

<i>Sussex.</i>			
St. Leonards	82	§	
Ditchling	88.5	§	
<i>Hampshire.</i>			
Hurst Castle	82	§	
Portsmouth (Milton)	80.5	§	
Southampton	87	§	
Alton (Ashdell).....	91.0		
Strathfield Turgiss	91.1	§	
<i>Berks.</i>			
Reading (Tilehurst Road)..	90.0		
<i>Herts.</i>			
Berkhamstead (Rosebank).	91.0	§	
Harpenden (Rothamstead)	91		
Hitchin (Wratten)	90.0		
<i>Bucks.</i>			
Slough (Upton Hall)	91.2		
Winslow (Addington)	92.0	§	
<i>Oxford.</i>			
Oxford (Mag. Coll.)	89.0		
„ (Radcliffe Obs.)	89		
Banbury (Bloxham)	83.0		
<i>Northampton.</i>			
Easton Mauduit.....	93.5		
Castle Ashby.....	92.0		
Northampton (Sedgebrook)	90.0		
<i>Cambridge.</i>			
Cambridge Obs.....	92	§	
<i>Essex.</i>			
Harlow (Sheering Rect.)...	84.0		
<i>Suffolk.</i>			
Rendlesham Hall	88.0		
Bury St. Ed. (Westley) ...	86.0		
<i>Norfolk.</i>			
Geldeston [Beccles]	90	§	
Denver	91.8		
Yarmouth (Sailor's Home).	85	§	
Norwich (Blofield)	90.0	§	
Lynn (Hillington).....	89.3	§	
<i>Wilts.</i>			
Salisbury (Alderbury)	97.0		
Marlborough (Mildenhall).	82.0		
<i>Dorset.</i>			
Weymouth(LangtonHerng.)	75.0		
Blandford (Whatcombe) ...	86.0		
<i>Devon.</i>			
Salcombe (Prawle Point)..	76	§	
Plymouth	79		
Torquay (Cary Green).....	76.7	§	
Ashburton (Druid Ho.) ...	85.0	§	
Tavistock (Rose Villa) ...	83.6	§	
Cullompton	84	§	
Barnstaple Athenæum.....	85.0	§	
„ (Arlington Ct.)	82		
<i>Cornwall.</i>			
Falmouth Obs.	74	§	
<i>Somerset.</i>			
Templecombe(Stowell Rec.)	85	§	
Wells	89.0		
<i>Gloucester.</i>			
Bristol (Over Court).....	85.0		
Cirencester	85		
Stroud (Upfield)	85.0		
Cheltenham(Southam Vill.)	87.0	§	
<i>Hereford.</i>			
Ross (The Graig)	88.0	§	
Hereford.....	87	§	
<i>Shropshire.</i>			
Ch. Stretton (Woolstaston)	84.0		
Wem (The Clive Vic.).....	85.5		
<i>Stafford.</i>			
Wolverhampton Park	86.7		
„ (Wrottesley)	87		
Burton (Hoar Cross).....	85.0		
Cheadle (The Heath Ho.)..	82.9	§	
<i>Worcester.</i>			
Tenbury (Orleton)	87.0		
<i>Warwick.</i>			
Shipston (Weston Park)...	92.0		
Coventry (Coundon).....	85.0		
Birmingham (Monument)..	85.7		
<i>Leicester.</i>			
Barkby	95.0		
Loughboro' (Forest Road).	91	§	
<i>Rutland.</i>			
Ketton Hall [Stamford] ...	93.0	§	
<i>Lincoln.</i>			
Boston.....	93.0		
Horncastle (Bucknall).....	92.0		
„ (Hemingby) ...	91.3		
<i>Nottingham.</i>			
Nottingham Castle	90.4		
Worksop (Hodsock Priory)	88.7	§	
Hesley Hall (Tickhill).....	91.0	§	
<i>Cheshire.</i>			
Neston (Hinderton)	85.7		
Frodsham (Dunsdale)	83.0		
Knutsford (Heathside) ..	86.0		
Birkenhead (Bidston Obs.)	84.6		
<i>Lancashire.</i>			
Manchester (Plymouth Gr.)	89.0		
„ (Oldham Road)	84.0	§	
Prestwich Asylum	84	§	
Bolton (Chadwick Museum)	81.9	§	
Southport (Hesketh Park).	76.8		
Preston	81.5		
Blackpool	79	§	
Stonyhurst Coll.	79		
Lancaster (Rose Bank).....	82.0		
<i>York W.R.</i>			
Sheffield	86.5		
Meltham (Harewood Ldg.)	87.1	§	
Wakefield Prison	87.0	§	
Bradford.....	85.0	§	
York	86	§	
Knaresboro'	84.0		
Arnliffe	86.0		
<i>York E.R.</i>			
Patrington (Spurn Head)..	87		

<i>York E. R. (con.)</i>		<i>Carnarvon.</i>	
Hull (Pearson Park)	93·0	Llandudno	82·4 S
Driffield (York Road)	90·0 S	<i>Jersey.</i>	
<i>York N. R.</i>		St. Aubins	89 S
Scarborough	90 S	SCOTLAND.	
<i>Durham.</i>		<i>Roxburgh.</i>	
Durham Observatory	86	Melrose (Abbey Gate).....	83·0
<i>Northumberland.</i>		<i>Edinburgh.</i>	
N. Shields	83 S	Blacket Place	84·0 S
Alnwick Castle.....	80	<i>Perth.</i>	
<i>Cumberland.</i>		Coupar Angus Station	83·0
Keswick (The Beeches) ...	87·5	<i>Forfar.</i>	
<i>Monmouth.</i>		Dundee (Eastern Necrop.)..	84·2
Llanfrechfa.....	80 0	IRELAND.	
Monmouth (The Hendre)..	87·0	<i>Galway.</i>	
WALES.		Galway (Queen's Coll.) ...	82·0
<i>Carmarthen.</i>		<i>Sligo.</i>	
Llandoverly.....	88·0	Collooney (Markree Obs.)..	80·2
<i>Montgomery.</i>		<i>Cavan.</i>	
Churchstoke (Mellington)..	86 S	Lough Sheelin (Arley).....	82·5

ANOTHER ECCENTRICITY IN LONDON TEMPERATURE.

WE have always held that be the meteorological observations at the Royal Observatory, Greenwich, ever so good, it is a mistake for the Registrar General's Department to treat them as representative of London. The air on the Kentish hill is very different from that in either St. James's or St. Giles's, and there are sunshine and breezes at the former, when all is calm and foggy at the latter.

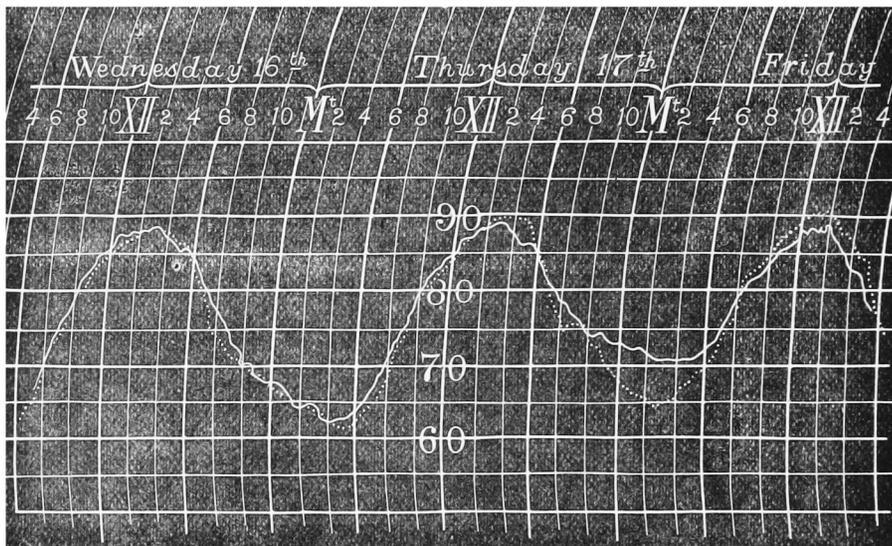
Under the title "Maximum Shade Temperature in April, 1893," on page 70 of the present volume, we showed that on April 20th the maximum temperature at the Botanic Gardens, Regent's Park, was only 77°·5; at Camden Square, 78°·1; at Greenwich, 78°·9; at Old Street (in the heart of the City) it was 79°·1 (in that case agreeing closely with Greenwich); while at Norwood it was 81°·6, and at West Kensington it was 82°·2.

Mr. Searle has called our attention to another curious case—the minimum in the early hours of August 18th was—

<i>Camden Square.</i>			<i>Greenwich.</i>	<i>West Kensington.</i>	<i>"London."</i>
<i>Glaisher's Stand.</i>	<i>Stevenson's Screen.</i>	<i>Grass.</i>	<i>Glaisher's Stand.</i>	<i>Stevenson's Screen.</i>	<i>(? Acre Lane, Brixton.) Stevenson's Screen.</i>
64°·1	65°·3	56°·8	67°·3	71°·3	72°·0

Seven degrees difference within three miles of Hyde Park Corner looked like evidence of carelessness somewhere. But it is not so. Fortunately, both at West Kensington and at Camden Square, Richard thermographs were working in the same stands with the minimum thermometers; and the two sheets show marvellous agreement during the 16th and on the 17th until about 6 p.m., when the rate of fall at West Kensington becomes less, and all through the night the temperature there remains much above that at Camden Square;

the temperature at 3 a.m. was nearly 7° lower at Camden Square than at West Kensington. The two curves are reproduced in the accompanying woodcut ; the dotted line representing Camden Square, and the continuous line Kensington.



As regards the $67^{\circ}\cdot3$ at Greenwich, we see that it has only once been exceeded—viz., on August 8th, 1846, when the lowest temperature was $68^{\circ}\cdot0$. Minima above 60° are very rare.

We do not know the explanation, but suppose that a layer of smoke covered the western part of the metropolis, but did not reach the higher and more northerly part, so that nocturnal radiation went on normally at Camden Square (*vide* grass min. = $56^{\circ}\cdot8$), while the denizens of the West had an extremely hot night.

EXTRAORDINARY RAINFALL IN A SHORT PERIOD AT PRESTON, LANCASHIRE.

To the Editor of the Meteorological Magazine.

SIR,—In Preston on Thursday, the 10th inst., there was a severe TS from about 2.0 a.m. to 5.0 a.m. The rain, however, was only slight. This storm moved away north-eastwards, and the day was dull as a whole, and very warm, the max. in the shade being 78° about 2.0 p.m. The wind was light from the S.E., and heavy thundery-looking clouds were visible most of the day till 3.30 p.m., when it darkened in all round, and about 3.45 T was heard in the S.W. near to the town. For an hour prior to this, however, there was T in the N.E. some 10 miles away.

At 4.5 p.m., the surface wind being S.E., huge drops of rain began to fall, at first slowly, but soon increased to a heavy downpour, accompanied by much T and L, over the town. This continued till 4.25,

when it all but ceased, and a *dead calm* followed, the darkness continuing. It was very noticeable how from 4.5 to 4.25 the rain fell from S.E. to S.W. alternately, changing four times.

At 4.29 p.m., without a moment's warning, the strongest wind I ever remember sprang up from the S.E., accompanied by blinding hail (some stones being as large as a shilling piece in diameter), so heavy that it was impossible to see more than about a yard through it! This lasted till 4.34, during which time the amount of hail, the fury of the wind, the constant L, and the great darkness, made a scene ever to be remembered by those who witnessed it. There was very much T during the time, but indoors it was almost inaudible owing to the deafening noise caused by the hail on windows and roof.

At 4.34 p.m., it became lighter and the hail ceased, but the rain continued in a moderate degree till 4.40, when it was all over.

At the Corporation Offices (16, Church Street), where I was present at the time, 2.09 in. fell in the 35 minutes 4.5 to 4.40 p.m.

After much careful thought and consideration, I submit the following, as showing approximately how this fall of 2.09 in. was distributed over the 35 minutes 4.5 to 4.40 :—

	in.
4.5 to 4.25.....	.70
4.25 to 4.29.....	.04
4.29 to 4.34.....	1.25
4.34 to 4.40 .....	.10
Total	2.09

I consider the amount, 1.25 in. in the five minutes 4.29 to 4.34 p.m., well within the mark, and *too little* if anything, and it is the general opinion in the Corporation Offices that not more than .70 in. fell from 4.5 to 4.25.

I have measured the rain at Calder Mount, Garstang, for about 14 years, and believe the above numbers to be very nearly correct. It is a great pity that the fall in the first part of the storm was not measured at 4.25 p.m.

The above-mentioned excessive rain did damage in Preston to the extent of thousands of pounds. The streets and ground floors of shops, &c., were in many places 2 ft. deep in water, and there were few cellars that escaped flooding. Many main sewers were burst, manhole covers being forced off, streams of water spurting up 6 ft. high in some parts of the borough.

The terrific wind blew signboards down, slates off, and caused much general havoc. Very much T was heard over to the N.E. in the direction of Slaidburn till 8.0 p.m.

- At Leyland, 4 miles S., there was no rain or storm at all.
- „ Southport, 13 „ S.W., „ „ „ „ „ „
- „ Anderton Fold, Barton, 7 miles N., the rainfall was 1.31 in.
- „ Calder Mount, Garstang, 9½ „ „ „ „ .73 „

There was considerable damage by lightning in the Garstang district, &c.—Yours truly,

SYDNEY WILSON.

Calder Mount, Garstang, August 18th, 1893.

SUNSPOTS AND AIR TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—The following relations and figures, deduced from a consideration of Dr. Buchan's useful table of mean temperatures in London from 1763 to 1892 (recently published in the Journal of the Scottish Meteorological Society), may be found interesting. They appear to favour the view (of Köppen and others) that a higher air temperature generally goes with minimum sunspots than with maximum.

In this period we find 12 years of sunspot minima and 11 of maxima. I tabulate the mean temperature of each of the six months—April to September—first, in each of the minimum years, then find the average for each month from those twelve means. Proceeding similarly with the maximum years, I get another group of six averages, which are then compared, month by month, with the former. Having thus dealt with the sunspot minimum and maximum years, I next go through the same process with the year just after the minimum, and compare with the year just after the maximum; then with the year just before the minimum compared with that just before the maximum. The results are these:—

(1) *Sunspot minimum years compared with sunspot maximum.*—In five out of the six months the averages of the former years are higher. Thus we have—

	April.	May.	June.	July.	Aug.	Sept.
(a) Min. years	48 ^o ·4 ...	55 ^o ·8 ...	60 ^o ·1 ...	62 ^o ·5 ...	63 ^o ·1 ...	59 ^o ·6
(b) Max. ,,	47 ^o ·2 ...	55 ^o ·6 ...	59 ^o ·9 ...	63 ^o ·4 ...	61 ^o ·8 ...	57 ^o ·2
Excess or defect of (a)	+1·2	+·2	+·2	−·9	+1·3	+2·4

(2) *Year after sunspot minimum compared with year after sunspot maximum.*—In five out of the six months the averages of the former are higher—

(a) Year after min.	47 ^o ·1 ...	54 ^o ·2 ...	60 ^o ·2 ...	63 ^o ·6 ...	62 ^o ·8 ...	59 ^o ·9
(b) ,, ,, max.	46 ^o ·2 ...	53 ^o ·6 ...	58 ^o ·9 ...	62 ^o ·8 ...	64 ^o ·0 ...	59 ^o ·0
Excess or defect of (a)	+·9	+·6	+1·3	+·8	−1·2	+·9

(3) *Year before sunspot minimum compared with year before sunspot maximum.*—In four out of the six months the averages of the former years are higher—

(a) Year before min.	47 ^o ·9 ...	54 ^o ·5 ...	61 ^o ·4 ...	63 ^o ·4 ...	63 ^o ·6 ...	57 ^o ·9
(b) ,, ,, max.	47 ^o ·7 ...	54 ^o ·9 ..	60 ^o ·3 ...	64 ^o ·1 ...	63 ^o ·0 ...	57 ^o ·2
	+·2	−·4	+1·1	−·7	+·6	+·7

Many of these differences are small, but the general agreement is perhaps noteworthy.

July is more often hotter than August than less hot (72 out of those 130 years). It is a curious fact—and I don't know if it has been previously noticed—that in eight out of the twelve sunspot

minimum years, August has had a higher mean temperature than July ; while in nine out of the eleven sunspot maximum years July has been hotter than August. If this were other than fortuitous, we might expect, I think, to find a similar state of things in the year just after minimum, compared with that just after maximum. But the conditions are here reversed. Thus, year after min., July was hotter than August in seven years out of eleven, while in one year the months were equal. On the other hand, year after max., August was hotter than July in nine years out of eleven.

A. B. M.

REVIEW.

Meteorology at the Paris Exposition [1889] by A. LAWRENCE ROTCH, Member of the International Jury of Awards of Class XV. [Extract from vol. ii. of the Reports of the U.S. Commissioners to Exposition]. n.p., n.d., but probably Washington, 1893. 8vo, 52 p.

THIS is a paper which irritates us because it is good and well illustrated, and because, though good, we are afraid that few of our readers will be able to get a copy. We always object to useful books being "privately printed," because it is treating our readers unfairly to tantalize them by explaining the merits of what they cannot buy.

In the present case Mr. Rotch had no alternative. His report is part of the official volumes, and he has probably received merely a very few copies for himself. Possibly copies of the complete series of reports will be found in the large Public Libraries.

There is no doubt that the Meteorological Section of the Paris Exposition owed much to Mr. Rotch's perseverance in hunting up all the scattered exhibits which had to be brought to the attention of the jury, and his efforts in that direction have their fruition in the articles in the *American Meteorological Journal* for 1889 and in the present report, which has the advantage of twenty or thirty woodcuts.

In many ways Mr. Rotch was admirably qualified for a juror. In fitting up the Blue Hill Observatory he is understood to have spared no expense in the providing of instruments ; and very few persons have visited as many observatories as he has, or know as well as he does the patterns of instrument constructed by the principal European opticians. When to this is added conscientiousness, energy, self-denial, and the devotion of some months to the work, we can understand why his summary of the instruments exhibited is almost, if not absolutely, perfect. If we had equally clear, thorough, and well illustrated accounts of each exhibition from 1851 onwards, there would be less difficulty than there is in drawing up a complete and accurate record of the progress in the construction of meteorological apparatus.

We can hardly afford stronger evidence of the care with which

Mr. Rotch has drawn up this report than by mentioning the two points in which alone we think that he is wrong. On page 240 he speaks of the "anemograph and pluviograph of Demichel"; we think that this should be Dr. Michel, but are not sure, and we wish that he had given an engraving of them. On page 252, in his description of Eon's electric thermometer, Mr. Rotch says: "This thermometer is superior to those heretofore made, since the contacts work in a vacuum, so that they are not easily oxidized." We make no accusation against M. Eon, but the sliding indicators referred to by Mr. Rotch as new had been used seven years previously by Mr. Goolden; for, in the *Quar. Jour. Roy. Met. Soc.*, vol. x. (1884), p. 197, we have the Catalogue of the Exhibition on March 9th, 1884, and entry No. 24 runs as follows:—

24. **Goolden's Electrical Six's Thermometer** (1882). The indices can be set at any desired range of temperature, and if the temperature either rises above or falls below these limits, a bell is sounded at any convenient distance from the instrument.

Exhibited by L. CASELLA, F.R. Met. Soc.

This description does not explain the construction, but we had one of the instruments; the tubes were hermetically sealed, the indices slid on fixed wires, and in short Eon's seems to us an inferior copy.

If the Chicago Exhibition is meteorologically a worthy successor to the Paris one, we cannot wish for a more impartial, lucid, and in all respects satisfactory reporter than Mr. Rotch.

THE CLIMATE OF THE BRITISH EMPIRE DURING 1892.

OUR annual summary of the climates of the British Empire for last year includes all the stations appearing in the monthly tables with the one exception of Hobart, Tasmania, where the observations appear to have been discontinued some months ago. There are, however, one or two changes which call for comment. At Toronto, the minimum temperature on grass was not reported for some of the winter months, no doubt owing to the record being interrupted by heavy falls of snow. The result of this is to make the altogether unimportant value of 12°·1 at London the lowest minimum on grass in the table. The temperature of the dew point and the relative humidity are no longer given in the returns from Winnipeg, and although this makes a gap in the tables, we think that many meteorologists will consider it a wise omission, considering the uncertainty which attaches both to the readings of the wet bulb thermometer and to the hygrometrical tables, at such low temperatures as are frequent there.

The summary of extremes shows the same features year after year, and the variations are very slight. Winnipeg, as usual, scores the greatest number of extremes, viz.: the lowest shade temperature, the greatest range of temperature, the greatest mean daily range,

and the lowest mean temperature. Adelaide resumes its old place with the highest temperature in shade and in sun. Three stations, Mauritius, Bombay and Ceylon share the distinction of recording the least mean daily range of temperature; and Bombay, for the third time in ten years, registered the greatest fall of rain. The new station of Esquimalt retains the distinction, which it acquired last year, of being the dampest station, and this year appropriately adds to it the greatest amount of cloud.

We have, in connection with these summaries, more than once referred to the fact that the Australian stations record higher temperatures both in shade and in sun than occur at the East Indian stations, and we think that we may well devote a little space to an examination of the records in illustration of the well known fact that in India special protection from the sun is an absolute necessity, and sunstrokes are of frequent occurrence; while in Australia an ordinary felt hat is the usual head covering, and sunstrokes are no more feared than in England.

For comparison we have selected Adelaide and Calcutta, the stations which record the highest temperatures in the respective countries. The first table, which gives the absolute maximum temperatures in shade and in sun for ten years, clearly proves our statement as to the higher temperatures recorded in Australia. It shows an average excess at Adelaide of 5°·2 in shade, and of 6°·4 in sun.

Absolute Maximum Temperature in Shade and in Sun for each of the ten years 1883 to 1892.

YEAR.	Max. in Shade.		Max. in Sun.	
	Adelaide.	Calcutta.	Adelaide.	Calcutta.
1883	109·5	100·2	174·0	163·0
1884	110·2	103·7	169·3	163·6
1885	107·4	105·3	173·6	164·7
1886	112·4	103·5	174·5	167·0
1887	111·2	102·0	164·0	159·5
1888	107·5	106·6	160·6	165·4
1889	109·0	101·8	170·7	161·2
1890	105·0	105·6	163·9	161·4
1891	102·7	102·7	165·0	158·5
1892	110·8	102·7	173·8	160·3
Mean	108·6	103·4	168·9	162·5

In the following table we have compared the averages of the four hottest months of the year at the two stations, including in the calculation the average maximum temperature in shade and the average humidity.

Average of the Six Years 1887-1892.

Station.	Month.	Absolute.		Average.		Month.	Absolute.		Average.	
		Max. in Sun.	Max. in Shade.	Max. in shade.	Humidity.		Max. in Sun.	Max. in Shade.	Max. in Shade.	Humidity.
Adelaide.	Dec.	157·5	99·5	81·9	48	Jan.	165·2	107·5	86·0	46
Calcutta..	Mar.	153·6	97·6	90·5	67	April	156·8	102·8	95·1	66
Adelaide. + or -		+ 3·9	+ 1·9	- 8·6	- 19		+ 8·4	+ 4·7	- 9·1	- 20
Adelaide.	Feb.	159·1	101·7	84·6	47	Mar.	154·7	100·6	80·9	51
Calcutta..	May	158·9	100·6	94·3	73	June	159·8	98·0	91·8	79
Adelaide. + or -		+ 0·2	+ 1·1	- 9·7	- 26		- 5·1	+ 2·6	- 10·9	- 28

This table shows that while in three cases out of the four, higher temperatures in sun, and in all cases higher temperatures in shade were recorded at Adelaide, yet the average maxima are always higher at Calcutta, and the humidity of the air is much greater. If we take the average of the whole period dealt with, *i.e.*, the 24 hottest months in the last six years at each station, we have—

	Absolute Max. in Sun.	Absolute Max. in Shade.	Average Max. in Shade.	Relative Humidity.
Adelaide.....	159·1	102·3	83·3	48
Calcutta.....	157·3	97·7	92·9	71
Adelaide + or -	+1·8	+4·6	- 9·6	- 23

Or to put it in words. Although the temperature at the Australian station occasionally runs up to an exceptionally high point, the heat is accompanied by a dry atmosphere; while in India the heat is more prolonged, and is accompanied by a considerable degree of humidity.

SUMMARY.

<i>Highest Temp. in shade</i>	110°·8 at Adelaide on January 20th		
<i>Lowest</i> " "	— 44°·4 at Winnipeg on January 18th		
<i>Greatest Range in year</i>	134°·4 at Winnipeg		
<i>Least</i> " "	24°·5 at Colombo, Ceylon		
<i>Greatest Mean Daily Range</i> ...	22°·0 at Winnipeg		
<i>Least</i> " " " ...	{ 10°·2 at Mauritius 10°·2 at Bombay 10°·2 at Colombo, Ceylon		
		<i>Highest Mean Temp.</i>	80°·8 at Colombo, Ceylon
		<i>Lowest</i> " "	32°·4 at Winnipeg
<i>Driest Station</i>	Adelaide, mean humidity 63		
<i>Dampnest Station</i>	Esquimalt mean humidity 90		
<i>Highest Temperature in Sun</i> ...	173°·8 at Adelaide		
<i>Lowest Temperature on Grass</i> ..	12°·1 at Camden Square*		
<i>Greatest Rainfall</i>	95·12 in. at Bombay		
<i>Least</i> " "	21·30 in. at Jamaica, Kingston		
<i>Most Cloudy Station</i>	Esquimalt, average amount 6·3		
<i>Least Cloudy Station</i>	Calcutta, average amount 3·8		

* The min. on grass not being recorded at the Canadian stations.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1893.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	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.									
England, London	67·6	31	25·9	19	56·6	36·3	38·6	77	103·4	19·9	·32	6	3·5
Malta.....	66·2	18	44·2	22	61·9	49·4	47·5	79	129·2	38·0	2·27	7	4·5
<i>Cape of Good Hope</i> ...	93·8	13	55·0	30	79·6	60·6	62·0	78	...	...	·13	3	3·0
<i>Mauritius</i>	84·8	7	66·0	17	82·7	72·5	69·5	79	138·7	58·2	6·08	25	6·1
Calcutta.....	92·8	28	57·5	2	84·2	65·6	65·5	75	147·1	51·0	1·85	5	3·8
Bombay.....	91·8	14	66·7	1	84·8	71·6	68·3	72	141·1	58·1	·00	0	0·7
Ceylon, Colombo ...	92·2	9	70·8	4	87·4	73·5	71·7	78	153·0	67·0	5·15	18	3·4
<i>Melbourne</i>	105·5	2	43·3	25	76·4	54·0	...	65	151·1	34·2	1·45	4	4·1
<i>Adelaide</i>	105·3	1	47·5	23	84·2	60·1	50·2	46	157·5	37·5	·59	3	2·9
<i>Sydney</i>	81·3	7	54·8	13	73·2	62·0	61·0	85	148·3	42·3	10·01	22	6·3
<i>Wellington</i>	71·0	23	44·0	19	64·4	50·8	47·4	70	136·0	35·0	7·22	13	4·7
<i>Auckland</i>	78·0	1	41·0	28	70·1	54·6	54·2	89	136·0	40·0	2·27	9	4·6
Jamaica, Kingston.....	91·7	11	63·8	17	85·6	67·8	65·0	72	...	...	·00	0	4·4
Trinidad	91·0	30 ^a	61·0	9	87·5	65·2	66·7	72	150·0	57·0	·19	3	...
Toronto	61·4	24	8·4	15	32·9	22·0	24·0	75	...	2·0	2·04	18	7·0
New Brunswick, Fredericton	50·6	25	—11·7	7	35·8	12·8	18·8	68	...	...	1·32	11	5·0
Manitoba, Winnipeg ...	40·0	29 ^a	—30·1	2	22·9	—6·9	...	...	...	...	·22	6	5·0
British Columbia, Esquimalt.....	54·5	21	29·3	5	48·7	36·7	36·9	80	...	...	3·36	19	8·0

^a And 31st.

REMARKS.

MALTA.—Mean temp. 54°·4 ; mean hourly velocity of wind 9·8 miles. TS on 2nd ; L on 7th and 25th. J. SCOLES.

Mauritius.—Mean temp. of air 0°·7 below, dew point 0°·4 below, and rainfall 2·09 in. below, their respective averages. Mean hourly velocity of wind 9·7 miles, or 0·2 mile below average ; extremes, 24·9 on 24th, and 1·8 on 1st ; prevailing direction, E.S.E. T on 5 days ; L on 4 days ; T and L on 3 days. From 25th to 28th, a cyclone passed E. and S.E. of Mauritius. C. MELDRUM, F.R.S.

Melbourne.—T and L on the 3th and 4th ; L on the 6th, 17th and 30th ; smoke haze on the 26th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 1°·8 above average of 36 years. Very dry up to 9 a.m. on the 30th, only ·01 in. of rain having fallen. The total for the first three months of the year (·62 in.) is the smallest on record, the previous lowest being ·65 in. in 1888. C. TODD, F.R.S.

Sydney.—Mean temp. 1°·7 below, mean humidity 9 above, and rainfall 4·58 in. above, their respective averages for 35 years. H. C. RUSSELL, F.R.S.

Wellington.—Fine in the early part of the month, until night of 9th, when R came on, heavy on 10th from N.W., changing during the day to S, and blowing a strong S.W. gale ; very strong gale on night of 10th, and heavy R, 5·70 in. falling in 24 hours, causing heavy floods. R continued up to 11 a.m. on 11th, and in about 36 hours 6·12 in. of R fell, the heaviest on record. Remainder of the month, generally fine, with a few showers towards the end. Slight earthquake on 17th at 1 a.m.

Auckland.—Early part of the month showery and unsettled ; violent gale from N.E. on 10th and 11th. The rest of the month fine, settled weather, but rather cool, the mean temp. being 3° below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Fine. Since 1870 there have been only two other months, viz , April, 1873, and December, 1875, in which no rain fell. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
AUGUST, 1893.

[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.	·89	XI.	Builth, Abergwessin Vic.	4·69
„	Birchington, Thor	·92	„	Rhayader, Nantgwillt..	4·02
„	Brighton, Prestonville Rd	...	„	Corwen, Rhug	3·96
„	Hailsham	1·32	„	Carnarvon, Cocksidia	3·59
„	Ryde, Thornbrough	1·11	„	I. of Man, Douglas	4·00
„	Alton, Ashdell.....	1·35	XII.	Stoneykirk, Ardwell Ho.	5·00
III.	Oxford, Magdalen Col...	1·00	„	New Galloway, Glenlee	5·54
„	Banbury, Bloxham	1·44	„	Melrose, Abbey Gate ...	2·76
„	Northampton, Sedgebrook	1·69	XIII.	N. Esk Res. [Penicuick]	3·25
„	Alconbury	1·98	„	Edinburgh, Blacket Pl.	3·16
„	Wisbech, Bank House..	1·84	XIV.	Glasgow, Queen's Park.	3·34
IV.	Southend	1·05	XV.	Islay, Gruinart School..	4·08
„	Harlow, Sheering ...	2·51	XVI.	Dollar.....	2·64
„	Colchester, Lexden.....	1·47	„	Balquhidder, Stronvar..	6·12
„	Rendlesham Hall	1·58	„	Coupar Angus Station..	2·29
„	Diss	1·56	„	Dunkeld, Inver Braan..	4·39
„	Swaffham	1·74	„	Dalnaspidal H.R.S. ...	5·69
V.	Salisbury, Alderbury ...	·70	XVII.	Keith H.R.S.	4·27
„	Bishop's Cannings	1·98	„	Forres H.R.S.	3·19
„	Blandford, Whatcombe ..	1·04	XVIII.	Fearn, Lower Pitkerrie.	2·17
„	Ashburton, Holne Vic....	2·48	„	Loch Shiel, Glenaladale	8·67
„	Okehampton, Oaklands.	1·88	„	N. Uist, Loch Maddy ...	6·90
„	Hartland Abbey	2·22	„	Invergarry	4·15
„	Lynmouth, Glenthorne.	2·96	„	Aviemore H.R.S.	3·88
„	Probus, Lamelyn	1·75	„	Loch Ness, Drumnadrochit	2·65
„	Wincanton, Stowell Rec.	2·04	XIX.	Invershin	2·94
„	Weston-super-Mare	1·80	„	Scourie	4·37
VI.	Clifton, Pembroke Road	2·36	„	Watten H.R.S.	2·02
„	Ross, The Graig	1·37	XX.	Dunmanway, Coolkelure	9·11
„	Wem, Clive Vicarage ...	1·89	„	Fermoy, Gas Works ...	5·50
„	Cheadle, The Heath Ho.	2·80	„	Killarney, Woodlawn ...	4·34
„	Worcester, Diglis Lock	1·88	„	Tipperary, Henry Street	3·64
„	Coventry, Coundon	1·69	„	Limerick, Kilcornan ...	3·08
VII.	Ketton Hall [Stamford]	1·62	„	Ennis	3·76
„	Grantham, Stainby	2·50	„	Miltown Malbay.....	4·63
„	Horncastle, Bucknall ...	1·00	XXI.	Gorey, Courtown House	4·05
„	Worksop, Hodsck Priory	1·34	„	Mullingar, Belvedere ...	4·68
VIII.	Neston, Hinderton	2·08	„	Athlone, Twyford	4·18
„	Knutsford, Heathside...	2·96	„	Longford, Currygrane...	4·37
„	Lancaster, Rose Bank...	4·28	XXII.	Galway, Queen's Coll...	3·72
„	Broughton-in-Furness...	7·99	„	Crossmolina, Enniscoe..	5·39
IX.	Ripon, Mickley	2·92	„	Collooney, Markree Obs.	4·29
„	Scarborough, South Cliff	1·34	„	Ballinamore, Lawderdale	5·41
„	East Layton [Darlington]	2·26	XXIII.	Lough Sheelin, Arley ..	3·71
„	Middleton, Mickleton..	2·46	„	Warrenpoint	4·47
X.	Haltwhistle, Unthank..	3·25	„	Seaforde	5·11
„	Bamburgh	1·62	„	Belfast, Springfield	5·61
„	Newton Reigny	4·07	„	Bushmills, Dundarave...	4·55
XI.	Llanfrechfa Grange	2·87	„	Stewartstown	5·28
„	Llandovery	3·04	„	Buncrana	5·58
„	Castle Malgwyn .....	...	„	Lough Swilly, Carrablagh	5·96

AUGUST, 1893.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which >0.1 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
		inches.	inches.	in.								
I.	London (Camden Square) ...	1.61	— .27	.78	4	11	93.6	18	44.8	29	0	0
II.	Maidstone (Hunton Court)...	1.24	— .45	.65	31	10	...	...	...	...	...	...
	Strathfield Turgiss	1.66	— .05	.43	4	16	91.1	17	37.1	29	0	1
III.	Hitchin	2.40	+ .58	.57	31	11	90.0	18	39.0	28	0	...
	Winslow (Addington)	1.24	— .73	.45	3	11	92.0	18	38.0	29	0	0
IV.	Bury St. Edmunds (Westley)	2.06	— .14	.69	11	10	86.0	18	47.0	28 ^d	0	...
	Norwich (Cossey)	1.90	...	.43	3	13	...	...	...	...	...	...
V.	Weymouth (Langton Herring)	1.01	— .92	.23	20	10	75.0	15	48.0	28 ^d	0	...
	Torquay (Cary Green) .....	.86	...	.17	3	10	76.7	16	49.8	6	0	0
	Bodmin (Fore Street)	2.62	— .23	.82	3	17	...	...	...	...	...	...
VI.	Stroud (Upfield)	1.81	— .28	.64	3	12	85.0	13 ^b	46.0	25	0	...
	Church Stretton (Woolstaston)	2.23	— .53	.55	20	14	84.0	15	44.5	28	0	0
	Tenbury (Orleton)	2.16	+ .04	.39	4	13	87.0	15	40.2	29	0	0
VII.	Leicester (Barkby)	1.57	— .87	.35	11	14	95.0	18	35.0	27	0	0
	Boston	1.35	— .77	.37	3	14	93.0	18	44.0	28	0	...
	Hesley Hall [Tickhill]	1.62	— .54	.39	9	14	91.0	18	40.0	6	0	...
VIII.	Manchester (Plymouth Grove)	2.51	— .58	.41	22	18	89.0	15	44.0	5	0	0
IX.	Wetherby (Ribston Hall) ...	1.43	— .91	.35	11	8	...	...	...	...	...	...
	Skipton (Arncliffe)	5.19	+ .86	1.56	2	16	86.0	15	43.0	30	0	...
	Hull (Pearson Park)	2.21	— .43	.90	5	14	93.0	18	43.0	6	0	0
X.	Newcastle (Town Moor)	2.24	— .47	.49	2	19	...	...	...	...	...	...
	Borrowdale (Seathwaite).....	13.58	+ 5.13	2.92	2	23	...	...	...	...	...	...
XI.	Cardiff (Ely)	3.53	— .08	.90	20	15	...	...	...	...	...	...
	Haverfordwest	2.79	— .39	.62	7	13	81.8	10	39.2	29	0	0
	Aberystwith, Gogerddan	3.68	...	.60	11	15	87.0	14	32.0	28	1	...
	Llandudno	1.45	— .91	.26	2	12	82.4	9	45.8	28	0	...
XII.	Cargen [Dumfries]	4.48	+ 1.49	.94	20	18	80.6	9	38.8	28	0	...
	Jedburgh (Sunnyside)	2.45	+ .21	1.15	7	12	85.0	14	40.0	28	0	...
XIV.	Old Cumnock	3.80	+ .38	.56	20	20	...	...	...	...	...	...
XV.	Lochgilphead (Kilmory)	6.36	+ 1.80	1.28	21	21	...	...	35.0	27	0	...
	Oban (Craigvarren)	1.77	...	...	...	...	...	...	...	...	...	...
	Mull (Quinish)	3.67	— .48	.36	21 ^a	25	...	...	...	...	...	...
XVI.	Loch Leven Sluices	3.30	+ .36	.90	21	13	...	...	...	...	...	...
	Dundee (Eastern Necropolis)	3.00	+ .43	.90	20	20	84.2	15	41.5	7	0	...
XVII.	Braemar	2.99	— .34	.52	21	24	76.0	14	31.0	28	1	2
	Aberdeen (Cranford)	1.77	...	.35	20	18	80.0	15	36.0	27	0	...
XVIIII.	Strome Ferry	5.48	+ .81	1.18	21	27	...	...	...	...	...	...
	Cawdor [Nairn]	2.90	+ .65	.67	15	23	...	...	...	...	...	...
XIX.	Dunrobin	2.67	+ .27	.39	4	19	75.0	15	44.0	24	0	...
	S. Ronaldsay (Roseberry).....	1.88	— .68	.35	15	22	70.0	18	44.0	5	0	...
XX.	Darrynane Abbey	6.58	...	1.08	10	22	...	...	...	...	...	...
	Waterford (Brook Lodge) ...	4.40	+ .98	1.14	10	17	77.0	14	43.5	29	0	...
	O'Briensbridge (Ross)	3.38	...	.80	2	15	78.0	13 ^c	51.0	27	0	...
XXI.	Carlow (Browne's Hill)	3.91	+ .94	.93	18	17	...	...	...	...	...	...
	Dublin (Fitz William Square)	2.71	+ .19	.52	18	16	79.8	15	47.9	26	0	0
XXII.	Ballinasloe	3.78	+ .60	.61	6	16	80.0	15	44.0	26	0	...
	Clifden (Kylemore)	5.94	...	1.08	10	19	...	...	...	...	...	...
XXIII.	Waringstown	4.55	+ 1.44	.93	9	19	85.0	14	45.0	4	0	0
	Londonderry (Creggan Res.) ..	5.34	+ 1.22	.67	13	26	...	...	...	...	...	...
	Omagh (Edenfel)	6.21	+ 2.72	1.50	9	21	81.0	14	41.0	28	0	0

a And 30. b And 15, 18. c And 15. d And 29.

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

METEOROLOGICAL NOTES ON AUGUST, 1893.

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 summer of 1893 will deserve a place "among the records" and of the month of August the period from 8th to 21st has been the hottest ever recorded at this station. Farther west, on the chalk and gravel, there is even now a water famine. All the autumn flowers are faded and dried up, having bloomed out of their usual season. T and L on 3rd and 9th.

ADDINGTON.—A very fine month, with many hot days. During the past 23 years we have only once before had a max. temp. of 92° , viz., on August 13th, 1876. The average max. temp. of the month, 75° , is exactly the same as it was in 1884, in which year the max. temp. was above 80° on 10 days; this month it was 80° or above on 7 days only, but on 2 days it was 90° . Grass fields again very much dried up.

BURY ST. EDMUNDS.—A very hot month, max. temp. above 60° and min. temp. above 47° every day. Distant T on the 3rd; TS with much L on the 10th; distant L on the 18th.

LANGTON HERRING.—A fine, hot, dry month. From the 6th to the 19th absolute drought. From the 7th to the 20th inclusive the temp. was uniformly very high, varying but slightly from day to day. The mean temp. for that fortnight was higher than the mean for any other fortnight in August, 1872-92. The mean temp. of the month at 9 a.m., $64^{\circ}6$, was $2^{\circ}4$ above the average. L on the 9th; fogs on 10th, 12th, 13th, 17th and 18th. High wind on 8th.

BODMIN, FORE STREET.—Rather wet at the commencement, and only 4 dry days to the 12th, then very fine and hot to the 18th. Much hay saved after the 23rd, more in fact than in June and July. Harvest finished fully three weeks earlier than usual.

STROUD, UPFIELD.—Springs drying up; water wanted in many places. High wind on 3rd and 9th and TSS on the latter day.

WOOLSTASTON.—A dry and sultry month. Splendid harvest weather. Mean temp $63^{\circ}0$. T and L on 9th and 10th.

ORLETON.—A very fine month, hotter than any August since 1867; temp. more than $4^{\circ}5$ above the average. Temp. above 80° on 10 days, and above 70° on 23 days. Heavy TSS on 4th, 9th and 10th.

BARKBY.—Brooks, ponds and most wells quite dry after the 17th. Earthquake distinctly felt on the 4th, on which day there was heavy T, as also on 9th, 10th and 18th.

HESLEY HALL, TICKHILL.—Heavy TSS during the night of the 10th.

MANCHESTER, PLYMOUTH GROVE.—Brilliant weather from the 8th to 18th. T and L on the 10th and 22nd. A heavy hailstorm, which lasted 20 minutes, on 22nd. Mean temp. $64^{\circ}5$. The hottest August in my record of 25 years with the exception of 1880, when the mean temp. was 66° .

HULL, PEARSON PARK.—TSS on the 4th, 5th and 10th.

WALES.

HAVERFORDWEST.—A very fine, warm month; temp. on 12 days 70° and upwards, on 3 days 80° and upwards. Seasonable R fell at short intervals, but in small quantities. Barley crops sadly deficient; oat crop better; wheat the finest crop of the lot, and excellent in quality; root crops excellent, apples and pears abundant and good. Strange sight, hay harvest coming after corn harvest. Hay not such a total failure after all; the quality of it, as of other things, excellent. Total R of the eight months $18\cdot88$ in. In the first eight months of 1859 the fall was only $18\cdot04$ in., and in that year the drought was absolute from the 9th April to 27th; no R fell in May; on the 3rd June $\cdot30$ in. fell, after which none fell until July 9th, when $\cdot30$ in. fell; '09 in. fell

on the 20th, and .19 in. on the 28th. This drought came to an end on the 31st, with a fall of .75 in. In my judgment this was a far more complete and disastrous drought in this county than the present drought of 1893.

GOGEADDAN.—S.W. wind most of the month; nice showers; very growing weather throughout.

SCOTLAND.

CARGEN.—The mean temp. of the month, $60^{\circ}\cdot7$, is $2^{\circ}\cdot5$ above the average, and is the highest for August since 1880, when it was $61^{\circ}\cdot8$. The temp. of each of the last six months was above the average. Very warm weather was experienced between the 8th and 17th, the mean temp. of the 10 days being $65^{\circ}\cdot3$. Vegetation consequently is in a very forward state, fully a month earlier than usual, and almost all the crops in the district are now in the stackyards. TSS on the 4th, 16th, 19th, and 29th. A severe gale on the 21st. A fine lunar rainbow was seen on the night of the 24th. As instances of the exceptional conditions of this season, at the end of the month a small dish of strawberries appeared on the table, and a rhododendron was in flower for the second time this year.

JEDBURGH.—The weather has been marked by very high and low temp., but mostly the former. The cereal crops are mostly cut, and secured in excellent condition. The rain has been very beneficial to the root crops. Within the memory of living man the corn crop has not been so generally cut in the month of August as it has been this year.

BRAEMAR.—An excellent month, and unusually fine crops, beautifully ripe, and already almost reaped.

ROEBERRY.—Fine throughout. Mean temp, $56^{\circ}\cdot2$.

IRELAND.

DARRYNANE.—A decidedly wet month, but warm. The last six days very fine and hot with heavy dew at nights. T on the 7th.

WATERFORD, BROOK LODGE.—Mean temp. 2° higher than last August. The first three weeks of the month very broken weather, with some T. T on 9th, 17th, and 23rd. Fogs on 13th and 14th.

O'BRIENSBRIDGE, ROSS.—L on the 9th. From the 10th to the close a splendid harvest month. Temp. unusually high, but more so at night than by day. Min. on 17th, 67° , and often 66° .

CARLOW, BROWNE'S HILL.—Heavy R on the 18th, .66 in. falling in 45 minutes.

DUBLIN.—This was a record month as regards high temp. On no fewer than 14 days did the thermometer exceed 70° in the shade, and the mean temp. was one degree above that of August, 1871, when it reached 62° . The present month is also remarkable for the magnificent display of lightning which occurred on the evening and during the night of the 9th. The mean temp. ($63^{\circ}\cdot0$) was much above the average ($59^{\circ}\cdot7$). High winds were noted on 10 days, and attained the force of a gale on three occasions. A TS of great severity occurred on the 9th. T was also heard on the 18th. L on the 13th, 18th, and 23rd. H on the 18th. Foggy on 12th, 13th, and 14th.

WARINGSTOWN.—A most abundant harvest, well saved. Hay crop fair in quantity, quality very good. Roots excellent.

EDENFEL.—The heavy and persistent rains of the first week were accompanied by moderate temperatures, but on the 8th and 9th a marked accession of heat was followed on the latter night by the most violent TS since August, 1873, lasting from 7 p.m. till 2 next morning, during which 1.50 in. of rain fell in torrential showers, and the bell tower and bell of a neighbouring church were thrown down by the accompanying lightning. A hot spell followed, with but little intermission till the 20th, and thence to the end of the month the weather was fresh, cool, and agreeable. A most abundant harvest is almost completed, and the copious rains and warmth above noted have produced a general after vegetation of phenomenal luxuriance.