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HEAVY FALLS OF RAIN IN JULY, 1903.

A REMARKABLY wet July following a remarkably wet June has made it quite clear that the year 1903 is to have a rainfall much above the average in the south of England at least. As in June so in July, the heavy rain has not been accompanied by thunderstorms of remarkable severity, though electrical disturbances have not been absent. The most striking features of the July rainfall have perhaps been the very high falls which occurred in the north of Kent on Thursday, the 23rd, and the heavy rain in London on the early morning of Sunday, the 26th, when several of the newspaper offices were flooded and the printing of the Sunday papers stopped.

The monthly falls, with the difference from the average as well as the aggregate excesses of rainfall for the year, will be found set forth in detail in the Tables. We may mention that at Camden Square there were five days with a rainfall exceeding one inch between June 13th and July 23rd, and in only one previous year, in 1878, has so great a number of rainfall days with falls of one inch or over been recorded. Between June 13th and July 25th there were no less than seven days with a rainfall exceeding three-quarters of an inch, and by July 31st the rainfall from January 1st amounted to 22·04 in., whereas in 1902 the total fall for the year was 20·84 in., and the average yearly fall for the ten years, 1890-99, was 22·78 in. Since the Camden record commenced in 1858 there has been no previous instance of two consecutive months with over 5 inches of rain each, nor of so great a fall as 11·63 in. in any two consecutive months.

As regards the exceptionally heavy falls, we cannot do better than let our correspondents speak for themselves. The first of the following letters refers to the 19th; all the others to the 23rd.

To the Editor of Symons's Meteorological Magazine.

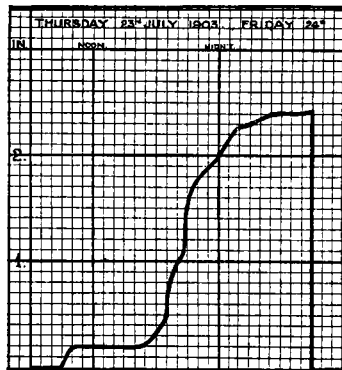
As a regular yearly correspondent of yours in the matter of rainfall, I think it will be of interest to you if I send a report of the most remarkable storm I ever witnessed in England. Dense masses of clouds appeared to come from all sides at 4.30 p.m. on July 19th. The storm began, the lightning was almost continuous, and in 30 minutes, when there was a lull in the storm, I measured 1·68 in. of rain; within a quarter of an hour it began again, and in a little over

half-an-hour a further fall of 1·53 in. The storm then passed away towards the S.E. Altogether 3·21 inches of rain fell in about one hour and a half. Several trees were struck, and I had two heifers killed and one injured by the lightning not far from my house ; they were under a tree that was struck.

J. G. WOOD.

*Shaldon Manor, Alton, Hants,
20th July, 1903.*

The heaviest rainfall which has occurred on the summit of Crowborough Hill since the commencement of my residence there at the end of the year 1889 is recorded on the enclosed copy of my rain gauge diagram. The fall commenced at 9 o'clock on Thursday morning, 23rd July, when two-tenths of an inch fell in one hour ; then there was a cessation from 10 o'clock a.m. till 5 o'clock p.m., when the rain recommenced, and fell continuously till 5 o'clock a.m. on Friday, the 24th, by which time 2·25 inches additional rain had fallen, thus showing that 2·45 inches had fallen in 14 hours.



Each vertical line represents one hour,
each horizontal line '10 in.

ISAAC ROBERTS.

*Starfield, Crowborough,
27th July.*

On the morning of the 24th my gauge measured 2·48 in., 13½ hours rain. We had neither thunder nor wind ; the heavy black clouds seemed to pass from east to west. This is a record for

J. MASSON.

*Tottingworth Park, Heathfield, Sussex,
July 26th, 1903.*

I registered no less than 2·79 in. this morning, which fell in 17 hours. So far as I know, this is unprecedented for this locality.

C. E. JONES.

*9, Manor Terrace, Lea Bridge Road, Leyton, E.
July 24th, 1903.*

The rainfall here for 24 hours ending 10 a.m. July 24th, has been 2·85 in., the result of heavy showers in the morning and 15 hours continuous rain, from 4.30 p.m. July 23rd to 7.30 a.m. July 24th. I thought the amount sufficiently remarkable to notify to you.

M. BOARDMAN.

*Glen Andred, Groombridge, Sussex,
July 24th.*

I registered this morning at 9 a.m. **2·89** in. Rain began about 4 p.m., and at 7 p.m. 0·25 in. had fallen. A tropical rain fell from about 7.30 to 9.30, and heavy rain till daylight. Rain ceased about 8.30 a.m.

FREDERICK WILKIN.

Lower Cowsley Wood, Sussex, 24th July, 1903.

The rainfall, as measured by myself here, for 24 hours ending 9 a.m., 24th inst., was **3·02** in. Rain started at 6.45 p.m., 23rd, but only fell in any quantity after 7.15 p.m.

Measurements were at		
23rd.....	7.15 p.m.	·01 in.
	8.15 p.m.	·53 „
	9.15 p.m.	1·04 „
	10.15 p.m.	1·49 „
24th.....	9 a.m.	3·02 „

The rain ceased practically on the stroke of 9 a.m.

F. W. FREIR.

Bylock Hall, Ponders End, Middlesex, July 25th, 1903.

I have to inform you that the rainfall for 24 hours ending 9 a.m. this day, amounted to no less than **3·11** in. The rain overflowed the receiver (which holds 2·90 in.) into the large cylinder. The rain occurred from 10 a.m. till noon, and from 5 p.m. to 6.30 a.m. on 24th.

I. C. STENNING.

Steel Cross House, Tunbridge Wells, 24th July, 1903.

I registered **3·38** in. of rain here for the period 5.40 p.m. on 23rd to 8 a.m. on 24th. As a rule our rainfall is small on board the ship. On this occasion it came down in torrents. I had been in town and coming back, just on this side of Dartford, the embankment had washed down and blocked the lines; they managed, however, to clear one line, over which all trains, up and down, had to pass slowly.

D. WILSON-BARKER.

H.M.S. Worcester, off Greenhithe, Kent, July 24th, 1903.

The amount of rain measured at 9 a.m. to-day (July 24th) for the preceding 24 hours totalled **3·42** inches. This amount is almost unprecedented so far as London and its neighbourhood are concerned, the nearest approach, as far as I have been able to ascertain, being 3·28 in. at Camden Square on 23rd June, 1878. The fall of rain was heaviest from 6.30 to 10.30 p.m. on July 23rd, during which time the amount was 2·31 inches.—At Greenwich Observatory (distant $\frac{3}{4}$ mile W.N.W.) the total fall was **3·15** inches. There was some thunder and lightning between 7.15 and 7.45 p.m. on the 23rd.

H. K. G. ROGERS.

13, Eastcombe Villas, Blackheath, S.E., 24th July, 1903.

We are surprised to see so little in the papers about the heavy rainfall we measured in this district on Thursday. You may be interested to know that we had **3·28** in. My brother, living three miles off (nearer Gravesend) measured **3·75** in., and a friend at Thorney, near Gravesend, **3·84** in. In our own case, ·53 in. fell between 11 a.m. and 1.30 p.m. We had a fine afternoon, but it began to rain again at 6 p.m. and kept up a continual downpour until about 9 a.m. on Friday. We only measured ·02 in. for Friday. I believe they had between 2 and 3 inches at Frindsbury. Thunder was heard on Thursday morning, but very distant.

FRANCES PYE.

*Knight's Place, Rochester,
July 25th, 1903.*

This morning at 9 o'clock I measured the exceptional amount of **3·94** inches of rain, being the quantity for previous 24 hours. The greater portion fell between 6.30 and 9 p.m., but I believe that it rained all night and was raining slightly at 9 o'clock this morning. There was a little thunder last evening. I may say that I measured *most* carefully (twice), taking all precautions to avoid error. My gauge holds $4\frac{1}{2}$ inches.

LIONEL BURRELL.

*Westley, Sidcup,
July 24th, 1903.*

[Dr. Burrell is to be congratulated on his prudence in having a gauge large enough to contain so exceptional a fall. Another observer at Sidcup spoiled his record for the year and lost the satisfaction of noting a great fall, by having so small a receiver that his gauge overflowed with 2·50 in., an amount which any summer thunderstorm might deposit in an hour.]-Ed. *S.M.M.*

SCOTTISH METEOROLOGICAL SOCIETY.

THE Half-yearly General Meeting of the Society was held in the Hall of the Royal Scottish Society of Arts, 117, George Street, Edinburgh, on July 18th, Lord MacLaren, Vice-President, in the chair.

The report of the Council, which indicated that the affairs of the Society were in a satisfactory condition, was adopted.

Dr. Buchan read a paper on "The Rainfall of Scotland in relation to Sunspots." A set of eleven maps was exhibited, showing the variations for each of 144 Scottish stations most of which had practically continuous records from 1855 to 1898, that is for four eleven-year sunspot periods. The amounts for each station for the years 1855, '66, '77, '88 were grouped together, those for 1856, '67, '78, '89, and so on. Each of these eleven groups of four years was averaged, and the deviations of each from the 44-years' mean were entered as percentages on the corresponding maps. The broad results were of

a striking character, the year following that of sunspot maximum being a year of decided rainfall excess, whilst there was a tendency to a secondary maximum about the time of sunspot minimum. The different stations all over the country confirmed one another in a remarkable manner, but this variation was more pronounced for places on the west coast than for places on the east. Combining and averaging the results for all the stations dealt with, the following curve for "all Scotland" was obtained :—

Year of cycle	i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.
Per centage under											
or above average	-3	-2	-5	-4	-3	+4	+7	+7	+1	-1	—
of 42·6 inches ...											

The time of rainfall maximum corresponded to a period of excess of winds with a westerly component.

The results presented referred to Scotland only. An examination, for instance, of the rainfall of the south-eastern counties of England showed that there the curve was inverted, the principal maximum occurring at the time at which the secondary maximum occurred in Scotland. The curves for the different countries of the world must be studied in relation to the varying meteorological conditions of different regions.

Lord MacLaren made some remarks on the nature of sunspots. The double maximum suggested that two influences were in operation. Perhaps there was a double variation, one of rainfall intensity and one of rainfall frequency. Sir John Murray emphasized the cumulative effect of the causes at work by which the year of rainfall maximum was deferred till the year following that of maximum sunspots.

Mr. R. T. Omond, the hon. secretary, followed with a paper on "The Location of Rainfall Stations in Scotland." From the scientific point of view it was desirable to know with equal accuracy the amount of rain that fell on each small portion of the country ; but a map on which were entered all places from which records were available showed lamentable blanks in most of the mountainous or thinly populated districts. The Council, therefore, appealed to members to aid them in an endeavour to secure additional rainfall observers, especially in the Southern Uplands, the Western Highlands and the extreme North.

OBSERVING THE FALL OF A METEORITE.

REFERRING to a note in our February number, stating that meteoric stones had been seen to fall only four times in the British Isles, the Rev. W. C. Plenderleath, of Mamhead Rectory, writes stating that he had heard of another case, and sending an account of it written by the lady who saw the phenomenon. In the absence of a mineral-

ogical examination of the stone it is impossible to say positively that it was a meteorite and not a piece of ironstone struck by the flash of lightning which fused the sand. The description runs :—

“ With pleasure I write all I remember of the incident referred to in Mr. Plenderleath’s letter, and I will make it as clear as I can. In 1887 (I think early in August) there was a very heavy thunderstorm at Harrogate, and in the surrounding districts. We were then living at Starbeck, a hamlet between Harrogate and Knaresborough. I was watching the storm from the drawing-room window, when suddenly (simultaneously with a sharp, cracking clap of thunder, immediately overhead) I saw a bright white light fall, in a flash of lightning. As it touched the earth I heard a loud fizz—like an enormous match being struck. When the rain ceased I went to the spot where it fell, in a meadow, at the bottom of the garden, about 50 yards distant. I saw a disturbance in the ground, and on digging at a little below the surface, I found a hard, heavy substance, about the size of a guinea-fowl’s egg, surrounded by pieces of light grey and white substance, like slate. I collected it all and sent it to Professor Tyndal; by return of post I had a kind note from Mrs. Tyndal, saying that the Professor was from home, but that she had notified him. In a few days I heard from Professor Tyndal, thanking me for the specimen, and saying that it was ‘ironstone,’ and the fragments ‘fusion of sand by the lightning.’ Dr. Tyndal did not return the specimens, and I do not know what became of them. My husband’s health was very bad, and we left for the east, and Japan, immediately afterwards, and the meteorite passed from my mind, interesting though it was. I was seven years absent from England. It is a long time ago now, nearly sixteen years, and so much has happened since—but I always remember the interesting circumstance, and feel rather proud to have seen and found it. I wish I could tell what became of it.”

Abraham Follett Osler.

1808—1903.

THE death of Mr. James Glaisher, at the advanced age of 93, has been quickly followed by that of his still more patriarchal contemporary, Mr. A. F. Osler, F.R.S., who, although less known to the public, was a notable figure in the meteorological world of the first half of the last century. Mr. Osler devised the self-recording pressure-plate anemometer and rain-gauge with which his name is associated, in the year 1837, and, although for purposes of exact measurement the instrument in its original form has been superseded by Mr. Dines’s pressure-tube anemometer, it exercised a very important influence on the growth of our knowledge of the force of the wind. These anemometers were used at the temporary observatories at St. Helena, Toronto and the Cape of Good Hope during Ross’s Antarctic expedition of 1839-43. Mr. Osler was engaged in business in Birmingham, and the first of his anemometers to be constructed has, we believe, been at work in the observatory of the Birmingham and Midland Institute for sixty-six years.

Correspondence.

HEAVY FALLS OF RAIN IN SHORT PERIODS.

To the Editor of Symons's Meteorological Magazine.

ON page 78 of your Magazine for June I note that Mr. F. Campbell Bayard records some phenomenal short period rainfalls, of which the most remarkable is that of Beddington Corner—3·50 in. in less than an hour.

The greatest fall I have ever registered was during a thunderstorm in North Sussex on June 7th, 1889, when $2\frac{1}{4}$ inches fell in $1\frac{1}{2}$ hours. This is at the rate of 1·50 in. per hour, or considerably less than half that recorded by Mr. Campbell Bayard. In *British Rainfall*, 1886, p. 117, I see there are three remarkable falls within the last 30 years of half an hour and less, viz. :

2·12 inch	at Canterbury	in 20 minutes.
2·34 „	at Camden Square	in 30 „
2·90 „	at Glamorgan	in 30 „

But I fail to find any record to equal $3\frac{1}{2}$ inches in less than an hour, and shall be glad to know whether this is a record for Surrey.

Yours faithfully,

ARTHUR F. PARBURY.

Jesses, Haslemere, Surrey, 17th June.

[The measurement of the rate of rainfall is of great importance, but it has been much neglected, and until self-recording rain gauges are much more frequently used than at present we must remain with very imperfect information. Although very heavy falls of rain in short periods have rarely been measured, it is not safe to conclude that they rarely occur, for their apparent rarity may be due merely to the small number of observers who are on the watch for them.

So far as we can ascertain by consulting the volumes of *British Rainfall*, the fall of 3·50 in. of rain in one hour at Beddington Corner, on May 30th, 1903, is the greatest amount ever recorded in one hour in the British Isles with one exception, 3·63 in. having fallen in one hour at Maidenhead in 1901. In 1889 a fall of 3·64 in. in 1 hr. 5 min. (at the rate of 3·36 in. per hour) took place at Henley-in-Arden; in 1901 a fall of 3·25 in. in 55 minutes (at the rate of 3·55 in. per hour) was reported from Wadhurst, and in 1900 a fall of 3·75 in. occurred at Ilkley in 1 hr. 15 min. (at the rate of three inches per hour). We have found no other case of a continuous rain for more than 55 minutes at an average rate of 3 in. per hour. For shorter periods, of course, far greater intensities are on record. Thus, in 1893, a fall of 1·25 in. took place in five minutes at Preston, the rate being 15·00 in. per hour. The diagram published annually in *British Rainfall* shows that in order to be exceptional an hour's rain must exceed 1·75 in., a half-hour's 1·25 in., a quarter-hour's ·80 in., and five minutes' fall ·30 in.; these values corresponding respectively

to 1·75 in., 2·50 in., 3·20 in., and 3·60 in. per hour. We trust that the attention called to this matter by Mr. Parbury may induce many observers to observe the duration of exceptionally heavy showers, and read their gauges as soon as the shower is over.—ED., *S.M.M.*]

PREVALENCE OF MACKEREL SKIES IN THE LATTER PART OF JUNE.

To the Editor of Symons's Meteorological Magazine.

I WAS much struck by the prevalence, during the latter part of June, of what Abercromby, in his treatise on Weather, calls one of the rarest skies seen, viz., mackerel. From June 25th to 30th a distinct mackerel sky was visible during some period of the day. At 7.30 a.m. on the 27th, a really beautiful mackerel sky was visible of a pearly white colour at the zenith; when first observed it was of a minute cumuli-form appearance, it gradually changed between 7.30 and 7.45 a.m., first into wavelets and then into flecks, and by 8 a.m. it had assumed the appearance of an almost perfect scale cloud. A still more beautiful instance was seen on the 28th at 8.30 p.m.; this cloud was of a dark minute cumuli-form appearance, tinged a glowing golden red, set in a golden yellow background, the contrast being very fine. On the same evening, towards 9.30 p.m., cirro-stratus was visible in the W.N.W.; it appeared to hang in the sky like a pall of smoke on a calm day, and was tinged a peculiar brick-dust tint round the edges.

S. C. RUSSELL.

*"Dunrobin," Cedar Road, Sutton, Surrey,
July 3rd, 1903.*

REVIEWS.

Report of the Meteorological Council for the year ending 31st March, 1902, to the President and Council of the Royal Society. London. Printed for H. M. Stationery Office, 1902. Size $9\frac{1}{2} \times 6$. Pp. 164. Price 1s. 2d.

THIS report, though dated on the cover 1902, was not in the hands of the public in that year. Of the new work taken up by the Council, we may notice the preparation of the meteorological reports for the Registrar-General, a work which had for many years been carried out by the late Mr. Glaisher. The Council supplied meteorological instruments to the Antarctic Expedition on board the *Discovery*, and opened a new statistical department in the largest and most accessible room in the Meteorological Office, where the public may consult the records preserved there. Other desirable extensions of the work of the Office are referred to, and regret expressed, which will meet with general sympathy, that they are at present impracticable, on account of the full occupation of the staff in other duties which cannot be set aside.

The weather forecasts for the year were rather more successful than usual, 58 per cent. of complete and 26 per cent. of partial successes being claimed, as compared with an average of 55 and 27. The special storm warnings were as usual rather better, 62 per cent. being completely, and 26 per cent. partially justified.

The report on the Climatological stations shows a satisfactory increase in the number of sunshine records. Appendix V. contains a summary of the conspicuous meteorological occurrences of 1901, and maps are given of the distribution of rainfall during the heavy falls of November 11th and 12th, showing the relation of the rainfall to barometric pressure and wind.

This report seems to exhale a spirit of hopefulness, and we trust that facilities may be afforded the Meteorological Office to carry out the new work hinted at or already begun.

Theory of Observations. By T. N. THIELE, Director of the Copenhagen Observatory. London: C. and E. Layton, 1903. Size $10\frac{1}{2} \times 8\frac{1}{2}$. Pp. 144. Plate. Price 12s. net.

THIS is a discussion of the theory of observations, dealing in a comprehensive way with the laws of error and probability. The treatment of every collection of statistics necessarily involves the application of these laws either designedly or implicitly, but it would be impossible in this place to follow Mr. Thiele's systematic development of the subject which is treated in a purely general way with much mathematical detail. We must congratulate the author on his admirable command of the English language, his clear and graceful use of which makes the memoir pleasant to read and the reasoning easy to follow.

Quarterly Return of Births, Marriages and Deaths for England and Wales. Published by the Authority of the Registrar General. London: April 28th, 1903. Price 9d.

WE notice this well-known official publication, because the first quarter of 1903 contains the first issue of the meteorological tables compiled by the Meteorological Office. These are preceded by remarks on the weather, extracted from the Monthly Weather Reports, and the tables themselves contain data from sixty-one stations in England, Wales and the English Channel. The stations are grouped into eight districts, and are selected so as to represent the various meteorological conditions of each district with regard to distance from the sea, height above sea level, and relation to aggregation of population as well as to uniformity of geographical distribution. With so small a number of stations scattered over so large an area the attempt to take account of all the factors specified is a bold one, but it is an attempt in the right direction, and we are not rash enough to say that we could improve upon it. Unfortunately

uniformity in recording has not yet been attained. Some stations only give the readings once daily at 9 a.m., some are taken at 8 a.m. and 6 p.m., others at 9 a.m. and 3 p.m., but these are distinguished by the use of special type from the majority of the stations, which have readings for 9 a.m. and 9 p.m., and the latter alone are used for estimating the mean values for the eight districts. The scientific value and practical utility of the tables have been distinctly increased by the changes which have been made.

The National Physical Laboratory. Report for the Year 1902. London: Harrison and Sons. 1903. Size $10\frac{1}{2} \times 7$. Pp. 52.

A PROMPT report of work done, including as an appendix a record of the magnetic and meteorological observations at Kew Observatory. As showing the value of the Kew verifications and the excellence of the work of leading opticians, we note that out of 2733 meteorological thermometers tested in 1902, only 55 were rejected on account of excessive error or for other reasons; thus 98 per cent. of the thermometers submitted were of high accuracy.

Rapport sur les Observations Internationales des Nuages au Comité International Météorologique, par H. HILDEBRAND HILDEBRANDSSON. I. Historique: Circulation Générale de l'Atmosphère. Upsala, 1903. Size $10\frac{1}{2} \times 7\frac{1}{2}$. Pp. 44 and 22 plates.

PROFESSOR HILDEBRANDSSON of Upsala first describes the steps by which the International Meteorological Committee were induced to organize systematic observations of clouds in all parts of the world. One result of this was the adoption of an international nomenclature for clouds and the preparation of the well-known international cloud atlas. Another result was the observation of cloud movement, especially the movement of the upper clouds, at a number of stations in all parts of the world.

The second and larger part of the report is devoted to the discussion of the observations which have been collected, and this is illustrated by plates showing the average cloud-directions at each station for each month in the year. The conclusions arrived at are so important that we translate them in full.

"We have proved by direct observations the following results:—

"1. Above the thermal equator and the equatorial calms an air-current prevails from the east all the year round and at great heights it appears to have a high velocity.

"2. Above the trade winds there prevail anti-trades blowing from S.W. in the northern hemisphere, and from N.W. in the southern.

"3. These upper anti-trades do not blow beyond the limits of the surface trade winds, but are deviated more and more to the right in the northern hemisphere and to the left in the southern, until they become westerly winds above the tropical high pressure belts, where they descend to supply the surface trades.

"4. The regions situated near the equatorial limits of the trade winds lie according to season in the trades or in the equatorial calms, and consequently above them there is an upper monsoon, consisting of the anti-trade in winter and the equatorial current in summer.

"5. From the tropical high pressure belts the pressure of the air diminishes regularly, on the average, towards the poles or at least to within the polar circles. Thus the air of each temperate zone is drawn into a great polar whirl, turning from west to east. The circulatory movement seems to be of the same nature as that of an ordinary cyclone; the air of the lower layers approaches the centre and that of the upper retires from it more and more as the height increases up to the highest regions in which we have cloud observations.

"6. The upper layers of air of the temperate zones extend over the tropical high-pressure belts in order to descend there.

"7. The irregularities found at the surface, especially in the region of the Asiatic monsoons, in general disappear at the height of the lower or intermediate clouds.

"8. It is necessary to abandon the idea of a vertical circulation of air between the tropics and the poles hitherto admitted according to Ferrel and James Thomson."

These results are a statement of observed facts as to cloud movement and are in no way theoretical. The author points out in addition that the direction of the upper air-currents seems to coincide with the average paths of barometrical depressions which may originate as satellites in the great atmospheric currents.

THE SEVEN MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—July, 1903.

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London	+ 10·17	186	Arncliffe ...	+ 11·94	138	Braemar	+9·60	156
Tenterden	+3·81	128	Hull	+ 2·02	116	Aberdeen	+5·17	132
Hartley Wintney	+8·82	168	Newcastle.....	+3·45	126	Cawdor	+4·98	131
Hitchin	+ 10·24	185	Seathwaite +	20·75	131	Glencarron +	13·96	130
Winslow	+7·90	164	Cardiff	+6·81	136	Dunrobin .....	.....	.....
Westley	+2·55	119	Haverfordwest	+6·72	132	Darrynane	+4·13	116
Brundall.....	+2·66	120	Gogerddan ...	+5·96	128	Waterford ...	+7·16	135
Alderbury	+6·59	147	Llandudno ...	+4·25	129	Broadford ..	+6·92	140
Ashburton	+7·79	131	Dumfries ...	+ 11·96	154	Carlow	+8·83	150
Polapit Tamar ...	+5·82	132	Lilliesleaf	+8·09	152	Dublin	+4·78	133
Stroud	+9·00	164	Colmonell	+3·94	118	Mullingar.....	+7·94	141
Woolstaston	+7·32	149	Glasgow ...	+ 14·33	178	Ballinasloe ...	+6·64	135
Boston	+3·16	130	Inveraray ...	+ 10·29	128	Clifden	+2·27	106
Hesley Hall	+1·88	117	Islay	+4·91	122	Crossmolina ..	+7·28	128
Derby	+2·86	123	Mull	+7·12	125	Seaforde	+6·88	136
Bolton	+2·44	112	Loch Leven +	13·53	174	Londonderry..	+2·64	113
Wetherby	+6·92	155	Dundee	+4·27	130	Omagh	+8·34	141

RAINFALL AND TEMPERATURE, JULY, 1903.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which ≥ 0.1 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1890-9.	Greatest Fall in 24 hours.								
				Dpth	Date		Max.		Min.			
		inches.	inches.	in.			Deg.	Date	Deg.	Date	In shade.	On grass.
I.	London (Camden Square) ...	5.20	+ 2.95	1.33	17	13	87.2	10	45.2	8	0	0
II.	Tenterden	3.67	+ 1.07	1.17	23	16	83.4	11	40.5	8	0	0
"	Hartley Wintney	3.40	+ 1.04	.70	23	15	85.0	10	44.0	28b	0	0
III.	Hitchin	4.16	+ 1.75	1.36	23	15	82.0	10	41.0	7	0	...
"	Winslow (Addington)	3.47	+ 1.00	.80	23	14	86.0	10	41.0	8	0	0
IV.	Bury St. Edmunds (Westley) ..	3.82	+ .91	1.47	23	15	86.8	10	40.0	8	0	...
"	Norwich (Brundall)	5.37	+ 2.50	2.28	23	19	83.2	10	40.4	21	0	0
V.	Winterborne Steepleton	4.52	...	1.80	25	15	79.1	10	39.5	14	0	0
"	Torquay	3.62	...	.80	25	15	76.2	10	48.3	14	0	0
"	Polapit Tamar [Launceston]..	3.54	+ .52	.68	16	16	78.1	11	39.1	14	0	0
VI.	Stroud (Upfield)	3.89	+ 1.28	1.31	21	16	79.0	2	47.0	7	0	...
"	Church Stretton (Woolstaston) ..	3.13	+ .80	.90	19	19	78.0	10	47.0	8, 9	0	...
"	Worcester (Diglis Lock)	3.35	+ 1.59	.92	18	19	...	...	...	...	...	...
VII.	Boston	2.53	+ .41	.60	23	14	90.0	10	40.0	8	0	...
"	Hesley Hall [Tickhill]	2.23	+ .26	.41	11	14	86.0	10	40.0	8	0	...
"	Derby (Midland Railway)	2.20	— .11	.52	25	15	86.0	10	42.0	7	0	...
VIII.	Bolton (The Park)	3.77	— .33	.77	14a	17	77.0	2	43.9	8	0	0
IX.	Wetherby (Ribston Hall) ...	3.24	+ .95	.85	11	18	...	...	...	...	...	...
"	Arncliffe Vicarage	5.04	+ .01	.92	14	18	...	...	...	...	...	...
"	Hull (Pearson Park)	2.68	+ .36	.58	14	16	86.0	10	41.0	8	0	0
X.	Newcastle (Town Moor)	4.73	+ 2.04	.80	14	16	...	...	...	...	...	...
"	Borrowdale (Seathwaite)	10.25	+ .84	2.32	6	18	75.8	2	44.4	7, 8	0	...
XI.	Cardiff (Ely)	4.58	+ 1.34	1.09	29	18	...	...	...	...	...	...
"	Haverfordwest	3.75	+ .41	1.02	21	18	75.6	10	45.4	13	0	...
"	Aberystwith (Gogerddan) ...	5.09	+ 1.47	1.28	21	15	80.0	9	...	...	...	...
"	Llandudno	2.56	— .02	.41	14	17	80.0	2	49.0	2, 7	0	...
XII.	Cargen [Dumfries]	5.01	+ 1.67	1.74	14	14	76.0	2	40.0	7c	0	...
XIII.	Edinburgh (Royal Observatory) ..	3.82	...	1.00	16	14	74.6	2	42.5	7	0	0
XIV.	Colmonell	3.49	+ .29	1.02	14	15	78.0	9	41.0	5, 23	0	...
XV.	Tighnabruach	5.08	...	1.42	4	18	70.0	18	43.0	6, 13	0	...
"	Mull (Quinish)	5.00	+ .89	1.46	4	22	...	...	...	...	...	...
XVI.	Loch Leven Sluices	5.41	+ 2.34	1.62	6	18	...	...	...	...	...	...
"	Dundee (Eastern Necropolis) ..	4.40	+ 2.04	1.55	16	19	77.0	10	39.2	19	0	...
XVII.	Braemar	3.42	+ .65	.86	26	20	68.5	2	35.0	8, 19	0	5
"	Aberdeen (Cranford) ...	5.27	+ 2.64	1.40	16	21	80.0	9	37.0	7	0	...
"	Cawdor (Budgate)	3.63	+ .21	1.15	5	20	...	...	...	...	...	...
XVIII.	Strathconan [Beaul]	5.17	+ .51	1.62	6	11	...	...	...	...	...	...
"	Glencarron Lodge	6.81	— .09	1.52	3	22	71.1	25	36.6	14	0	...
XIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...
"	S. Ronaldshay (Roeberry) ...	...	...	...	...	...	...	...	...	...	...	...
XX.	Darrynane Abbey	4.35	+ .63	.88	14	24	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	3.63	+ .25	.57	14	18	75.0	8	43.0	7d	0	...
"	Broadford (Hurdlestown) ...	4.59	+ 1.61	.71	14	24	74.0	9	47.0	22	0	...
XXI.	Carlow (Browne's Hill)	4.58	+ 1.63	.52	26	19	...	...	...	...	...	...
"	Dublin (Fitz William Square) ..	4.02	+ 1.44	.52	14	23	79.0	9	44.1	7	0	0
XXII.	Ballinasloe	4.58	+ 1.31	.80	14	19	73.0	9	42.0	12	0	...
"	Clifden (Kylemore)	6.57	— .02	1.38	14	21	...	...	...	...	...	...
XXIII.	Seaforde	4.92	+ 1.73	1.19	14	21	88.0	9	40.0	6	0	0
"	Londonderry (Creggan Res.) ..	4.88	+ 1.18	1.50	14	23	...	...	...	...	...	...
"	Omagh (Edenfel)	4.36	+ .81	1.20	14	23	75.0	9	44.0	11e	0	0

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

a and 27. b and 29. c and 8, 20. d and 24, 26. e and 19, 23.

SUPPLEMENTARY RAINFALL, JULY, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3.77	XI.	Llandefaelog-fach.....	...
II.	Dorking, Abinger Hall ..	4.45	„	New Radnor, Ednol.....	3.58
„	Sheppey, Leysdown	5.22	„	Rhayader, Nantgwillt ...	...
„	Hailsham	5.58	„	Lake Vyrnwy	4.56
„	Crowborough.....	5.06	„	Ruthin, Plâs Drâw ...	5.17
„	Ryde, Beldornie Tower..	1.95	„	Criccieth, Talarvor	4.36
„	Bournemouth, Kempsey ..	3.59	„	I. of Anglesey, Lligwy..	2.90
„	Emsworth, Redlands ...	3.15	„	Douglas, Woodville.....	4.77
„	Alton, Ashdell	3.71	XII.	Stoneykirk, Ardwell Ho.	3.34
„	Newbury, Welford Park ..	2.83	„	Dalry, Old Garroch	4.52
III.	Oxford, Magdalen Coll..	3.17	„	Moniaive, Maxwelton Ho.	4.19
„	Banbury, Bloxham	5.11	„	Lilliesleaf, Riddell	4.36
„	Pitsford, Sedgebrook ...	3.10	XIII.	N. Esk Res. [Penicuick]	...
„	Huntingdon, Bampton.	3.39	XIV.	Dalry, Blair	4.70
„	Wisbech, Bank House...	4.19	„	Glasgow, Queen's Park..	3.74
IV.	Southend	4.86	XV.	Inveraray, Newtown ...	4.63
„	Colchester, Lexden	3.90	„	Ballachulish, Ardsheal...	7.18
„	Saffron Waldon, Newport	4.36	„	Campbeltown, Redknowe	4.33
„	Rendlesham Hall	5.59	„	Islay, Eallabus.....	3.59
„	Swaffham	2.67	XVI.	Dollar	5.64
V.	Salisbury, Alderbury ...	2.73	„	Balquhider, Stronvar...	...
„	Bishop's Cannings	2.85	„	Coupar Angus Station...	4.12
„	Ashburton, Druid House	5.02	„	Blair Atholl ...	3.42
„	Okehampton, Oaklands.	3.02	„	Montrose, Sunnyside ...	5.46
„	Hartland Abbey	3.41	XVII.	Alford, Lynturk Manse..	6.59
„	Lynmouth, Rock House	2.57	„	Keith H.R.S.....	6.34
„	Probus, Lamellyn	4.47	XVIII.	Fearn, Lower Pitkerrie..	3.21
„	Wellington, The Avenue	2.51	„	S. Uist, Askernish	3.06
„	North Cadbury Rectory	3.00	„	Invergarry	5.90
VI.	Clifton, Pembroke Road	1.75	„	Aviemore, Alvie Manse.	...
„	Ross, The Graig	2.52	„	Loch Ness, Drumnadrochit	4.28
„	Shifnal, Hatton Grange	2.09	XIX.	Invershin	2.77
„	Wem Rectory	2.53	„	Bettyhill	3.35
„	Cheadle, The Heath Ho.	3.32	„	Watten H.R.S.....	3.73
„	Coventry, Kingswood ...	...	XX.	Cork, Wellesley Terrace	6.42
VII.	Market Overton	2.27	„	Killarney, District Asyl.	3.91
„	Grantham, Stainby	1.72	„	Glenam [Clonmel]	5.89
„	Horncastle, Bucknall ...	2.35	„	Ballingarry, Hazelfort...	4.69
„	Workshop, Hodsck Priory	2.20	„	Milton Malbay	4.70
VIII.	Neston, Hinderton	4.99	XXI.	Gorey, Courtown House	4.17
„	Southport, Hesketh Park	2.51	„	Moynalty, Westland ...	3.82
„	Chatburn, Middlewood.	4.48	„	Athlone, Twyford	4.32
„	Duddon Val., Seathwaite Vic.	7.54	„	Mullingar, Belvedere ...	5.53
IX.	Langsett Moor, Up. Midhope	3.29	XXII.	Woodlawn	4.88
„	Baldersby	3.44	„	Westport, Murrisk Abbey	5.00
„	Scalby, Silverdale	3.73	„	Crossmolina, Enniscoe ..	5.12
„	Ingleby Greenhow Vic..	4.14	„	Collooney, Markree Obs.	5.19
„	Middleton, Mickleton ...	3.51	XXIII.	Enniskillen, Portora ...	4.88
X.	Beltingham	4.99	„	Warrenpoint.....	7.38
„	Bamburgh	5.27	„	Baubridge, Milltown ...	5.95
„	Keswick, The Bank	4.37	„	Belfast, Springfield	4.91
„	Melmerby Rectory	4.93	„	Bushmills, Dundarave..	4.54
XI.	Llanfrechfa Grange	2.98	„	Stewartstown	4.63
„	Treherbert, Tyn-y-waun	4.92	„	Killybegs	6.84
„	Castle Malgwyn	4.47	„	Horn Head	4.61

METEOROLOGICAL NOTES ON JULY, 1903.

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.

LONDON, CAMDEN SQUARE.—The first half was fine, dry and generally warm, the only R of the first 15 days being .01 in. on 12th, which terminated an absolute drought of 22 days' duration. A TS early on the 18th, with heavy R, commenced an exceedingly wet period with lower temp., which prevailed till the 29th; during this time 5.07 in. fell. The wettest July in 45 years. Mean temp. $63^{\circ}.2$, or $0^{\circ}.1$ below the average.

ABINGER HALL.—The first half dry, then very wet. In about 20 minutes on the morning of the 18th .50 in. of R fell. Much bush fruit spoiled by R. Low night temp., with frosts.

TENTERDEN.—The first half dry and warm, the last half very wet, with several TSS. Absolute drought for 15 days ended on 4th, and partial drought for 30 days, with .20 in. of R, ended on 19th.

CROWBOROUGH.—With the exception of .02 in. on 5th, no R fell till the 15th, the weather being a continuation of the drought which began on June 20th. After the 15th there was very heavy and continuous R, 2.51 in. falling on 23rd. The first half warm, but during the wet period unseasonably cold. Mean temp. $60^{\circ}.0$.

HARTLEY WINTNEY.—Absolute drought for 23 days ended on the 12th, after which the weather was exceedingly unsettled, with heavy R almost daily until the end. TSS on 18th, 19th and 30th. Temp. very low and weather dull and cloudy.

WINSLOW, ADDINGTON.—In the 24 days ended on 14th only .01 in. of R was registered, but from the 16th to the end wet weather prevailed. Very heavy TS on 19th.

COLCHESTER, LEXDEN.—Absolute drought for 23 days ended on the 13th. Hot till about the 10th; vegetation very much dried up. The last half very wet and cold.

BURY ST. EDMUNDS, WESTLEY.—No R fell from June 19th to July 12th. Very wet from the 23rd to the end. Corn much laid. T on 23rd, 26th, 29th and 30th.

NORWICH, BRUNDALL.—Like last year during this month the ther. only once reached 80° . The R was the greatest recorded in the neighbourhood in July since 1879, and nearly all fell in the second half, the first half being nearly rainless.

WINTERBORNE STEEPLTON.—The early part was dry, but the latter part very wet; it being the wettest July since 1894. TSS on 26th and 29th.

TORQUAY, CARY GREEN.—R 1.27 in. above the average. Duration of sunshine 237 hours, being 1.5 above the average. Mean temp. $61^{\circ}.3$, or $0^{\circ}.4$ below the average. Mean amount of ozone 4.5; max., 9.0 on 6th with N.W. wind, min., 1.0 on 19th with N.N.W. wind.

WELLINGTON.—The month opened fine and warm, but after the 14th hardly a day touched the average max temp., and R was frequent, although the normal was only exceeded by about .25 in.

NORTH CADBURY RECTORY.—The coolest, cloudiest, windiest and wettest July in at least 8 years. Very dry till 15th, then very rainy and rather cool. The R was largely exceeded in the immediate neighbourhood to E. and N., owing to the way in which TSS always work away from here. The aggregate R for the 7 months was 1.56 in. more than the previous highest in 7 years.

CLIFTON, PEMBROKE ROAD.—Mostly fine, with several very hot days in the first fortnight, but a few slight showers. Unsettled and showery in the third week, with some T, the remainder cool, with R on most days, and fresh westerly winds. Comparatively little sunshine. R 1.33 in. below the average.

WEM, THE RECTORY.—Dull, and at times very cold. Little sunshine. Some hay still lying in fields at the end.

HULL, PEARSON PARK.—Very unsettled, dull and cloudy. TSS on 11th and 29th. Stormy and cold on 6th and 7th. Sunshine recorded 106 hours.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Very unsettled; an unusual amount of T and L, but not near. Hay harvest interfered with, though some was secured well in the first fortnight.

HAVERFORDWEST.—Very unsettled, with some low night temps. Hot and summerlike from the 8th to the 14th, followed by some very oppressive days; no TSS, but persistent, strong, and often cold winds following R. Hay crops much damaged by wet. Potatoes good, but fruit scarce. Duration of sunshine 188·8 hours.

DOUGLAS, WOODVILLE.—Cold and ungenial with N. to N.W. winds, while only 4 wetter Julys have occurred in 30 years. A violent N.W. gale sprang up on the 5th, lasting some 30 hours.

SCOTLAND.

CARGEN [DUMFRIES].—Dull, cheerless, and full of sudden variations in temp. and other conditions. Hay work much interfered with, and turnip crop likely to be the worst for years.

RIDDELL.—R 1·51 in. above the average. Cold and rainy, with much wind, especially from the E.

BALLACHULISH, ARDSHEAL.—The wettest July ever recorded at this station. R 2·15 in. above the average.

COUPAR ANGUS.—R nearly twice the average, and the total from January 1st 6·71 in. above the average. Mean temp. 57°·1; slightly below the average. No lengthened period of summer weather.

BETTYHILL.—The R fell mostly in the earlier half, the fall on the 5th, 1·72 in., being unusually heavy. A number of fine days, chiefly towards the end.

WATTEN, H.R.S.—Cloudy, cold, and with little sunshine. Frost on several nights about the middle. A notable R storm on 5th.

IRELAND.

DARRYNANE ABBEY.—R nearly 20 per cent. over the average. Much blight showing in potatoes.

BROADFORD, HURDLESTOWN.—Very wet. Hay cut during the month is quite ruined, and blight has appeared on the potatoes.

MILTOWN MALBAY.—Rather cool, with much T, and only a few dry days. Bad for hay making in this district. Blight appearing generally on the potato crop.

DUBLIN, FITZWILLIAM SQUARE.—Though an average month as to temp. it was in other respects unfavourable, the weather being for the most part unsettled, and R both frequent and heavy. Mean temp. 60°·1, or 0°·2 below the average. Duration of sunshine 169·3 hours.

MARKREE OBSERVATORY.—Very wet, with frequent TSS, and temp. very low throughout. A small amount of sunshine, the days generally cloudy and gloomy, but the nights fine and bright. A few fogs.

BELFAST, SPRINGFIELD.—R an inch above the average. T and L very prevalent. Very disappointing for farmers.

OMAGH, EDENFEL.—Up to the 12th the weather was better than the record would indicate. The temp. was about normal, what R there was fell at night, and for those who took advantage of it an abundant hay harvest was well saved. The remainder of the month was of the character too frequently typical of these parts in July, deluging, but not continuous rains, dull skies and mostly stagnant atmosphere, but no damage that a few fine days would not repair.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1903.

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	59·0	20	48·1	18	50·8	40·0	40·5	85	86·0	19·5	·83	10	6·6
Malta.....	63·2	24	42·5	4, 19	59·6	47·9	45·6	78	111·6	37·1	1·52	7	6·2
Lagos, W. Africa .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	92·1	11	53·7	18	76·9	60·0	56·4	67	...	...	·22	3	3·2
Durban, Natal	92·9	28	63·6	25	84·7	68·0	...	...	149·1	...	2·40	13	5·2
Mauritius.....	87·8	11a	68·8	22	85·8	73·1	72·4	81	154·4	63·5	6·00	16	6·6
Calcutta.....	89·1	27	49·8	5	82·0	59·8	56·4	63	144·0	41·9	·64	1	2·4
Bombay.....	89·2	8	61·7	7	82·7	67·0	62·1	67	137·8	52·9	·00	0	0·1
Madras	91·4	15b	67·2	8	87·0	71·9	70·4	78	141·9	63·0	2·17	3	2·8
Kodaikanal	72·9	28	45·6	9, 22	66·2	48·6	45·4	70	136·6	33·2	1·00	3	3·9
Colombo, Ceylon.....	93·9	23	68·5	1, 3	90·4	73·6	71·6	77	152·0	62·2	3·95	5	4·0
Hongkong.....	72·8	25	41·9	3	62·7	55·1	50·2	73	127·6	...	·21	3	7·8
Melbourne.....	104·4	9	42·7	25	76·3	56·8	50·5	61	165·3	36·3	1·36	8	5·3
Adelaide	105·6	9	49·6	15	81·5	58·9	50·9	52	161·9	45·0	1·00	5	4·2
Coolgardie	106·6	19	51·0	15	89·3	60·8	53·0	47	172·0	47·2	·38	3	3·2
Sydney	98·1	3	59·3	12	81·0	65·9	60·5	67	139·5	52·6	1·02	8	5·3
Wellington	78·0	24	43·0	3	68·3	54·4	53·5	77	138·0	32·0	1·98	12	6·5
Auckland	78·0	15	50·0	2	71·8	58·9	53·3	65	142·0	49·0	2·08	9	4·7
Jamaica, Negril Point..	89·9	14	66·5	4	85·8	69·5	68·1	73	...	...	1·22	1	...
Trinidad	90·0	19c	64·0	13d	88·0	67·0	69·5	77	164·0	60·0	·68	6	...
Grenada.....	86·2	19	70·6	26	83·0	72·8	69·3	73	150·0	...	2·27	13	3·0
Toronto	45·5	28	—5·7	17	32·1	19·4	22·6	79	56·2	—8·8	2·80	16	7·1
Fredericton, N.B.	49·8	28	20·5	19	28·5	8·2	6·5	58	...	...	4·36	9	5·5
Winnipeg	36·0	27	—36·7	15	14·5	—8·6	...	...	...	...	·10	2	2·2
Victoria, B.C.	53·3	22	27·2	12	44·6	35·0	...	...	...	...	1·31	9	6·2
Dawson	21·6	28	—53·1	11	—0·6	—17·8	...	...	...	...	1·35	6	4·3

a—and 19, 24. b—and 27. c—and 23. d—and 25.

MALTA.—Mean temp. of air 52°·7, or 1°·5, below; mean hourly velocity of wind 9·4 miles, or 2·4 below averages. Mean temp. of sea 60°·0.

MAURITIUS.—Mean temp. of air 0°·3 above, dew point 2°·1 above, and R 1·01 in., below averages. Mean hourly velocity of wind 3·6 below average, extremes 23·5 on 8th, and 0·0 on 2nd, 4th, and 16th; prevailing direction E. by S.

KODAIKANAL.—Mean temp. of air 55°·3. Mean velocity of wind 293 miles per day. Bright sunshine 203·1 hours.

COLOMBO.—Mean temp. of air 80°·9, or 0°·5 above, of dew point 3°·1 above, and R 1·66 in. above, averages. Mean hourly velocity of wind 7·1 miles, prevailing direction N.E. to S.W.

HONGKONG.—Mean temp. of air 58°·4. R 1·10 in. below average. Sunshine 77·2 hours. Mean hourly velocity of wind 12·6 miles; prevailing direction E. by N.

ADELAIDE.—Mean temp. of air 70°·2, has only once been lower in February during previous 46 years. R ·39 in. above average. Good rains over agricultural settlements.

SYDNEY.—Mean temp. 2°·4 above, humidity 6·0 below, and R 3·88 inches below averages.

WELLINGTON.—Mean temp. 1°·2 below, and R 1·66 in. below, averages.

AUCKLAND.—Mean temp. 2°, and R 1½ in., below averages.

TRINIDAD.—R ·77 in. below the 40 years' average.