

THE DAILY RAINFALL OF JUNE, 1903.

THE distribution of rainfall during June was so remarkable, both in time and space, as to merit more detailed consideration than is possible in the general treatment of the months in Part II. of this volume. A preliminary account, with a map of the total fall for the month (reproduced here), was published* immediately after the records were received from stations reporting monthly. Although fuller information suggests some minor alterations in the run of the isohyets, the map correctly expresses the distribution of rainfall for the month; the relation to the averages may be understood more clearly in the small map facing p. [185] and the accompanying letterpress. It will be noticed that the north-west of Ireland was remarkably dry, the fall over a large area being less than one inch for the whole month, and the whole of Ireland, except the extreme south, had a very low rainfall.

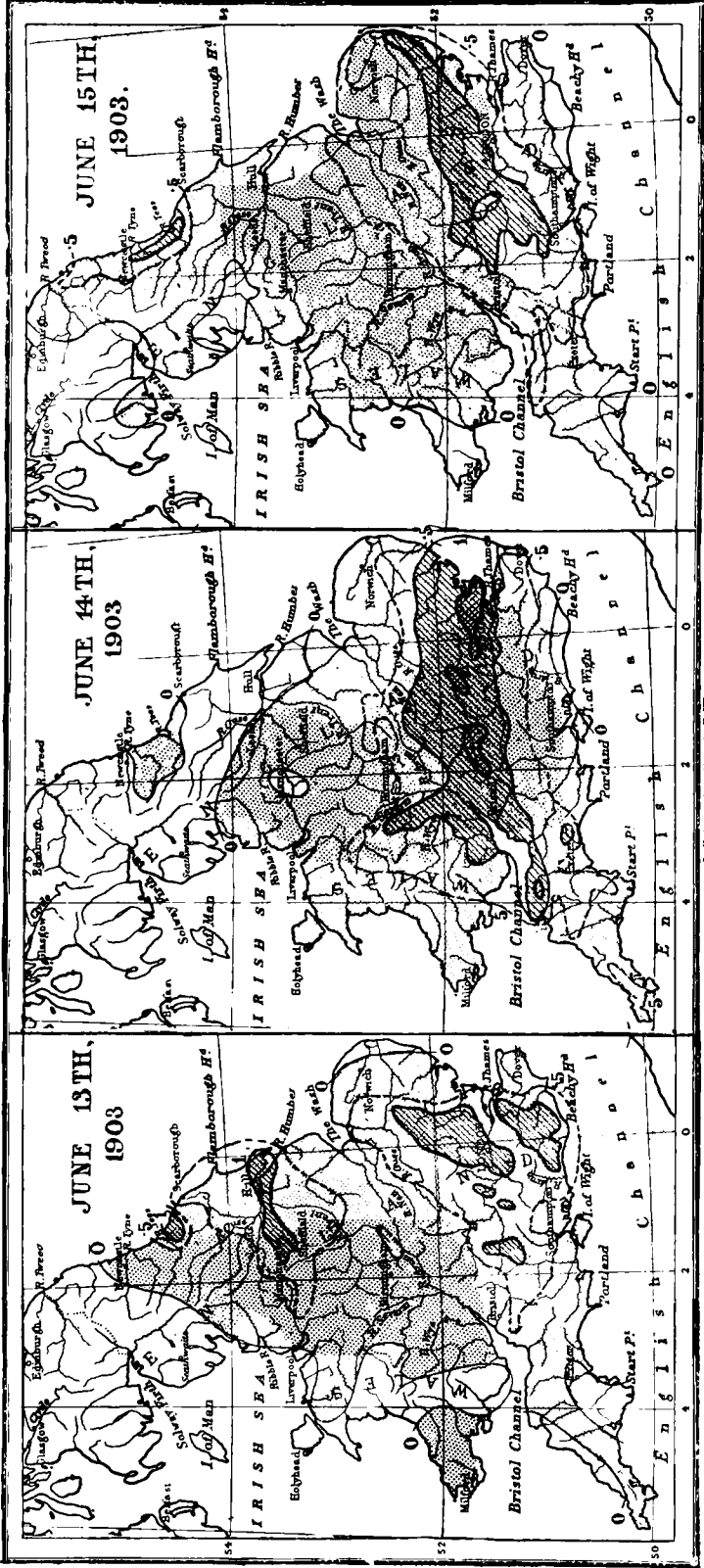
In Great Britain there were four districts where the fall was less than 2 inches, viz.: (1) the north-east of Scotland; (2) the south of Scotland and north of England; (3) the centre of England from the Mersey to the Humber and the Wash; and (4) Cornwall.

Along the south coast of Ireland and across the south of England, from the Bristol Channel to the Thames, the rainfall was very high, and in parts unprecedentedly great. More than 9,000 square miles of the south of England received above 4 inches of rain, and of that more than 2,000 square miles had 6 inches and upwards.

The meteorological conditions which led to this extraordinary excess of precipitation on the low ground of the Thames valley are worth referring to, though we cannot treat them in detail. The first point to notice is that there were fewer rainy days than the average in all parts of the country. Over England the number averaged 10, for Scotland about 13, and in Ireland 12. The table of daily rainfall which concludes this article has been carefully corrected for entries to wrong day, and is believed to show accurately the fall for each day

**Met. Mag.*, July, 1903, pp. 93—99.

RAINFALL OF ENGLAND AND WALES, JUNE 13-15, 1903.



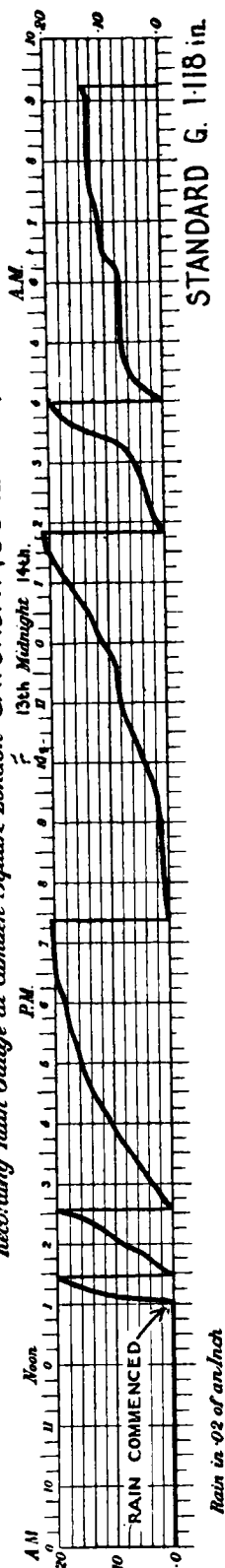
The unshaded land received no rain. The dotted area had less than an inch of rain, the broken line separating it into portions with less and more than half-an-inch. The line shaded areas had more than an inch of rain, and the cross-shaded part (on the 15th only) had falls exceeding two inches.

as measured at 9 o'clock on the morning following the date to which the amount is entered. The stations are those which were selected for the tables of droughts and rainy spells, and were chosen on account of their uniform distribution over the country, and the care with which we believe the records are kept. It will be noticed that except on the 4th, in Wales, there was no rain worth mentioning from the 1st to the 7th inclusive in any part of the British Isles. An exceedingly wet period lasted from the 8th to the 19th in the south of England, but the 12th and 18th were dry in most places, and there was a general tendency for the rainfall to be concentrated into the three days, 13th, 14th and 15th. At almost all the stations, except along the south coast and in the Cornwall-Devon peninsula, the three days contributed more than half the rainfall of the month. In the north of England, Scotland, and Ireland, these days were not particularly wet, but while practically no rain fell in the south of England after the 19th, a second series of wet days commenced in the Midlands on the 23rd, and lasted about four days. In the north of England and throughout Scotland there was rain every day from the 24th to the 30th, and in most parts of Ireland it was wet from the 22nd to the 30th, the earlier part of the month having been phenomenally dry.

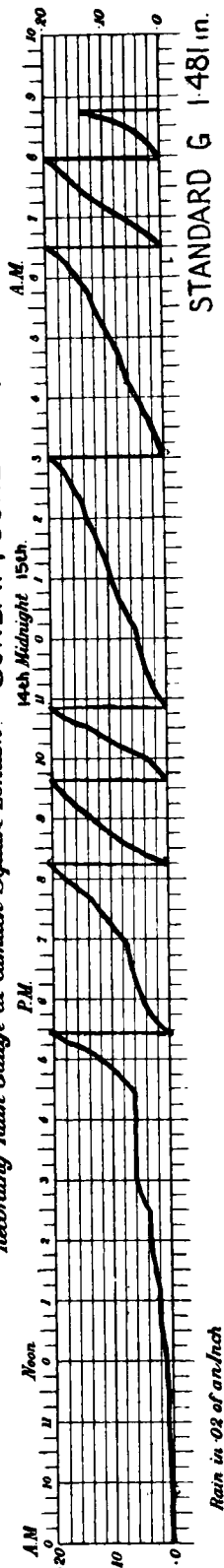
The main interest lies in the three remarkable days from the 13th to the 15th. Camden Square may be taken as representative of the very wet patch in the lower Thames valley, and from the curve drawn by the recording gauge, it is found that rain began at 1 p.m. on the 13th and continued without a moment's intermission until 11.30 p.m. on the 15th, a total duration of $58\frac{1}{2}$ hours, yielding a total fall of 3.44 in. The rest of the month had six days on which rain fell, and the total duration of all these amounted to $51\frac{1}{2}$ hours, while the corresponding rainfall was 2.99 in. So we find that the one long-drawn-out shower of nearly three days' duration accounted for 53 per cent. of the duration and 53 per cent. of the amount of the month's rain. The remarkable feature of the three days' rain is, that it was practically continuous at the average rate of .001 in. *per minute* for the whole time, although, in order to compare the records of observers who have not got automatic gauges, it is necessary to treat it in three parts. Several observers recorded 60 hours of continuous rain; at Islip 70, and at Cookham 72 hours were reported.

RECORD OF CASELLA AUTOMATIC GAUGE AT CAMDEN SQUARE.

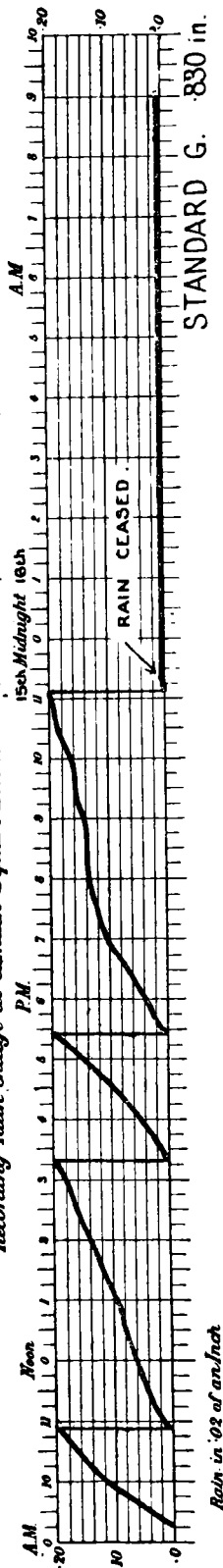
Recording Rain Gauge at Camden Square London SATURDAY, JUNE 13th, 1903.



Recording Rain Gauge at Camden Square London SUNDAY, JUNE 14th, 1903.



Recording Rain Gauge at Camden Square London MONDAY, JUNE 15th, 1903.



The trace of the gauge is thickened in order to make it more prominent. The ascending sloping line is drawn by the pen of the rain gauge on the strip of paper, which is placed upon the circumference of a drum rotating once in 24 hours. When the pen reaches the line of .20 in., the receiver of the gauge automatically empties and the pen returns in a straight line to zero. The pen is also brought back to zero when the paper is changed each morning about 9 o'clock.

The three little maps facing p. 21 are compiled from the daily readings at all the stations in England, Wales and the South of Scotland for which particulars are available, so that, small as they are, each map has been reduced from a large sheet on which the rainfall at about 1,500 stations is separately shown. The portion of the land left white shows those parts where no rain at all fell during the 24 hours. The part which is shaded in a light dotted tint had less than one inch of rain, and the dotted line separates the area with less than half-an-inch, which lies on the coastward side, from that with over half-an-inch, which lies on the inland side. The more darkly shaded portions had over one inch of rain in the 24 hours, and the darkest shade, which appears on the map for the 14th only, indicates falls exceeding two inches. We are not aware that the distribution of rainfall on three consecutive days has ever been so minutely represented before; and, indeed, the only previous instance in which it was attempted was, we believe, Mr. Symons's discussion of the heavy rains of October and November, 1894.

On the 13th there was a large area in Yorkshire with more than half-an-inch of rain, including a strip along the Humber and Don with more than an inch; but on the other two days that district had very little rain, and it apparently lay outside the great three-day shower of the south. Between the Tyne and the Tees some heavy falls occurred on the 13th and 15th, but these also were isolated.

In the south it will be observed that no rain fell in mid-Wales, parts of Cornwall and Devon and the extreme east of Norfolk and Suffolk on the 13th; but a great triangle, with its apex south of Bristol and its base stretching from Dungeness due north to the Wash, had more than half-an-inch of rain at every point, and within it lay five patches where more than an inch of rain fell. The two largest patches lay respectively to the north and to the south of the North Downs, the former including London. On the 14th, a broad wet belt stretched due east and west from about the meridian of 4° W. to the east coast of England. It closely resembled in distribution the rain of September 10th (see p. [141]), and, speaking generally, we may describe it as a strip of country with more than half-an-inch of rain, about 100 miles wide and 250 miles long, south of Birmingham and north of Dover, enclosing a strip with more than an inch of rain running along the centre, and about 60 miles wide by 200 miles long. In the heart of that strip a row of isolated patches in which the rainfall exceeded two inches ran from west to east. It will be noticed

on comparing the maps that the greater part of the country which had falls exceeding an inch on the 13th lay within the great continuous belt where the rainfall exceeded an inch on the 14th.

The 15th was, on the whole, less wet, and the distribution of the rain resembled that on the 13th. The area with more than half-an-inch of rain stretched unbroken from coast to coast, from the Bristol Channel to the Wash on the north, from Southampton Water to the Thames on the south. Within this almost the whole of the upper Thames valley, and a strip, 160 miles long and averaging 30 miles wide, running thence through Suffolk, received more than an inch of rain. The greater part of this wet area had also more than an inch of rain on the 14th, and some of it, including part of Berkshire, nearly the whole of Hertfordshire and a strip of Essex, had more than an inch on the 13th also. Table II. gives a list of all the stations recording 1·00 in. or more on three consecutive days, and it is one of the most remarkable cases of prolonged heavy rain that has been placed on record in these pages.

We have measured the areas between different lines of rainfall on the large-scale map of England and Wales, and calculated the mean fall as follows:—

Areas of England and Wales with various degrees of rainfall.

Date.	Over 2·00 in. sq. miles.	1·50-2·00 in. sq. miles.	1·00-1·50 in. sq. miles.	·50-1·00 in. sq. miles.	·00-·50 in. sq. miles.	No rain, sq. miles.	Total sq. miles.
June 13th..	—	—	4352	12,621	29,740	11,597	58,310
June 14th...	970	3021	7411	12,303	24,422	10,570	58,697
June 15th...	—	289	4669	15,496	33,759	4,042	58,255

The total differs a little on each day, because in making the measurements sometimes a little more, sometimes a little less of the adjoining sea was included, where an area of heavy rain lay upon an estuary like the Thames or Bristol Channel.

It will be noticed that on the 13th over 4000, on the 14th over 11,000, and on the 15th nearly 5000 square miles had more than one inch of rain, and the following sum may show the volume of water which fell:—

Date.	Volume on areas with over 1·00 of R. sq. mi. x in.	Volume on areas with ·50-1·00 in. sq. mi. x in.	Total volume.		
			sq. mi. x in.	Million gals.	Million tons
June 13th.....	5,308	9,695	22,438	324,902	1450
June 14th.....	16,721	9,332	32,259	467,110	2085
June 15th.....	6,018	11,902	28,048	406,135	1813
Total.....	28,047	30,929	82,745	1,198,147	5348
Per cent. of total vol. }	34	37	100		

Taking the three days together, 34 per cent., or one-third of the whole precipitation, is seen to have fallen on the area with over one inch of rain ; 37 per cent., or considerably more than a third on the area with between half-an-inch and an inch of rain, and by difference 29 per cent., or considerably less than a third, on the very much larger area, where the rain fell in less amount. The average rainfall on the area with more than one inch was 1·22 on the 13th ; 1·48 on the 14th, and 1·21 on the 15th ; while over the whole surface of England and Wales it was ·38 in. on the 13th, ·55 in. on the 14th, and ·48 in. on the 15th,—an average of ·47 in. per day for the three days. This corresponds to a total amount of nearly 1,200,000 million gallons, or 5,348 million tons of water precipitated from the atmosphere on the land in three days : enough water if it could all have been stored to supply the whole population of England and Wales with 25 gallons per head for more than three years.

The amount of water precipitated in the form of rain has thus been determined accurately, and we regret that time fails us to discuss the matter in relation to the distribution and changes of atmospheric pressure.

In the monthly summary of the *Weekly Weather Report* published by the Meteorological Office, there is an interesting diagram showing the path of the barometric depression which accompanied the bad weather of the middle of June. Such cyclones as a rule pass rapidly across the country and disappear ; but this one moved remarkably slowly. The path of the centre entered the Bristol Channel on the 13th, crossed the South of England, and passed into the English Channel south of the Isle of Wight. Here the centre remained almost stationary for 24 hours during the 14th, and then passed into the North Sea close along the East Anglian coast. The heavy rainfall of all three days was, as is usually the case, on the left of the track of the centre

TABLE I.—Daily Rainfall during the Month of June, 1903.

	St. Pancras, Camden Square.	Hythe, Hillcrest Road.	Brighton, Old Steigne.	Basingstoke, Sher- borne St. John.	Oxford, Magdalen College.	Blisworth, Cuff House.	Stamford, Easton.	Colchester, Lexden.	Saffron Walden.	Geldeston [Beccles].	Hillington.	Calne, High Street.	Swanage, Royal Victoria Hotel.	Torquay, Cary Green.	Bideford, Northam Vicarage.	St. Austell, Trevanna.	Ilminster, Ilton Vicarage.	Ross, The Graig.
1	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
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Total	6.43	3.04	2.34	5.01	5.66	4.21	1.98	3.16	5.27	2.54	2.51	4.45	1.91	1.88	1.15	1.63	3.25	2.81

TABLE I.—Daily Rainfall during the Month of June, 1903.—(continued.)

	Weston Park [Shiftal].	Gaistor, Hundon Manor.	Worksep, Hodsock Priory.	Chellaston.	Macclesfield, The Park.	St. Michael's-on- Wyre Vicarage.	Knarsborough, Farnham.	Sedburgh, Akay.	Lowthorpe, The Elms.	Darlington, Hur- worth Grange.	Morpeth, Bothalhaugh.	Brampton, Denton House.	Dungeon Ghyll.	Llantrisant, Talygarth.	Llandoverey, Tonn.	Haverfordwest, High Street.	New Radnor, Ednol.	Lake Vyrnwy.
1	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
2	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
3	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
4	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
5	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
6	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
7	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
8	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
9	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
10	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
11	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
12	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
13	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
14	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
15	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
16	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
17	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
18	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
19	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
20	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
21	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
22	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
23	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
24	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
25	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
26	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
27	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
28	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
29	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
30	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Total	95	2·12	1·29	1·53	1·28	1·53	1·82	1·89	1·72	1·97	2·55	1·68	3·35	1·84	1·52	2·13	3·69	1·30

DAILY RAINFALL OF JUNE.

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TABLE I.—Daily Rainfall during the Month of June, 1903.—(continued.)

	Denbigh, Garm.	Garliestown, Galloway House.	Dumfries, Ivy Bank.	Hawick, Brank- holme.	Edinburgh, Royal Observatory.	Girvan, Plimmore.	Dalry, Blair.	Buchlyvie, The Manse	Inveraray, Newtown.	Stronhan, Laudale.	Islay, Ardbeg.	Blair-Atholl.	Dundee, Bal- ruddery.	Aberdeen, Cran- ford.	Keith Station.	Fort Augustus, St. Benedict's.	Alvey Manse.	Loch Torridon, Bendamp.
1	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
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Total	1.29	2.28	1.71	1.16	1.09	3.09	3.21	3.30	2.96	2.75	.59	2.25	2.39	1.59	1.89	2.85	2.10	2.86

TABLE I.—Daily Rainfall during the Month of June, 1903.—(continued.)

	Alness, Ardross Castle.	Almaharra.	Castletown, The Clett.	Cork, The Palace.	Darrynane Abbey.	Clonmel, Bruce Villa.	Limerick, Roxborough.	Miltown Malbay.	Ennisceorthy, Ballyhyland.	Bray, Fassaree.	Mountsrath, Ballyhn.	Oldcastle, Killisheagh Rectory.	Ballinasloe.	Westport, Murrisk Abbey.	Collooney, Markree Observatory.	Banbridge, Mill- town.	Bushmills, Dundarave.	Newtown Stewart, Baron's Court.	Horn Head.
1	.02	.03	.09					.01											
2																			.01
3		.04																	.01
4	.19																		.01
5																			
6																			
7																			
8	.01	.09	.01	.25	.07	.44	.31		.02	.13	.01		.01	.01					
9					.03			.01		.10									
10															.03	.08	.01	.05	.02
11	.02	.07	.06		.01					.30	.01		.01		.02	.12			.04
12	.15	.11	.03						.03	.05									
13						.02		.01	.01	.02	.01		.02		.04		.02		.01
14						.03				.06									
15				.06				.01		.04			.06					.05	
16		.05											.01						.03
17	.01	.10	.11																
18																			
19			.05																
20			.01	.11	.28			.19						.01					
21				.11		.12	.20		.16	.07	.28	.22	.29	.14	.12	.48	.33	.48	.13
22	.01			.28	.82		.10	.08	.26		.17	.10	.10	.13	.03	.01		.05	.06
23	.01			.37	1.70	.04									.09	.03	.05	.56	.02
24	.35			.07	.15	.04	.90		.03		.65	.08	1.02	.11	.23	.12		.17	.28
25	.04	.05		1.57	.77	.68	.29	.32	1.75	.50	.53	.13	.27	.07	.02	.12		.05	.01
26	.06	.03	.06	.68	.17	.66	.15	.05	1.11	.29	.36	.25	.10	.03	.02	.15		.07	
27	.18	.26	.05	.34	.10	.33	.01	.26	.62	.09	.31	.16	.10	.20	.04	.03	.09	.06	.06
28	.14	.07	.10	.01	.02			.06			.05			.11	.03	.03	.06	.22	.12
29	.08	.26	.76									.04	.03	.02	.04	.05	.06	.08	
30	.14	.27	.34					.01			.02	.05	.02		.01	.01	.16		.01
Total	1.41	1.43	1.71	3.74	4.12	2.36	2.02	1.01	5.04	1.65	2.40	1.03	2.04	.83	.70	1.22	.72	1.78	.89

TABLE II.—*Stations reporting 1·00 in. or more of Rain on each of three consecutive days in June, 1903.*

County.	Station.	JUNE.			Total.
		13th.	14th.	15th.	
Berkshire	Newbury (Welford Park)	1·23	1·42	1·15	3·80
"	" (Weston)	1·00	1·35	1·00	3·35
"	Maidenhead (Heywood Park)	1·15	1·35	1·12	3·62
"	Cookham Vicarage	1·07	1·54	1·08	3·69
"	Wantage (Letcombe Regis)	1·00	2·00	1·10	4·10
Middlesex	Potters Bar (Little Heath)	1·28	1·90	1·06	4·24
Hertfordshire ...	Watford (St. Albans Road)	1·03	1·66	1·17	3·86
"	" (Weetwood)	1·00	1·86	1·14	4·00
"	Broxbourne (Stafford House)	1·36	2·24	1·20	4·80
"	St. Albans (County Museum)	1·01	1·85	1·16	4·02
"	Gilston Park	1·20	1·50	1·42	4·12
"	Hatfield (Holwell House)	1·20	1·70	1·07	3·97
"	Hertford (Bayfordbury)	1·03	1·66	1·02	3·71
"	" (Sewage Works)	1·05	1·48	1·04	3·57
"	Ware (Red House)	1·00	1·40	1·12	3·52
"	" (Fanham's Hall)	1·05	1·35	1·32	3·72
"	Welwyn (Bridge House)	1·10	1·64	1·55	4·29
"	Much Hadham	1·15	1·39	1·33	3·87
"	Bennington House	1·02	1·31	1·40	3·73
"	"	1·04	1·50	1·45	3·99
"	Buntingford (Hamels Park)	1·15	1·32	1·44	3·91
"	Hitchin (Wratten)	1·12	1·75	1·50	4·37
"	" (The Chilterns)	1·11	1·64	1·51	4·26
"	Buntingford (Hillside)	1·15	1·28	1·55	3·98
"	" (Throcking Rectory)	1·08	1·20	1·76	4·04
"	Royston (Therfield Rectory)	1·04	1·71	1·66	4·41
Buckinghamshire.	Wooburn (The Chestnuts)	1·09	1·36	1·18	3·63
"	Chalfont St. Giles (The Stone)	1·10	1·81	1·12	4·03
Bedfordshire	Holwell Bury [Hitchin]	1·55	1·44	1·05	4·04
"	Stotfold [Baldock]	1·04	1·77	1·71	4·52
Essex	Epping (The Hemnalls)	1·58	2·00	1·04	4·62
"	Dunmow (Bigods Hall)	1·25	1·25	1·04	3·54
"	Saffron Walden (Debden Rectory)	1·00	1·26	1·58	3·84
"	" " (Newport)	1·11	1·28	1·72	4·11
"	" "	1·06	1·01	1·78	3·85
"	" " (Audley End)	1·02	1·03	1·67	3·72