

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

CCCLIV.]

JULY, 1895.

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### THE DRYNESS OF THE FIRST HALF OF 1895.

SEVERAL correspondents have sent notes calling attention to the fact that the first six months of this year have given a total rainfall smaller than even that of 1893.

Before writing anything upon the subject, we have tried to ascertain what departure from the average might be expected during the six months.

We have already shown that three consecutive dry years may have slightly less than four-fifths of the average; that two consecutive dry years may have only three-quarters of the average, and that one driest year may have rather less than two-thirds of the average; or, writing them as percentages—

Three consecutive years.	Two consecutive years.	One driest year.
78	74	63

We know also that a month may have no rain, when, of course, the percentage is 0. Plotting these values on a curve, it seems as if for six months the least total might be expected to be about half the average, or 50 per cent.

We have tested this by the Camden Square record, which now covers 37 consecutive years.

We may premise that on the mean of 37 years the fall for the first six months averages 11·40 inches, and for the second six months 14·48 inches, or 44 and 56 per cent. respectively of the *yearly* total.

The following are the six driest first six and driest last six months, and their percentages of the mean fall for the respective six months during the whole 37 years:—

#### *Dry Six Months.*

Year.		Total Depth.	Per cent of Mean.	Year.		Total Depth.	Per cent. of Mean
		in.				in.	
JAN. to JUNE.	1870	6·90	60	JULY to DEC.	1863	10·62	73
	1874	6·93	61		1864	8·48	59
	1887	7·16	63		1874	11·89	82
	1892	8·12	71		1884	10·60	73
	1893	6·39	56		1887	12·05	83
	1895	5·48	48		1890	9·8	68

This seems to show not merely that on the average the first six months are drier than the second (as everyone knew before), but also that they are liable to greater deficiencies than the second six months. The average percentage for the six most remarkable dry periods of January to June is 60, but for the corresponding group for July to December it is 73.

Lastly—and this is the point which has led to the enquiry—January to June of 1895 comes out with a little less than half the average, and as absolutely the driest corresponding period for 37 years.

We will now give some data worked upon a shorter basis, so as to include a representative number of stations, and thus to ascertain the area over which the drought has been exceptional. We have taken stations of which we have the values for 1895 and for 1893, and the average for 1880-89; and finally, to keep the table within a reasonable size, we print only those values which show that the fall has in 1895 been less than 70 per cent. of the 1880-89 mean:—

*Relation of the total rainfall in the first six months of 1893 and 1895 to the average for the same period during 1880-1889.*

STATION.	COUNTY.	Mean 1880-9.	1893.		1895.	
			Amount.	Percent	Amount.	Percent
		in.	in.		in.	
Camden Square.....	Middlesex ..	10·76	6·40	60	5·48*	51
Abinger Hall.....	Surrey .....	12·73	8·66	68	8·16	64
Chiselhurst .....	Kent .....	9·25	6·39	69	4·98	54
Tenterden .....	„ .....	10·95	9·69	89	6·83†	62
Crowborough.....	Sussex .....	13·82	9·43	68	7·99	58
Strathfield Turgiss ..	Hants .....	10·64	8·11	76	7·14	67
Fielde's Weir .....	Herts.....	10·79	5·74	53	5·01	47
Addington .....	Bucks .....	11·57	8·21	71	6·50	56
Magdalen College.....	Oxford .....	11·50	5·92	51	6·43	56
Sheering.....	Essex.....	9·88	6·37	64	5·54	56
Barkby .....	Leicester ..	11·70	7·05	60	7·96	68

\* Driest in 37 years.

† Driest in 32 years.

From this table it appears —

- (1.) That our estimate that the fall of rain for a period of six months may fall to half the average is very near the truth.
- (2.) That the district in which the deficiency in 1895 has been greatest is slightly to the N.E. of London.

This second conclusion is corroborated by the very remarkable figures contained in the following letter, for which we are indebted to Mr. Bryan. The Fielde's Weir figures are incorporated in the

above table ; the others cannot be, because we have not the averages. The Buckhurst Hill total of 4·06 inches looks more like the summer value for the Riviera than the total for six months in "so called" rainy England.

*To the Editor of the Meteorological Magazine.*

SIR,—Herewith I beg to send you the rainfall for the six months ending 30th June at stations in the Valley of the Lea. You will observe that the rainfall is very low indeed.

Lea Bridge ... ..	4·26 in.
Ferry Lane, Walthamstow ... ..	4·49 „
Chingford Mill ... ..	4·83 „
Hagger Lane, Walthamstow ... ..	4·90 „
Buckhurst Hill ... ..	4·06 „
High Beech ... ..	4·66 „
Waltham Abbey ... ..	5·84 „
Feilde's Weir (junction of river Stort and river Lea)... ..	5·01 „

Yours truly,

WILLIAM B. BRYAN, M.I.C.E.

*East London Waterworks Company, Lea Bridge, July 6th, 1895.*

## A FIN DE SIÈCLE PROJECT.

*To the Editor of the Meteorological Magazine.*

SIR,—Referring to the article on Grousset's proposal, in the *Meteorological Magazine* for this month, I think that you will find that the feasibility of the scheme is evident, from what has been done at Wieliczka salt-mines, a few miles from Cracow. I copy from "*The Angelus*" for May, 1895, published in Honduras. You may be able to verify the statement ; if it is correct, the greatest depth is over two miles :—

"The system of mines extends over an area of 6 miles from east to west, and 2 miles from north to south, with underground streets, squares, &c., and over 30 miles of tramway ; the greatest depth reached about 12,000 feet. At the depth of 300 feet is St. Anthony's chapel, hewn out of the salt rock. One of the caverns, called the *great hall*, contains lustres hanging from the roof, and all the curiosities, crystals, petrifications, &c., which have been found in the mines. It is of amazing beauty, as the salt, according to its various qualities, is of different colours, greenish, dark-grey, yellow, &c. The annual output of salt exceeds 50,000 tons."—Yours faithfully,

R. STRACHAN.

11, *Offord Road, N.*, June 19th, 1895.

[We were rather startled at the depth of "12,000 feet," as that ought to give a temperature of 281° F. The only work which we can find on our own shelves which gives a description of these wonderful mines is Klöden's *Handbuch der Erdkunde*, and it agrees with *The Angelus* in all respects except—as to the depth. Our Honduras contemporary has added a 0—1,200 feet is given by Klöden and is no doubt correct.—ED.]

## A LOST OPPORTUNITY—RECORDING RAIN GAUGES.

WE are sorry to use the above heading, but it seems the only appropriate one. We have heard much of the new Brussels Observatory at Uccle, and have often had to refer to the good work done by M. Lancaster. We suppose that either the Director, M. Folie, or perhaps a committee, is responsible for the instruments provided; but with whomsoever the responsibility rests, it is apparently the case that this observatory, upon which thousands of pounds have been spent, does not possess either a recording or a storm rain gauge. We can arrive at no other conclusion, from the fact that a great thunder and rain storm broke over the observatory about noon on June 10th, of which M. Lancaster gives a description in *Ciel et Terre*, but while his remarks give a vivid word picture of the storm, the actual numerical values are but two (and they are not absolutely consistent), and there is no information whatever as to the intensity of the fall during different parts of the 35 minutes.

The storm is stated to have begun at 5 minutes after noon, and to have lasted 35 minutes; that is to say, from 0.5 p.m. to 0.40 p.m., and the fall in 35 minutes is stated to have been 60 mm. (2.36 in.), but we are told also that the fall between 1 p.m. and 3.30 p.m. was 6 mm. (0.24 in.), and that the total for the day was 66 mm. (2.60 in.). This implies that there was no rain between 0.40 p.m. and 1 p.m., but nothing in the text gives that idea.

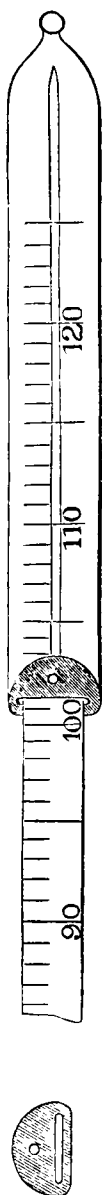
The Brussels records extend back for half-a-century, no such fall has occurred before, but every meteorologist knows that such falls will occur sooner or later. It has come, and apparently found skilled observers with no better apparatus than that put up by Quetelet more than half-a-century ago.

Brussels observatory is not alone in this unpreparedness. Greenwich Observatory has no recording rain gauge, except the antiquated one put up among the chimney pots about 1840. So with the other public observatories; Cambridge has not one, nor Bidston, nor Edinburgh (but one may be ordered for the new observatory, we do not know), nor Dublin.

On the other hand, we believe that the following Meteorological stations are already provided with one or more:—

Div. I. Camden Sq. (Private)	Div. VI. W. Bromwich Corporation
„ I. Hornsey Local Board	„ VII. Leicester „
„ II. Croydon (Private)	„ VIII. Liverpool „
„ II. Kew Observatory.	„ VIII. Stonyhurst Observatory
„ II. Eastbourne (Private)	„ VIII. Lancaster Corporation
„ II. „ Corporation	„ XIII. Edinburgh (Private)
„ III. Berkhamsted (Private)	„ XIV. Glasgow Observatory
„ III. Oxford Observatory	„ XVII. Aberdeen
„ IV. Abbey Mills (London C.C.)	„ XVIII. Fort William
„ V. Rousdon Observatory (Pvt.)	„ XX. Valentia.
„ V. Falmouth Observatory	„ XXIII. Armagh Observatory

# INDELIBLE DEGREE MARKS ON THERMOMETERS.



EVER since thermometers have been made accurately, and with the divisions engraved on the stems, there has been trouble from the black coming out of the said divisions, and when one realizes how extremely fine and shallow is the cut, in which the black has to be retained, the astonishment is, not at the fact that the black sometimes comes out, but that it ever stops in. As the result of much thought, this evil has, by the use of better materials, been largely mitigated. Some thermometers also, especially for use as "grass minima," are made on a plan which we suggested twenty years ago, and were told was impossible. We may as well mention what it was. About 50 years back, Mr. G. Leach, a very careful meteorological observer, had glass tubes made of about  $\frac{1}{4}$ -inch internal diameter, and long enough to contain the stem of a thermometer on which the divisions had been engraved and blackened; the bulb was left outside, and the tube was packed round with cork and other materials. These "Leach's shields" did partly protect the degree marks, but the joint was not air-tight, moisture condensed inside, and the divisions washed out. We suggested that the joint should be welded, and were told that unequal expansion would cause fracture—but it has been done.

Mr. Hicks, of Hatton Garden, has, however, hit upon a plan which seems to us perfect and everlasting. It seems so difficult to construct that an increased price would be necessary, but that is not the case, and if Mr. Hicks likes to supply the thermometers at

the usual price, it is not for the public to complain.

We cannot expect a description alone to be sufficient, so give a view of a broken bit of the tube and a section of the same.

The process of construction apparently is—

- (1) Prepare the thermometer stem with an enamel back and two bores, one of the usual size for the mercury or spirit,

- and the other a large flattened bore behind to contain a strip of mica.
- (2) Blow the bulb on the ordinary bore, fill with mercury or spirit, and seal that bore.
  - (3) Point off  $32^{\circ}$ ,  $52^{\circ}$ ,  $72^{\circ}$ , &c., on the front of the stem.
  - (4) Transfer these points to a prepared strip of mica, and divide and figure it as if it were the thermometer stem.
  - (5) Drop this scale into the large flattened bore, so that it agrees perfectly with the  $32^{\circ}$ ,  $52^{\circ}$ , &c., marks.
  - (6) Weld the bore, and thus hermetically seal the scale in position.

The illustration shows a broken thermometer stem with part of the mica scale projecting. The section shows the thermometric bore for the mercury or spirit, and the flattened bore for containing the mica scale.

We have carefully examined both a sound and a broken thermometer made under this patent, and as far as we can see, there is no reason why it should not be as legible a thousand years hence as in the present year of 1895.

#### ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of this Society for the present session, was held on Wednesday evening, June 19th, at the Surveyors' Institution, Westminster. Mr. R. Inwards, F.R.A.S., President, in the chair.

Mr. R. H. Curtis, F.R.Met.Soc., read a paper on the "Hourly Variation of Sunshine at Seven Stations in the British Isles." The paper is based on records of the Campbell-Stokes instruments for 10 years, 1881-1890. at Aberdeen, Glasgow, Armagh, Stonyhurst, Valencia, Kew, and Falmouth.

The results are dealt with in two ways : (1) A comparison of the actual duration, irrespective of the varying length of time that the sun is above the horizon at the different stations, and (2) The relation of the duration recorded, expressed as a percentage of the possible duration.

From the fact that there is a fairly close agreement between the means for the two 5 year periods, into which the 10 years have been divided, it may be inferred that the 10-year means approximate closely to the means which a longer period would yield.

Taking first the average daily duration, Falmouth is decidedly the most sunny station of the seven, having a daily average amount of sunshine of  $4\frac{1}{2}$  hours. This amount is half-an-hour more than that recorded at Valencia, and three-quarters-of-an-hour more than at Kew. Of the other four stations, Aberdeen, the most northern but at the same time a coast station, with 3.64 hours has more than either Stonyhurst or Armagh, both inland stations ; whilst Glasgow with only 3 hours, or about a quarter of its possible amount, has the smallest record of the seven, a result to some extent due to the

nearness of the observatory to the large manufacturing works with which the City of Glasgow abounds. At Valencia, Kew, Stonyhurst and Armagh the maximum duration is reached in May, the daily mean amount varying in the order named from  $6\frac{3}{4}$  to 6 hours. At Falmouth and the Scotch stations the increase goes on to June, when the mean duration at Falmouth reaches  $7\frac{1}{2}$  hours, at Aberdeen  $6\frac{1}{4}$  hours, and at Glasgow 5·6 hours.

As might have been expected, January and December are the most sunless months of the year. At no station is there much difference between them, but the smallest mean daily duration of sunshine occurs in December at every station except Falmouth, where January is the least sunny month of the two.

Considering the distribution of sunshine throughout the day, the most prominent feature at all stations is the rapid increase in the mean hourly amount during the first few hours following sunrise and the even more rapid falling off again, just before sunset. This rapid increase in every month of the year covers two or three hours and the decrease rather less, the changes in the hourly amounts during the remainder of the day being of much smaller amplitude. This seems to be due rather to the greater extent of the lower atmosphere through which the sun's rays have to pass at those times than to greater cloudiness.

It is impossible in a short notice to describe the hourly variation but a few salient points may be mentioned. At Aberdeen, the different months show great similarity, and the most sunny hour is always at or close to noon; the hours following have a slight advantage over those preceding it.

At Glasgow, the greater amount of sunshine in the afternoon is well shown and, except in the winter, the max. occurs about 2 p.m.

At Armagh the sunniest part of the day occurs just before noon, but the variation is peculiar in several months, the max. in July occurring as early as 9 a.m.

The Stonyhurst maximum occurs at noon and 1 p.m., but varies in the different months from 11 a.m. in March and April, to 2 p.m. in July and August.

Valencia shows a fairly uniform course from sunrise to sunset, the max. occurring at noon.

At Kew, the increase and decrease in the hourly duration is very uniform, rising to 40 per cent. of the possible amount at noon and 1 p.m.

At Falmouth, the maximum is reached at 11 a.m. and is maintained till 2 p.m., the afternoon hours having rather more sun than the corresponding hours of the morning.

Mr. C. Harding thought that the smoke of the Glasgow factories mentioned in the paper is the cause of the defect of sunshine shown in the morning hours.

Mr. Bayard remarked on the flatness shown at the top of the curves of hourly variations, the lines being comparatively straight

from 10 a.m. to 3 p.m., also on the adjustment of the different patterns of instrument.

Mr. Dines suggested that the flatness of the curves is due to the fact that the instrument is a heat recorder and that, although slight obscuration would stop the record early or late, it would not do so when the altitude of the sun is considerable. He would like to see the records compared with those from photographic recorders.

Mr. Sowerby Wallis thought that, considering the effect of smoke at Glasgow and the slight interruption in the record at Armagh caused by the shadow of the anemometer, we should not at once assume that other anomalous results shown in the paper represented physical facts.

Mr. Tripp said that the Campbell instrument recorded the heat rays, the photographic the chemical rays, and asked whether there was any means of recording the light rays.

Mr. Symons believed that no other country in the world could produce such a series of records, and was proud to welcome the paper. The effect of smoke at Glasgow could not be denied, but Falmouth showed a similarity in the curve, though to a less extent. He thought the records were a function of the altitude of the sun, and would like to see the effect of this eliminated from the results.

The Hon. F. A. R. Russell would like to see the results compared with observations of direction of wind, amount of cloud and mist and haze.

Mr. Gaster said that the paper had proved the greater amount of sunshine at coast than at inland stations, but experiments were necessary as to the difference at hill and at valley stations. The direction of wind was important in relation to the effect of smoke, and a comparison of sunshine records at Kew and Greenwich showed this well.

Mr. Backhouse spoke on the daily variation of cloud as compared with sunshine.

Mr. Marriott referred to papers on the sunshine observations at Greenwich by Mr. Ellis, and at Kew by Mr. Whipple, described a method of testing the adjustment of the instrument, and spoke of the importance of height above ground.

The President spoke of the effect of wind, mist, rain, &c., on the trace burnt on the cards.

Mr. Curtis, in reply, said that the results should undoubtedly be studied not only with the physical characteristics of the station, but also with the other meteorological elements. He did not think that wind had any effect on the record, but while mist moderated the amount of burning, cloud stopped it altogether.

Mr. H. Harries, F.R.Met. Soc., read a paper on "The Frequency, Size and Distribution of Hail at Sea." The author had examined a large number of ships' logs, and gave extracts from them showing that hail has been observed in all latitudes, as far as ships go north



and south of the equator, and that seamen meet with it over wide belts on the polar side of the 35th parallel.

The Hon. F. A. R. Russell analysed the records showing that few of them described what would on land be called great hail storms, and that the majority were near shore or at least not in mid-ocean. The hour being late, the discussion was not continued.

## HISTORY OF BRITISH EARTHQUAKES.

*To the Editor of the Meteorological Magazine.*

SIR,—Many notices of British earthquakes are to be found in the *Meteorological Magazine*, perhaps more frequently in the early than in recent numbers. The subject has indeed but little direct connection with meteorology, but the training provided by the accurate reading of delicate instruments and the careful observation of the weather is precisely that which is most essential to the seismologist.

With a view to aiding in the careful observation of earthquakes and to pointing out the details most worthy of attention, I have drawn up a short paper of suggestions, a copy of which by your kind permission is inserted in this number of the *Met. Mag.*

I would also take this opportunity of mentioning that I am preparing a history of the British earthquakes of the nineteenth century, and should be very grateful for any notices of past or future shocks which your readers may be so kind as to contribute, whether derived from newspapers, private diaries, or other trustworthy sources. That such a history should even approach completeness is of course out of the question; my aim must be to reduce, as far as possible, the imperfection of our seismic record.

Yours obediently,

CHARLES DAVISON.

373, Gillott Road, Birmingham, June 17th, 1895.

## DO OVERHEAD WIRES WARD OFF LIGHTNING?

Have our cities been altogether wise in burying their electric wires? To answer this question, observations were first made in all the cities having telephone installations, and in a large number of places without such installations; and their result has been to demonstrate the fact that the network of telephone wires has diminished the violence of thunderstorms and lessened the danger from lightning. As the first statistics obtained were not free from objections, the observations were continued according to definitely limited rules. Thus there were examined 900 places, of which 340 had city telephone systems, and 560 had none. The results were favourable to the first; the ratio of injury to buildings in them to that in places without telephone systems was as 1 to 4·6. It may be objected that places without telephone systems are

usually smaller than those which possess them, and that experience has shown that danger from lightning is greater in the country than in the city. But this danger is at the greatest only about twice as large, while the above given ratio between towns with and without telephone systems shows the danger in the latter to be about five times greater. It seems to speak especially well for the protective powers of the telephone system that of a total of ninety-four buildings which were damaged by lightning in cities provided with such systems, there was only one which had a water-pipe connected with the lightning conductor. The wider problem also was investigated, whether the network of wires of the telephone system hinders or weakens the lightning discharge by gradually equalising the difference of electric potential which exists between the clouds and the earth's surface; and here the equally favourable result appeared that in the places with telephone systems an average of three lightning discharges struck the earth during each hour of storm, while in the places without telephone systems five bolts struck during the same time. The observations are not yet completed, but it should already be regarded as proved that the network of wires of a telephone system actually exerts a protecting influence against injury from atmospheric electricity.—[*Gaea (Leipsic).*]—*Public Opinion*, April 19th, 1895.

#### TELEPHONES AND THUNDERSTORMS

Do overhead telephone wires exercise a controlling influence on the electricity of the atmosphere? That the converse occurs is evidenced only too plainly by the disturbances in telephonic communication which result from the presence or proximity of a thunderstorm. More than one instance may be recalled of a telephone wire being struck by lightning, to the detriment of the instrument and to the discomfiture of the listener. Such a case was commented upon in the *Lancet* of May 5th, 1894. But do overhead wires ward off lightning? We are indebted to the *Decorators' Gazette and Plumbers' and Gasfitters' Review* for the "fact" that the risk to buildings of being struck by lightning in places unprotected by overhead telephone wires is nearly five times greater than in places provided with a telephone system.\* An immunity of this kind cannot be considered improbable. It is to be remembered that an overhead telephone wire becomes in point of fact a lightning conductor, and in this capacity may act in two ways: (1) by equalising differences of potential, it may prevent the occurrence of the disruptive discharge; or (2) receiving a lightning charge it may carry the current to earth. With reference to the first point there can be little doubt that overhead conductors, if connected to earth, do play an important part in the distribution of atmospheric electricity. Lord Kelvin in a recent paper (read before the Philosophical Society of Glasgow) states that the difference of potential he obtained between the earth, and an insulated burning match placed nine feet above the ground, was 200 to 4,000 volts. What, then, is the result of permanently connecting by a good conductor the

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\* We think that the *Lancet* is mistaken in giving the credit to the *Decorator's Gazette* (a copy of which we have been unable to obtain) as the resemblance to the preceding quotation from the *Gaea* seems to show that the *Decorator's Gazette* has simply reproduced its facts.

earth and the atmosphere directly above it, a condition which exists in the case of single-wire telephone circuits? Such an arrangement must tend to equalise potential and prevent the accumulation of those charged masses which no doubt form the nucleus of the storm cloud. This equalisation will continue to take place in all conditions of weather. But when a storm does occur, it is obvious that the wire if struck by lightning carries the current to the point of greatest danger—viz., to the instrument and to anyone in its vicinity. Therefore, unless the strictest structural precautions be taken, such a wire becomes a source of danger rather than of safety.

To obviate this danger, every post or support for overhead wires ought to be fitted with a lightning guard, and every instrument, whether using the earth as a return or not, should be fitted with an efficient form of lightning arrester. Where the overhead wires are not connected to earth, as is the case with overhead "lighting mains" and "twin" telephone circuits, any equalising effect upon potential difference is practically lost, and any circuit connected with overhead wires of this kind must be dangerous, inasmuch as such wires become lightning conductors in all but the saving device of an earth connection. For "lighting mains" it can scarcely be doubted that the underground system is in most respects the better: (1) for obvious reasons connected with the size of the cables; (2) for the electrical reason that if carried overhead no earth connection is allowable by the Rules of the Board of Trade. For telephones the adoption of the "twin wire" system seems to bring with it the advisability of placing the wires below the surface of the ground, inasmuch as this system does away with the earth return as part of the circuit. It therefore appears that from an electrical point of view there may be in overhead wires an element both of safety and of danger. The latter will certainly predominate unless supports be protected with lightning guards and every instrument provided with an efficient "protector"—that is, with an unfailing means of carrying a strong current to earth without passing through the instrument. Is this secured in practice? Can it be secured with any certainty by even the best lightning arrester or earthing device of any description? As long as the coarse expedient of a connecting wire is necessary for the guidance of electrical energy, so long must this question of "wiring," with its safeties and its dangers, be one of great and growing interest. But it may be pointed out that if every house were fitted with an efficient form of lightning guard, a greater immunity from lightning discharges would be secured than that which at present exists with the closest network of overhead telephone wires.—*Lancet*, May, 1895.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1894.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	52·1	17 <sup>a</sup>	26·3	31	46·7	36·4	37·6	86	69·6	24·6	2·28	16	6·1
Malta.....	68·9	1 <sup>b</sup>	43·2	19	61·7	51·4	47·7	75	113·2	37·5	7·29	22	6·8
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i> .....	85·3	25	69·0	22	83·1	73·8	70·2	79	137·7	62·0	5·90	16	6·8
Calcutta.....	81·7	5	51·2	28	76·2	58·3	58·3	76	136·5	43·0	·01	1	2·2
Bombay.....	88·1	19	64·0	15	83·2	69·3	66·4	72	134·9	54·5	·01	1	1·0
Ceylon, Colombo ...	89·7	...	68·6	27	87·1	72·8	69·4	74	149·0	64·0	3·25	15	5·4
<i>Melbourne</i> .....	92·0	10	45·6	18	75·0	56·8	54·6	72	141·1	37·2	2·71	11	8·6
<i>Adelaide</i> .....	102·8	13	49·9	2	84·2	60·6	53·0	51	165·0	41·6	1·37	11	5·0
<i>Sydney</i> .....	90·7	15	56·2	3	76·6	64·9	59·4	65	156·2	46·7	3·03	19	5·7
<i>Wellington</i> .....	80·0	30	48·0	19 <sup>c</sup>	70·1	55·9	53·8	72	144·0	34·0	·82	8	3·9
<i>Auckland</i> .....	79·0	27	56·0	12 <sup>d</sup>	73·9	59·9	60·4	80	144·0	54·0	·20	4	4·3
Jamaica, Kingston.....	90·3	12	63·2	25	85·1	67·7	66·2	80	...	...	2·43	5	3·9
Grenada.....	86·4	24	70·2	12	82·3	72·9	70·8	73	159·0	...	7·84	24	2·8
Trinidad .....	90·0	20	68·0	<sup>e</sup>	86·9	69·8	70·5	81	169·0	66·0	3·16	14	...
Toronto .....	49·3	16	—5·0	28	37·2	25·6	25·3	79	...	—11·2	2·12	17	6·9
New Brunswick, Fredericton .....	46·9	17	—10·2	10	31·2	10·3	17·7	65	...	...	2·73	15	5·1
Manitoba, Winnipeg ...	37·4	19	—24·5	27	23·7	5·4	...	...	...	...	·55	10	4·9
British Columbia, Esquimalt .....	47·7	11	28·2	28	42·0	34·1	36·9	93	...	...	1·66	17	6·0

a—and 18. b—and 5. c—and 20, 28. d—and 14. e—Various.

## REMARKS.

MALTA.—Adopted mean temp. (55°·8), 0°·5 below the average. Mean hourly velocity of wind 11·6 miles. Thunderstorms on 8 days, and lightning on 5 other days. Hail on 3 days. Dew point temp. ranged between 56°·6 on the 6th and 36°·0 on the 18th.

J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·6 above, dew point 2°·2 above, and rainfall ·79 in. above, their respective averages. Mean hourly velocity of wind 12·0 miles, or 1·1 mile above the average; extremes, 30·3 on 17th and 0·0 on 3rd; prevailing direction, E.S.E. to E. by N. Thunder and lightning on 1st, 4th, 5th and 27th, and thunder on 7th and 13th.

C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on the 1st, 2nd, 3rd, 5th and 6th, and lightning was seen on the 4th and 18th.

D. G. MANTELL.

Adelaide.—Mean temp. 1°·4 above, and rainfall ·54 in. above, the average of 37 years. Weather generally hot, and general and heavy rains setting in after Christmas Day, especially heavy in pasture districts E. and N.E. of Lake Eyre. C. TODD, F.R.S.

Sydney.—Mean temp. 1°·1 above, humidity 4·7 below, and rainfall ·44 in. above, their respective averages.

H. C. RUSSELL, F.R.S.

Wellington.—Prevailing wind N.W. and strong in the early part of the month. Generally fine pleasant weather. Mean temp. 2°·2 above, and rainfall 3·12 in. below, their respective averages.

R. B. GORR.

Auckland.—Remarkable for its extreme dryness, the total rain for the month being only ·20 in., the average of 27 years being 2·78 in. Mean temperature much above the average.

T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Generally fine. Northers from 16th to 20th and on 29th. Rainfall above the average. Mean hourly velocity of wind 3·7 miles. R. JOHNSTONE.

TRINIDAD.—Rainfall 1·65 in. below the average of 30 years.

J. H. HART.

# SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1895.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	37	XI.	Lake Vyrnwy .....	1.31
"	Birchington, Thor .....	75	"	Corwen, Rhug .....	56
"	Hailsham .....	66	"	Carnarvon, Cocksia ..	69
"	Ryde, Thornbrough .....	96	"	I. of Man, Douglas .....	91
"	Emsworth, Redlands ..	74	XII.	Stoneykirk, Ardwell Ho.	1.40
"	Alton, Ashdell .....	54	"	New Galloway, Glenlee	76
III.	Oxford, Magdalen Col...	73	"	Melrose, Abbey Gate	1.95
"	Babury, Bloxham .....	88	XIII.	N. Esk Res. [Penicuik]	1.40
"	Northampton, Sedgebrook	61	"	Edinburgh, Blacket Pl.	2.88
"	Alconbury .....	53	XIV.	Glasgow, Queen's Park.	1.68
"	Wisbech, Bank House..	1.25	XV.	Inverary, Newtown .....	2.86
IV.	Southend .....	19	"	Islay, Gruinart School..	...
"	Harlow, Sheering .....	16	XVI.	Dollar .....	2.45
"	Colchester, Lexden .....	24	"	Balquhiddy, Stronvar.	2.42
"	Rendlesham Hall .....	36	"	Balhulig .....	1.72
"	Diss .....	55	"	Dalnaspidal H.R.S. ....	2.57
"	Swaffham .....	1.78	XVII.	Keith H.R.S. ....	5.25
V.	Salisbury, Alderbury ...	1.37	"	Forres H.R.S. ....	3.66
"	Bishop's Cannings .....	95	XVIII.	Fearn, Lower Pitkerrie.	3.51
"	Blanford, Whatcombe.	1.40	"	Loch Shiel, Glenaladale	...
"	Ashburton, Holne Vic..	1.65	"	N. Uist, Loch Maddy ...	2.56
"	Okehampton, Oaklands.	1.10	"	Invergarry .....	2.05
"	Hartland Abbey .....	1.75	"	Aviemore H.R.S. ....	2.73
"	Lynmouth, Glenthorne.	1.19	"	Loch Ness, Drumadrochit	4.94
"	Probus, Lamellyn .....	1.51	XIX.	Invershin .....	2.29
"	Wellington, Sunnyside..	1.40	"	Scourie .....	1.92
"	Wincanton, Stowell Rec	1.00	"	Watten H.R.S. ....	2.46
VI.	Clifton, Pembroke Road	82	XX.	Dunmanway, Coolkelure	2.75
"	Ross The Graig .....	93	"	Fermoy, Gas Works ...	3.59
"	Wem, Clive Vicarage ...	89	"	Killarney, Woodlawn ...	2.97
"	Cheadle, The Heath Ho.	1.20	"	Caher, Duneske .....	2.18
"	Worcester, Diglis Lock	3.60	"	Ballingarry, Hazelfort..	1.12
"	Coventry, Coundon .....	1.23	"	Limerick, Kilcornan ...	1.25
VII.	Ketton Hall [Stainford]	1.24	"	Ennis .....	...
"	Grantham, Stainby .....	72	"	Miltown Malbay .....	1.59
"	Horncastle, Bucknall ...	1.68	XXI.	Gorey, Courtown House	3.35
"	Worksop, Hodsok Priory	1.98	"	Athlone, Twyford .....	90
VIII.	Neston, Hinderton .....	1.63	"	Mullingar, Belvedere ...	2.34
"	Preston, Haighton .....	...	"	Loughford, Currygrane..	1.18
"	Broughton-in-Furness..	1.59	XXII.	Woodlawn .....	1.17
IX.	Ripon, Mickley .....	3.22	"	Crossmolina, Enniscoe..	1.39
"	Melmerby, Boldershy ...	3.49	"	Collooney, Markree Obs.	1.62
"	Scarborough, South Cliff	2.68	"	Ballinamore, Lawderdale	1.32
"	Middleton, Mickleton..	1.44	XXIII.	Lough Sheelin, Arley ..	1.69
X.	Haltwhistle, Unthank..	1.56	"	Warrenpoint .....	2.33
"	Bamburgh .....	1.51	"	Seaford .....	1.50
"	Keswick, The Beches...	1.01	"	Belfast, Springfield ...	2.81
XI.	Llanfrechfa Grange .....	1.49	"	Bushmills, Dundarave...	2.29
"	Llandoverly .....	78	"	Stewartstown .....	2.33
"	Castle Malgwyn .....	69	"	Buncrana .....	2.23
"	Builth, Abergwessiu Vic.	1.23	"	Lough Swilly, Carrablagh	2.73
"	Rhayader, Nantgwillt..	1.00			

JUNE, 1895.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						Days on which 101 or more fell.	TEMPERATURE.				No. of Night below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		Max.	Min.							
				Dpth	Date				Deg.	Date	Deg.	Date		
													inches.	inches.
I.	London (Camden Square) ...	·30	— 1·71	·20	18	4	83·9	23	42·2	15	0	0		
II.	Maidstone (Hunton Court)...	·19	— 1·43	·15	30	5	...	...	...	...	...	...		
III.	Strathfield Turgiss .....	·66	— 1·14	·28	28	10	83·3	9	34·8	15	0	4		
IV.	Hitchin .....	...	...	...	...	...	...	...	...	...	...	...		
V.	Winslow (Addington) .....	·32	— 1·54	·18	28	5	80·0	26	35·0	15	0	1		
VI.	Bury St. Edmunds (Westley) ..	·52	— 1·27	·10	1 <sup>a</sup>	8	75·0	23	39·0	15	0	...		
VII.	Norwich (Brundall) .....	·85	...	·40	27	10	79·0	23	37·7	15	0	2		
VIII.	Weymouth (Langton Herring) ..	2·00	— ·23	1·03	28	9	77·0	8	44·0	15	0	...		
IX.	Torquay (Cary Green) ...	1·10	...	·50	28	8	77·0	8	43·0	16	0	0		
X.	Polapit Tamar [Launceston]..	1·55	— ·66	·49	30	8	80·0	24	31·0	16	0	2		
XI.	Stroud (Upfield) .....	·67	— 1·72	·25	29	8	83·0	25	46·0	15	0	...		
XII.	Churchstretton (Woolstaston) ..	·73	— 1·82	·27	26	5	82·0	25	39·0	15	0	1		
XIII.	Tenbury (Orleton) .....	·85	— 1·76	·56	1	7	83·0	25	33·2	15	0	5		
XIV.	Leicester (Barkby) .....	·71	— 1·64	·23	30	9	86·5	26	29·5	14	2	6		
XV.	Boston .....	1·17	— ·72	·34	26	7	90·0	26	35·0	15	0	...		
XVI.	Hesley Hall [Tickhill] .....	1·95	— ·03	·65	26	10	86·0	26	34·0	15	0	...		
XVII.	Manchester (Plymouth Grove) ..	3·05	— ·40	·94	28	10	86·0	26	34·0	14	0	1		
XVIII.	Wetherby (Ribston Hall) ..	2·17	— ·28	·78	2 <sup>b</sup>	6	...	...	...	...	...	...		
XIX.	Skipton (Arncliffe) .....	2·38	— ·98	·67	1	11	...	...	...	...	...	...		
XX.	Hull (Pearson Park) .....	2·49	— ·74	·87	26	9	79·0	26	34·0	15	0	...		
XXI.	Newcastle (Town Moor) .....	3·04	— 1·40	·82	26	13	...	...	...	...	...	...		
XXII.	Borrowdale (Seathwaite) .....	3·18	— 3·40	·77	1	10	...	...	...	...	...	...		
XXIII.	Cardiff (Ely) .....	1·63	— ·80	·39	1	9	...	...	...	...	...	...		
XXIV.	Haverfordwest .....	1·23	— 1·33	·49	30	9	80·3	25	34·2	16	0	6		
XXV.	Aberystwith (Gogerddan) .....	·89	...	·30	29	6	80·0	7	...	...	...	...		
XXVI.	Llandudno .....	·89	— ·88	·35	1	9	77·4	26	42·5	15	0	...		
XXVII.	Cargen [Dumfries] .....	...	...	...	...	...	...	...	...	...	...	...		
XXVIII.	Jedburgh (Sunnyside) .....	1·04	— ·70	·36	17 <sup>c</sup>	10	82·0	25 <sup>d</sup>	32·0	13 <sup>e</sup>	2	...		
XXIX.	Colmonell .....	1·23	...	·28	28	7	83·0	25	32·0	12 <sup>e</sup>	2	...		
XXX.	Lochgilthead (Kilmory) .....	2·00	— 1·10	·62	26	14	...	...	32·0	12	1	...		
XXXI.	Mull (Quinish) .....	·77	— 2·52	·28	17	13	...	...	...	...	...	...		
XXXII.	Loch Leven Sluices .....	1·20	— ·55	·40	18	7	...	...	...	...	...	...		
XXXIII.	Dundee (Eastern Necropolis) ..	1·62	— ·15	·60	17	11	78·9	8	36·3	13	0	...		
XXXIV.	Braemar .....	2·67	— ·68	·87	18	15	77·4	7	34·4	13	0	4		
XXXV.	Aberdeen (Cranford) .....	2·34	...	·70	17	14	74·0	22	35·0	12	0	...		
XXXVI.	Strathconan [Beaul] .....	5·71	— 3·22	1·73	18	7	...	...	...	...	...	...		
XXXVII.	Glencarron Lodge .....	4·52	...	1·00	17	20	76·0	25	35·9	14	0	...		
XXXVIII.	Cawdor [Nairn] .....	4·34	— 2·94	1·11	17	18	...	...	...	...	...	...		
XXXIX.	Dunrobin .....	2·75	— ·73	·72	17	16	68·8	8	36·5	12	0	...		
XL.	S. Ronaldsay (Roeberry) .....	2·02	— ·26	·31	3	18	67·0	6	40·0	11 <sup>e</sup>	0	...		
XLI.	Darrynane Abb-y .....	1·81	...	·52	30	7	...	...	...	...	...	...		
XLII.	Waterford (Brook Lodge) ..	...	...	...	...	...	...	...	...	...	...	...		
XLIII.	O'Briensbridge (Ross) .....	1·07	...	·36	27	6	...	...	...	...	...	...		
XLIV.	Carlow (Browne's Hill) .....	2·85	— 1·01	·78	30	9	...	...	...	...	...	...		
XLV.	Dublin (Fitz William Square) ..	1·87	— ·21	·64	30	12	77·6	26	42·3	15	0	0		
XLVI.	Ballinasloe .....	·97	— 1·33	·33	30	7	79·0	24	30·0	13	2	...		
XLVII.	Clifden (Kylemore) .....	2·23	...	·60	30	13	...	...	...	...	...	...		
XLVIII.	Waringstown .....	1·76	— ·31	·40	3	12	85·0	25 <sup>d</sup>	35·0	15	0	3		
XLIX.	Londonderry (Creggan Res.) ..	2·08	— ·34	·31	20	18	...	...	...	...	...	...		
L.	Omagh (Edenfel) .....	1·21	— 1·26	·30	18	12	82·0	24	30·0	12	2	3		

a And 11, 18. b And 27. c And 28. d And 26. e And 13, 15.

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

# METEOROLOGICAL NOTES ON JUNE, 1895.

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

## ENGLAND.

STRATHFIELD TURGISS.—The month opened with unsettled weather and cloudy, but soon became fine and very dry. TSS occurred around this station, but did not develop here. The end of the month was showery and unsettled. On the 13th, 15th, 16th and 17th there was frost upon the grass.

ADDINGTON.—The least R on record for the month of June. The fall of the first six months of the year, 6·50 in. on 63 days, is also, with the exception of 1892, when only 6·40 in. fell on 73 days, the least recorded. On the 26th a very sharp TS occurred one mile to the N. of us, but no R fell here. Again on the evening of the 29th heavy R fell in the same locality, but none here. On the morning of the 15th slight frost on grass occurred, enough to blacken potatoes in low situations.

BURY ST. EDMUNDS, WESTLEY.—A month of great drought; the R fell in such small quantities that it dried up in a very short time. We have suffered more than in 1893, and the agricultural look-out is very bad. On the 26th, a short distance from here, a good R fell, and the TS on that night was most grand.

NORWICH, BRUNDALL.—A very dry month and many warm days. Mean temp. about the average. R one inch below the average. T on 1st, 12th, 13th, and 20th; T and L on 14th and 27th; L on 26th.

LANGTON HERRING.—On the whole a fine, bright, sunny month, very favourable for securing the hay. Mean temp. at 9 a.m., 61°·4, which is 1°·1 above the average of 23 years. Fog on the 22nd, but no T or L. The average reading of the bar. was the highest in June in 14 years.

TORQUAY, CARY GREEN.—Rainfall 1·28 in. below the average; Mean temp. 59°·6 or 1°·8 above the average; duration of sunshine, 273 hours 5 min., being 40 hours 30 min. above the average; no sunless day.

POLAPIT TAMAR.—A very hot, dry and calm month. The average max. shade temp. for the month is as high as 68°·8. The total R for the first six months of 1895 is only 11·54 in., being 2·96 in. under the average.

STROUD, UPFIELD.—T from 11 a.m. to 6 p.m., and a few flashes of L, on the 26th; the storm came from the S. and went to the E. On the 29th a flash of L and heavy peal of T about 5 p.m.

WOOLSTASTON.—A very hot and dry month, R falling on five days only. A severe storm of T and L occurred on 26th. Mean temp. 58°·6.

TENBURY, ORLETON.—A very fine, hot, dry month, the hottest June since 1870, and with the exception of June, 1889, the driest in the same time. Mean temp. was 2°·8 above the average. Sharp frosts on five mornings, the one on the 15th doing considerable damage to potatoes, &c. Great TS all round on the 26th, but no R here; T and L also on 29th. Fog on 1st and 3rd.

LEICESTER, BARKBY.—A very dry month, hay crops deficient. Mean temp. 58°·6. T on 12th, 26th, 27th and 30th.

HESLEY HALL [TICKHILL].—Severe TSS on 26th and 27th, and heavy T on 30th.

MANCHESTER, PLYMOUTH GROVE.—Summer weather from 7th to 10th; from 11th to 17th cold and unsettled, the temp. on grass falling to 29° on 15th. Fine summer weather from 19th to 25th. On the 26th a violent TS, the L being very vivid and frequent; T and L also on 27th, with showers, and a violent TS, with torrents of R, on 28th; T and L again on 29th, and T and showers on 30th. Mean temp. 58°·5.

## WALES.

HAVERFORDWEST.—There were six minima on grass below 32°, and 26° was recorded on the 16th, which committed sad havoc among the potatoes and

French beans; ash leaves were blighted as if by fire, and the young ferns were more or less destroyed. There has been no such frost in June in living memory in this locality. From the 25th to the end small quantities of R fell, but during the rest of the month almost absolute drought prevailed, with bright sunshine and high day temp. Straw will be very short, and in many localities green crops never came up. Prevailing wind E.N.E. and N.W.

GOGERDDAN.—Bright sunshine throughout, with N.W. and N.E. winds. Frosty mornings in the third week of the month.

#### SCOTLAND.

JEDBURGH.—The first half of the month was very dry and pastures and vegetation were much affected and hay is a light crop. Cereals looked well after the R in the last week but the straw will be short. T and L on 17th.

COLMONELL.—Rainfall 1·53 in. below the average of 19 years. T and L on the 26th, distant T on 29th.

MULL, QUINISH.—T on 29th. A dry hot month and crops suffered much from want of rain.

BRAEMAR.—T and L from 2 p.m. to 4 p.m. on 19th and from 3 p.m. to 8 p.m. on 26th.

ABERDEEN, CRANFORD.—The early part of the month was very dry. Vegetation stagnant in light soils.

CAWDOR [NAIRN].—Sharp TS and heavy H on 26th. Heavy showers and T on 29th and 30th.

ROEBERRY.—The first and latter parts of the month were fine, a cold snap occurring from the 9th to the 19th. On the evening of the 26th the heaviest TS experienced for many years occurred. Mean max. in shade  $57^{\circ}9$ ; mean min.  $46^{\circ}7$ .

#### IRELAND.

DARRYNANE ABBEY.—A very fine and very hot month, the middle being particularly hot and bright.

O'BRIENSBRIDGE, ROSS.—A splendid month with much brilliant sunshine. Some welcome R at the close. Distant T on 28th and 29th.

DUBLIN.—This was an exceptionally favourable month. Fair and quiet weather held until the 26th, hot sunshine by day being often succeeded by calm cold nights especially about the 13th. From the 26th to the close violent electrical disturbances took place and R fell in abundance. Mean temp.  $59^{\circ}2$  or  $1^{\circ}4$  above the average. High winds were noted on only 4 days and the force of a gale was never attained. Temp. reached or exceeded  $70^{\circ}$  in the screen on 7 days. H fell on the 12th and 29th. Solar halos were observed on the 3rd, 8th, 11th, 13th and 23rd. TSS occurred on the 26th, 29th and 30th.

WARINGTOWN.—The rainfall of the last week did much good, but previous to that the state of the country was very critical.

EDENFEL.—With a continuance of deficient rainfall the month was most variable as to temp. the calm, hot and clear weather of the first week having given place on the 9th to a cold spell culminating on the 13th in a temp. of  $30^{\circ}$  in the screen and  $25^{\circ}$  on the grass and on the 15th of  $31^{\circ}$  and  $27^{\circ}$  respectively, the severest June frost ever recorded here. Potatoes and all tender plants in low situations were killed to the earth and the foliage of horse chestnut, rhododendron and laurel completely destroyed. With somewhat unsettled conditions a hot spell recurred during the fourth week followed by T, L, H and R.