

Symons's Meteorological Magazine.

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“BRITISH RAINFALL, 1915.”

THE fifty-fifth annual volume of *British Rainfall*, compiled by Dr. H. R. Mill and Mr. Carle Salter, has been completed, is now in the press, and will be issued at an early date.

The new volume is a little thinner than its immediate predecessors, a fact which is not due to any appreciable falling off in the data available, but merely to the dearth of paper and the increased cost of production in all departments. The saving of space has been made systematically in all three parts of the work.

Part I. contains the Annual Report of the Director to the Trustees, the usual subscription lists, two original papers on rainfall matters, viz., a discussion of the Average Annual Rainfall of the Forth Valley, with a map, and a discussion of the 100-years' rainfall record at Greenwich, the latter by Mr. W. C. Nash. There is also a summary of the changes in the Staff of Observers in the form this year of a mere skeleton table, and, finally, a list of Observers deceased during the year, with a few short obituary notices.

The Report refers to the effect of the war on the work of the British Rainfall Organization. Curiously enough there is only a falling off of 41 in the total number of rain records received, 5,412, and there is no increase in the length of the Obituary list, a fact no doubt due to the small number of young men who are Rainfall Observers. Thus, out of 92 deaths recorded the ages of 67 were known and averaged 72, only three being below 40. The chief effect has been a shrinkage of the income from subscriptions for the publications, and the depletion of the Office Staff by enlistment.

Part II., though retaining its rather too comprehensive title “Rainfall and Meteorology of 1915,” has been modified by the inclusion of the articles on Evaporation and Percolation, and on the Camden Square meteorological record, formerly given in Part I., and by the exclusion of the Observers' Notes on the Days and on the Year. The omission of these notes was the only possible way of saving space without sacrificing matter of more definite scientific value. The usual full discussion is given of the number

of rain days, the Duration of Rain, Heavy Rains in Short Periods and Heavy Falls on Rainfall Days. This last section has been undergoing a gradual evolution during the last fifteen years, and is now modified a little more in the direction of the cartographic study of all days the distribution of rainfall on which was remarkable or interesting, even if the amount of precipitation fell far short of that dealt with in the old discussions of maximum falls in which this section originated. Rain-spells and droughts, monthly and seasonal rainfall are discussed in the same manner as before, and the final treatment of the relation of the total rainfall of the year to the average takes the same form and includes the coloured map as given in the nine previous volumes. It is now possible to compare these ten maps of differences from the average with interesting results. As in last year's volume the Extremes of Rainfall for the year are dealt with on a regional and not on a statistical basis, thus overcoming the difficulty of deciding whether the lowest and highest rainfalls reported for the year were accurate—it being obvious that the risk of error in extreme figures is always greater than in those of more normal magnitude.

Part III. consists of the General Table of Rainfall at about 5,400 stations, and here the only means of economizing space was by the omission of the series of maps showing the divisions in which the stations are grouped. This omission is a war measure, and it is hoped that it may not be necessary another year.



REVIEWS.

A Study of the Radiation of the Atmosphere. By ANDERS ÅNGSTRÖM. Washington, 1915. Size, $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 159.

THIS investigation, was made by the aid of the Hodgkins Fund of the Smithsonian Institution. The work includes an analysis of the effect of certain factors—humidity, temperature, haze, clouds—upon the radiation of the atmosphere. These results are summarized at the beginning of the volume, and several important conclusions are arrived at. The following abstract will indicate the scope and value of Prof. Angström's deductions. The variations of the total radiation of the atmosphere are at lower altitudes than 4,500 metres, principally caused by variations in temperature and humidity, the total radiation received being very nearly proportional to the fourth power of the temperature at the observing station. The effect of an increase in water vapour is to increase the radiation, and this has been expressed by an exponential law. Increased pressure of water vapour is found to decrease the effective radiation from the earth to every point of the sky, the diminution being much larger for large zenith angles than

for small ones. The radiation of the upper, dry atmosphere would be approximately 50 per cent. of that of a black body at the temperature of the place of observation. The radiation during the day time appears to be subject to the same laws that hold for nocturnal radiation. An increase in altitude affects the radiation of a blackened body according to the temperature and humidity gradient. An increase of the humidity or a decrease of the temperature gradient tends to shift the height (3,000 metres), at which the effective radiation is attained, to higher altitudes. The influence of clouds is very variable, whilst haze exerts an almost inappreciable effect. It is probable that the radiation from large water surfaces is almost constant at different temperatures and consequently in different latitudes.

Road Amundsen's Antarctic Expedition Scientific Results: Meteorology.
By H. MOHN. Size, 11 × 7. Kristiania, 1915. Pp. 78.

THIS is a discussion of observations at Framheim, lat. 78° 38' S., long. 163° 37' W., the nearest fixed point to the South Pole at which observations have been made. The period of observation extends from April 1st, 1911, to January 31st, 1912.

The tri-daily observations are given *in extenso* and analysed in great detail. The mean temperature reduced to the 5 years' means from McMurdo Sound is $-11^{\circ}\cdot4$ F., that of McMurdo Sound being $0^{\circ}\cdot7$ F. or 12° higher. From May to September Framheim is on the average 18° colder than McMurdo Sound, showing that a pole of cold lies over the ice-barrier, where calms are much more frequent than in the vicinity of Victoria Land. The effect of Föhn in McMurdo Sound also increases the normal temperature difference between the two stations. The coldest month is August and the warmest December, with mean temperatures of $-34^{\circ}\cdot2$ F. and $25^{\circ}\cdot0$ F. respectively. The temperature never rose to 32° , the minimum was $-74^{\circ}\cdot2$. The mean barometric pressure was 29.13 ins., the maximum being 30.19 ins. in December, and the minimum 28.07 in. in May. In connection with the pressure observations it is noted that both the barometers (Wild Fuess No. 361 and Adie No. 839) reached Framheim in good condition. Satisfactory comparisons of the two instruments were made there, but, owing to an accident, both instruments were broken at Colon on the way home. In view of this it is remarkable that no reference has been made to the comparison with the standard of the Argentine Meteorological Office at Buenos Aires in 1912 and 1913. For more than a year after the expedition the *Fram* barometers were placed side by side with the Argentine standard, the results being eminently satisfactory.

R.C.M.

METEOROLOGY OF DAVIS STRAIT AND BAFFIN BAY.

At a meeting of the Challenger Society on the 31st May last, a paper upon the Meteorology of Davis Strait and Baffin Bay was contributed by Captain Campbell Hepworth, C.B., who mentioned that his information upon this subject was obtained from a set of meteorological charts of those regions which have been prepared at the Meteorological Office, and are now in course of publication.

He stated that these charts, which refer to the six months May to October, were based on observations that had been contributed by the commanders and officers of exploring and whaling ships ; and number 39,100 in all. For the construction of similar charts of the remaining six months of the year the data available were insufficient. The chief points that are brought out in these charts are as follows :—

The distribution of pressure over Davis Strait, Baffin Bay and the lands adjoining is mainly subordinate to the general distribution of pressure over the polar regions of the Western Hemisphere, but partly to local conditions.

The distribution of surface temperature is the result, for the most part, of the commingling of the (1) warm Atlantic water from the south, and (2) the cold current from the north, which is modified (3) by the ice that is carried direct from the north, that which has its origin in the Strait and Bay, and in the Greenland Fjords ; also in a measure by the east Greenland current that rounds Cape Farewell and flows up the west coast.

Variations in air temperature are attributable to (1) variations in the temperature of the sea surface ; (2) variations in the temperature of the adjoining lands ; (3) changes in distribution and quantity of floating and fast ice in the Strait, Bay, and on the land, by direct contact ; (4) the direction and force of wind ; also in its persistency.

The direction of the wind over the Strait and Bay is dominated by the general distribution of pressure over the Atlantic Quadrant of North Polar Regions, but is modified by the pressure gradient referable to a temperature gradient between land and sea ; also, indirectly to the paths followed by depressions over these regions through the control they exercise on the direction and force of the wind. Wind direction is characterized also by its tendency to follow the course of the Strait and the Bay, *i.e.* to flow in either a south-easterly or a north-westerly direction. The winds of least frequency are those from south-west, north and north-east. The deflection of the wind coast-wise particularly in the neighbourhood of the land is probably due to a pressure gradient caused by differences of temperature between land and sea.

Winds that attain to gale force in the Strait and Bay are chiefly from south-easterly or from north-westerly directions. An increase of wind to gale force is attributable to the influence of an invading

depression, which on its passage travels generally from west eastward. Gales from south-westward are rarely experienced because the low pressure over the south of Greenland diminishes the pressure gradient when the path of the approaching depression lies to the north of it.

The principal currents in Davis Strait and Baffin Bay are ice bearing polar currents emerging from Smith Sound, Lancaster Sound, and Jones Sound, which unite, and flow southward on the west side of the Bay, Strait, and along the Labrador coast, from which coast this current takes its name. The velocity of the current depends mainly upon the direction and force of the wind. Another current which issues from the East Greenland Sea, through Denmark Strait flows down the east and up the west coast of Greenland, penetrating in May and June to 74°N . and in July and August to as far north as Smith Sound. Flowing north its volume is diminished by the diversion of its outer edge westward and southward, this water forming what is known as the *Middle Current*. An undercurrent of relatively warm saline water, partly of equatorial origin, enters the Strait and spreads northward, layers of which come to the surface in Baffin Bay and Disco Bay. The ice in Baffin Bay, not of local origin, is derived from Arctic Seas, issuing from Smith, Lancaster and Jones Sounds. A dense mass of ice collects in the Bay, and extends to the northern part of the Strait; in all but three months of the year this ice mass is impenetrable. In contrast to this ice congestion a relatively ice-free sheet of water is found in the months of summer and early autumn in Baffin Bay. It is not, as has been supposed, located in the same part of the Bay each month, but it is, nevertheless, evidently identical with what is known as the *North Water*. The ice in Davis Strait is received mainly from the north through the Bay, but also from the East Pack, or *Storis*, partly, however, it is of local origin.



COLD SNAP IN MELBOURNE.

MR. H. F. HUNT, Commonwealth Meteorologist, has forwarded to us an interesting account of the unprecedented cold experienced in Melbourne, in the last week of May this year. In that city frosts are very rare, and wintry conditions such as are familiar in England excite as much public interest as a burst of tropical heat in summer does in England. The figures quoted below show how rarely such cold snaps occur, and the importance of the inter-relation between the weather of the northern and southern hemispheres, makes the occurrence of such an exceptional phenomenon of more than Australian interest.

The following information has been supplied by the Australian Meteorological Office :—

	Minimum (in Screen).	Minimum (on Grass).
May 25	33·2	22·2
„ 26	32·3	21·1*
„ 27	33·8	24·0
„ 28	31·9	24·5
„ 29	29·9*	22·3
„ 30	35·3	28·5

* Record.

Lowest ever recorded in 61 years for May, 31°·3, on 26th May, 1895.

Lowest terrestrial in 61 years for May, 23°·2, on 21st May, 1897.

Apart from 1895, the most recent cold day in May was 29th May, 1913. The “terrestrial” on that day was 28·5, and it was preceded by another day of frost, the terrestrial reading being 31·1.

In May, 1895, there were three days of frost, viz., 17th (minimum 37·6, terrestrial 28·5), 22nd (minimum 39·1, terrestrial 30·0), and 26th (minimum 31·3, terrestrial 31·0).

In May, 1897, the following were days of frost :—

	Min.	Terri.		Min.	Terri.
8th	37·9	28·1	20th	34·9	24·6
9th	34·9	25·8	21st	33·5	23·2
10th	39·2	29·2	22nd	33·5	23·7
11th	41·1	27·7	23rd	37·0	26·5

In this month there were two periods of four consecutive frosts, viz., 8th to 11th inclusive, and 20th to 23rd, inclusive.

The present spell of cold weather, 6 days consecutively of frosts, is the most severe that has occurred in Melbourne, three out of the five days breaking all previous records, although in May, 1912, there were five days of frost, but only two consecutive days, as the others were scattered throughout the month. The average number of frosty mornings during May in Melbourne is 1·2, or six in five years.

Frosts were recorded in parts of the country on May 25th, more particularly in the north and north central districts, the Mallee, Gippsland and Western districts not reporting any. On the next day frosts were almost prevalent throughout the inland parts, except the Mallee. On May 27th another cold day was experienced in the Western district, but frosts were not very pronounced there, nor in the Wimmera and the Mallee, while Gippsland was still free.

On May 29th frosts and fogs were reported inland. In the Mallee, Wimmera, Gippsland and parts of the western district, temperatures appeared to be normal, and frosts absent. In the north-eastern parts they are the most severe, but north-central districts are almost as bad.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

SUMMER TIME.

IN answer to Mr. J. H. Fry's letter in the July Magazine it may be safely asserted that none of the considerations which have been set out by him were forgotten by those who do object very strongly to having the clocks put wrong by an hour, and he misses the point of their objection.

Meteorologists know, no men better, that for some purposes they have to use local time, which, for those purposes is the true time ; and also that for other purposes they must use *a* standard time. Comparisons of temperature, say at Penzance and Ramsgate at 8 a.m., noon, and 4 p.m., to be of any use would of necessity be made by the local times of those two places ; whereas if one were tracing the passage of a storm, *e.g.*, the famous hurricane of March 24th, 1895, which travelled from Milford Haven to Lowestoft in about 5 hours, this would necessarily be done in terms of *a* standard time, which happens, in our case, to be that of Greenwich.

No superstitious veneration is felt by meteorologists for Greenwich time. Greenwich is *not* ideally the best place for England to reckon from, Cheltenham, two degrees westward, would divide the country much more fairly. But when railways made *a* standard time a necessity for railway purposes, Parliament, for many obvious reasons, hardly could have selected any other spot. There the necessary apparatus already was. Parliament did not create it, but found it.

Moreover, it is perfectly possible for a provincial town to keep *a* standard time for its railways, and local time for its own purposes ; as was done in France, and may still be done for aught that I know, *e.g.*, at Marseilles many a passenger off a steamer has blessed the quarter of an hour difference between Marseilles and Paris time that just enabled him to catch a train ! Such a practice has great advantages in educating people in true ideas about time.

Had days and nights been of equal length all over the globe, sunrise and sunset would have continued to be the starting points for time reckoning, as they were for the rough calculations of primitive mankind ; but men have been driven by the facts to take noon and midnight as the only possible moments to reckon from ; and action by Parliament, which obscures this, and decrees other starting points, is educating the people in a wrong direction, and is action *different in kind* from that which appointed the time of Greenwich to be the railway time for the whole country.

H. A. BOYS, F.R.Met.Soc.

North Cadbury Rectory, August 2nd, 1916.

SUNSET COLOURING.

On the evening of July 9th, shortly after sunset, an unusual optical phenomenon was observed in the north-western sky from near Benson, Oxon. A small bank of cloud was lying above the horizon and behind this could be seen the top of a distant cumulus. From the top of the cumulus a purple band of colour stretched up into the sky for an estimated distance of about 20° . Near the upper end of this band there was a patch of cirrus which showed a brilliant pink in the sunset rays, and the contrast between the purple of the band and the pink of the cloud was most striking. There was a sheet of high stratus or cirro-stratus cloud over most of the sky at the time which made the evening rather dark and served to show up the colour effects the more. It appeared at first as though where the purple band crossed the patch of cirrus it hid the colour of the latter rendering the pink less bright, but a few minutes later this effect was not noticeable so that it may have been an illusion.

The phenomenon was first observed about five minutes after sunset (it was probably visible earlier, but no observation was made). For five minutes it remained strikingly brilliant, and then rapidly faded away, and by fifteen minutes after sunset all colouring had disappeared. The band, which at first appeared to be a pure purple, took on a slightly greenish tint before disappearing. It did not rise quite vertically from the top of the cumulus throughout, but sloped a few degrees to the right when first seen, and then, after passing through the vertical position, lent over to the left at the end. There can be little doubt that it was pointing directly from the position of the sun below the horizon throughout. If the band had looked merely dark against the sky we might ascribe it to the shadow of the cumulus showing on the dust of the atmosphere, but whence the purple colouring? It may be mentioned that earlier in the evening a rather brilliantly coloured fragment of the 22° halo had been visible in a small piece of high cloud.

J. S. DINES.

66, *Sydney Street, Chelsea.*

REMARKABLE DROUGHT IN DEVONSHIRE.

MAY I draw your attention to the remarkable July drought in this district? Even when the temperature failed to reach 70° (as it did up to the 19th) we had very little rain; .88 in. on the 6 days, of which .57 in. fell on one day (the 6th). Since the 12th July we have had no rain at all here, and as during the last week or so it has been extremely hot, everything in the garden is perishing for want of water. It is curious, however, how winds from some northerly

quarter still predominate here. I append herewith maximum and minimum temperatures and direction of wind at 9 a.m. and 9 p.m. (G.M.T.) for the last 10 days of July.

Date	Max. temp.	Min. temp.	Wind direction.	
			9 a.m.	9 p.m.
July 22	77	57	E.	N.
„ 23	78	55	N.E.	N.E.
„ 24	80	51	N.E.	W.
„ 25	82	60	N.E.	N.W.
„ 26	77	51	S.E.	E.
„ 27	75	53	W.N.W.	W.
„ 28	75	54	W.N.W.	N.W.
„ 29	73	50	N.W.	N.W.
„ 30	76	48	W.	W.
„ 31	80	59	N.E.	N.E.

The warmest day throughout during the period was the 25th (mean temp. 71°). The highest 9 a.m. and 9 p.m. (G.M.T) readings both occurred on the 31st, viz., 67° and 64° respectively. It is worthy of note that during this spell of heat, whilst at 2 p.m. each day the relative humidity is about 45 per cent., the 9 a.m. and 9 p.m. readings average about 90 per cent. The amount of humidity does not appear here to be affected by the direction of the wind, as at a sea-coast station.

The accuracy of the daily rainfall record from my Snowdon gauge is substantiated by the amount found in my monthly gauge, kept in another part of the garden, viz. .89 in. This would, therefore, seem to be one of the driest parts of Devon during the present drought, which is peculiar, as this is *normally* a wet district. Height above sea-level *about* 600 ft. Rainfall at Ipplepen (S. Devon) 1.14 in., Manaton (Dartmoor) 1.39 in. D. W. HORNER, F.R.Met.Soc.

Moretonhampstead, Devon, August 3rd, 1916.

HEAVY RAIN ON JULY 23rd.

A VERY severe thunderstorm and great rain occurred on the afternoon of the 23rd, July, 1916. The rain began at 3 p.m., and ended at 4.15 p.m. (1½ hours) during which 1.02 inches fell. This fall was quite local, as there was no rain at all that day one mile to the west, or one mile to the east of this. The storm came from the N.E. and went to the S.W. I thought there would have been a big rainfall at Woodpark, Scariff, on that day. But Mr. Hibbert told me he had no rain at all. There were great floods in all the streams about here, and our mountain roads were much damaged. But the floods only lasted about an hour. The forenoon of that day was very fine and hot, with not a sign of the coming storm. The evening was very fine also. M. BENTLEY, Lieut.-Col.

Hurdlestown, Broadford, July, 1916.

THUNDERSTORM OF JULY 24th, 1916.

THE forenoon was gloriously fine, the temperature reaching 72° in the shade, with a clear sky and a little cirrus cloud. The barometer 600 ft. above sea-level, stood at 29·62 ins. and was inclined to fall slightly. At 1.30 p.m. a small bank of dark cloud was observed to the N. and distant thunder was heard. At 2 p.m. thunder was heard to the S. and rapidly came nearer. Soon afterwards an extensive bank of thunder cloud rapidly overspread the whole sky from the N., and a storm of great intensity set in, which lasted without any interval until 4.30 p.m., lightning being very frequent and dangerously near most of the time. But the feature of the storm was the, for this neighbourhood, unprecedented rainfall. Between 2.20 p.m. and 4.30 p.m. it amounted to 2·91 in., and the entire fall in barely four hours was 3·01 in. The heaviest fall registered here in 24 hours since 1910 has been 1·73 in., on Aug. 1st of that year. Great masses of earth were burst from the high banks of the Hacketstown-Tallow Road, on the steep slope to the W. of the town, and carried in fragments down the decline for many yards. A bridge over a tiny stream which flows at the foot of this slope was swept clean away, leaving a precipitous cut in the highway eight yards deep. There were three head of cattle killed by lightning just outside the town to the E. The storm seemed to travel about N.N.E. and S.S.W. on rather a narrow path. The barometer fell to 29·55 during the storm. Pressure had been almost steady for three days. The wind never rose to more than a fresh breeze from N.W., and before and after the storm, and part of the time during it, the wind was scarcely perceptible.

The storm was confined to a very narrow path travelling N.N.E. to S.S.W. There was absolutely no rain at Rathvilly, 6 miles W. of Hacketstown or Killigan, 3 miles N.W. Here marks of violent rain begin 1½ miles from Hacketstown. There was but little rain in the town land of Rithnagrew, which approaches to 1 mile from Hacketstown to E.N.E. There was none in that of Kilcarney, 3 miles N.E., nor in Clonmore, 3 miles due S. In Fallow, 9 miles S.W. the storm was of phenomenal violence, but nothing to compare to what it was in the immediate neighbourhood of Hacketstown. It extended to the S. of Fallow, being violent at Aghadi, 3 miles beyond. How much further we have not yet information.

C. S. S. ELLISON.

Hacketstown.

THE THUNDERSTORMS, JUNE 10th.

THIS day was extraordinary for the number of thunderstorms that seemed to pass all round us but never right overhead. These storms developed in the North at 11.24 a.m. old time, and continued, on and off, until evening. No damage seemed to have been done here by the lightning, although a rather dangerous storm passed in the distance from N. to N.E., between 3 and 3.35 p.m., with much forked lightning. One vivid flash was followed by a terrible peal of thunder. As the storm moved away the cloud effects were impressively grand and of an extraordinary coppery hue.—Rainfall was no way remarkable after so much thunder, only .45 in. being recorded.

G. E. DACEY.

Lewisham, S.E., July 8th, 1916.

METEOROLOGICAL NEWS AND NOTES.

A METEOROLOGICAL OFFICE CIRCULAR of four pages has been issued in June and July, about the 20th of the month, giving notices of honours conferred on members of the Meteorological Committee and of the Meteorological Office Staff, details of the effects of the Summer Time Act on the observing stations reporting to the Meteorological Office, lists of official publications, notes and queries, and obituary notices of deceased Observers. The new publication is of real interest, and should prove useful to those to whom it is sent, but no indication appears upon the circular as to how they may be obtained, or whether the issue is to be regular.

THE CLIMATE OF GEORGETOWN, DEMERARA is summarized in *Meteorological Office Circular No. 2* in the following table of two lines of figures, a translation of which into the familiar British units we append in two additional lines :—

Comparison of Meteorological Records, 1846-56, and 1887-1914.

		Pressure. m.s.l. mb.	Temperature.			Vapour Pressure. mb.	Relative Humidity. %	Annual Rainfall. mm.
			Mean. a.	Max. a.	Min. a.			
1846-1856	..	1011.5	299.3	302.2	296.4	28.45	76.2	2434.8
1887-1914	..	1012.2	300.1	302.5	297.1	28.35	76.1	2394.0
		in.	F.	F.	F.	in.		in.
1846-1856	..	29.87	79.3	84.6	74.1	0.84	76.2	95.86
1887-1914	..	29.89	80.8	85.1	75.4	0.84	76.1	94.25

THE IRONY OF NAMES was illustrated a few weeks ago at the Field Hospital of the R.A.M.C. at El— in the Egyptian desert when, on a day with a shade temperature of over 311° C. absolute (100°F.) four patients were admitted in succession bearing the names of Winter, Storm, Snow and Frost.

RAINFALL TABLE FOR JULY, 1916.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1875— 1909. in.	1916. in.
Camden Square.....	London.....	51 32	0 8	111	2'57	1'68
Tenterden.....	Kent.....	51 4	*0 41	190	2'21	1'11
Arundel (Patching).....	Sussex.....	50 51	0 27	130	2'46	'77
Fordingbridge (Oaklands)...	Hampshire.....	50 56	1 38	135	2'14	1'59
Oxford (Magdalen College)...	Oxfordshire.....	51 45	1 15	186	2'43	1'59
Wellingborough(Swanspool)...	Northampton.....	52 18	0 41	155	2'54	1'38
Bury St. Edmunds(Westley)...	Suffolk.....	52 15	*0 40	226	2'68	1'93
Geldeston [Beccles].....	Norfolk.....	52 27	*1 31	38	2'37	...
Polapit Tamar [Launceston]...	Devon.....	50 40	4 22	315	2'74	1'24
Rousdon [Lyme Regis].....	".....	50 41	3 0	516	2'68	'93
Stroud (Field Place).....	Gloucestershire..	51 44	2 13	226	2'75	1'86
Church Stretton (Wolstaston)..	Shropshire.....	52 35	2 48	800	2'58	1'63
Boston.....	Lincolnshire.....	52 58	0 1	11	2'35	1'67
Worksop (Hodsock Priory)...	Nottinghamshire	53 22	1 5	56	2'35	1'26
Mickleover Manor.....	Derbyshire.....	52 54	1 32	280	2'57	2'02
Macclesfield.....	Cheshire.....	53 15	2 7	501	3'41	...
Southport (Hesketh Park)...	Lancashire.....	53 39	2 59	38	2'92	1'05
Arncliffe Vicarage.....	Yorkshire, W.R.	54 8	2 6	732	4'75	4'95
Goldsborough Hall.....	".....	54 0	1 25	119	2'61	1'52
Hull (Pearson Park).....	" E.R.	53 45	0 20	6	2'39	1'65
Newcastle (Town Moor) ...	Northumberland	54 59	1 38	201	2'90	2'92
Borrowdale (Seathwaite) ...	Cumberland.....	54 30	3 10	423	8'91	6'57
Cardiff (Ely).....	Glamorgan.....	51 29	3 13	53	3'26	2'43
Haverfordwest.....	Pembroke.....	51 48	4 58	90	3'39	1'90
Aberystwyth (Gogerddan)...	Cardigan.....	52 26	4 1	83	4'03	1'67
Llandudno.....	Carnarvon.....	53 20	3 50	72	2'52	1'36
Cargen [Dumtries].....	Kirkcudbright...	55 2	3 37	80	3'20	5'18
Marchmont House.....	Berwick.....	55 44	2 24	498	3'30	5'81
Girvan (Pinmore).....	Ayr.....	55 10	4 49	207	3'73	4'81
Glasgow (Queen's Park) ...	Renfrew.....	55 53	4 18	144	2'91	3'37
Islay (Eallabus).....	Argyll.....	55 47	6 15	68	3'41	2'24
Mull (Quinish).....	".....	56 34	6 13	35	4'12	3'11
Balquhiddier (Stronvar).....	Perth.....	56 21	4 23	422	4'34	4'48
Dundee (Eastern Necropolis)	Forfar.....	56 28	2 57	199	2'84	7'52
Braemar.....	Aberdeen.....	57 0	3 24	1114	2'65	4'58
Aberdeen (Cranford).....	".....	57 8	2 7	120	3'00	3'34
Gordon Castle.....	Moray.....	57 37	3 5	107	3'25	3'24
Drumnadrochit.....	E. Inverness ...	57 20	4 29	138	3'37	4'60
Fort William ..	".....	56 49	5 6	171	4'92	2'91
Loch Torridon (Bendamph)...	W. Ross.....	57 32	5 32	20	5'35	3'88
Dunrobin Castle.....	Sutherland.....	57 59	3 56	14	2'91	1'94
Killarney (District Asylum)	Kerry.....	52 4	9 31	178	3'53	1'92
Waterford (Brook Lodge)...	Waterford.....	52 15	7 7	104	3'13	1'16
Nenagh (Castle Lough).....	Tipperary.....	52 54	8 24	120	3'02	1'68
Ennistymon House.....	Clare.....	52 57	9 18	37	3'57	1'66
Gorey (Courtown House) ..	Wexford.....	52 40	6 13	80	2'90	1'00
Abbey Leix (Blandsfort)....	Queen's County..	52 56	7 17	532	2'99	2'32
Dublin(FitzWilliamSquare)	Dublin.....	53 21	6 14	54	2'60	2'14
Mullingar (Belvedere).....	Westmeath.....	53 29	7 22	367	3'16	4'14
Crossmolina (Enniscoe).....	Mayo.....	54 4	9 16	74	3'26	1'82
Cong (The Glebe).....	".....	53 33	9 16	112	3'72	1'04
Collooney (Markree Obsy.)...	Sligo.....	54 11	8 27	127	3'36	2'86
Seaforde.....	Down.....	54 19	5 50	180	3'32	3'04
Ballymena (Harryville).....	Antrim.....	54 52	6 13	150	3'44	2'43
Omagh (Edenfel).....	Tyrone.....	54 36	7 18	280	3'34	1'97

RAINFALL TABLE FOR JULY, 1916—*continued.*

RAINFALL OF MONTH (<i>con.</i>)					RAINFALL FROM JAN. 1.				Mean Annual 1875-1909.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours.	No. of Days	Date.	Aver. 1875-1909.	1916.	Diff. from Aver. in.	% of Av.		
		in.			in.	in.			in.	
— .89	65	.71	7	13	13.53	16.49	+2.96	122	25.11	Camden Square
—1.10	50	.29	16	10	13.65	15.95	+2.30	117	27.64	Tenterden
—1.69	31	.39	6	7	14.92	17.85	+2.93	120	30.48	Patching
— .55	74	.69	6	11	15.18	16.98	+1.80	112	31.06	Fordingbridge
— .84	65	.84	6	13	13.03	15.96	+2.93	122	24.58	Oxford
—1.16	54	.33	6	11	13.76	15.32	+1.56	111	25.20	Swanspool
— .75	72	.46	4	13	13.44	16.73	+3.29	124	25.40	Westley
...	...	...	...	...	11.98	...	...	...	23.73	Geldeston
—1.50	45	.43	3	10	18.62	18.69	+ .07	100	38.27	Polapit Tamar
—1.75	35	.68	6	4	17.01	15.93	—1.08	94	33.54	Rousdon
— .89	68	.54	16	10	15.83	17.13	+1.30	108	29.81	Stroud
— .95	63	.36	6	12	16.88	17.90	+1.02	106	32.41	Wolstaston
— .68	71	.46	3	16	12.21	16.68	+4.47	137	23.35	Boston
—1.09	54	.23	7	13	13.15	14.66	+1.51	111	24.46	Hodsock Priory
— .55	79	.63	2	10	14.34	18.78	+4.44	131	26.65	Mickleover
...	...	...	...	...	18.17	...	...	...	34.73	Macclesfield
—1.87	36	.27	1	13	15.88	14.34	—1.54	90	32.70	Southport
+ .20	104	1.16	7	19	31.97	34.65	+2.68	108	61.49	Arncliffe
—1.09	58	.32	7	12	14.54	15.77	+1.23	108	27.29	Goldsborough Hall
— .74	69	.70	12	13	13.47	16.25	+2.78	120	26.42	Hull
+ .02	101	.69	20	18	14.45	16.52	+2.07	114	27.94	Newcastle
—2.34	74	1.55	1	17	65.29	72.77	+7.48	111	129.48	Seathwaite
— .83	75	1.05	6	14	20.48	25.77	+5.29	126	42.28	Cardiff
—1.49	56	.38	6	10	22.84	19.74	—3.10	86	46.81	Haverfordwest
—2.36	41	.52	12	13	22.15	24.70	+2.55	112	45.46	Gogerdan
—1.16	54	.40	2	10	14.89	16.89	+2.00	113	30.36	Llandudno
+1.98	162	1.48	7	20	22.26	27.66	+5.40	124	43.47	Cargen
+2.51	176	1.75	7	13	17.68	24.54	+6.86	139	33.76	Marchmont
+1.08	129	.70	11	18	24.83	29.13	+4.30	117	49.77	Girvan
+ .46	116	.68	7	16	18.42	...	...	...	35.97	Glasgow
—1.17	66	.49	11	18	23.80	29.25	+5.45	123	48.79	Eallabus
—1.01	76	.71	10	19	27.67	25.25	—2.42	91	56.57	Quinish
+ .14	103	2.23	7	12	37.75	45.42	+7.67	120	73.77	Stronvar
+4.68	265	3.36	7	18	14.86	22.88	+8.02	154	28.64	Dundee
+1.93	173	1.21	7	15	17.80	25.89	+8.09	145	34.93	Braemar
+ .34	111	.90	7	17	17.02	18.83	+1.81	111	32.73	Aberdeen
— .01	100	.47	6	22	15.52	23.32	+7.80	150	30.34	Gordon Castle
+1.23	136	1.80	7	23	19.42	32.40	+12.98	167	36.13	Drumnadrochit
—2.01	59	.95	7	22	38.71	42.26	+3.55	109	75.80	Fort William
—1.47	73	.75	31	18	42.90	50.05	+7.15	117	83.93	Bendamp
— .97	67	.78	7	12	17.19	21.26	+4.07	124	31.90	Dunrobin Castle
—1.61	54	.64	7	13	28.40	29.01	+ .61	102	54.81	Killarney
—1.97	37	.34	5	9	20.53	19.40	—1.13	95	39.57	Waterford
—1.34	56	.54	3	12	20.53	22.26	+1.73	108	39.43	Castle Lough
—1.91	46	.34	1, 11	12	23.24	24.99	+1.75	108	46.52	Ennistymon
—1.90	34	.37	6	12	18.32	18.67	+ .35	102	34.99	Courtown Ho.
— .67	78	.47	24	15	18.83	21.75	+2.92	115	35.92	Abbey Leix
— .46	82	.43	1	13	14.75	19.14	+4.39	130	27.68	Dublin
+ .98	131	1.05	6	14	19.17	25.78	+6.61	134	36.15	Mullingar
—1.44	56	.63	11	13	26.64	30.74	+4.10	115	52.87	Enniscoe
—2.68	28	.29	11	11	25.13	26.35	+1.22	105	48.90	Cong
— .50	85	.47	1	21	22.19	27.20	+5.01	123	42.71	Markree
— .28	92	.84	1	14	20.74	22.48	+1.74	108	38.91	Seaforde
—1.01	71	.49	1	16	21.53	25.72	+4.19	119	40.84	Ballymena
—1.37	59	.39	3	13	20.44	23.68	+3.24	116	39.38	Omagh

SUPPLEMENTARY RAINFALL, JULY, 1916.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road ..	1.54	XI.	Lligwy	1.77
„	Ramsgate	1.64	„	Douglas	2.06
„	Hailsham .....	.89	XII.	Stoneykirk, Ardwell House...	2.53
„	Totland Bay, Aston House...	.55	„	Carsphairn Shiel	5.65
„	Stockbridge, Ashley	1.43	„	Beattock, Kinnelhead	5.76
„	Grayshott	1.40	„	Langholm, Drove Road	6.05
III.	Harrow Weald, Hill House...	1.74	XIII.	Selkirk, The Hangingshaw...	5.28
„	Pitsford, Sedgebrook	1.72	„	North Berwick Reservoir	4.26
„	Woburn, Milton Bryant	1.51	„	Edinburgh, Royal Observaty.	5.18
„	Chatteris, The Priory	1.75	XIV.	Maybole, Knockdon Farm ...	3.71
IV.	Elsenhams, Gaunts End	1.23	XV.	Buchlyvie, The Manse	4.73
„	Shoeburyness	1.04	„	Ballachulish House	3.04
„	Colchester, Hill Ho., Lexden	.86	„	Oban	2.13
„	Ipswich, Rookwood, Copdock	1.79	„	Campbeltown, Witchburn ..	2.43
„	Aylsham, Rippon Hall	1.28	„	Holy Loch, Ardnadam	3.13
„	Swaffham .....	.94	„	Tiree, Cornaigmore	2.24
V.	Bishops Cannings	1.08	XVI.	Dollar Academy	4.30
„	Wimborne, St. John's Hill ...	1.00	„	Glenlyon, Meggernie Castle..	5.05
„	Ashburton, Druid House	1.06	„	Blair Atholl	6.77
„	Cullompton	1.20	„	Coupar Angus	7.22
„	Lynmouth, Rock House	1.04	„	Montrose, Sunnyside Asylum.	6.73
„	Okehampton, Oaklands	1.18	XVII.	Alford, Lynturk Manse	3.84
„	Hartland Abbey .....	.93	„	Fyvie Castle	2.09
„	Probus, Lamellyn .....	..	„	Keith Station ..	2.50
„	North Cadbury Rectory .....	.97	XVIII.	Rothiemurchus	3.11
VI.	Clifton, Stoke Bishop	1.67	„	Loch Quoich, Loan	9.05
„	Ledbury Underdown	1.75	„	Skye, Dunvegan	2.80
„	Shifnal, Hatton Grange	1.92	„	Lochmaddy, Bayhead	1.35
„	Droitwich	1.81	„	Fortrose	4.16
„	Blockley, Upton Wold	2.00	„	Glencarron Lodge	4.08
VII.	Grantham, Saltersford	1.60	XIX.	Altnaharra	2.38
„	Market Rasen .....	.78	„	Melvich	1.98
„	Bawtry, Hesley Hall	1.17	„	Loch More, Achfary	3.77
„	Derby, Midland Railway	2.01	XX.	Dunmanway, The Rectory ..	.78
„	Buxton	2.59	„	Glanmire, Lota Lodge	2.09
VIII.	Nantwich, Dorfold Hall	1.93	„	Mitchelstown Castle	2.57
„	Chatburn, Middlewood	2.99	„	Darrynane Abbey .....	.79
„	Lancaster, Strathspey	2.27	„	Clonmel, Bruce Villa	1.43
IX.	Langsett Moor, Up. Midhope	1.49	„	Broadford, Hurdlestown	2.45
„	Scarborough, Scalby	1.96	XXI.	Enniscorthy, Ballyhyland...	2.56
„	Ingleby Greenhow	1.77	„	Rothnen, Clonmannon	1.80
„	Mickleton	3.05	„	Ballycumber, Moorock Lodge	3.29
X.	Bellingham, High Green Manor	3.56	„	Balbriggan, Ardgillan	1.85
„	Ilderton, Lilburn Cottage ...	4.73	„	Castle Forbes Gardens	4.39
„	Thirlmere, The Bank	5.34	XXII.	Ballynahinch Castle	2.41
XI.	Llanfrecfa Grange	1.93	„	Woodlawn	1.67
„	Treherbert, Tyn-y-waun	3.36	„	Westport, St. Helens ...	2.06
„	Carmarthen, The Friary	2.18	„	Dugort, Slievemore Hotel ...	3.17
„	Fishguard, Goodwick Station.	1.15	XXIII.	Enniskillen, Portora	2.05
„	Crickhowell, Tal-y-maes	1.00	„	Dartrey [Cootehill]	2.74
„	New Radnor, Ednol	1.95	„	Warrenpoint, Manor House ..	3.33
„	Birmingham WW., Tyrmynydd	2.93	„	Belfast, Cave Hill Road	2.66
„	Lake Vyrnwy	2.56	„	Glenarm Castle	1.46
„	Llangynhafal, Plâs Drâw	1.48	„	Londonderry, Creggan Res...	3.23
„	Dolgelly, Bryntirion	2.50	„	Dunfanaghy, Horn Head ...	2.29
„	Bettws-y-Coed, Tyn-y-bryn...	2.36	„	Killybegs	2.61

THAMES VALLEY RAINFALL:

JULY, 1916.



Symon's Meteorological Magazine

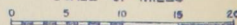
Watershed of River Thames above Teddington, and River Lee above Feltham Water

Rainfall Stations reporting
Isohyetals.

ALTITUDE SCALE

Below 250 feet	250 to 500 feet	500 to 1000 feet	Above 1000 feet
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SCALE OF MILES



THE WEATHER OF JULY.

THE cold, gloomy conditions characteristic of the whole month of June continued without interruption throughout the first half of July, the low temperature and absence of sunshine being specially marked in eastern districts. After about the 16th warmer weather set in, but it was not until the 19th that the sky cleared in the south, an improvement which was delayed in the north till the 22nd. In one or two restricted areas there was a marked retardation in the setting in of summer conditions notably in the east of England, where the month remained cold and sunless throughout. In the extreme north of Scotland dull weather also persisted, although this was associated during the last ten days with an increase of temperature.

The mean temperature of the month, taking the country as a whole, was half a degree below the average. The only areas where an excess was recorded were the north of Scotland, the south-west of England, and the south of Ireland, where the normal was exceeded by about a third of a degree F. On the other hand in the east and south-east of England temperature fell more than two degrees F. below the normal, and in the Channel and Midlands the mean was a degree under the average.

The highest temperature in shade was 83° at Kilmarnock on the 24th, and a similar reading at Manchester on the 26th. On the 31st the maximum at Camden Square (in a Glaisher stand) was 84°·4. The lowest temperature, 33°, occurred at West Linton on the 6th, when the grass minimum fell to 26°.

The rainfall of the month amounted to three or more times the average in some places in the east of Scotland affected by the storm of the 8th, but less than a third of the average fell in parts of Sussex and Devon, and in Co. Mayo in Ireland. Except in Brecon, Cumberland, and one or two isolated patches in north-western districts, the rainfall in England and Wales was under two inches.

Less than an inch fell in Lincoln, on the east coast, from the Wash to the mouth of the Thames, and on the south coast from Dungeness to Torquay.

In Scotland as much as 9·4 in. fell at Perth, and 9·0 in. at Loan, W. Inverness. More than five inches fell over the counties of Forfar, eastern Perth, Fife, and Midlothian. To the north and north-east of this region the rain fell off rapidly to under two inches. On the extreme west coast the fall was under three inches. In Ireland the rainfall was, in general, under the average. A few stations in Westmeath had more than the normal. The actual fall varied from four inches in Donegal and Longford to less than an inch on the south coast of Cork.

The most notable rain storm of the month occurred in the eastern districts of Scotland on July 7th and 8th, when a shallow depression which appeared off the south of Ireland on the 6th, passed eastward to the North Sea.

The maximum falls reported on the 7th were 3·42 in. at Perth, 3·35 in. at Dundee, 3·17 in. at Edinburgh (City Observatory), and 3·03 in. at Edzell. On the 8th 1·90 in. fell at Perth, 1·30 in. at Dundee, and 1·06 in. at Edzell, the total rainfall for the two days being 5·32 in. at Perth, 4·65 in. at Dundee, and 4·09 in. at Edzell. At a considerable number of other places in the area affected, the rainfall for the two days was just under four inches.

Over the country, as a whole, the general rainfall expressed as a percentage of the average was England and Wales 64 per cent. ; Scotland, 114 per cent. ; Ireland, 64 per cent. ; British Isles, 80 per cent.

Bright sunshine was deficient, the general defect being three-quarters of an hour per day. There was a daily excess of about half an hour in the south west of England, and a deficit exceeding two hours a day in the east of England. The amounts at individual stations were as follows, Weymouth, 257 hours ; Sidmouth, 233 hours ; Southport, 173 hours ; Hodsock Priory, 149 hours ; Camden Square and Bolton, 147 hours ; Copdock, 144 hours ; Swinton House, 141 hours ; Perth, 135 hours ; Markree Observatory, 132 hours ; Hull and Paisley, 106 hours ; Loch More, 90 hours.

In London (Camden Square) the mean temperature was 61°·9 or 1°·6 below the average. Duration of rain, 18·3 hours. Evaporation, 2·23 in.

Climatological Table for the British Empire, February, 1916.

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	53·7	13	26·6	25	45·7	34·8	35·2	85	92·5	25·5	3·46	21	6·8
Malta	66·2	25	46·3	11	58·9	51·8	...	89	112·0	...	6·85	15	3·0
Lagos	90·4	9, 13	70·1	6	88·9	76·4	73·1	73	146·5	65·0	1·45	2	6·9
Cape Town ...	95·1	20	54·5	15	81·0	60·6	57·1	65	...	...	·40	5	2·9
Johannesburg ...	84·5	29	50·3	10	79·1	55·9	52·9	70	...	50·5	3·75	10	3·1
Mauritius ...	87·3	13	66·2	8	84·7	72·1	70·3	77	...	64·8	4·16	18	5·1
Bloemfontein ...	93·6	16	47·4	14	88·7	58·2	50·9	50	...	...	·58	6	2·8
Calcutta... ..	93·1	27	49·5	10	84·6	60·4	55·9	58	...	36·0	·00	0	1·5
Bombay... ..	84·9	8	59·2	7	81·4	67·9	62·3	67	132·8	43·0	·00	0	1·1
Madras	97·3	29	62·7	5	88·3	69·1	67·9	74	160·2	58·7	·00	0	1·5
Colombo, Ceylon	89·5	17	64·1	6	87·5	70·1	69·5	78	159·3	55·7	·07	2	4·7
Hongkong ...	75·1	24	49·4	14	62·9	56·1	54·0	80	...	...	1·31	6	8·2
Sydney	90·7	1	59·3	15, 16	79·1	65·5	61·9	72	155·2	49·9	2·67	18	5·7
Melbourne ...	101·2	18	52·9	9	76·8	58·9	55·3	65	153·1	44·1	2·02	10	5·4
Adelaide ...	106·8	17	53·8	7	86·4	62·1	51·5	41	156·9	44·9	·29	2	2·7
Perth	102·5	25	56·0	27	83·3	62·7	57·3	59	162·0	47·9	1·88	7	3·3
Coolgardie ...	107·0	14	54·4	19	92·7	62·5	50·8	36	166·4	50·8	·07	2	1·6
Hobart, Tasmania	93·0	15	47·1	19	69·0	54·4	51·8	70	147·9	35·3	2·03	10	6·9
Wellington ...	78·6	25	46·4	29	72·6	61·2	57·8	73	135·6	35·4	1·85	6	7·0
Auckland ... ..	...	...	...	...	75·7	62·7	...	...	...	...	·51	8	...
Jamaica, Kingston	89·2	25	63·2	4	84·6	67·6	65·9	75	...	...	·57	6	...
Grenada	87·0	10	70·0	*	83·0	72·0	...	74	133·0	...	2·63	16	1·5
Toronto	43·7	17	-9·3	21	26·1	11·8	12·1	81	...	...	...	...	...
Fredericton ...	45·0	1, 26	-20·0	14, 15	24·7	3·4	8·7	82	...	...	2·80	12	6·2
St. John, N.B.	46·2	1	-11·5	21	26·4	10·7	12·0	72	...	13·3	2·48	19	6·2
Alberta, Edmonton	...	...	...	...	...	...	...	...	...	...	...	...	...
Victoria, B.C. ...	59·0	26	23·8	1	44·8	35·2	36·0	85	112·0	23·0	7·03	16	7·0

* Several.

Johannesburg.—Bright sunshine, 273·1 hours.*Mauritius.*—Mean temp. 0°·4, dew point 0°·9 and R 1°·24 in. below averages, mean hourly velocity of wind 1·0 above average.*Bloemfontein.*—A very hot and dry month.

COLOMBO, CEYLON.—Mean temp. 75°·8, or 1°·2 below, dew point 1°·2 above, and R 1·70 in., below, averages. Mean hourly velocity of wind 4·9 miles. T and L on 19th.

HONGKONG.—Mean temp. 59°·6, mean hourly velocity of wind 16·8 miles. Bright sunshine 80·3 hours.

Melbourne.—Mean temp. 0°·4 above, and R ·33 in. above, averages.*Adelaide.*—Mean temp. 0°·1 above, and R ·33 in. below, averages.*Perth.*—Rainfall in excess of average.*Coolgardie.*—Temp. 1°·6 above, and R ·75 in. below, averages.*Hobart.*—Temp. 0°·7 below, and R ·60 in. above, averages.*Wellington.*—Mean temp. 4°·6 above, and R 1·58 in. below, averages. Bright sunshine 232·4 hours.