* or 5·2 hours above the average. Mean temp. 62°·8 or 1°·1 above the average. Mean amount of ozone 3·8.

NORTH CADBURY.—The first five days were cloudy, showery and cool, after which it was hot, dry and bright till 24th, then tremendous rains, excessive humidity and gloom turned a hitherto dry month into the wettest July in 8 years, and wetter than any month in 1903, except October.

CLIFTON.—Fine and hot with little exception till 22nd, when the weather broke up. TSS on 19th and 25th and torrential rains on 25th (1·22 in.) and 26th (1·18 in.), followed by daily R till the end, 3·32 in. falling in the last week.

ROSS.—The dry weather which had persisted from June 1st continued till July 21st, with the exception of a slight T shower on 19th. The Wye was unusually low and within an inch of record minimum height. From 22nd to 29th frequent refreshing showers occurred. The great heat from 6th to 25th enabled the later grass crops to be well secured and rapidly ripened grain crops.

WOOLSTASTON.—There was a very heavy TS on 25th lasting from 2.45 to 3.45 p.m., the R in the hour being 1·26 in. A tall Wellingtonia only 15 yards from the rectory was struck by L.

BOLTON.—The weather was highly favourable to agriculture. The duration

of sunshine was 151 hours 55 minutes,* or 1 hour above the average. The mean temp., $60^{\circ}\cdot9$, was $0^{\circ}\cdot6$ above the average, and the R was sufficient for steady growth owing to moisture in the soil. The hay crop was secured in excellent condition. T and L on 2nd and 12th; T on 23rd and 31st, and L on 24th.

SOUTHPORT.—Warm and very dry with large mean daily range of temp. and low humidity. Mean temp. $2^{\circ}\cdot1$ above the average. R $2\cdot13$ in. below the average of 32 years. Underground water low.

HULL.—Exceptionally warm throughout, with hot, dry periods, succeeded by copious rain, followed again by fine weather. T on 2nd and 23rd, and T and L on 25th and 30th.

LLANDOVERY.—Changeable, but fine on the whole. Several TSS occurred, and there was a very brilliant display of L on the night of 19th. Range of temp. on 7th 40° and on 8th 41° .

HAVERFORDWEST.—The finest and warmest July since 1900. Temp. reached 70° or more on 11 days. Distant TS on 12th. Duration of sunshine $226\cdot7$ hours.*

DOUGLAS.—On the whole a pleasant month. The first days were cold and unsummerlike, but the weather improved thereafter, although only 25 hours sunshine were recorded in the last week. A remarkably severe gale lasted some 50 hours, including 14th and 15th. TSS on 12th and 25th.

SCOTLAND.

CARGEN [DUMFRIES].—Grand hay weather, and corn and green crop prospects exceptionally good. More than half the R fell between midnight and 10 p.m. on 15th.

LILLIESLEAF.—R $\cdot35$ in. below the average. Heavy R on four days, but no T. Remarkably heavy growth of vegetation. Little sunshine.

MULL, QUINISH. Fine and warm. R always sufficient and never excessive.

COUPAR ANGUS.—Bright sunshine and blue sky were deficient, and a struggling sun through a hazy atmosphere predominated, with a small daily range of temp.

DRUMNADROCHIT.—The R was less than half the previous lowest in 18 years, and $2\cdot12$ in. below the average of that period. Vegetation suffered much from drought, and in some cases cattle had to be turned into cornfields for want of grass.

BETTYHILL.—With the exception of a little in the early part, there was scarcely any R, and crops and pasture were failing.

WATTEN.—Cloudy, fine and very dry, though with few sunny days.

CASTLETOWN.—The first part was warm and showery with westerly winds, and the latter warm and very dry, with light variable winds and cloudy and overcast skies.

IRELAND.

DARRYNANE ABBEY.—Wet, with some fine and hot intervals. R 34 per cent. above the average.

MILTOWN MALBAY.—Sultry and wet, with much T during the last fortnight. The heaviest R but one for 32 years. On the night of 25th $2\cdot85$ in. fell in 8 hours. Potato blight everywhere.

DUBLIN.—Warm and generally fine. The R was small but fell on 15 days, although more than half fell on 15th and 25th. TS on 19th.

MARKREE OBSERVATORY.—The first part was fine and dry, but from 19th heavy showers fell, and there were frequent TSS.

OMAGH.—Although the R was above the average, it fell so largely at night that, accompanied as it was by higher temp., it seemed much drier than July, 1903, which had smaller R. Fruit, both large and small, was quite phenomenal, and ordinary crops promised equal abundance. Little T or L.

* Campbell-Stokes.

† Jordan

Climatological Table for the British Empire, February, 1904

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	54·3	20	27·9	29	44·6	34·3	35·2	86	85·6	41·4	2·58	19	7·1
Malta	63·7	3	44·3	26	62·5	5·6	47·2	77	111·9	39·8	·89	6	3·7
Lagos, W. Africa	91·0	7, 16	68·0	25	87·6	74·0	73·2	71	139·5	63·0	1·17	2	2·7
Cape Town	96·8	3	54·4	7, 8	79·8	62·0	57·7	64	...	...	·09	2	3·2
Durban, Natal	95·4	7	61·4	1	84·4	67·7	...	...	151·5	...	8·77	18	4·7
Mauritius	89·9	22	70·4	3	85·7	73·2	71·3	78	152·8	66·0	4·92	22	7·5
Calcutta	90·4	28	47·0	2	82·9	59·1	56·8	62	145·8	40·4	2·58	2	0·9
Bombay	91·2	13	66·8	6	85·3	70·5	66·2	69	139·2	58·4	·00	0	1·7
Madras	87·0	29	61·2	1	84·4	66·7	66·6	76	138·7	56·4	·00	0	2·1
Kodaikanal	71·1	15	42·6	27	64·7	46·6	37·8	53	135·1	23·4	·15	3	3·0
Colombo, Ceylon	92·7	25	65·0	3, 4	87·9	70·9	69·3	76	152·7	59·2	2·03	4	3·2
Hongkong	73·5	21	52·5	9	68·1	58·5	52·7	69	127·6	...	·20	3	3·7
Melbourne	96·7	18	49·0	29	73·7	56·8	54·4	73	153·2	41·8	6·24	10	6·3
Adelaide	104·0	17	52·0	28	81·4	61·5	51·3	51	153·6	47·2	·27	6	4·9
Coolgardie	107·5	3	48·2	25	88·6	60·1	48·5	40	180·5	44·0	·00	0	1·4
Sydney	84·2	...	52·5	...	76·1	63·3	59·2	69	126·9	43·1	3·95	15	5·6
Wellington	80·4	10	47·3	20	70·9	55·6	51·9	67	132·0	42·0	2·26	7	5·9
Auckland	79·5	18	53·0	20	72·6	59·7	57·2	74	147·0	48·0	3·71	9	4·5
Jamaica, Negril Point.	88·5	19	64·3	28	84·3	68·1	68·6	79	...	...	4·50	9	...
Trinidad	87·0	sevl	61·0	24a	84·6	65·7	69·3	83	167·0	58·0	2·56	16	...
Grenada	84·8	26	68·4	22	80·9	71·1	68·6	75	150·4	...	3·33	19	2·9
Toronto	42·0	28	-10·5	16	22·3	4·3	13·5	85	88·0	-18·0	3·00	12	5·5
Fredericton	49·8	22	35·0	6	22·9	-0·2	4·7	61	...	...	2·79	13	5·1
Winnipeg	36·0	27	-35·8	9	3·2	-18·9	...	...	...	...	·71	6	4·0
Victoria, B.C.	49·3	21	24·5	8	43·3	35·5	...	...	...	...	3·93	22	8·2
Dawson	-3·0	1	-48·0	4	-17·8	-31·7	...	...	...	...	·36	5	3·8

a and 25, 26.

MALTA.—Mean temp. of air 56°·6 or 2°·5 above, mean hourly velocity of wind 13·8 or 2·1 above, averages. Mean temp. of sea 59°·9.

MAURITIUS.—Mean temp. of air 0°·2, dew point 0°·4 above, and R 2·03 in. below, averages. Mean hourly velocity of wind 9·5 miles, or 1·5 mile below average.

KODAIKANAL.—Mean temp. of air 53°·9. Mean velocity of wind 329 miles per day. Bright sunshine 239·3 hours.

CEYLON, COLOMBO.—Mean temp. of air 79°·0 or 1°·3 below, dew point 1°·2 below, and R ·02 in. below, averages. Mean hourly velocity of wind 9 miles; prevailing direction N.

HONGKONG.—Mean temp. of air 62°·6. Bright sunshine 207·5 hours. Mean hourly velocity of wind 13·9 miles; mean direction E.

ADELAIDE.—Mean temp. of air 2°·6 below, and R ·35 in. below, normal.

SYDNEY.—Mean temp. of air 1°·3, humidity 3·5, and R ·93 in. below, averages.

WELLINGTON.—Mean temp. 1°·9 above, and R ·38 in. above, averages; prevailing winds, N. and N.W.

TRINIDAD.—R ·91 in. above the 40 years' average.