

Symons's Meteorological Magazine.

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VOL. L.

“ BRITISH RAINFALL, 1914.”

THE fifty-fourth annual volume of *British Rainfall*, compiled by Dr. H. R. Mill and Mr. Carle Salter, will be ready for distribution early in August. The editorial work is already completed save for revising the final proofs of the last sheets, and only the mechanical processes of printing and binding remain to be finished. The volume now on the verge of completion differs in appearance from its predecessors by being slightly wider and slightly thinner. The extra width enables the General Table of Annual Rainfall to be extended by the addition of a column giving the total rainfall for the year in millimetres as well as in inches, thus enabling anyone to whom millimetres are more familiar than inches, or in any way preferable, to utilize all the annual data, while those content with the old units are put to no inconvenience. The wider page has also facilitated the arrangement of several tables in the earlier parts of the volume and by allowing more words in the printed page it has materially reduced the thickness of the book.

The total number of stations dealt with is 5445, being 75 more than last year. The rate of increase is not so great as usual on account of the war; but it is surprising and gratifying that no falling off in the number has taken place. The Director's Report mentions the fact that the grant asked for from the Development Fund has been declined. The work of the Organization has been carried on as in former years. Mr. H. E. Carter, the chief computer, has joined the Army and his post is kept open for him.

In Part I. the original articles include a description of the remarkable thunderstorm of June 14th, 1914, and an account by Mr. J. Fairgrieve of the development of the rain-fields of the storm in different parts of the country with half-hourly maps. There is also an illustrated summary of the paper on Isomeric Rainfall Maps of the British Isles prepared by Dr. Mill and Mr. Salter for the Royal Meteorological Society. The enlarged page enables the discussion of monthly rainfall in Part II. to be slightly amplified.

SOUTHERN HEMISPHERE WEATHER IN 1914.

By R. C. MOSSMAN, F.R.S.E.

(Continued from p. 77.)

No data from South Georgia for the last quarter of 1914 having yet come to hand, the monthly departures from the South Orkneys for this period have had double weight attached to them in computing the deviations. We may now summarise the more prominent features of last year's weather in the Southern Hemisphere month by month. In judging of the weight to be attached to instances in which a record is broken it is of course necessary to consider the period covered by the observations taken into consideration.

In January barometric pressure was in excess of the average very generally, but normal in a line stretching from Buenos Aires to Santiago de Chile. Temperature on the mean of all the stations was $0^{\circ}\cdot4$ above the average. The month was the hottest on record at such widely separated places as Santiago, Johannesburg, and St. Helena, but was distinctly cool in South Australia, the north of New Zealand, and the far South Atlantic and adjacent Patagonian stations. The month was exceptionally dry in West Australia, New South Wales, Tasmania, the West Indies, and Christmas Island, and unusually wet in middle latitudes on the coast of Chile, in the Argentine Republic, east of 70° W, and between the latitudes of 35° and 40° S.

In February pressure conditions were on the whole in excess of the average, but at Wellington and the South Orkneys slightly under the normal. Temperature on the mean of all the stations was $0^{\circ}\cdot7$ above the average, and while no records were broken, the month was very warm in South Australia and at Santiago, and cool in West Australia. Rainfall was generally under the average, the drought being most intense at Melbourne, Hobart, Valdivia and Christmas Island, the small rainfall at the latter station constituting an extreme record. On the other hand at Evangelists Island 16.54 in. fell, the maximum February fall hitherto observed, and in marked contrast to the drought noted on the Pacific coast some 700 miles to the north. The month was also wet in the province of Buenos Aires, at Rio, and at Perth.

In March barometric pressure was much in excess of the normal at the southern extremity of the South American continent, the excess diminishing to the S.E. and W, but elsewhere it did not deviate much from the average. Temperature was above the normal nearly everywhere, with extreme records at Johannesburg and Christmas Island, the general excess being $1^{\circ}\cdot1$. The heat was specially marked in South Australia, and in Argentina, north of latitude 40° S., rather cool conditions prevailed. No rain records were broken, but there was a marked excess in New South Wales and on the littoral of the Province of Buenos Aires. An

intense drought prevailed at Perth, and both Rio and Cape Town had less than a third of the normal rainfall.

In April pressure conditions referred to the normal were very irregular, the values, to take extremes, being much under the average at Wellington, and considerably in excess at Punta Arenas. The general excess of temperature was $0^{\circ}\cdot4$, the month being the warmest April on record at Sydney, the South Orkneys, South Georgia and Johannesburg, and the coldest on record at Perth. At the other stations comparatively normal conditions prevailed; there was a drought in New South Wales, on the coast of Chile in latitude 40° S., at Santiago, and at Johannesburg. On the other hand the rainfall was excessive in Argentina, where many stations had enormous excesses.* At such widely separated stations as Hobart, Christmas Island, and Evangelists Island there was also an excess with an extreme record at the last named station.

In May pressure was well in excess of the normal in Australia, New Zealand, Brazil and South Africa, and in defect at the South Orkneys and Magellan Straits region. Temperature was low in New Zealand, at Perth, and at Rio, and high in the far South Atlantic, Argentina and South Africa. Rainfall was under half the average at Perth, Adelaide, and Rio; the wettest area being on the Buenos Aires littoral, where nearly double the normal fell.

In the three winter months, June, July, and August, which can be conveniently treated as a whole, pressure was markedly above the average in West and South Australia, and to a less degree in New Zealand, and much below the average in South America, between the parallels of 23° and 40° S. The low pressure at Punta Arenas and the South Orkneys is also worthy of remark. Temperature was very generally above the average, and while neither June nor July were "record" months anywhere, August was notable warm in Australia and cold in the south of Argentina and the South African hinterland. Both Adelaide and Sydney showed August records for warmth, while Johannesburg broke the record for cold. As regards rainfall, the outstanding features were the great droughts at Rio de Janeiro, which had the driest winter in a record beginning in 1851, the excessive precipitation in the middle latitudes of Argentina and Chile, and the scanty rainfall at Adelaide, some parts of New Zealand, and in the region of Magellan Straits. In July all previous records for dry weather were broken at Evangelists Island and Rio, and in August at Adelaide, three New Zealand stations, the South Orkneys and Point Galera.

In September pressure was very high in Australia, New Zealand, and the far South Atlantic, and low in Brazil and the middle latitudes of Argentina. At Melbourne it was the highest in Sep-

* See *Met. Mag.*, Vol. 49, p. 102.

tember during the 57 years covered by the records, exceeding the normal by 0.25 in. Except for the warmth in West Australia and at Johannesburg, and the cold in the south of South America the temperature values do not call for comment. Rainfall was very large in the middle latitudes of Chile and to a less degree on the littoral of Buenos Aires, and at Sydney. A drought prevailed in South and West Australia, over all but the western points of New Zealand, at Johannesburg, and at Christmas Island, with extreme records at Perth, South Georgia, and Christmas Island.

In October the outstanding feature of the pressure distribution was the great excess over South Australia and New Zealand, and the equally marked defect at the South Orkneys, which had the lowest October mean pressure on record, while Melbourne had the highest. Temperature was very high in South and West Australia where all previous records for heat were broken at Perth, Adelaide, and Melbourne. The month was also warm at Hobart, Dunedin, Cape Town and Christmas Island, and distinctly cold at Hokitika, on the west coast of the South Island of New Zealand, and the South Orkneys. There was a great drought in South Australia; Adelaide having the lowest rainfall in 74 years, and Melbourne in the 69 years of observations, while the 15 years' data from Evangelists Island and Point Galera also show extreme records of deficient rain. On the other hand Santiago had more than five times and Sydney nearly three times the normal.

In November pressure was generally under the average, except at Melbourne. Temperature, except in South Australia and one or two other widely separated localities, was under the normal, the low temperature being specially marked on the west coast of New Zealand and the Patagonian region. Extreme records for warmth were established at Melbourne, Sydney, and Christmas Island, and for cold at Hokitika. Rainfall was generally in excess of the normal, but in the North Island of New Zealand, the Magellan Strait area, and at Christmas Island was about half the normal. On the other hand the rainfall was more than double the average at Perth, Concepcion and Ajo; and at Santiago de Chile as much as ten times the long average. At this station September was the wettest since 1868, October the wettest since 1891, while November's rainfall constituted a "record." It must of course be noted that the *mean* monthly rainfalls at Santiago for the three months under review are relatively small, 1.16 in., .57 in., and .21 in., respectively.

In December pressure was rather low over Australia, New Zealand, and the south of Brazil, and high in Magellan Strait. Temperature was in excess of the normal in South Australia, the South Orkneys, St. Helena, and Christmas Island, and below the normal in most other localities; the low temperature on the west coast of New Zealand, where Hokitika was as much as 7°.4 under

the average (a record), being a marked feature. Rainfall was rather irregular, "records" for excess being set up at the South Orkneys and Johannesburg.

During the year 1914 pressure did not vary from the average more than .04 in. at any station, except Melbourne, where the excess was a tenth, while the mean annual value at Perth (W. Australia), was the highest since 1877. Temperature was the highest on record at Adelaide and Sydney, and was also considerably above the normal at Johannesburg and St. Helena, where every month except April had a mean in excess of the average. The north and west of New Zealand and Magellan Strait had a mean much below the average, Hokitika having a deficiency of $2^{\circ}2$, the lowest since 1868. The year was the driest in a 74 years' record at Adelaide, and in a 39 years' record at Perth, and the wettest in a 57 years' record at Ajo. The drought was also very pronounced at Auckland, where there were only two years with a smaller rainfall than 1914, viz., 1859 and 1885. During the last five months of the year both Auckland and Wellington had the lowest rainfall yet recorded. In other regions the year was a wet one in Chile, between latitudes 30° and 38° S., at Sydney and St. Helena, while a moderate deficit was noted at Rio de Janeiro, the West Indies, and Christmas Island.

At the May meeting of the Royal Meteorological Society Dr. Mill and Mr. H. E. Carter read a paper on "The Wet Winter in England," and also made reference to previous wet winters, those of 1876-77 and 1911-12. We have examined a considerable mass of data referring to the conditions in the Southern Hemisphere and find that as a rule so far as any rule can be established from three cases, wet winters in England are preceded by hot and dry weather in South Australia and New Zealand, and moderate warmth and rainfall at Cape Town, returns from other places examined being conflicting. The conditions associated with the wet winters under consideration are not very definite, the most pronounced being heat at Sydney and Adelaide, and great cold in New Zealand. Dunedin and Hokitika show a pronounced excess of rainfall and Rio a defect. During the four months, November, 1914, to February, 1915, a great drought prevailed at Auckland, Wellington, and Cape Town, while at Hokitika 63.43 in. of rain fell, being 167 per cent. of the normal and the highest yet observed during this period. The period at Hokitika was also the coldest on record, the mean temperature being $4^{\circ}8$ under the average, while Sydney, Adelaide, and Perth gave a mean excess of $2^{\circ}4$. It is worthy of note that in January and February, 1915, no rain fell at Cape Town, while for the first quarter of this year the mean temperature was $72^{\circ}1$, the heat and drought being unprecedented in the past three quarters of a century.

TABLE IV.—Showing the Monthly and Annual Rainfall of 1914 as a Percentage of the Average—continued.

Station.	Years taken for Average.	Years of Obsns.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR.
SOUTH AMERICA.															
Punta Arenas	1901-1910	27	74	97	56	110	165	59	(59)	29	70	53	51	175	(85)
Punta Arenas	1888-1910	27	93	90	56	117	155	73	(46)	28	84	58	64	184	(90)
Evangelists Island	1901-1910	15	72	187	115	170	131	66	42	76	94	68	66	113	101
Point Galerá	1901-1910	15	251	32	35	34	116	114	114	57	158	51	183	79	98
Valdivia	1901-1910	20	318	14	48	27	141	128	125	67	149	45	187	84	101
Concepcion	1901-1910	35	389	0	62	79	66	113	143	91	189	151	242	90	115
Concepcion	{ 1876-1887	35	299	0	64	74	82	149	162	76	200	117	202	68	124
Concepcion	{ 1892-1910														
Santiago de Chile	1901-1910	48	0	0	0	66	63	196	115	142	634	543	2298	0	169
Santiago de Chile	1867-1910	48	0	0	0	42	100	252	143	123	347	498	1018	0	192
Ajo (Argentina)	1858-1911	57	200	156	179	15	181	187	191	264	152	149	249	119	212
Río de Janeiro	1858-1911	64	51	148	32	193	41	1	5	10	55	126	68	113	82
WEST INDIES.															
Trinidad	1862-1910	53	17	38	66	50	52	89	56	92	106	91	109	117	83
Grenada	1891-1910	24	40	71	92	108	85	77	71	71	83	118	98	72	81
S. ATLANTIC.															
St. Helena	1892-1910	23	118	126	122	129	136	102	94	137	131	72	224	143	125
S. AFRICA.															
Cape Town	1871-1910	73	351	62	30	75	58	91	119	117	132	28	102	48	93
Johannesburg	1905-1914	10	50	68	76	35	60	380	0	242	13	82	171	178	97
Kimberley	1894-1913	21	35	64	60	105	178	200	0	300	130	212	162	211	108
Christmas Island	1902-1913	13	10	35	117	168	169	195	14	26	5	1	51	143	85

ROYAL METEOROLOGICAL SOCIETY.

AN ordinary meeting of this Society was held on June 16th, at 70, Victoria Street, Westminster, Major H. G. Lyons, F.R.S., President, in the Chair.

The President announced that the Council had accepted the resignation of the Assistant Secretary, Mr. William Marriott, who was now retiring after 43 years of valuable work with the Society. The Fellows of the Society could only realize in part their indebtedness at all times to his kindly help, and the science of Meteorology, to the development of which he had devoted himself, owed much to his labours.

Prof. H. H. Turner, D.Sc., F.R.S., read a paper on "Discontinuities in Meteorological Phenomena." This paper formed a continuation of the author's previous researches in periodicity in rainfall incidence. There was apparently a regular series of dates at each of which a new chapter was opened in the history of the weather. The weather during each period had pronounced individual features, and the changes between the periods were abrupt and not gradual. The study of these discontinuities in various long series of observations brought to light a remarkable coincidence between the changes and certain regular laws connected with the movement of the earth's axis. The movement of the earth's pole on its surface was known to be a complex movement which was alternatively large and small. Periods of quiescence in this movement were well marked and appeared to precede the meteorological discontinuities by about a year. Col. H. E. Rawson suggested the possible relation of the 19-month period investigated by Prof. Turner, and the 19-year period noticed in the oscillations of the high pressure belt. The study of the barometer see-saw between the Argentine and Bombay indicated that the anti-cyclonic belt reached a maximum northerly position at intervals of 19 years, and the dates corresponded roughly to certain of Prof. Turner's critical dates of discontinuities. This pressure oscillation provided a theory for explaining the position of the world's great deserts. Sir Napier Shaw said that Prof. Turner's contribution marked a new stage in the study of periodicity, but the latitude which allowed the mathematician to change the period from time to time gave room for doubt as to the soundness of the theories. Mr. W. W. Bryant said that the theory of the change in the earth's axis provided at least a physical basis to explain meteorological periodicity. As to which was cause and which effect, it had been suggested that the slight deviations noticed in the earth's axis might be due to the changing of the earth's centre of gravity caused by alterations in the positions of the air masses. The best proof of the value of the theory would be found in prediction, a test which had proved an absolute failure in the case of the sunspot forecast.

Messrs. R. Inwards, R. Strachan, W. B. Tripp, J. S. Dines, and F. J. W. Whipple also spoke.

Mr. Charles Harding read a paper on "Battle Weather in Western Europe." The author tabulated the meteorological data collected from Official reports from August, 1914, to April, 1915, and discussed the abnormalities with relation to the western battle area. The greatest rainfall excess was shown to lie in the south-east of England and the north-east of France. It was not suggested that in the recent wet weather the rainy conditions had been generated by gun-firing, but it seemed quite possible that at times, when conditions were favourable to rain, the rains had been augmented or accelerated by the concussion initiated over the battle grounds.

Mr. W. W. Bryant remarked on the non-coincidence of the positions of gun-fire and individual heavy rains, and the danger of such slender evidence as rain falling at a distance. Mr. E. H. S. Bruce said that it was necessary to consider the actual solid matter liberated by the explosions as a nucleus for haze and rain. Messrs. R. Inwards and W. B. Tripp also spoke.

The following were elected Fellow of the Society : Messrs. A. B. Hitchens and S. Tocherny, F.R.A.S.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

UNUSUAL EFFECTS OF LIGHTNING FLASH IN NORTH LONDON.

WHEN in Edmonton yesterday my interest was roused by hearing reports of a supposed thunderbolt, which had fallen in a garden near by, during a severe thunderstorm on the afternoon of June 30th. The report stated that a hole had been formed in the ground and it seemed that the matter was worth further investigation. This I was enabled to carry out by the kindness of the owner of the garden. The actual damage consisted of three shallow holes arranged in a semicircle four feet in diameter, each hole being about four or five inches deep. The gravelly soil had been thrown out in each case in a direction away from the centre of the semi-circle, and was lying in little heaps close to the individual holes. From the bottom of one depression a small tube, like a mole run, extended downwards in a slanting direction towards the centre of the semicircle. A stick one foot long could be passed down this without reaching the end. There was heavy rain at the time of the occurrence, and a possible explanation seems to be that a lightning flash struck the ground and followed down the tube like hole which there

is reason to think existed previously. This might cause violent boiling of the water below and the explosive pressure may then have blown out the three depressions in the ground. This would account for the soil in each case being blown out away from the centre of the circle. The curious thing is that the heavy rain had completely flooded the garden to a depth of some 6 inches or more, and one would naturally have expected that if a flash had reached the surface of the pond thus formed it would have dissipated itself in the water and not followed one isolated path into the ground below. During the storm a fountain of water some three or four feet high was observed at the spot just after a lightning flash, though it was not, of course, till the water had subsided that the damage done would be seen.

J. S. DINES.

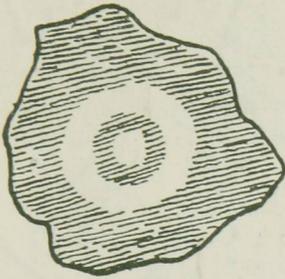
South Farnborough, July 7th, 1915.

THUNDERSTORM AND HAIL, SUNDAY, JULY 4th.

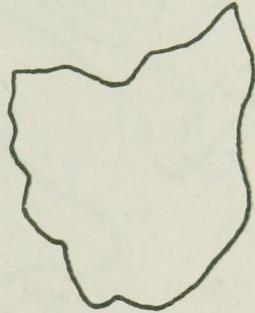
BETWEEN 2.40 and 3.15 p.m. on the afternoon of July 4th we had a thunderstorm accompanied by torrential rain and large hailstones. The lightning was not vivid, nor were there any very loud thunder claps. The thunder consisted of heavy rumblings, almost continuous, for about half an hour. The storm came from W.S.W., and at 3.30 p.m. its lingering traces were declining in the E.N.E., where dark sullen clouds, from which the faintly audible rolling of distant thunder came, were still discernible.

Some of the larger hailstones were $1\frac{1}{4}$ inches in their average dimensions, but they were of many irregular forms. A few were oval, but the shape most favoured was roughly pyramidal. In many specimens the centre of the flat lower side showed a white area fringed with a purer ring of ice and then a white ring. There was, however, little symmetry in the markings or in the shape of the particles. Temperature at the cessation of the storm stood at 61° .

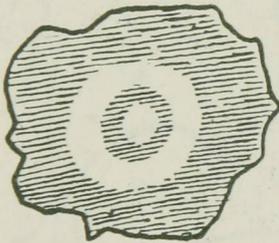
Considerable damage appears to have been done at Bristol and the neighbourhood. Many correspondents describe the hailstones as being as large as walnuts. At Wick and Kingswood several trees were blown down, and 100 panes of glass were smashed in Kingswood Chapel. At Burnham the hailstones are stated to have been of enormous size and many windows were broken. "Gulls caught in the tempest were blown inland as helpless as if they were leaves." Floral displays in the gardens were cut down as if by a sickle. At Mangotsfield the glass suffered materially. Wheat was much damaged and apple trees almost denuded of both foliage and fruit, while in all orchards the crop of apples will be seriously diminished. At Wrington the atmosphere grew so dark



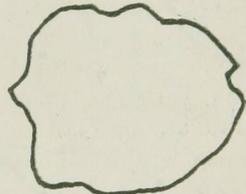
1.



3.



2.



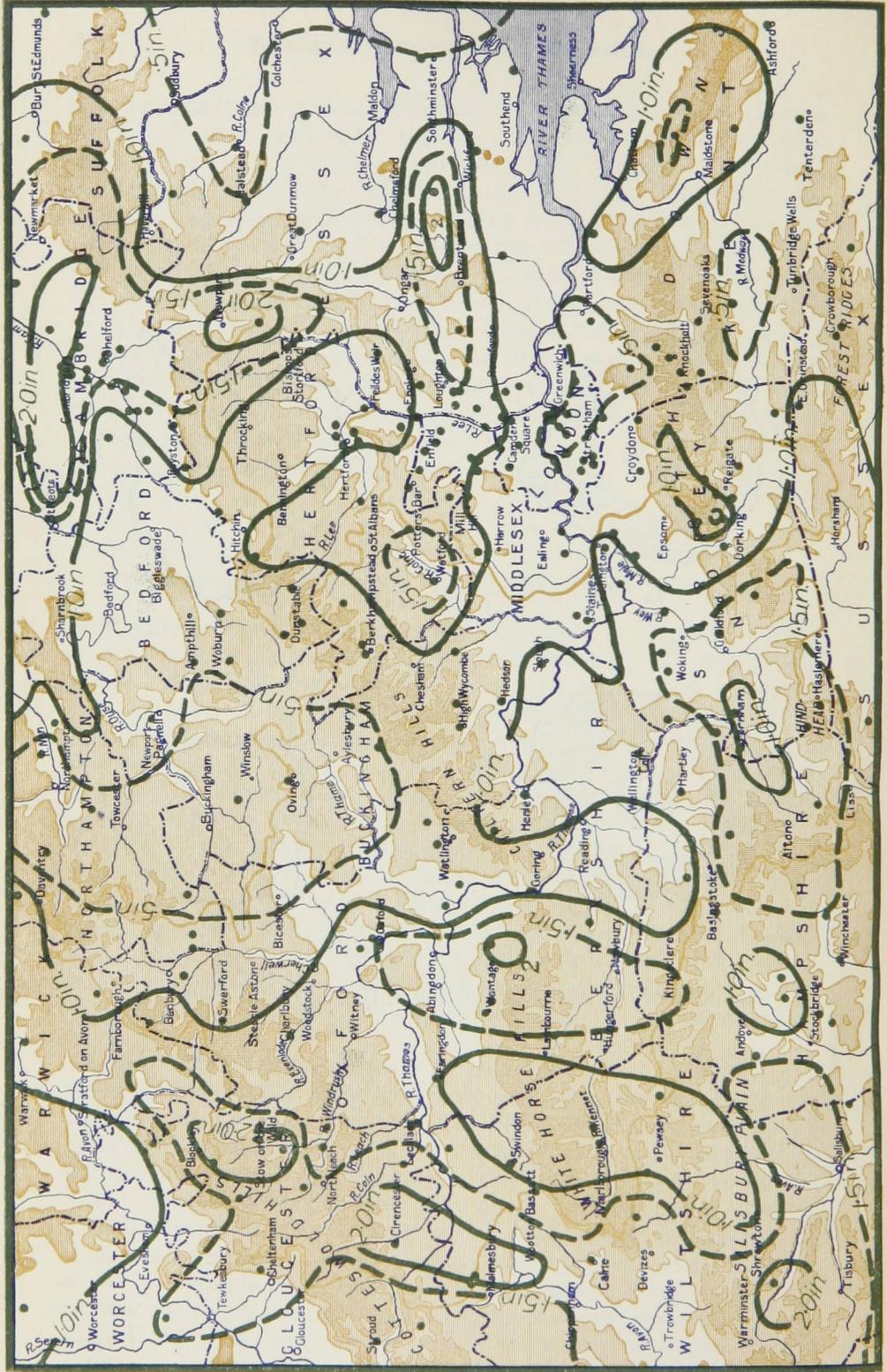
4.

Sections of hailstones which fell at Bristol on July 4th, 1915.

Face p. 98.

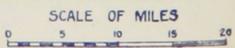
W. F. Denning del.

THAMES VALLEY RAINFALL — JUNE 1915.



ALTITUDE SCALE

Below 250 feet	250 to 500 feet	500 to 1000 feet	Above 1000 feet
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at 2.30 that one could not see across the road. Broken glass and beaten down crops attested the violence of the storm. At High-bridge, Weston-super-Mare and other towns in this part the same experiences are reported. At Bristol some of the low-lying districts were flooded but not seriously. The fact that the tide was out enabled the fresh to be quickly carried off and thus extensive damage was averted.

It is perhaps worthy of note that on July 1st, 1914, we had a great thunderstorm in this city and serious flooding.

I took tracings of some of the larger particles and here are a few of them in their natural size :—

Nos. 1 and 2 exhibit roughly the markings on the lower flat sides of the stones. No. 4 was about the average size of the stones.

W. F. DENNING.

Bristol, July 4th, 1915.

THUNDERSTORM ON JULY 4th.

DURING a thunderstorm here on July 4th, .88 in. of rain fell in about half an hour. The storm was accompanied by large hailstones and lumps of ice, one lump I measured was $1\frac{1}{2}$ inches by one inch, and half an inch thick in the centre, and many round hailstones were three-quarters of an inch in diameter. The hailstones had concentric layers of clear and opaque ice, and under a lens appeared full of minute air bubbles.

ROBT. C. SIKES, M.Inst.C.E.

Milton Cottage, Stapleton, Bristol, July 7th, 1915.

THE SEASONS.

I do not think Mr. Bonacina's case for counting May as summer and August as autumn is quite convincing. The solar difference between the two months in favour of May is not very marked, except as between the end of May and the end of August. The relative frequency of thunder in May and gales in August is, perhaps, only apparent to very perceptive people.

On the other hand the difference of air temperature is noticeably to the advantage of August. If there is an autumnal suggestion about the latter part of August, nights in May are sometimes more than autumnal. At least that would probably be the opinion of those whose flowers or vegetables were cut by frost on May 31st last.

G. WESTON.

The Vicarage, Bethersden, Ashford, Kent.

RAINFALL TABLE FOR JUNE, 1915.

STATION,	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875— 1909. in.	1915. in.
Camden Square.....	London.....	51 32	0 8	111	2'28	·69
Tenterden.....	Kent.....	51 4	*0 41	190	2'03	·71
Arundel (Patching).....	Sussex.....	50 51	0 27	130	2'13	·45
Fawley (Cadland).....	Hampshire.....	50 50	1 22	52	2'17	1'97
Oxford (Magdalen College).....	Oxfordshire.....	51 45	1 15	186	2'27	1'49
Wellingborough(Swanspool).....	Northampton.....	52 18	0 41	155	2'14	1'76
Shoeburyness.....	Essex.....	51 31	*0 48	13	1'77	·79
Bury St. Edmunds(Westley).....	Suffolk.....	52 15	*0 40	226	2'21	1'15
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	1'77	1'90
Polapit Tamar [Launceston].....	Devon.....	50 40	4 22	315	2'18	2'03
Rousdon [Lyme Regis].....	".....	50 41	3 0	516	2'18	1'49
Stroud (U pfield).....	Gloucestershire.....	51 44	2 13	226	2'43	·96
Church Stretton (Wolstaston).....	Shropshire.....	52 35	2 48	800	2'59	1'05
Boston.....	Lincolnshire.....	52 58	0 1	11	1'95	·88
Worksop (Hodsock Priory).....	Nottinghamshire.....	53 22	1 5	56	2'06	·71
Mickleover Manor.....	Derbyshire.....	52 54	1 32	280	2'55	3'58
Macclesfield.....	Cheshire.....	53 15	2 7	501	2'85	2'33
Southport (Hesketh Park).....	Lancashire.....	53 39	2 59	38	2'26	1'64
Arncliffe Vicarage.....	Yorkshire, W.R.....	54 8	2 6	732	3'63	·84
Wetherby (Ribston Hall).....	".....	53 59	1 24	130	2'17	·78
Hull (Pearson Park).....	"..... E.R.....	53 45	0 20	6	2'09	·28
Newcastle (Town Moor).....	Northumberland.....	54 59	1 38	201	2'04	·48
Borrowdale (Seathwaite).....	Cumberland.....	54 30	3 10	423	6'94	1'80
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	2'55	1'25
Haverfordwest.....	Pembroke.....	51 48	4 58	90	2'74	4'12
Aberystwyth (Gogerddan).....	Cardigan.....	52 26	4 1	83	2'97	1'73
Llandudno.....	Carnarvon.....	53 20	3 50	72	1'97	1'53
Cargen [Dumfries].....	Kirkcudbright.....	55 2	3 37	80	2'84	...
Marchmont House.....	Berwick.....	55 44	2 24	498	2'38	1'52
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	3'04	1'00
Glasgow (Queen's Park).....	Renfrew.....	55 53	4 18	144	2'41	1'85
Inveraray (Newtown).....	Argyll.....	56 14	5 4	17	3'64	2'12
Mull (Quinish).....	".....	56 34	6 13	35	3'30	·99
Dundee(Eastern Necropolis).....	Forfar.....	56 28	2 57	199	2'06	1'70
Braemar.....	Aberdeen.....	57 0	3 24	114	2'18	2'22
Aberdeen (Cranford).....	".....	57 8	2 7	120	2'02	1'50
Gordon Castle.....	Moray.....	57 37	3 5	107	2'13	·71
Fort Augustus(S. Benedict's).....	E. Inverness.....	57 9	4 41	68	2'07	·68
Loch Torridon (Bendamph).....	W. Ross.....	57 32	5 32	20	4'07	·79
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	2'10	·46
Wick.....	Caithness.....	58 26	3 6	77	1'83	·85
Killarney (District Asylum).....	Kerry.....	52 4	9 31	178	2'92	1'97
Waterford (Brook Lodge).....	Waterford.....	52 15	7 7	104	2'79	2'11
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	2'70	1'68
Ennistymon House.....	Clare.....	52 57	9 18	37	3'18	1'84
Gorey (Courtown House).....	Wexford.....	52 40	6 13	80	2'59	1'48
Abbey Leix (Blandsfort).....	Queen's County.....	52 56	7 17	532	2'58	2'37
Dublin(Fitz William Square).....	Dublin.....	53 21	6 14	54	2'00	1'62
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	2'72	2'77
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 16	74	3'17	2'17
Cong (The Glebe).....	".....	53 33	9 16	112	3'18	1'56
Collooney (Markree Obsy.).....	Sligo.....	54 11	8 27	127	3'11	2'83
Seaforde.....	Down.....	54 19	5 50	180	2'88	1'46
Bushmills (Dundarave).....	Antrim.....	55 12	6 30	162	2'56	...
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	2'82	2'76

RAINFALL TABLE FOR JUNE, 1915—continued.

RAINFALL OF MONTH (con.)					RAINFALL FROM JAN. 1.				Mean Annual 1875-1909.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.		No. of Days	Aver. 1875-1909. in.	1915. in.	Diff. from Aver. in.	% of Av.		
		in.	Date.							
-1.59	30	.17	26	8	10.96	13.94	+2.98	127	25.11	Camden Square
-1.32	35	.38	30	6	11.44	14.17	+2.73	124	27.64	Tenterden
-1.68	21	.19	28	7	12.46	16.93	+4.47	136	30.48	Patching
- .20	91	1.07	30	8	13.31	17.44	+4.13	131	31.87	Cadland
- .78	66	.53	25	10	10.60	12.66	+2.06	119	24.58	Oxford
- .38	82	1.39	30	8	11.22	10.16	-1.06	91	25.20	Swanspool
- .98	45	.31	28	8	8.00	8.74	+ .74	109	19.28	Shoeburyness
-1.06	52	.46	28	7	10.76	10.82	+ .06	101	25.40	Westley
+ .13	107	1.23	28	9	9.61	12.98	+3.37	135	23.73	Geldeston
- .15	93	.44	28	11	15.88	20.62	+4.74	130	38.27	Polapit Tamar
- .69	68	.45	27	9	14.33	14.58	+ .25	102	33.54	Rousdon
-1.47	40	.78	25	7	13.08	13.54	+ .46	104	29.81	Stroud
-1.54	41	.40	25	7	14.30	17.08	+2.78	119	32.41	Wolstaston
-1.07	45	.31	25	11	9.86	8.90	- .96	90	23.35	Boston
-1.35	34	.28	28	6	10.80	8.67	-2.13	80	24.46	Hodsock Priory
+1.03	140	2.19	30	7	11.77	12.24	+ .47	104	26.65	Mickleover
- .52	82	1.21	25	9	14.76	16.24	+1.48	110	34.73	Macclesfield
- .62	73	.47	25	8	12.96	14.02	+1.06	108	32.70	Southport
-2.79	23	.35	30	8	27.22	27.07	- .15	99	61.49	Arncliffe
-1.39	36	.62	30	3	11.63	11.54	- .09	99	26.87	Ribston Hall
-1.81	13	.15	26	4	11.08	9.98	-1.10	90	26.42	Hull
-1.56	24	.19	26	6	11.55	10.08	-1.47	87	27.94	Newcastle
-5.14	26	.30	29	10	56.38	55.24	-1.14	98	129.48	Seathwaite
-1.30	49	.50	25	12	17.22	16.68	- .54	97	42.28	Cardiff
+1.38	150	1.27	22	13	19.45	22.67	+3.22	117	46.81	Haverfordwest
-1.24	58	.38	28	9	18.12	22.49	+4.37	124	45.46	Gogerddan
- .44	78	.53	23	7	12.37	13.63	+1.26	110	30.36	Llandudno
...	...	...	...	...	19.06	...	...	...	43.47	Cargen
- .86	64	.69	26	8	14.38	11.10	-3.28	77	33.76	Marchmont
-2.04	33	.56	5	5	21.10	23.97	+2.87	113	49.77	Girvan
- .56	77	1.18	26	6	15.51	13.45	-2.06	87	35.97	Glasgow
-1.52	58	.88	26	9	29.32	31.74	+2.46	108	68.67	Inveraray
-2.31	30	.39	2	10	23.55	24.46	+ .91	104	56.57	Quinish
- .36	83	.70	26	7	12.02	11.35	- .67	94	28.64	Dundee
+ .04	102	1.13	29	6	15.15	18.37	+3.22	121	34.93	Braemar
- .52	74	.64	26	10	14.02	13.31	- .71	95	32.73	Aberdeen
-1.42	33	.30	2	8	12.27	13.08	+ .81	107	30.34	Gordon Castle
-1.39	33	.19	4	9	20.22	15.26	-4.96	75	44.53	Fort Augustus
-3.28	19	.28	2	7	37.55	35.42	-2.13	94	83.93	Bendamph
-1.64	22	.14	26	8	14.28	...	...	...	31.90	Dunrobin Castle
- .98	46	...	...	...	12.71	10.17	-2.54	80	29.88	Wick
- .95	67	...	...	...	24.87	23.64	-1.23	95	54.81	Killarney
- .68	76	.66	26	12	17.40	15.65	-1.75	90	39.57	Waterford
-1.02	62	.31	26	12	17.51	16.36	-1.15	93	39.43	Castle Lough
-1.34	58	.70	4	10	19.67	19.97	+ .30	102	46.52	Ennistymon
-1.11	57	.36	25	11	15.42	13.48	-1.94	87	34.99	Courtown Ho.
- .21	92	.38	10	15	15.84	14.37	-1.47	91	35.92	Abbey Leix
- .38	81	.54	25	13	12.15	11.12	-1.03	92	27.68	Dublin
+ .05	102	.58	26	13	16.01	17.65	+1.64	110	36.15	Mullingar.
-1.00	68	.62	4	10	23.38	22.93	- .45	98	52.87	Enniscoie
-1.62	49	.53	2	9	21.41	19.68	-1.73	92	48.90	Cong
- .28	91	.65	4	14	18.83	26.72	+1.89	110	42.71	Markree
-1.42	51	.58	4	6	17.42	16.22	+1.20	93	38.91	Seaford
...	...	...	...	...	15.49	...	...	...	37.56	Dundarave
- .06	98	.82	4	11	17.10	16.99	- .11	99	39.38	Omagh

SUPPLEMENTARY RAINFALL, JUNE, 1915.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road.	·96	XI.	Lligwy	·75
„	Ramsgate	·46	„	Douglas	·89
„	Hailsham	·93	XII.	Stoneykirk, Ardwell House...	·96
„	Totland Bay, Aston House...	·67	„	Carsphairn Shiel	1·34
„	Stockbridge, Ashley	1·42	„	Beattock, Kinnelhead	1·17
„	Grayshott	1·51	„	Langholm, Drove Road	2·56
III.	Harrow Weald, Hill House...	1·19	XIII.	Meggat Water, Cramilt Lodge	1·06
„	Caversham, Rectory Road ...	1·04	„	North Berwick Reservoir.....	1·68
„	Pitsford, Sedgebrook.....	·36	„	Edinburgh, Royal Observaty.	1·58
„	Woburn, Milton Bryant.....	·75	XIV.	Maybole, Knockdon Farm ...	1·10
„	Chatteris, The Priory.....	1·21	XV.	Balachulish House	1·56
IV.	Elsenharn, Gaunts End	2·36	„	Campbeltown, Witchburn ..	1·82
„	Colchester, Hill Ho., Lexden	·50	„	Holy Loch, Ardnadam.....	3·09
„	Ipswich, Rookwood, Copdock	·46	„	Islay, Eallabus	1·90
„	Blakeney	·62	„	Tiree, Coraigmore	1·32
„	Swaffham	·83	XVI.	Dollar Academy	1·74
V.	Bishops Cannings	1·82	„	Balquhider, Stronvar.....	1·76
„	Wimborne, St. John's Hill ...	·58	„	Glenlyon, Meggernie Castle..	1·54
„	Ashburton, Druid House... ..	1·82	„	Blair Atholl	2·54
„	Cullompton	2·00	„	Coupar Angus	1·27
„	Lynmouth, Rock House	1·51	„	Montrose, Sunnyside Asylum.	·69
„	Okehampton, Oaklands... ..	1·86	XVII.	Alford, Lynturk Manse	1·07
„	Hartland Abbey.....	1·65	„	Fyvie Castle	1·56
„	Probus, Lamellyn.....	3·89	„	Keith Station	1·19
„	North Cadbury Rectory.....	1·27	XVIII.	Rothiemurchus	·93
VI.	Clifton, Pembroke Road.....	·94	„	Loch Quoich, Loan	1·05
„	Ross, The Graig	·62	„	Drumnadrochit	·47
„	Shifnal, Hatton Grange.....	1·59	„	Skye, Dunvegan	·74
„	Droitwich.....	·84	„	Lochmaddy, Bayhead	·59
„	Blockley, Upton Wold.....	2·24	„	Glencarron Lodge	·91
VII.	Market Overton.....	2·24	XIX.	Invershin	·48
„	Market Rasen	·33	„	Melvich	·53
„	Bawtry, Hesley Hall	·58	„	Loch Stack, Achfary	·60
„	Derby, Midland Railway.....	1·24	XX.	Dunmanway, The Rectory ..	3·55
„	Buxton .....	...	„	Glanmire, Lota Lodge.....	2·11
VIII.	Nantwich, Dorfold Hall	1·43	„	Mitchelstown Castle	2·54
„	Chatburn, Middlewood	1·07	„	Darrynane Abbey.....	2·93
„	Lancaster, Strathspey	·87	„	Clonmel, Bruce Villa	1·55
„	Langsett Moor, Up. Midhope	1·35	„	Newmarket-on-Fergus.Fenloe	1·14
IX.	Scarborough, Scalby	·41	„	Laragh, Glendalough	2·03
„	Ingleby Greenhow	·64	„	Ballycumber, Moorock Lodge	2·26
„	Mickleton	·40	„	Balbriggan, Ardgillan	1·44
X.	Bellingham, High Green Manor	·91	XXII.	Ballynahinch Castle.....	...
„	Ilderton, Lilburn Cottage ...	·92	„	Woodlawn	2·06
„	Keswick, The Bank.....	1·41	„	Westport, St. Helens	1·79
XI.	Llanfrecfa Grange	1·02	„	Dugort, Slievemore Hotel ...	2·63
„	Treherbert, Tyn-y-waun	3·58	„	Mohill Rectory	2·33
„	Carmarthen, The Friary	2·38	„	Enniskillen, Portora.....	2·59
„	Fishguard Goodwick Station.	4·22	XXIII.	Dartrey [Cootehill]	2·75
„	Crickhowell, Tal-y-maes.....	1·10	„	Warrenpoint, Manor House ..	1·80
„	New Radnor, Ednol	2·12	„	Banbridge, Milltown	2·55
„	Birmingham WW., Tyrmynydd	2·02	„	Belfast, Cave Hill Road	1·65
„	Lake Vyrnwy	1·20	„	Ballymena Harryville	2·46
„	Llangynhafal, Plás Draw.....	·88	„	Londonderry, Creggan Res...	3·79
„	Dolgelly, Bryntirion.....	1·84	„	Dunfanaghy, Horn Head ...	1·13
„	Beitws-y-Coed, Tyn-y-bryn...	...	„	Killybegs	1·61

THE WEATHER OF JUNE.

THE month opened with relatively high pressure over the Iberian Peninsula and low pressure off the north of Scotland, showers being experienced in some parts of Ireland and Scotland. On the 2nd the Atlantic depression spread farther over the United Kingdom, the southerly current bringing heavy rain in the south of Ireland, the maximum amounts being 1·36 in. at Caheragh, 1·30 in. at Valentia, and 1·07 in. at Darynane, sharp ground frosts were noted on the morning of the 2nd in such widely separated localities as the north of Scotland, North Wales, and in Devonshire. On the 4th and 5th temperature rose considerably reaching a maximum for the month in most localities on the 8th, the highest values recorded being 90° at Cromer and Norwich, and 89° at several other places in the east of England and at Camden Square. The highest temperatures in most parts of Ireland and Scotland were recorded on the 12th. Associated with the high temperature small shallow depressions producing a thundery type of weather developed on the 7th and 8th. On the 9th an inch fell at Skegness, and on the following day during a heavy thunderstorm at Llaniddansant, Carmarthen, as much as 3·03 in. fell in rather less than three hours. From about the 12th to the 23rd anti-cyclonic rainless conditions associated with easterly winds and much sunshine prevailed over the whole country and ground frosts occurred in many parts. On the 18th and 19th even shade minima as low as 28° were recorded at Balmoral, 31° at Durham, and 32° or slightly less in the midland counties and the north-west of England. During this cold period which did great damage to crops and vegetables the shade temperature at Margate at no time fell below 50°, and at Ventnor 48°. A sharp ground frost was also noted on the morning of the 20th, the thermometer falling to 24° at Llangammarch Wells, 25° at Greenwich, and 26° at Tunbridge Wells and Birmingham, while in the shade the temperature fell to 32° at the first named station and also at Balmoral. Frost also occurred in the middle and west of Ireland damaging the potato crop. Between the 22nd and the 25th a cyclonic disturbance in the south ended the long dry period, rain falling locally with heavy thunderstorms during the last four days of the month. At Wernbystack and Llanfrechfa Grange, in South Wales, an absolute drought of 36 days terminated on the 24th. Partial droughts lasting about six weeks occurred at Liverpool, 44 days, Mansfield 42 days, and Totland Bay 41 days. Several heavy rainfalls occurred during the thunderstorm, at the close of the month the maximum daily falls reported being 2·80 ins. at Buxton and 2·19 ins. at Mickelover on the 30th. The scanty rainfall of the month was very irregular in distribution. More than three inches fell in the extreme south of Ireland, over the greater part of Cornwall and in several small areas in Wales, the north of Ireland, and the Midlands. Less than an inch fell over the east coast districts and in a narrow fringe on the south coast, while the north of Scotland was equally dry, less than a third of the average falling in many places. At Hull only 13 per cent. of the normal fell, and at Bendamph where no rain fell after the 8th, 19 per cent. In Ireland more than half the average fell practically everywhere.

In the Thames Valley most rain fell on the Cotteswolds, where there was over two inches, while in parts of Buckingham and North Hants less than one-fourth of an inch fell. Over the Kingdom as a whole, the general rainfall expressed as a percentage of the average was as follows:—England and Wales, 57; Scotland, 49; Ireland, 73; British Isles, 59.

Sunshine was abundant, the following amounts being reported:—Camden Square, 206·2 hours; Totland Bay, 215·3 hours; Copdock, 241·2 hours; Sidmouth, 205·4 hours; Ashbourne, 226·8 hours; Matlock Bath, 224·1 hours; Southport, 243·9 hours; Hull, 150·0 hours; Haverfordwest, 199·7 hours; Paisley 204·0 hours; Lock Stack, 248·0 hours; Swinton, 165·1 hours.

In London (Camden Square) a partial drought lasting 39 days ended on the 25th. Mean temperature 61°·1 or 1° above the average. Duration of rain 8·8 hours. Evaporation 3·15 inches.

Climatological Table for the British Empire, January, 1915.

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.									
London, Camden Square	53°	13	26°	23	44°	35°	35°	86	73°	24°	4·12	19	7·9
Malta	68·9	29	43·5	21	60·1	50·9	...	86	142·0	...	1·79	11	1·8
Lagos	90·3	23	67·0	10	87·5	74·3	71·0	73	139·5	62·0	·78	4	6·6
Cape Town	94·8	8	59·5	3	82·6	63·7	59·2	62	...	...	·00	0	2·4
Natal, Durban ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Johannesburg	84·8	2	53·9	17	75·3	58·1	60·2	88	..	52·4	11·63	19	7·4
Mauritius	91·5	28	68·2	5	87·5	71·9	67·2	68	...	60·4	1·03	14	5·8
Bloemfontein	93·7	11	58·4	6	85·3	64·0	58·5	61	..	...	4·37	10	4·7
Calcutta	85·5	27	49·3	2	78·5	57·3	54·8	65	...	38·6	·41	2	3·7
Bombay	87·2	12	62·3	9	83·4	68·5	62·7	66	134·0	49·4	·00	0	1·7
Madras	86·7	11	65·9	9, 28	84·1	69·9	68·8	80	153·2	62·5	9·61	8	5·2
Colombo, Ceylon	91·0	24	66·3	30	86·8	72·3	71·7	78	162·6	62·1	1·49	14	4·5
Hongkong	71·0	28	41·7	16	64·0	56·3	51·8	72	...	...	·35	6	5·4
Sydney	104·6	26	57·4	9	80·1	64·7	59·2	65	164·3	48·2	1·18	8	4·7
Melbourne	103·7	16	48·6	22	77·9	57·4	51·5	55	160·3	40·6	1·61	8	4·5
Adelaide	108·3	16	50·2	8	87·1	61·3	50·0	38	159·3	41·1	·49	3	3·3
Perth	102·2	11	56·6	19	87·5	66·2	62·5	66	170·0	48·6	·87	3	2·6
Coolgardie	103·4	23	53·2	20	86·5	63·5	55·1	50	160·0	52·0	3·43	9	4·3
Hobart, Tasmania	92·9	25	47·2	14	70·1	52·8	45·8	55	151·1	37·6	·17	9	6·6
Wellington	84·0	29	47·6	2	69·0	57·1	54·7	74	152·0	33·4	1·73	8	6·5
Auckland	81·5	9	50·0	20	72·6	59·2	57·7	76	152·0	47·0	3·09	6	5·6
Jamaica, Kingston	89·9	29	66·8	25	86·2	70·3	67·8	75	...	...	1·11	6	...
Grenada	86·0	24	71·0	3	82·8	72·7	...	76	135·0	...	5·06	9	2·8
Toronto	46·7	17	-1·0	22	30·7	16·6	18·7	88	110·0	-6·0	3·53	12	6·6
Fredericton	51·0	19	-29·0	31	28·0	8·9	...	85	...	...	3·34	9	6·0
St. John, N.B.	50·0	7	-9·0	31	32·0	16·7	22·2	78	...	...	5·79	9	5·6
Alberta, Edmonton	43·3	17	-22·0	27	19·9	1·9	...	89	82·8	-27·8	·55	8	5·6
Victoria, B.C.	49·4	30, 31	30·9	22	44·3	36·7	37·0	87	...	...	1·55	14	6·6

Johannesburg.—Bright sunshine 166·2 hours.

Mauritius.—Mean temp. 0°·5 above, dew point 3°·1 below, and R 6·58 in. below, averages. Mean hourly velocity of wind 10·1 miles, or 1·0 miles below average.

COLOMBO, CEYLON.—Mean temp. 79°·6 or 0°·6 above, dew point 1°·5 above, and R 1·79 in. below, averages. Mean hourly velocity of wind 6·4 miles.

HONGKONG.—Mean temp. 60°·1. Mean hourly velocity of wind 10·9 miles. Bright sunshine 179·4 hours.

Melbourne.—Mean temp. 0°·2 above, and R ·21 in. below, averages.

Adelaide.—Mean temp. 0°·1 above, and R ·24 in. below, averages.

Perth.—Mean temp. 3°·2 above average, excessive rains recorded.

Coolgardie.—Temp. 2°·6 above, and R about 3 in. above, averages.

Hobart.—Mean temp. 0°·9 below average.

Wellington.—Mean temp. 0°·6 above, and R 1·58 in. below, averages. Bright sunshine 232·7 hours.

Auckland.—Rainfall slightly above, temperature slightly below, and sunshine below, averages.

ALBERTA, EDMONTON.—Warm and sunny with large variations of temperature, less snow than usual.