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SYMONS'S
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METEOROLOGICAL MAGAZINE.

CCCXXV.]

FEBRUARY, 1893.

[PRICE FOURPENCE,
or 5s. per ann. post free.

In Memoriam.

H. F. BLANFORD, F.R.S., F.R. Met. Soc.

G. M. WHIPPLE, B.Sc., F.R. Met. Soc.

L. REDIER.

PROF. F. VAN RYSSELBERGHE.

It is rare for four meteorologists, each of such eminence as to claim notice in these pages, to pass away in one month; but that being the case, our notes upon their work must be very brief.

Mr. Blanford had won a distinguished position as a geologist before he took up meteorology, which he did in 1862, and rapidly obtained important promotion, so that when in 1874 the Indian Government established a central meteorological office for the whole of India, Mr. Blanford was placed at its head. How excellently he performed the duties of his office, and how thoroughly he justified his selection for it, is known to every meteorologist. No better proof of the wisdom of putting one man in absolute control of a Meteorological Department could be quoted than that afforded by the publications issued under Mr. Blanford's *régime*. He retired in 1888 and settled at Folkestone, but in spite of broken health, continued to render valuable service to meteorology almost to the last, when he has passed away at the age of 58.

With respect to Mr. Whipple, we reprint from one of our early numbers a paragraph, merely adding that we are sure that all will agree that Mr. Whipple's work during the sixteen subsequent years has far more than justified the position which we took in 1876:—

KEW OBSERVATORY.

“We are extremely glad to announce that the appointment of Director of Kew Observatory, held in the past by Francis Ronalds, John Welsh, and Balfour Stewart, has, at last, been conferred on the proper person. In so designating Mr. Whipple, we take an unusual position, but one which we believe to be impregnable. He has spent almost all his life in the Observatory; since Prof. Balfour Stewart's resignation he has practically borne much of the responsibility of the management, and there is certainly no living man who better understands the establishment and the work to which it is at present devoted.”—*Met. Mag.*, vol. xi. (1876), p. 164.

M. Redier, of Paris, who had received the distinction of *Officier de la Légion d'Honneur* for his skill as an inventor and maker of scientific instruments, was best known in this country for his very ingenious self-recording barometer,* with which results of almost marvellous accuracy have been obtained by Mr. E. T. Dowson, of Beccles.†

Prof. Van Rysselberghe was also an inventor. His great achievement, his Meteorograph, was fully described by him before the Meteorological Society on February 17th, 1875, and the account is published in the *Quarterly Journal*; its leading and unique feature is that the indications of the instruments can not merely be read off at any distance to which a telegraph wire can be carried, but that at the termination of the wire the readings of the instruments, pressure, temperature, wind, &c., are automatically engraved on a metal plate which, when transferred to a printing press, will give any requisite number of complete diagrams. At one of the International Exhibitions at Paris the Van Rysselberghe Meteorograph at Brussel was connected with a recording apparatus at Paris, and every change in the weather at Brussels was automatically engraved upon the plate in the Paris Exhibition.

DISTRIBUTION OF RAIN IN MAURITIUS DURING THE DECADE 1881-90.

By Prof. V. RAULIN.

IN the *Meteorological Magazine* for March, 1885 (Vol. XX., p. 19), was inserted an analysis which I had made of the rainfall of Mauritius during the decade 1871 to 1880, and also a map of the Island. I have now the pleasure of sending a similar analysis (but based upon many more records) for the decade 1881-90.

It will save trouble to reprint the paragraph describing the general physical features of the Island :—

“Mauritius is approximately semi-circular in shape, its longer axis lying S.S.W.—N.N.E., and its centre in lat. 20° 15' S. Like Réunion (or Bourbon) it is a volcanic island, but without any crater in activity; there is a tolerably marked mountainous plateau, but none of the peaks are high, the principal being Piton de Milieu, 1,931 ft., and the Piton of the Black River Mountains in the S.W., which reaches 2,911 ft.”

For the data used in this analysis, as was the case with the previous one, I am indebted to Dr. C. Meldrum, F.R.S., Director of the Royal Alfred Observatory, who publishes annually the “Results of the Meteorological Observations” made in the colony, and has been kind enough to furnish me with copies.

* *Met. Mag.*, vol. x. (1875), p. 33.

† *Quar. Jour. Met. Soc.*, vol. ix. (1883), p. 180.

Observations, during the above decade, have been made at ninety-three stations ; but there are only 56 available for the determination of seasonal rainfall—42 extending over from eight to ten years, and 14 from four to seven years.

The *yearly totals* generally range from 60 to 100 in. The amount is less at 10 stations, and falls to 29·66 in. at Wolmar (Black River). The rain is much heavier in the centre of the island, and 15 stations have falls exceeding 100 in., the highest being 142·53 in., at St. Hubert (Grand Port).

Seasonal distribution.—As a rule, stations in the N., E., and S.E. (Pamplemousses Rivière du Rempart, Flacq and Grand Port) have the intermediate System VII. (winter and summer wet), and those in the W. and S. (Moka, Plaines Wilhelms, and Savanne) have the marine System V. (winter and autumn wet, spring and summer rather dry). On the west coast, now that records are available, we find in the Black River District the normal System I. (dry winter, wet summer).

Compared with the previous decade, the general distribution remains much the same, excepting a few changes at individual stations, and the substitution in Moka and Plaines Wilhelms of System VII. by System V. This may be due to the fact that the fall in the second decade has been less than in 1871-80.

RÉGIME VII. (As at BAR-LE-DUC.)—Winter and Summer wet.

Stations.	Height above Sea.	Years.	Summ'r	Aut'mn	Winter.	Spring.	Year.
<i>A. East and South Coast—</i>							
	ft.		in.	in.	in.	in.	in.
St. Antoine	90	1881-90 (10)	18·94	19·18	6·67	4·43	49·22
Poudre d'Or	60	1881-90 (10)	19·07	20·73	8·25	5·42	53·47
Schœnfeld.....	?	1883-90 (8)	19·00	22·83	8·10	5·38	55·31
Mon Songe	620	1883-90 (8)	26·20	29·04	11·81	8·16	75·21
Union	500	1881-90 (8½)	26·26	29·16	13·39	7·04	75·85
Unité.....	?	1882-90 (9)	28·78	33·66	13·48	9·89	85·81
Sébastopol	870	1882-90 (9)	37·24	40·77	20·18	13·70	111·89
Sans-Souci	860	1881-90 (9)	42·50	46·69	26·11	17·38	132·68
Etoile	790	1881-90 (10)	32·31	38·45	18·59	12·58	101·93
Ansejonchée.....	70	1881-90 (10)	33·90	36·03	14·37	9·40	93·70
St. Hubert	800	1881-90 (10)	47·12	53·73	24·01	17·67	142·53
Cluny	1000	1881-90 (10)	45·95	51·62	24·36	17·69	139·62
Riche-en-Eau	800	1881-90 (10)	34·48	35·52	15·51	10·25	95·76
Astræa.....	700	1882-90 (10)	38·15	39·11	19·59	12·12	108·97
Deux-Bras	650	1881-90 (10)	37·01	40·10	18·32	11·88	107·31
Gros Bois	500	1881-90 (10)	33·73	37·18	16·19	10·35	97·45
<i>B. West Coast & Inland—</i>							
St. André	175	1881-90 (10)	15·91	16·37	5·00	4·12	41·40
Royal Alfred Observatory.	179	1881-90 (10)	17·88	18·62	6·29	4·61	47·40
Botanical Gardens.....	225	1881-90 (10)	24·54	25·88	10·34	7·35	68·11
Constance.....	626	1881-89 (8½)	24·67	27·43	11·40	7·57	71·07
La Grande Rosalie.....	643	1881-90 (10)	26·34	26·41	11·82	8·36	72·93
Fontenelle	360	1881-87 (6)	21·40	24·37	13·72	9·57	69·06

RÉGIME V. (As at LIMOGES.)—Winter and Autumn wet, Spring and Summer rather dry.

Stations.	Height above Sea.	Years.	Summ'r	Aut'mn	Winter.	Spring.	Year.
			in.	in.	in.	in.	in.
<i>B. West Coast and Inland</i> (continued)—							
Labourdonnais.....	290	1881-90 (10)	24·80	24·65	9·46	6·42	65·33
Rigny.....	575	1881-90 (10)	29·72	29·71	14·73	10·50	84·66
Beau Vallon.....	60	1881-90 (10)	25·62	23·66	10·51	6·45	66·24
Joli Bois.....	600	1881-89 (7 $\frac{3}{4}$)	42·19	42·14	20·01	14·06	118·40
Solitude.....	90	1885-90 (6)	16·15	13·18	4·47	2·84	36·64
Gentilly.....	1150	1881-90 (6 $\frac{3}{4}$)	37·80	29·42	12·02	8·28	87·52
The Bower.....	1080	1883-90 (6 $\frac{1}{2}$)	26·04	22·11	8·07	6·30	62·52
Lynnwood.....	1100	1881-90 (9 $\frac{1}{2}$)	32·31	23·44	9·76	7·48	72·99
Alma.....	1500	1881-90 (10)	47·46	42·46	23·03	16·51	129·46
Bon Air.....	1050	1886-90 (4 $\frac{1}{2}$)	29·91	21·47	7·60	5·44	64·42
Minissy.....	1150	1881-90 (9 $\frac{1}{2}$)	31·40	24·04	8·76	6·67	70·87
Beau Séjour.....	970	1881-90 (10)	27·17	22·66	7·60	5·90	63·33
Westra.....	1300	1881-85 (5)	28·24	23·76	12·23	8·39	72·62
Trianon.....	950	1881-90 (10)	24·61	20·12	7·34	5·54	57·61
Phoenix.....	1300	1881-90 (10)	28·86	23·69	10·90	7·57	71·02
Highlands.....	1400	1885-90 (6)	27·80	19·63	9·98	6·27	63·68
Réunion.....	1420	1881-90 (10)	30·88	26·22	14·67	10·02	81·79
Curepipe, Nursery Gardens	1840	1882-90 (8 $\frac{3}{4}$)	42·40	40·62	24·24	16·80	124·06
Villa le Bain.....	?	1886-90 (5)	43·37	40·06	24·68	17·57	125·68
Henrietta.....	1549	1881-90 (9 $\frac{3}{4}$)	28·88	25·16	15·61	10·55	80·20
The Glen.....	1580	1886-90 (4 $\frac{3}{4}$)	30·00	24·59	14·38	10·76	79·73
La Marie.....	1715	1881-90 (8 $\frac{3}{4}$)	34·30	31·60	19·24	13·45	98·59
Tamarin Falls.....	1629	1886-90 (4 $\frac{3}{4}$)	28·67	23·61	13·71	10·06	76·05
Chamarel.....	850	1881-90 (9 $\frac{3}{4}$)	27·18	24·46	15·81	9·41	76·86
Colmar.....	400	1881-89 (8 $\frac{1}{2}$)	36·74	36·18	16·24	12·02	101·18
St. Avoild.....	840	1886-90 (4 $\frac{1}{2}$)	45·34	45·33	21·14	14·71	126·52
Riche Bois.....	700	1881-90 (10)	37·29	37·21	20·13	12·68	107·31
Caledonia.....	1380	1881-90 (9 $\frac{1}{4}$)	45·82	44·34	25·44	18·80	134·40
Bénarès.....	300	1883-89 (6)	24·94	23·85	10·97	7·08	66·84
St. Aubin.....	300	1881-90 (10)	31·18	26·76	14·39	10·25	82·58
L'Union.....	90	1881-90 (10)	27·04	25·82	13·71	9·41	75·98
<i>RÉGIME I. (As at MOULINS.)—Dry Winter and wet Summer.</i>							
Wolmar.....	50	1883-90 (8)	14·25	11·78	1·44	2·19	29·66
Caselé.....	250	1888-90 (3)	31·23	14·01	2·60	6·06	53·90
Tamarin.....	150	1882-90 (9)	17·61	11·94	2·16	4·05	35·76
Bambous.....	180	1883-89 (5 $\frac{1}{2}$)	19·16	9·50	3·41	3·82	35·89

Montfaucon d'Argonne (Meuse), France.

V. RAULIN.

[With reference to Prof. Raulin's last remark, and with the view to obtaining some averages not likely to undergo material correction, we have taken out all the records perfect for the twenty years 1871-90, and give the results—

	Mean.		Difference.	Mean.
	1871-80. in.	1881-90. in.			1871-90. in.
Gros Bois.....	99·04	97·45	— 1·59	98·25
Roy. Alfred Obs....	52·05	47·40	— 4·65	49·73
Botanical Gardens	59·77	68·11	+ 8·34	63·94
Labourdonnais	70·01	65·33	— 4·68	67·67
Beau Vallon	60·48	66·24	+ 5·76	63·36
Beau Sejour	68·16	63·33	— 4·83	65·75
St. Aubin	83·90	82·58	— 1·32	83·24
L'Union	79·63	75·98	— 3·65	77·80

The differences between the Royal Alfred Obs. and the Botanical Gardens seem improbable, in—

1871-80 the excess at the Gardens was 7.72 in.

1881-90 „ „ „ „ „ „ 20.71 „

All the evidence points to some error or change at the Botanical Gardens.

The + difference at Beau Vallon is quite possibly correct, there is no station near, by which to check it.—ED.]

REVIEWS.

Investigations of the New England Meteorological Society for the year 1890.

Reprint from the Annals of the Astronomical Observatory of Harvard College, EDWARD C. PICKERING, Director. Vol. xxxi. Part 1. Cambridge, Mass., 1892, 4to, 155 pages, 5 plates.

HARVARD College must be a wonderful institution; it does an enormous amount of educational work, maintains a splendid observatory, with a branch one up in the high and pure air on the mountains of South America, and as the New England Meteorological Society is not very rich, has now undertaken to print its papers as appendices to its own annals. Some day perhaps Oxford or Cambridge may show similar vigour in similar directions, but we have no remembrance of seeing a single page of meteorology printed at the expense of any of the colleges or of the University of Cambridge. And with the exception of the annual pamphlet issued from the Radcliffe Observatory, the same may be said of Oxford.

The first 31 pages are devoted to a letterpress description and series of tables of data, of the year 1890, at the stations of the Society. This is followed by a paper by Mr. Warren Smith, giving lustrum tables of temperature and rain for all known and trustworthy stations in New England. It seems very strange to find in a modern table of the high standard aimed at in this paper, results based on one of Hawksbee's thermometers; but the following is the note to the earliest of the Cambridge (Mass.) registers:—

16. Observations taken "morning and evening," the hours averaging about 7 a.m., and from 3 to 4 p.m. No description of the gauge used is given in the original records, which are in the possession of the American Academy of Arts and Sciences, Boston, Massachusetts, neither is its exposure mentioned. The temperature observations from 1759 to 1763 were taken from a Fahrenheit thermometer made in London, and exposed on the north side of the house. It may be considered accurate, as the observer's notes show that he tested it by placing it in snow, and found that the mercury stood at the freezing point. The observer's description of the thermometer used for the rest of the observations is as follows: "My thermometer was of Mr. Hawksbee's make, filled with spirit of wine. Ye scale is divided into 100 parts, beginning from a certain point above marked 0 and ye 100th degree falls just above ye bulb of ye thermometer. Ye freezing point is numbered 65° Ye divisions are upward to 8°

above zero. Ye observations are expressed in the degrees with their decimal parts The instrument shows the highest temperature but not the lowest for it goes into the bulb. How it was adjusted in London I know not but it appears to me yt ye freezing point is marked considerably too high, for having plunged ye bulb into a vessel of snow I found yt ye spirit fell down to $76^{\circ}5$, and then rested." During several years, readings were taken from both thermometers and the record kept, and a table of corrections was obtained from these records, for changing the record by the Hawksbee thermometer to its equivalent in Fahrenheit readings.

The following are the yearly means for the various lustra for the various stations at Cambridge :—

1746-50.....	$46^{\circ}4$		1841-45.....	$46^{\circ}6$
1751-55.....	$46^{\circ}2$		1846-50.....	$47^{\circ}7$
1756-60.....	$46^{\circ}0$		1851-55.....	$47^{\circ}4$
1761-65.....	$46^{\circ}2$		1856-60.....	$47^{\circ}1$
1766-70.....	$46^{\circ}1$		1861-65.....	$48^{\circ}1$
			1866-70.....	$47^{\circ}1$
			1871-75.....	$46^{\circ}4$
1791-1795...	$50^{\circ}4$		1876-80.....	$48^{\circ}5$
1796-1800...	$48^{\circ}0$		1881-85.....	$48^{\circ}5$
1801-1805...	$49^{\circ}4$		1886-90.....	$49^{\circ}0$
1806-1810...	$47^{\circ}4$			

It is worth notice *en passant* that the first 45 years give a mean of $47^{\circ}5$ and the last fifty years of $47^{\circ}6$, which seems to indicate that the computed value of Hawksbee's thermometer cannot have been far out, and that there is no very great change in the temperature of the last 150 years. And, although there are no other records in these tables so old as the Cambridge ones, those at Salem, Andover and Newhaven for the end of the 18th century and the early years of the 19th, harmonize well with the curve indicated by the Cambridge ones.

The rainfall tables are less satisfactory. In the first place there is very little information as to the patterns of gauge or their size or height above ground. Secondly, five year periods are of course much too short to give comparable means, and for all questions of secular change we must have the total for every year, *not* means. Thirdly, even for the same town, two records which agree for three or four lustra suddenly differ; this must be due to changes in the instrument or its position, and should be carefully examined. Perhaps we had better give one or two illustrations :—

	1826-30.	1831-35.	1841-45.
Boston, Station 562	in. 42.45	in. 41.14	in. 34.63*
" " 563	42.76	42.69	43.33
Difference	+ .31	+ 1.55	+ 8.70

	1871-5.	1876-80.	1881-5.	1886-90.
	in.	in.	in.	in.
Boston, Station 107	50·69	49·81	46·20	49·59
„ „ 106	48·24	49·76	45·37	40·16*
Difference	-2·45	-·05	-·83	-9·43

The values to which we have attached * obviously need scrutiny.

The last portion of the volume may be described as a general review of theories respecting tornadoes, illustrated by an intensely interesting account of one which passed over Lawrence (Mass.,) July 26th, 1890. The paper, details, photographs and maps, are of the highest excellence.

The Geographical Distribution of Disease in Great Britain, by ALFRED HAVILAND, M.R.C.S., &c. Second Edition, London, Swan Sonnenschein, & Co., 1892, large 8vo., xvi.—406 pages, 4 coloured maps.

THE title of this work does not indicate it as coming within our province for review, and we shall certainly leave the medical portion to be dealt with by statisticians and medical men. But the author is one of those happy, facile writers, who (in a way beyond the imitation of ordinary mortals), glide off into all kinds of bye-paths, and leave flowers of language, scraps of mythology, geology, biology, anthropology, &c., &c., scattered throughout their works. This gives lightness and relief to books which would otherwise be very heavy reading; but then sometimes it leads to the author's forgetting what he was going to say—*e.g.*, in the contents of chapter ix., the last three subjects as stated on p. xiv., are “Deaths by Lightning—Barometer—The Climate of the Microphyte;” but we cannot find a word about either the first or the last of these items.

We have, however, found a paragraph about Microphytes in chapter x., section 2, and we quote it as a fair specimen of the author's style:—

The Habitats of Microphytes. (Bacteria, etc).—At present we are not in a position to discuss the habits of those organisms that are associated with floods, simply because we know nothing of their relation to the malignant diseases under discussion; we do know, however, that many of these fungi rejoice in moist death, whether of vegetable or animal, or both combined, and that dead putrid organic matter is the soil in which such plants mostly thrive. Flügge tells us that in addition to ground water, which is chiefly employed in drinking and household purposes, the water which flows on the surface of the ground often serves as a means of transport of *saprophytes*, and at times of *pathogenic bacteria*. In fact the water in gutters, streams and rivers is particularly dangerous, because it not infrequently serves the double purpose

of taking up and removing waste water of the most various kinds, and at the same time supplying water for household purposes.

We give three other extracts, whence our readers can judge for themselves as to the interesting matter between the boards of this handsome volume :—

No wonder those ancient nature-watchers, the early inhabitants of Greece, drew a broad distinction between the *upper* and the *lower* strata of our atmosphere; the former of which they considered pure and fit for their Olympian gods, calling it *Ether*, (*αιθήρ*), and Zeus, the dweller in ether (*αιθεριναίων*) according to Homer (Il. ii. 412; Od. xv. 523); whilst to the lower stratum in which floated vapour, fogs, clouds, dust, motes and haze, they applied the term air (*ἀήρ*). Mountain ether to these quick-witted, sensitive lovers of natural beauty was a delight, which stimulated their active brains, whilst it invigorated their limbs, and sent a thrill of enjoyment throughout their systems, that made life, health, vigour worth living for; no wonder then that their ideas of physical and mental perfection were associated with the medium in which they supposed their gods to live; and thus when they represented their deities in sculpture, they strove to give them the most perfect forms that men and women could be conceived to possess.

* * * * *

Such was the glorious mountain view that stood out clear, distinct and purple against the ruddy golden sky of a setting sun on the 21st of September, 1885, the date of my first visit to Orrest Head; the purple of the peaks merging into the dark green of the foliage of the lower heights of *Hawk's Head* and *Claipe Heights*, which seemed to lie humbly at their feet, whilst the broad waters of the lake, like an inland sea of molten silver, reflected their solemn beauty, and thus enhanced the glory of one of nature's grandest displays of brilliant colour and perfect form, never to be forgotten.

* * * * *

When the earliest neolithic men appeared in this region, Britain may have still been united to the Continent. But the connection was eventually broken. It is obvious that no event in the geological history of Britain can have had a more powerful influence on its human history than the separation of the country as a group of islands cut off by a considerable channel from direct communication with the mainland of Europe. Let us consider for a moment how the disconnection was probably brought about.

For the two pages describing the process, we must refer our readers to the book itself.

ROYAL METEOROLOGICAL SOCIETY.

THE annual meeting of this Society was held on Wednesday evening, January 18th, at the Institution of Civil Engineers, 25, Great George-street, Westminster; Dr. C. Theodore Williams, President, in the chair. After the report had been read, and the Officers and Council for the ensuing year had been elected, the President delivered an address on "The High Altitudes of Colorado and their Climates," which was illustrated by a number of lantern photographs.

Dr. Williams first noticed the geography of the plateaux of these regions, step by step, culminating in the heights of the Rocky Mountains; and described the lofty peaks, the great parks, the rugged and grand cañons, and the rolling prairie; dividing them into four classes of elevations between 5,000 and 14,500 ft. above sea-level. He then dwelt on the meteorology of each of these divisions, giving the rainfall and relative humidity, and accounting for its very small percentage by the moisture being condensed on the mountain ranges of the Sierras lying to the west of the Rockies; also noticing the amount of sunshine and of cloudless weather, the maximum and minimum temperatures, the wind force and the barometric pressure. Dr. Williams quoted some striking examples of electrical phenomena witnessed on Pike's Peak (14,147 ft.) by the observer of the U.S. Weather Bureau, when, during a violent thunderstorm, flashes of lightning and loud reports of thunder, with heavy showers of sleet, surrounded the summit, and brilliant glow-discharges, like jets of rose-white flame, jumped from point to point on the electric wire, while the cups of the anemometer, which were revolving rapidly, appeared as one solid ring of flame, from which issued a loud rushing and hissing sound. The climate of the parks is, however, Dr. Williams considered, of more practical interest; and in these, magnificent basins of park-like country, interspersed with pines, and backed by gigantic mountains, are resorts replete with interest for the artist, the sportsman, the man of science, and the seeker for health. Most of them lie at heights at from 7,000 to 9,000 ft., but snow does not usually remain long on the ground, while Herefordshire cattle in excellent condition are able to fatten on the good herbage, and to lie out all the winter without shed or stable. Dr. Williams predicted for these parks a great future, as high-altitude sanitarium for the American continent, especially as several of them have been brought within easy distance of Denver, the Queen City of the Plains, by various lines of railway. The resorts on the foot-hills and on the prairie-plains, at elevations of 5,000 to 7,000 ft., include, besides Denver, Colorado Springs, Manitou, Boulder, Golden, and other health stations, which can be inhabited all the year round, and where most of the comforts and luxuries of American civilisation are attainable in a climate where not more than half a day a week in winter is clouded over, where the rainfall is only about 14 inches annually, most of which falls during summer thunderstorms, where the sun shines brightly

for 330 days each year, and where the air is so transparent that objects 20 miles off appear close at hand, and high peaks are calculated to be visible at a distance of 120 miles. Dr. Williams summed up thus:—The chief features of the climate of Colorado appear to be—(1) Diminished barometric pressure, owing to altitude, which throughout the greater part of the State is not less than 5,000 ft. ; (2) Great atmospheric dryness, especially in winter and autumn, as shown by the small rainfall and low percentage of humidity ; (3) Clearness of atmosphere and absence of fog or cloud ; (4) Abundant sunshine all the year round, but especially in winter and autumn ; (5) Marked diathermancy of atmosphere, producing an increase in the difference of sun and shade temperatures varying with the elevation in the proportion of 1° for every rise of 235 ft. ; (6) Considerable air movement, even in the middle of summer, which promotes evaporation and tempers the solar heat ; (7) The presence of a large amount of atmospheric electricity. Thus the climate of this State is dry and sunny, with bracing and energizing qualities, permitting outdoor exercise all the year round, the favourable results of which may be seen in the large number of former consumptives whom it has rescued from the life of invalidism and converted into healthy, active workers ; and its stimulating and exhilarating influence may also be traced in the wonderful enterprise and unceasing labour which the Colorado people have shown in developing the riches, agricultural and mineral, of their country.

The annual meeting was preceded by an ordinary meeting, at which the following gentlemen were elected Fellows of the Society :—Dr. M. H. C. Atkinson, Dr. J. Chapman, Dr. W. Ewart, Dr. C. Gibson, Mr. W. Hanmer, Mr. H. H. Harding, Dr. A. Hardwick, Dr. E. Norton, Dr. D. A. Reid, Mr. A. L. B. Tindall, B.A., Mr. C. J. Wood, M.Inst.C.E.

THE RECENT FROST.

(Continued from p. 177 of Vol. XXVII).

In pursuance of the line of thought suggested in our previous note, we have extracted from the Daily Weather Reports the 8 a.m. temperatures, during the fortnight December 25th to January 7th, at 36 stations, and append a summary of the results. The stations are arranged according to their mean temperature at 8 a.m. during that fortnight, and the result is to bring again into marked prominence the mildness of the S. and W. of Ireland and of the Scilly Isles. On five, out of the fourteen days dealt with, Valentia was, at 8 a.m., the warmest place in Western Europe from whence reports were published. We are startled by the discrepancy between Scilly and Jersey, the latter being returned as scarcely warmer than Aberdeen ; but Jersey is a Meteorological Office station, and as that office spends large sums in inspecting its stations, we accept the values ; still, it seems very strange that on the average of a fortnight, Jersey was 11°·8 colder than Scilly. It will be seen that Scilly

was nearly 6° warmer than Nice; no wonder that we hear that a Syndicate has endeavoured to secure all the available land in Scilly for horticultural purposes. But why not do the same in the S.W. of Ireland—Valentia, for instance, which is even warmer?

Although the numbers of frosts run in fair accordance with the mean 8 a.m. temperatures, they do not do so absolutely; and the lowest minima are still more irregular; they are apparently affected by (1) proximity to sea, and (2) by the severe cold on the 6th. By the bye, it will be seen from p. 16 that our interpretation of the Braemar telegram was strictly accurate.

Temperatures from December 25th, 1892, to January 7th, 1893.

COUNTRY.	STATION.	Average Temp. at 8 a.m.	Number of Days below 32° at 8 a.m.	Min. during the period.	
				Temp.	Date.
<i>Portugal</i>	<i>Lisbon</i>	45·3	0	37	Dec. 29th & 30th.
Ireland.....	Valentia	43·3	0	29	Jan. 4th.
England.....	Scilly	43·1	0	30	„ 3rd.
Ireland.....	Roches Point..	42·0	1	26	„ 3rd.
<i>France</i>	<i>Nice</i>	37·3	1	27	„ 3rd.
Ireland.....	Belmullet.....	36·9	2	25	„ 3rd.
Scotland	Shetland	36·2	3	24	„ 5th.
Ireland.....	Mullaghmore.	35·7	4	24	„ 3rd.
„	Malin Head...	35·4	1	30	„ 2nd.
Wales	Pembroke.....	34·9	3	24	„ 2nd.
Scotland	Stornoway.....	34·7	5	22	„ 5th.
<i>France</i>	<i>Perpignan</i> ..	34·7	6	25	„ 6th & 7th.
Ireland.....	Donaghadee...	34·1	4	25	Dec. 26th.
<i>France</i>	<i>Barritz</i>	33·9	8	18	Jan. 4th.
Wales	Holyhead	33·3	6	29	Several days.
Scotland	Wick	32·7	3	12	Jan. 6th.
England	Ramsgate.....	31·9	6	19	„ 4th.
Ireland.....	Parsonstown..	31·6	5	15	„ 3rd & 4th.
England	Jersey	31·3	5	20	„ 2nd & 3rd.
Scotland	Aberdeen	30·3	6	12	„ 6th.
„	Ardrossan	30·1	10	21	„ 6th.
England	Yarmouth	29·7	10	20	„ 3rd & 4th.
Scotland	Leith	29·6	8	13	„ 6th.
England	Shields	28·4	11	18	„ 6th.
Scotland	Nairn	26·7	11	8	„ 6th.
England	London	24·7	14	15	„ 5th.
„	York	23·8	12	8	„ 5th.
„	Cambridge	22·8	13	10	„ 5th.
„	Oxford	22·5	14	14	Dec. 27th & 28th.
„	Loughboro'....	21·3	13	9	„ 27th.
<i>France</i>	<i>Lyons</i>	20·0	14	11	Jan. 2nd & 3rd.
<i>Germany</i>	<i>Berlin</i>	19·3	12	3	„ 7th.
<i>Belgium</i>	<i>Brussels</i>	19·3	14	10	„ 5th.
<i>France</i>	<i>Paris</i>	18·5	14	10	Dec 30th & Jan. 2nd
<i>Sweden</i>	<i>Stockholm</i> ..	17·8	14	1	Dec. 26th.
<i>Germany</i>	<i>Munich</i>	10·4	14	—4	Jan. 2nd.
MEAN...		30·1			

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1892.

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	81·7	3	46·3	19	70·5	52·2	50·4	71	129·0	41·6	1·62	9	6·5
Malta.....	95·4	12	66·3	22	86·4	70·8	66·0	69	146·5	61·7	·41	1	0·9
<i>Cape of Good Hope</i>	70·9	29 ^a	39·6	12	60·7	46·4	...	...	...	...	6·18	16	5·7
<i>Mauritius</i>	76·0	1, 4 ^b	58·8	27	74·6	64·7	59·7	73	121·9	50·1	3·10	19	4·5
Calcutta.....	92·5	8	75·9	25	87·4	78·0	78·8	88	158·3	74·4	10·55	20	8·3
Bombay.....	89·0	6	75·0	29	84·6	78·5	76·8	85	142·2	72·2	23·86	29	9·1
Ceylon, Colombo.....	87·2	20	74·3	22	85·0	77·7	73·5	81	151·5	70·0	1·10	15	6·8
<i>Melbourne</i>	62·5	31	34·3	30	54·8	40·6	42·3	82	112·2	28·2	1·44	14	6·4
<i>Adelaide</i>	63·6	4	36·5	29	58·0	43·3	42·0	76	127·9	28·1	2·61	13	6·1
<i>Tasmania, Hobart</i>.....	...	...	...	...	...	...	...	...	...	...	...	...	...
Wellington.....	60·0	19	32·5	31	51·8	42·9	41·6	79	99·0	25·0	12·17	21	5·8
<i>Auckland</i>	62·0	22	39·0	14	57·3	47·0	47·4	84	114·0	30·0	5·01	17	6·0
Jamaica, Kingston.....	94·8	11	71·0	2 ^c	89·4	73·5	70·6	74	...	...	·20	3	5·2
Trinidad.....	92·0	1	67·0	29	86·3	73·8	72·0	87	152·0	...	15·35	25	...
Toronto.....	93·5	28	44·0	1	78·8	57·6	59·7	73	...	40·5	2·50	14	4·0
New Brunswick, } Fredericton.....	87·7	12	45·5	7	78·2	53·7	57·1	67	...	...	3·91	13	4·0
Manitoba, Winnipeg } British Columbia, } Esquimalt.....	85·8	5	41·9	28	76·5	53·2	...	...	...	...	3·57	16	4·0
	74·2	27	45·7	20	65·2	50·5	51·4	82	...	...	·87	9	5·0

a And 30. b And 28. c And 21, 29.

REMARKS.

MALTA.—Mean temp. 77°·4. Mean hourly velocity of wind 8·9 miles. The sea temp. rose from 77°·0 to 80°·0. Thunderstorm on 21st. J. SCOLES.

Mauritius.—Mean temp. of air 0°·7 above, dew point 0°·4 above, and rainfall ·77 in. above, their respective averages. Mean hourly velocity of wind 12·9 miles, or 1·0 above average; extremes 26·4 on 16th and 20th and 1·9 on 22nd; prevailing direction, E.S.E. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on the 1st, 21st, 22nd, and 23rd, and lightning alone was seen on the 14th and 24th. F. C. H. CLARKE, Lt.-Col. R.E.

Melbourne.—Mean temp of air 0°·2, and rainfall ·31 in., below their respective averages. Mean temp. of dew point 0°·9, humidity 2, and amount of cloud 0·1 above their averages. Squally on 3 days; heavy dew on 11 days; hoar frost on 6 days; fog on 4 days; hail on the 8th. Linnar halos on 5 days. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·1 below the average of 35 years. The nights were colder than usual, the mean min. being 1°·2 below the average. The temp. on grass fell below 32° on 8 nights, the lowest reading being 28° 1 on the 29th. The rainfall was ·02 in. below the average. Moderate to heavy rains fell generally in the southern parts of the colony, but in the far north extremely dry weather continued. C. TODD, F.R.S.

Wellington.—A very wet, unpleasant month; almost constant rain, except for a few days in the middle; heavy rain 11th and 12th. 3·51 in.; snow on the hills round the harbour on 5 days; hail on 3 days; fog on 3 days; lightning on 26th. Rainfall nearly twice the average, and with one exception the greatest in any month during 28 years. Mean temp. 0°·3 below the average. R. B. GORE.

Auckland.—On the whole a wet and stormy month, but with several spells of fine weather. Mean temp. precisely the same as the average. Rainfall half an inch in excess. T. F. CHEESEMAN.

KINGSTON, JAMAICA.—Rainfall only one-tenth of the average. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
JANUARY, 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.			in.
II.	Dorking, Abinger Hall.	2.32	XI.	Builth, Abergwessin Vic.	3.91
„	Birchington, Thor	2.04	„	Rhayader, Nantgwillt..	4.00
„	Brighton, Prestonville Rd	1.87	„	Corwen, Rhug	1.95
„	Hailsham	2.15	„	Carnarvon, Cocksida ...	2.04
„	Ryde, Thornbrough	2.23	„	I. of Man, Douglas	2.44
„	Alton, Ashdell	2.36	XII.	Stoneykirk, Ardwell Ho.	2.09
III.	Oxford, Magdalen Col...	1.81	„	New Galloway, Glenlee	2.63
„	Banbury, Bloxham	2.11	„	Melrose, Abbey Gate ...	1.36
„	Northampton, Sedgebrook	1.59	XIII.	N. Esk Res. [Penicuick]	1.30
„	Alconbury	1.50	„	Edinburgh, Blacket Pl..	.71
„	Wisbech, Bank House..	1.68	XIV.	Glasgow, Queen's Park.	1.14
IV.	Southend	1.69	XV.	Islay, Gruinart School..	4.08
„	Harlow, Sheering	1.62	XVI.	Dollar	2.05
„	Colchester, Lexden.....	1.37	„	Balquhidder, Stronvar..	5.68
„	Rendlesham Hall	2.20	„	Coupar Angus Station ..	1.18
„	Diss	3.11	„	Dunkeld, Inver Braan..	1.91
„	Swaffham	2.15	„	Dalnaspidal H.R.S. ...	4.12
V.	Salisbury, Alderbury ...	1.59	XVII.	Keith H.R.S.	2.28
„	Bishop's Cannings	2.38	„	Forres H.R.S.	1.87
„	Blandford, Whatcombe .	2.72	XVIII.	Fearn, Lower Pitkerrie.	1.71
„	Ashburton, Holne Vic....	5.30	„	Loch Shiel, Glenaladale	11.67
„	Okehampton, Oaklands.	3.83	„	N. Uist. Loch Maddy ...	3.46
„	Hartland Abbey	3.06	„	Invergarry	4.58
„	Lynmouth, Glenthorne.	3.11	„	Aviemore H.R.S.	2.89
„	Probus, Lamellyn	3.10	„	Loch Ness, Drumnadrochit	2.16
„	Wincanton, Stowell Rec.	2.60	XIX.	Invershin	2.04
„	Weston-super-Mare	2.43	„	Scourie	2.54
VI.	Clifton, Pembroke Road	2.22	„	Watten H.R.S.	2.27
„	Ross, The Graig	2.30	XX.	Dunmanway, Coolkelure	6.62
„	Wem, Clive Vicarage ...	1.43	„	Fermoy, Gas Works ...	3.91
„	Cheadle, The Heath Ho.	2.35	„	Killarney, Woodlawn ...	...
„	Worcester, Diglis Lock	1.69	„	Tipperary, Henry Street	2.98
„	Coventry, Coundon	1.83	„	Limerick, Kilcornan ...	2.36
VII.	Ketton Hall [Stamford]	1.45	„	Ennis	2.29
„	Grantham, Stainby	2.01	„	Miltown Malbay	3.39
„	Horncastle, Bucknall ...	1.47	XXI.	Gorey, Courtown House	3.58
„	Worksop, Hodsck Priory	1.37	„	Mullingar, Belvedere ...	2.25
VIII.	Neston, Hinderton	1.04	„	Athlone, Twyford	2.42
„	Knutsford, Heathside ...	1.24	„	Longford, Currygrane ...	2.07
„	Lancaster, Rose Bank...	1.33	XXII.	Galway, Queen's Coll...	2.35
„	Broughton-in-Furness..	2.93	„	Crossmolina, Enniscoe..	3.36
IX.	Ripon, Mickley	1.60	„	Collooney, Markree Obs.	2.77
„	Scarborough, South Ciiff	1.81	„	Ballinamore, Lawderdale	2.60
„	EastLayton [Darlington]	1.81	XXIII.	Lough Sheelin, Arley ..	2.12
„	Middleton, Mickleton..	1.46	„	Warrenpoint	3.63
X.	Haltwhistle, Unthank..	1.31	„	Seaforde	2.94
„	Bamburgh	1.24	„	Belfast, Springfield	2.94
„	Newton Reigny	1.44	„	Bushmills, Dundarave...	2.02
XI.	Llanfrechfa Grange	2.59	„	Stewartstown	2.85
„	Llandovery	2.34	„	Buncrana	2.85
„	Castle Malgwyn	2.57	„	LoughSwilly, Carrablagh	2.82

JANUARY, 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 .01 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
		inches.	inches.	in.								
I.	London (Camden Square) ...	1.44	— .18	.26	9	17	52.7	31	15.4	5	14	24
II.	Maidstone (Hunton Court)...	2.20	+ .65	.50	16	19	...	...	...	...	...	...
III.	Strathfield Turgiss	2.30	+ .49	.39	9	22	52.2	23 ^c	10.0	5	17	27
IV.	Hitchin	1.65	+ .11	.36	26	21	51.0	31	12.0	4	19	...
V.	Winslow (Addington)	2.08	+ .27	.45	26	17	53.0	31	8.0	5	18	25
VI.	Bury St. Edmunds (Westley)	1.85	+ .38	.41	26	20	50.0	31	11.0	3	...	...
VII.	Norwich (Cossey)	2.18	+ .69	.35	26	17	...	...	...	...	...	...
VIII.	Weymouth(LangtonHerring)	2.04	— .30	.42	14	18	51.0	23	18.0	3	14	...
IX.	Torquay, Babbacombe	3.40	+ .58	1.02	28	15	53.1	24	18.6	3	7	24
X.	Bodmin (Fore Street)	3.56	— .45	.75	28	24	...	...	...	...	...	...
XI.	Stroud (Upfield)	2.13	— .07	.38	30	19	54.0	30	16.0	4	22	...
XII.	ChurchStretton(Woolstaston)	2.05	— .11	.69	26	21	50.0	31	17.0	2	18	24
XIII.	Tenbury (Orleton)	2.28	+ .14	.46	28	16	54.0	31	15.8	5	13	20
XIV.	Leicester (Barkby)	1.52	— .24	.44	26	19	53.0	30	7.0	3, 4	22	26
XV.	Boston	1.47	+ .08	.30	5	10	51.0	31	12.0	5	19	...
XVI.	Hesley Hall [Tickhill]	1.54	— .23	.42	31	15	54.0	31	9.0	5	21	...
XVII.	Manchester(PlymouthGrove)	1.57	— .89	.31	6	14	54.0	31	13.0	4	12	16
XVIII.	Wetherby (Ribston Hall) ..	.57	— 1.32	.28	7	4	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	2.50	— 3.14	.42	31	17	50.0	24 ^d	9.0	5	...	...
XX.	Hull (PearsonPark)	1.22	— .55	.18	26	18	54.0	31	10.0	5	16	25
XXI.	Newcastle (Town Moor)	1.79	— .02	.66	31	15	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	6.90	— 5.28	1.21	28	19	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	2.46	— .83	.46	30	16	...	...	...	...	...	...
XXIV.	Haverfordwest	3.89	— .53	.71	26	19	51.3	24 ^d	15.0	2	15	22
XXV.	Aberystwith, Gogerddan	2.75	— .78	.65	26	14	...	...	...	...	...	...
XXVI.	Llandudno.....	1.48	— .80	.27	31	19	...	...	...	...	...	...
XXVII.	Cargen [Dumfries]	1.80	— 1.97	.64	28	13	51.6	23	15.4	5	13	...
XXVIII.	Jedburgh (Sunnyside)	1.74	+ .02	.65	14	11	50.0	23	7.0	6	16	...
XXIX.	Old Cumnock	1.77	— 2.22	.21	22	20	...	...	...	...	...	...
XXX.	Lochgilphead (Kilmory)	3.90	— 2.24	.58	25	20	...	...	13.0	1	19	...
XXXI.	Oban (Craigvarren)	3.49	— .55	.25	18	50.0	30	19.0	2	11	...	...
XXXII.	Mull (Quinish)	3.34	— 2.33	.87	25	21	...	...	...	...	...	...
XXXIII.	Loch Leven Sluices	1.50	— 1.40	.20	8 ^a	11	...	...	...	...	...	...
XXXIV.	Dundee (Eastern Necropolis)	1.25	— .72	.20	6 ^b	19	52.2	23	19.7	6	15	...
XXXV.	Braemar	1.98	— .71	.19	21	23	47.2	24	—4.0	6	17	24
XXXVI.	Aberdeen (Cranford)	2.67	— .34	.16	26	26	52.0	23	10.0	5	13	...
XXXVII.	Strome Ferry	5.98	— .01	.69	25	23	...	...	...	...	...	...
XXXVIII.	Cawdor [Nairn]	1.87	— .30	.23	24	20	...	...	...	...	...	...
XXXIX.	Dunrobin	2.57	+ .11	.36	17	15	54.0	19	17.0	6	13	...
XL.	S. Ronaldsay (Roeberry).....	2.41	— .54	.38	16	26	47.0	17 ^e	25.0	4	14	...
XLI.	Darrynane Abbey	4.56	— .72	.5	22	...	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	4.11	+ .55	.94	7	18	53.0	23	17.0	3	10	...
XLIII.	O'Briensbridge (Ross)	2.16	— .37	.15	21	21	52.0	20 ^f	20.0	3	9	...
XLIV.	Carlow (Browne's Hill)	3.07	+ .17	.81	31	18	...	...	...	...	...	...
XLV.	Dublin (FitzWilliam Square)	2.24	+ .38	.51	31	19	54.9	30	20.2	3	4	16
XLVI.	Ballinasloe	2.27	— .81	.32	15	21	50.0	30	16.0	3, 4	13	...
XLVII.	Clifden (Kylemore)	7.23	— 1.40	.25	24	...	...	...	...	...	...	...
XLVIII.	Waringstown	2.29	— .36	.43	29	16	53.0	23	15.0	3	15	20
XLIX.	Londonderry (Creggan Res.) ..	2.75	— .67	.67	15	25	...	...	...	...	...	...
L.	Omagh (Edenfel)	2.86	— .16	.46	15	23	50.0	23 ^g	15.0	3	10	14

a And 9, 29, 31. b And 8, 16, 28. c And 30. d And 31. e And 18, 19, 22, 23, 24. f And 25. g And 24, 30.

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

METEOROLOGICAL NOTES ON JANUARY, 1893.

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

ENGLAND.

STRATHFIELD TURGISS.—A fair and mild month on the whole, but with two sharp snaps of frost, from 3rd to 5th, and on 16th. Grass min. on the 5th, $8^{\circ}1$. Black Hellebore in flower on the 18th; Winter Aconite on the 22nd.

ADDINGTON.—Intense frost during the first week, particularly on the 4th and 5th. The frost that set in on December the 22nd hardly left us until the 21st of this month, but after the 22nd much milder weather prevailed. The first day of the month had a max. temperature of 30° , the last day a max. of 53° .

BURY ST. EDMUNDS.—R or S fell on 20 days, mostly in small quantities.

LANGTON HERRING.—The severe weather which began on December 24th lasted to January 16th, and for 24 days the ther. did not rise above $40^{\circ}0$. Only on the last day of the month did the min. temperature exceed 41° , and the mean 9 a.m. temperature ($35^{\circ}3$) was $3^{\circ}7$ below the average of 21 years. The last days of the month were wet and damp with fogs on the 25th and 31st. Fine lunar halos were seen on the 26th and 27th.

BABBACOMBE.—A cold, showery, variable, rather dry and fine month, with a great rise of temperature from the min. of $18^{\circ}6$ on 3rd to the max. of $53^{\circ}1$ on 24th. No R was measured in the 14 days ending on the 5th, but 1.02 inches fell on 28th, mostly in heavy showers, with H and L from 0.35 a.m. to 4.45 a.m. on 29th. Cold from 1st to 17th, and very cold and dry on 1st, 2nd, 3rd and 15th. Warm from 18th to 20th, 22nd to 26th, and 28th to 31st, especially on the last two days. The mean temperature rose $23^{\circ}5$ from $25^{\circ}8$ on 2nd, to $49^{\circ}3$ on 31st. The shade max. rose above 50° on eight days (all occurring after the 17th), but did not reach 40° on ten days. Glazed frost on morning of the 16th. Gales on eight days. S on six days, whitening the ground on 14th. Soft H on 9th. H on 14th and 29th. Fog on 8th, 9th and 25th. Solar halos on 19th, 27th and 31st. Lunar halo on 27th.

BODMIN.—A mild month to begin with. Not much R until after the 24th. Gales of wind on the 16th and 17th, and 28th and 29th. Primroses picked on the 25th.

STROUD, UPFIELD.—Snowdrops and crocuses in flower on the last two days of the month. On the 6th about an inch of S fell, and 2 inches on the 13th. S.W. gale at night on 30th. Frost on 18 consecutive days, from 1st to 18th.

WOOLSTASTON.—The frost continued with great severity, and with repeated falls of S, till the 15th, when a very slow thaw set in, the frost frequently returning at night. Mean temperature $34^{\circ}9$.

TENBURY, ORLETON.—The first half of the month was very cold, but from the 17th to the end of the month the weather was much warmer. Mean temperature for the month nearly 2° below the average of 32 years. A great fall of S occurred on the 5th, 6th and 7th, covering the ground, about 12 inches deep on the average. Heavy R on 29th, flooding brooks. S on five days. Fog on three days.

MANCHESTER, PLYMOUTH GROVE.—S on the 6th, 7th, 15th and 17th. Very thick fog on the 4th, with severe frost, and thick fogs on the 16th and 17th. From the 18th to the 25th the weather was mostly mild, damp and foggy, and the last 3 days were as mild as May, and birds singing. Mean temp. $36^{\circ}3$.

WALES.

HAVERFORDWEST.—The frost of the first half of the month was one of the most intense and persistent recorded; the day temp. ranging as low as 26° , and seldom higher than 34° . During the first 12 days S fell heavily; the depth on the level varying in different localities from 7 to 9 inches, but in high places it drifted to the depth of many feet. After the second week, the weather, although cold, became stormy and wet, and the last week was very wet. The

month ended mild. During the first week the wind blew from the N.E., and E., the remainder of the month from N.W., S.W., and S.

GOGERDDAN.—A cold and sunless month throughout. S 2 inches deep on 6th, 3 inches on 7th, and 2 inches on 14th.

SCOTLAND.

CARGEN.—The severe frost experienced during the last 10 days of December, continued for 7 days in this month, and is the severest continued frost recorded here since January 1881, when the mean temp. for 20 days, was $23^{\circ}\cdot5$. The late frost, which continued for 17 days, shews a mean temp. $27^{\circ}\cdot7$. The ground was frozen to a depth of 11 inches, and on some of the lochs ice was as much as 14 to 15 inches thick. The last 16 days of the month were unusually mild, the mean temp. of the period being $43^{\circ}\cdot1$, which is only about 2° below the mean of April. Rainfall very deficient.

JEDBURGH.—The weather was cold and ungenial during the greater part of the month, with continued frosts. Root crops, especially on low lying ground, much injured. S on the 14th $6\frac{1}{2}$ inches deep.

BRAEMAR.—Observations commenced in 1856, and the lowest temperatures observed have been :—

1860	Dec. 25th	.....	Min. in air	$-11^{\circ}\cdot0$	Min. on grass	$-11^{\circ}\cdot0$
1881	Jan. 17th	.....	„ „ „	$-3^{\circ}\cdot8$	„ „ „	$-3^{\circ}\cdot8$
1882	Dec. 15th	.....	„ „ „	$-8^{\circ}\cdot0$	„ „ „	$-11^{\circ}\cdot0$
1893	Jan. 24th	.....	„ „ „	$-4^{\circ}\cdot0$	„ „ „	$-9^{\circ}\cdot0$

IRELAND.

DARRYNANE ABBEY.—A mild month ; only two or three slight night frosts ; a good deal of fog in the middle of the month ; strong winds and heavy seas in the last week. Primrose in flower on the 14th ; daffodil on the 30th.

O'BRIENSBRIDGE, ROSS.—The month began with sharp frost, the mean temp. of the 3rd, being $25^{\circ}\cdot4$; after this the temp. rose and continued high during the remainder of the month. An average number of rainy days, but the quantities small. Some squalls, but no severe storm. All spring bulbs coming into flower.

DUBLIN.—The promise of a cold month offered by very severe weather during the first ten days or a fortnight was not fulfilled. So decided was the recovery of temp. after the 15th, that the mean of the whole month scarcely fell below the average. The mean of the 1st to 14th inclusive, was $36^{\circ}\cdot0$, and that of 15th to 28th, $44^{\circ}\cdot3$. Solar halos were seen on the 15th and 25th ; a lunar halo on the 28th ; foggy on 4 days ; high winds on 18 days, reaching the force of a gale on 4 days, viz. : 7th, 8th, 16th, and 28th. ; H fell on 4 days ; S or sleet on 3 days. Temp. in screen exceeded 50° on 7 days.

EDENFEL.—The hard black frost that commencing on Christmas Day marked the exit of 1892, continued till 5th January, when a heavy fall of snow followed and afterwards light drifting S and high easterly winds till 9th, with gradually increasing temp. The remainder of the month was mild and open with considerable rainfall, but high average barometer.

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MARCH, 1893.

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THE SANDGATE DISASTER, MARCH 3RD, 1893.

THAT the pleasant little Kentish watering place should have suffered so severely as it has must be a source of regret to all, and the catastrophe is the more regrettable because (whatever one may think about the Local Board) one can have nothing but pity for a class who rarely receive much pity—viz., the lodging-house keepers, who, finding their houses twisted out of shape, have suffered almost worse than by a fire, while they are, of course, unprotected by any insurance.

The papers, on March the 5th, announced in bold type, "*Earthquake at Sandgate.*" The earth had indeed "quaked," and wrought havoc analogous to that of the real "earthquake" at Colchester in 1884, but the cause of that was deep in the earth; that of the present trouble is superficial, and as far as we can at present judge, is wholly meteorological.

Sandgate is built on a very narrow strip of land, slightly above the level of the sea at high tide, west of Folkestone, and between it and Hythe, while immediately to the north there is a high range of chalk hills on which is Shorncliffe Camp, Sandgate itself being south of the outcrop of the chalk. Without entering into geological questions, all our readers will understand that the green sands resting on the gault, when in a saturated condition, are incapable of resisting a downthrust. Therefore when (as we shall show) a long wet period followed a fortnight's sharp frost, and the high land became waterlogged, a slip forward of the low ground was a probable event, and the wreck of the houses upon it, inevitable.

Moreover, while the Sandgate disaster is by far the most serious one, small slips have occurred in many other parts of the country.

This, by-the-by, is one strong argument against the theory which has been put forward to the effect that the disaster at Sandgate is traceable to the vibration produced by blowing up the hull of the "Benvenue," which was wrecked on that coast in 1892.

We may as well dispose of this part of the subject at once:—

MARGATE.—Extensive falls of cliff continue to take place along the Thanet coast. At Margate, especially on the east side of the town, the falls recently

have been very heavy. The town council have purchased the foreshore beyond the borough boundary, and a scheme has been mooted for building a sea wall, the probable cost being put down at £10,000.

BROADSTAIRS.—At Broadstairs large falls have taken place close to the new Victoria Gardens.

RAMSGATE.—At other parts along the coast considerable inroads have been made, especially in the neighbourhood of Ramsgate.

FOLKESTONE.—In consequence of the heavy rains, there was a serious landslip near the Warren Inn, Folkestone, on Wednesday night (22nd February). A large quantity of soil fell on the railway, and traffic was delayed while the line was being cleared.

We have heard of slips in other places, near Reigate, also upon the Brighton line, and we were ourselves in a Great Western train delayed by part of that very well made line having slipped.

The following extract from the *Kentish Gazette*, published five days before the Sandgate disaster, gives a vivid idea of the condition of that ordinarily dry corner of England more than a week before the catastrophe occurred :—

EXTRAORDINARY RAINFALL AND FLOODS.

“Weather of a most extraordinary character has prevailed during the past week. Sunday (February 19th) was the warmest day for the time of year we have had for twenty years, but by Monday (20th) the thermometer had fallen considerably, and rain commenced to fall at about eleven o'clock in the evening, and continued without intermission throughout the whole of Tuesday (21st) and Wednesday (22nd). Almost two inches of rain fell during the 33 hours following its commencement. Snow and sleet were intermixed at times with the rain. On Thursday (23rd) rain and sleet fell heavily at intervals. The river is much swollen, and at places has overflowed its banks. As a consequence much damage has been done, houses and other property being completely flooded. At St. Stephen's the whole of the fields adjoining the river are under water, which in some places is from one to two feet deep. The storm-water drain-pipe running under the road, outside the late Colonel Horsley's house in St. Stephen's, and which near this point is reduced in size, was unable to bear the pressure put upon it and burst, flooding St. Stephen's-road and the gardens near. Twelve yards above this another drain proved unequal to its task, bursting and making it necessary to form a temporary bridge of planks for the passage of pedestrians. This has made the road so unsafe that it has been necessary to have a watchman stationed there.”

“A considerable amount of damage has also been caused in and around the villages in the neighbourhood of Canterbury. Not only are the public footways in the immediate neighbourhood of the river submerged, but several of the lawns and gardens of riverside residences are also under water. Since Tuesday morning (21st) the river Stour has been greatly swollen, and the current exceptionally

swift. The fields adjoining Mr. S. Williamson's property, near Westgate, present an appearance that has not been witnessed for the past ten years; they are one great sheet of water. For a considerable distance along the Whitehall-road the path is immersed to a depth of from six to seven inches, and a bridge that communicated between Mr. Williamson's residence and his garden, and runs over the river, has been entirely swept away, not even a beam of it remaining. At the bottom of Black Griffin-lane, where there are several plots of land under cultivation, the flooding is serious, and St. Peter's-lane presented a sorry spectacle; three or four houses are inundated to the depth of several inches, and the householders have, in consequence, been compelled to live upstairs. The same state of things exists at Camden Terrace, St. Peter's-place, the living rooms of three houses being flooded."

"We shall have 'Venice in Canterbury' if the rain continues. In St. Peter's-lane, on Thursday (23rd), all that was wanted was the city barge and the bridge that was washed away at Westgate, and the illusion would have been perfect."

"The railway between Ashford and Folkestone has been flooded during the week, but not sufficiently to impede the traffic."

"At South Ashford, on Tuesday (21st), the road was flooded to such a depth that ladies had to be conveyed across the "ford" on trolleys, and the South-Eastern Railway workmen had considerable difficulty in getting to the factory. Many who would not care to wade to work, 'lost a quarter' instead. In the lower parts of the town, basements generally were flooded, and a humane resident in Bridge-street found it necessary to carry his pig upstairs, where it was temporarily quartered in the back bedroom."

As regards the actual damage at Sandgate, and its cause, the following paragraphs will be of interest:—

"Mr. Bromley, surveyor, reported that he had examined 73 houses, 44 of which were quite safe, five of which could be restored, and 24 of which were unsafe for habitation. The result of the proceedings was considered by the Board as most satisfactory and reassuring, and calculated to restore public confidence."

"Practical men all agree more or less in their opinions on this point—the subsoil being of green sand is of such a treacherous nature that, lying as it does upon the gault, a slippery, impermeable clay, the subsidence may continue very much further before it finds a settlement. Some of the gaps in the walls and the earth have widened to-day, and in some cases buildings have sunk further to the extent of several inches. In the area affected by the subsidence there are very few, if any, houses which are not out of line or do not show cracking. Up to the present time the subsidence has not extended any further into the town. It is estimated that one-half the rateable value of the town has been practically destroyed, the total rateable value being about £10,000."

"The idea is that a large quantity of water had accumulated on the soft, springy sides of the hill above the town, and caused the upper strata of sand to slide seaward. The ground has long been held to be dangerous, and it is

thought probable that the recent blowing up of the Benvenue hurried the catastrophe."

"The subsoil of the cliff being soft green sand, resting upon slippery gault clay, and probably charged with water from the late heavy rains, it is thought that the upper stratum came down by its own weight, after the low spring tides, which had lessened the pressure from the sea at the base of the cliff."

"A very remarkable phenomenon has occurred along the foreshore not far from low-water mark, where there has been a distinct upheaval of sea-bed. During the space of a tide a ridge about four or five feet in height was formed."

The local authorities seem to have been very anxious to prove that the disaster was due to the blowing up of the Benvenue. They applied to the Local Government Board to send down an Inspector to examine and report, but he attributed it to excess of water in the soil, and said nothing about the Benvenue. Then they applied to Mr. Baldwin Latham, C.E., and the following is an abstract of his report :—

"The slip extended 1,100 yards, and the chief cause had been, probably, the scouring action of the sea on the beach. He did not think it would be a very serious matter to prevent a further extension of the slip. The remedy was to tap the hill by the insertion of drains at a sufficient depth in the ground where the subsidence had taken place, the drains coming out at what appeared to be the natural outlet for the springs. In proof of this theory he instanced the case of the Military Hospital, where the slip had abruptly stopped, the reason being that sufficient drains were laid from the hospital to the sea which carried off the water. At a cost of about £1,000 the Board could meet the present requirements, and prevent a further extension of the damage."

In conclusion, we give a few details as to the rainfall, and in the first place quote the following letter, which shows that heavy as was the fall on the 21st and 22nd at some of the stations quoted in the table, it was even heavier at Canterbury :—

To the Editor of the Meteorological Magazine.

SIR,—Since Monday last the rainfall here has been very large. The rain began to fall on Monday, the 20th, at about 10 p.m., and continued almost without intermission till Thursday morning, and the amount collected in the rain-gauge during that time measured 2·22 in. The prevailing wind was W. and S.W.

The Stour is very much flooded, but is now going down.

Yours truly,

L. E. METCALFE.

Harbledown, Canterbury, Feb. 24th, 1893.

Rainfall in East Kent, February, 1893.

February, 1893.	Hythe.	Walmer.	Hunton Court	Seven Oaks.	Birchington.	Sheppey.	February 1893.
	in.	in.	in.	in.	in.	in.	
1	·08	·04	·06	·13	·05	·06	1
2	·14	·06	·10	·13	·15	·14	2
3	·01	..	·02	·01	·02	·02	3
4	...	...	...	...	...	...	4
5	...	...	...	...	...	...	5
6	·04	·02	·02	...	·03	...	6
7	·10	·10	·10	...	·02	·04	7
8	...	...	·19	..	...	...	8
9	·18	·16	·19	·33	·10	·06	9
10	·06	·06	·06	·06	·04	·04	10
11	·12	·08	·14	...	·13	·04	11
12	·06	...	·04	...	·01	·02	12
13	·07	·12	·06	·11	·03	·07	13
14	·07	·06	·06	·07	·01	·02	14
15	·01	...	·03	·03	...	...	15
16	·13	·07	·05	·08	·04	...	16
17	·04	·03	·02	·05	·02	·01	17
18	·30	·18	·20	·29	·16	·12	18
19	·02	...	...	...	...	...	19
20	·50	·49	·45	·47	·39	·15	20
21	1·06	1·02	·67	·58	1·35	1·25	21
22	·56	·41	·39	·35	·32	·41	22
23	·03	·08	·02	·01	·07	·11	23
24	...	...	...	...	...	...	24
25	·05	·02	·08	·15	·10	·04	25
26	·18	·21	·30	·21	·12	·08	26
27	·45	·48	·02	·34	·64	·38	27
28	·04	...	·38	·06	·02	...	28
Total..	4·30	3·69	3·65	3·46	3·82	3·06	

It will be seen that at Hythe, which is within a mile or two of Sandgate, rain fell on 18 out of the last 19 days of February, the total for the month being about double the average. If that was not calculated to produce a saturated soil, we do not know what would be.

THE JANUARY FROST.

WE thought that the note in our last number would be all that was necessary to print upon the above subject, but our table dealt only with the frost up to January 7th, and it subsequently became much more intense upon the Continent. Two very interesting articles upon the subject have appeared, one by Prof. Van Behber in *Das Wetter*, the other by Padre Denza in the *Bolletino Mensuale* for February, 1893.

Referring those who desire to study the subject to those articles, and expressing our indebtedness to them for nearly all the facts which we present in an entirely different arrangement, we proceed to give—first, a table of the lowest temperatures recorded at many European stations (and two in Siberia), and secondly, a word or two by way of comment.

Absolute Minima in Shade, January, 1893.

Country.	Station.	Temp.	Date.	Country.	Station.	Temp.	Date.
Italy	Rome.....	22·1	14	Austria.....	Vienna.....	— 7·6	17
Spain	Madrid	21·2	4	Germany.....	Neufahrwasser.	— 7·6	14
Algeria ...	Laghouat.....	21·2	21	Bohemia.....	Prague.....	— 9·4	17
Austria ...	Trieste.....	17·6	13-14	Germany.....	Berlin.....	— 9·4	19
France ..	Nice.....	17·6	3	France.....	Belfort.....	—13·0	18
„ ..	Marseilles.....	15·8	17	Eur. Russia.	Wilna.....	—16·6	17
Italy	Pesaro.....	15·3	14	Germany.....	Memel.....	—16·6	16
France ..	Cette.....	14·0	17	Roumania....	Bucharest.....	—18·4	15
Italy	Turin.....	5·0	19	Germany.....	Swinemunde ...	—22·0	18
Belgium..	Brussels.....	3·2	16	Bulgaria.....	Sofia.....	—23·8	17
France ...	Gap.....	1·4	18	Sweden	Haparanda ...	—31·0	15
„ ..	Paris.....	1·4	16	Eur. Russia..	Moscow.....	—32·8	1
Germany.	Hamburgh.....	—0·4	18	„ „ ..	Kasan.....	—32·8	3
France....	Clermont.....	—4·0	18	„ „ ..	Archangel.....	—38·2	2
Denmark.	Copenhagen ..	—4·0	18	„ „ ..	Ekaterinenberg	—38·2	4
Germany.	Breslau	—7·6	15	Asiatic „ ..	Barnaul.....	—49·0	11
				„ „ ..	Tomsk.....	—50·8	11

Having plotted upon a map of Europe these values—those given in previous numbers of this Magazine, and others, such as the Roumanian ones, published by M. Hepites—we draw from them the following conclusions. We do not suggest that they are novel, but the facts are certainly not sufficiently well known.

Take first Roumania, lying north of Turkey, and nearly in the same latitude as Bordeaux. At the capital, Bucharest, the temperature, on January 15th, fell to $-18^{\circ}4$, or more than 50° below freezing. This, be it remembered, not on any lofty mountain, but at less than 400 feet above the level of the sea, and about 500 miles nearer the equator than London.

Again, take the mild places, with absolute minima of above 15° , and where do we find them:—Sicily, Corsica, Southern Italy, Lisbon, Trieste, on the Adriatic; Nice, on the Riviera; Laghouat, in

Algeria ; Madrid, Marseilles, London, Shields, Yarmouth, Ardrossan, Jersey, Ramsgate, Holyhead, Biarritz, Perpignan, and in almost all parts of Ireland.

Or, on the contrary, take minima, such as we rarely have in England—minima below zero of Fahrenheit's scale. Where do we find them? Our table shows it with sufficient clearness. In Eastern France, Germany, Austria, Hungary; and ever increasing in severity as we pass Eastwards: Moscow and Kasan with $-32^{\circ}8$, Archangel and Ekaterinenberg with $-38^{\circ}2$, and if, crossing into Asiatic Russia our table stops with Barnaul $-49^{\circ}0$, and Tomsk $-50^{\circ}8$, it is not either because thermometers could go no lower, or because it could not be colder, but because the records from Yakutsk have not been received. Severe almost beyond the comprehension of many persons as is a temperature of $-50^{\circ}8$, *i.e.*, $82^{\circ}8$ degrees below freezing point, there is little doubt that at Yakutsk it was colder still.

REVIEWS.

Meteorological and other Observations made in connection with the Total Solar Eclipse of January 1st, 1889, at Willows, California, by WINSLOW UPTON and A. LAWRENCE ROTCH. [Extract from *Annals Astron. Obs., Harvard*, vol. xxix.] 4to. 34 pages, 2 plates. J. Wilson and Son, Cambridge, Mass. 1892.

WE have read this through with great care. Each of the observers was in every respect perfectly, indeed exceptionally, gifted for the work. They had good instruments, a good site for placing them in, and the atmospheric conditions were on the whole favourable, and (almost needless to add) the printing and editing is of the excellence usual with all Harvard publications; and yet the impression left upon our mind is that but for the third word in the title [other] the time, fatigue, and cost of a journey of several thousand miles right across the United States were of far greater value than the results secured.

That the obscuration of the sun must produce effects analagous to those of sunset upon temperature and humidity seems so obvious that it might have been known from the earliest times, and as a fact, thermometric observations of the cooling of the air due to partial and to total solar eclipses have been made for more than a century and a quarter; and the fact of the lowest point of temperature being reached some minutes after the greatest phase, has been known upwards of seventy years, for Luke Howard, in his account of the eclipse of September 7th, 1820,* says, "The lowest temperature was observed about seven minutes *after* the greatest obscuration."

As regards increasing humidity, we have a record of the actual deposit of dew as early as 1706,† by Dr. J. J. Scheuchzer, of

* *Climate of London*, 2nd ed., vol. iii., p. 32.

† Mr. Ranyard, in "Observations made during Total Solar Eclipses" [*Memoirs R. Ast. Soc.*, 1879], p. 217, quotes J. Joaquim de Ferrer, of 1806, as the first to notice it

Zurich, who sent an account of the eclipse of May 12th, 1706, to the Royal Society, and concluded, "A sensible cold was felt, and a dew fell on the ground."

We have an impression that we have lately seen a circular proposing that in future eclipse expeditions special attention be devoted to observations of atmospheric pressure. Thirty-five years ago, at the foot of a table giving about three hundred barometer readings during the eclipse of March 15th, 1858,* Mr. Glaisher, F.R.S., put the following note, "No special remark is needed upon this table, there being no special change of readings which can be attributed to the eclipse," and a similar result has been arrived at over and over again—even the wonderful curve at Caroline Island in 1883 turning out to represent not a change in pressure, but the application of a correction with a wrong sign!

Every one of these facts is proved over again in the memoir before us, the whole being, as we have already said, as well done as possible. Grant all that, and one cannot help comparing the cost and the benefit, and wondering whether if the time and the money had been applied to tabulating and discussing some of the thousands of records now in existence it would not have produced a more useful contribution to meteorology.

We reserved from criticism the portion of the memoir devoted to "other" observations, because that word "other" covers the puzzling phenomenon of the so-called Shadow Bands, of which we believe that no satisfactory explanation has yet been given, and unfortunately this memoir does not help us. We think, however, that their study belongs rather to the astronomer and to the physicist than to the meteorologist, whose observational work in connection with solar eclipses is, we think, completed.

Das älteste Berliner Wetter-Buch, 1700-1701, von Gottfried Kirch und seiner Frau Maria Margaretha geb. Winkelmann. Herausgegeben von G. Hellmann. Berlin, 1893. 4to.

Dr. HELLMANN has certainly done well to print this first meteorological journal kept in Berlin, but we are much surprised that it should be the first. Putting aside Merle's MS. (which is very similar though more than 350 years older), we have in England regular weather journals with instrumental measurements of the depth of the fall of rain 23 years before this record begins, and only three years later we have a table of barometric heights and wind directions whence the general form of a cyclonic storm can be traced. We thought that England was late in such matters, but these facts do not support that idea. True, this is described as the oldest *Berlin Weather Journal*, which by no means excludes the possibility of there being many older ones in other parts of Germany—in fact, Dr. Hellmann, in his *Repertorium*, p. 963, quotes 1576 as the date of

* Report of the British Meteorological Society for 1858.

the "First weather observations at Dresden." Perhaps some day he will print a few pages of it.

It is curious that the MS. whence this pamphlet has been reprinted is not in Germany but in the Crawford Library at Edinburgh Observatory. Dr. Hellmann had been hunting for the MS. in various German libraries without success, and then on reading through the Crawford catalogue, found that the journals had been purchased by Lord Lindsay (now Lord Crawford), and formed part of his magnificent present to the Royal Observatory of Edinburgh. The entire MS. journals kept by Kirch and his wife form upwards of 1,000 quarto pages of old German writing; to decipher and copy them would take much time, and naturally Dr. Copeland is unable to send the MS. abroad. However, a German resident in Edinburgh kindly undertook to copy the commencement, *i.e.*, from August to December, 1700, and the whole of 1701. Dr. Hellmann's preface is very interesting, for he has been successful in tracing the early history of Miss Winkelmann, and of her observations before her marriage; her study of astronomy with the peasant-astronomer, Christoph Arnold; her meeting there with her future husband, Gottfried Kirch (who had been working with Hevelius); their marriage, and removal from Guben to Berlin; the husband's death and the wife's subsequent efforts to maintain herself and family. All this may have little to do with meteorology, but it is most gracefully told, and gives a great insight into the conditions of scientific work in the olden time.

In the part of the journal dealing with the frost of December, 1701, Kirch quotes some temperatures, and Dr. Hellmann tries (we think, with success) to form some notion as to the scale, but he expresses no opinion as to where the thermometer came from. It does not agree precisely with any of the fifteen scales given in Martine's "*Essays on the Construction and Graduation of Thermometers,*" but so much resembles II. and III., that we think that it was probably from Florence. With the thermometers which he used in later years we are not now concerned.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday, February 15th, at the Institution of Civil Engineers, 25, Great George-street, Westminster, Dr. C. Theodore Williams, President, in the chair.

Dr. J. H. Davies, Mr. G. F. Deacon, M.Inst.C.E., Mr. A. S. Helps, and Mr. R. H. Jeffery, B.A., were elected Fellows of the Society.

The President referred to the loss which the Society had sustained by the death of Mr. H. F. Blanford and of Mr. G. M. Whipple, both of whom were at one time Members of Council, but who had each retired on account of failing health.

The following papers were read :—

1. "Report on the Phenological Observations for 1892," by Mr. E. Mawley, F.R.Met.Soc. The Royal Meteorological Society has, for a

number of years past, collected observations on natural periodical phenomena, such as the date of the flowering of plants ; the arrival, song, and nesting of birds ; the first appearance of insects, &c. These observations were supervised and discussed by the Rev. T. A. Preston until 1888, since which time they have been under the direction of Mr. E. Mawley. The year 1892 was on the whole very cold and backward. The frequent frosts and dry weather during the first five months greatly retarded vegetation, and consequently all the early wild flowers, were very late in coming into blossom. Bush fruits and strawberries were, as a rule, good and fairly plentiful. Plums and pears were almost everywhere a failure, and apples were considerably under the average. The wheat crop was a very light one, owing in part to the attacks of blight brought on in many places by the frost in June. Oats, beans and peas were much under the average, while barley was the chief crop of the year. Potatoes, turnips and mangolds were above the average. During August butterflies were very numerous, the clouded yellow butterfly exceptionally so.

2. "Relation between the duration of Sunshine, the amount of Cloud, and the height of the Barometer," by Mr. W. Ellis, F.R.A.S. This is a discussion of the observations made at the Royal Observatory, Greenwich, during the fifteen years 1877-91, from which the author arrives at the following conclusions :—From February to October, there is on the whole distinct probability of increased sunshine and correspondingly less cloud, with increase of barometer reading, the increase of sunshine with increased barometer reading being especially marked in the months from April to September. The winter in all conditions of the barometer is uniformly dull. The conclusion is, of course, a general one. It might be interesting to group results of this kind with respect also to different winds, but a period of fifteen years is one probably altogether too short on which to found so extended an inquiry. But it is evident, on the whole, that high barometer in summer presages increased sunshine, that the effect is less pronounced in early spring and late autumn, and that it becomes slightly reversed in winter.

3. "Winter Temperatures on Mountain Summits," by Mr. W. Piffé Brown. In this paper the author gives the lowest winter temperature recorded on the summit of Y Glyder fach, 4 miles E.N.E. from Snowdon, and 3,262 feet above sea level, during the last 25 years. The thermometer used is an ordinary minimum ; it is screened against radiation above by a large thick slab of feldspar porphyry, and on the east, west, and south by a chaos of huge blocks of the same, standing, leaning, and prostrate, many of them over 100 tons in weight ; while to the north a steep slope of similar blocks falls away. The minima recorded range from 9° in the winter of 1891-2 to 26° in the winters of 1876-7 and 1884-5, the mean of the 23 records, being $16^{\circ}.3$. The President, Dr. Marcet, Mr. Scott, and Mr. Symons took part in the discussion, the main point raised being how far the results were liable to be vitiated by the possible "snowing up" of the thermometer.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1892.

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	82·1	17	43·1	11	72·6	53·7	52·9	74	126·7	37·3	3·06	17	5·7
Malta.....	99·2	1	67·3	10	87·4	71·2	67·0	68	153·7	61·4	...	...	0·9
<i>Cape of Good Hope</i> ...	78·7	14	38·6	11	61·5	46·9	...	...	...	...	4·61	12	6·0
<i>Mauritius</i>	77·5	9	59·8	21	75·1	65·3	61·6	76	127·4	50·2	3·80	16	5·6
Calcutta.....	91·0	14	74·7	23	86·8	77·3	78·3	88	156·5	74·2	8·86	15	7·3
Bombay.....	85·7	25	73·6	31	82·3	76·2	75·5	88	142·6	71·1	36·56	29	9·2
Ceylon, Colombo	86·4	10	72·3	13	84·3	76·5	71·2	78	150·0	70·0	1·86	15	6·4
<i>Melbourne</i>	66·8	20	31·0	5	57·9	43·4	44·1	79	121·3	25·5	2·05	16	6·6
<i>Adelaide</i>	67·5	16	37·6	10	61·0	47·2	45·8	76	140·0	30·1	2·63	20	6·5
<i>Tasmania, Hobart</i>.....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Wellington</i>	61·0	30	36·8	13	55·4	45·7	43·1	78	112·0	27·0	5·85	16	4·7
<i>Auckland</i>	65·0	30	39·0	2	60·2	48·9	48·8	80	118·0	30·0	4·34	20	6·2
Jamaica, Kingston.....	90·5	2, 23	70·1	11	88·6	72·9	72·0	80	...	...	1·09	8	4·4
Trinidad	91·0	19 ^a	67·0	4	80·9	70·4	72·5	83	154·0	...	9·21	25	...
Toronto	91·5	9	50·1	29	76·5	58·6	60·8	78	...	44·8	3·99	16	5·3
New Brunswick, Fredericton }	85·2	17	42·0	23 ^b	72·9	54·5	58·0	78	...	...	6·99	16	6·3
Manitoba, Winnipeg }	90·0	15	40·9	29 ^c	76·1	52·1	...	...	...	...	3·73	13	4·9
British Columbia, Esquimalt }	75·7	29	47·2	27	69·2	51·1	53·8	84	...	...	·72	7	3·6

a And 23, 24. b And 27. c And 30.

REMARKS.

MALTA.—Mean temp. 78°·4. Mean hourly velocity of wind 6·5 miles. The sea temp. rose to 82°·0. Lightning on 22nd and 27th. J. SCOLES.

Mauritius.—Mean temp. of air 1°·0 above, dew point 2°·4 above, and rainfall 1·63 in. above, their respective averages. Mean hourly velocity of wind 11·6 miles, or 0·6 below average; extremes, 26°·9 on 31st and 1°·8 on 29th. Prevailing wind E.S.E. to E. C. MELDRUM, F.R.S.

Melbourne.—Mean temp of air 0°·1, of dew point 2°·0, humidity 5, amount of cloud 0·4, and rainfall ·22 in., above their respective averages. Squally on 3 days; heavy dew on 10 days; hoar frost on 4 days; fog on 3 days; hail on the 1st. Lunar halos on 3rd and 6th; lightning on the 25th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 54°·1—just the average (54°·0). The dry weather over the northern areas broke up during the latter part of the month, and nice rains fell. The southern districts were, as has been the case all through the winter, favoured by good rains. C. TODD, F.R.S.

Wellington.—Up to the 6th, fine weather, with fresh N.W. wind; showery on 6th and 7th, then fine weather from 8th to 13th, with moderate wind; the remainder of the month generally showery. Prevailing wind N.W. Mean temp. 2°·5, and rainfall ·65 in. above the average. R. B. GORE.

Auckland.—A warm and moist month, with no heavy gales or other exceptional features. Mean temp. slightly above the average; rainfall also slightly in excess. T. F. CHEESEMAN.

KINGSTON, JAMAICA.—Rainfall one-fourth of, and temp. also below, the average.

R. JOHNSTON.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 1892

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	73°	19	36°	18	65°	49°	48°	74	118°	28°	2.12	13	5.1
Malta	95°	4	62°	11	81°	67°	64°	75	144°	58°	3.28	7	2.5
<i>Cape of Good Hope</i>	75°	4	38°	13	61°	47°	...	...	...	...	2.51	12	6.2
<i>Mauritius</i>	77°	17	61°	3	75°	64°	59°	72	127°	51°	1.41	21	5.7
Calcutta	92°	20	75°	30	87°	78°	78°	88	157°	74°	7.60	17	6.6
Bombay	85°	28	73°	1	82°	75°	74°	87	139°	70°	18.73	23	7.6
Ceylon, Colombo	87°	...	74°	11	85°	77°	71°	77	159°	67°	1.12	8	4.8
<i>Melbourne</i>	71°	13	34°	13	60°	45°	46°	79	121°	28°	2.30	11	...
<i>Adelaide</i>	74°	4	42°	12	65°	48°	46°	72	138°	32°	2.36	12	5.8
<i>Tasmania, Hobart</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Wellington</i>	62°	18	38°	13	57°	45°	42°	74	115°	33°	5.01	18	4.6
<i>Auckland</i>	64°	24	40°	12	61°	49°	48°	77	127°	34°	3.58	20	6°
Jamaica, Kingston	91°	19	69°	23	88°	72°	71°	77	...	...	3.15	10	...
Trinidad	93°	27	67°	15 ^a	88°	70°	72°	85	154°	63°	3.57	17	...
Toronto	79°	4	41°	20	69°	51°	52°	78	...	36°	3.12	10	4.2
New Brunswick, Fredericton	76°	4	34°	30	67°	44°	55°	76	...	...	3.05	10	4.0
Manitoba, Winnipeg	81°	17	31°	15	68°	42°	...	...	...	...	.86	8	5.6
British Columbia, Esquimalt	70°	3	40°	29	63°	48°	51°	90	...	...	4.09	11	6.0

^a And 21.

REMARKS.

MALTA.—Mean temp. 73°·1. Mean hourly velocity of wind 7·7 miles. The sea temp. fell from 82°·0 to 76°·8 Thunderstorms on 6 days, and lightning on 5 other days. J. SCOLES.

Mauritius.—Mean temp. of air 0°·6 below, dew point 0°·7 below, and rainfall ·06 in. below, their respective averages. Mean hourly velocity of wind 13·9 miles, or 1·8 above average; extremes, 27·8 on 10th, and 1·8 on 22nd; prevailing direction E. S. E. C. MELDRUM, F. R. S.

Melbourne.—Lightning on evening of 2nd.

R. L. J. ELLERY, F. R. S.

Adelaide.—Pressure very unsteady, with great range, the min. (29·231 in.) being the lowest ever recorded here. The mean temp. was slightly (0°·3) below the average, and rainfall was ·06 in. above the average. Good rains fell generally over the Colony, especially over the northern districts, where a severe drought had prevailed since the beginning of the year. C. TODD, F. R. S.

Wellington.—The early part of the month was generally fine, with light wind; from 8th to 11th showery, with strong winds; from 12th to 18th fine, with light wind or calm; from 19th to the end of the month showery, unpleasant weather. Mean temp. 0°·4, and rainfall ·75 in., above the average. Earthquakes on 25th—a few slight shocks after 1 a. m., N. E. to S. W. R. B. GORE.

Auckland.—A showery and unsettled month. Rainfall half-an-inch, and mean temp. 0°·5, above the average. T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL,
FEBRUARY, 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.			in.
II.	Dorking, Abinger Hall.	4·22	XI.	Builth, Abergwessin Vic.	9·89
„	Birchington, Thor	3·82	„	Rhayader, Nantgwillt..	8·70
„	Brighton, Prestonville Rd	3·36	„	Corwen, Rhug	5·12
„	Hailsham	3·81	„	Carnarvon, Cocksidia ...	4·45
„	Ryde, Thornbrough	3·71	„	I. of Man, Douglas	5·57
„	Alton, Ashdell	4·94	XII.	Stoneykirk, Ardwell Ho.	3·52
III.	Oxford, Magdalen Col...	2·54	„	New Galloway, Glenlee	6·71
„	Banbury, Bloxham	2·66	„	Melrose, Abbey Gate ...	3·47
„	Northampton, Sedgebrook	2·51	XIII.	N. Esk Res. [Penicuik]	5·20
„	Alconbury	1·77	„	Edinburgh, Blacket Pl..	2·63
„	Wisbech, Bank House..	2·31	XIV.	Glasgow, Queen's Park.	2·94
IV.	Southend	2·85	XV.	Islay, Gruinart School..	8·17
„	Harlow, Sheering	2·80	XVI.	Dollar.....	4·63
„	Colchester, Lexden	3·01	„	Balquhiddier, Stronvar..	8·92
„	Rendlesham Hall	2·51	„	Coupar Angus Station..	3·05
„	Diss	2·71	„	Dunkeld, Inver Braan..	5·09
„	Swaffham	2·52	„	Dalnaspidal H.R.S. ...	7·59
V.	Salisbury, Alderbury...	3·66	XVII.	Keith H.R.S.	1·68
„	Bishop's Cannings	4·30	„	Forres H.R.S.	2·30
„	Blandford, Whatcombe.	5·64	XVIII.	Fearn, Lower Pitkerrie.	2·03
„	Ashburton, Holne Vic....	11·29	„	Loch Shiel, Glenaladale	10·74
„	Okehampton, Oaklands.	7·24	„	N. Uist, Loch Maddy ...	5·36
„	Hartland Abbey	4·58	„	Invergarry	8·67
„	Lynmouth, Glenthorne.	6·23	„	Aviemore H.R.S.	3·87
„	Probus, Lamellyn	5·12	„	Loch Ness, Drumnadrochit	4·87
„	Wincanton, Stowell Rec.	3·90	XIX.	Invershin	3·19
„	Weston-super-Mare	3·59	„	Scourie	2·62
VI.	Clifton, Pembroke Road	4·58	„	Watten H.R.S.	2·02
„	Ross, The Graig	2·74	XX.	Dunmanway, Coolkelure	9·23
„	Wem, Clive Vicarage ...	2·61	„	Fermoy, Gas Works ...	3·80
„	Cheadle, The Heath Ho.	3·21	„	Killarney, Woodlawn ...	7·15
„	Worcester, Diglis Lock	2·02	„	Tipperary, Henry Street	3·83
„	Coventry, Coundon	3·59	„	Limerick, Kilcornan ...	3·07
VII.	Ketton Hall [Stamford]	2·10	„	Ennis	5·06
„	Grantham, Stainby	2·11	„	Milton Malbay.....	5·17
„	Horncastle, Bucknall ...	2·72	XXI.	Gorey, Courtown House	3·16
„	Worksop, Hodsck Priory	2·66	„	Mullingar, Belvedere...	3·34
VIII.	Neston, Hinderton	2·88	„	Athlone, Twyford	2·75
„	Knutsford, Heathside...	2·90	„	Longford, Currygrane...	3·27
„	Lancaster, Rose Bank...	5·33	XXII.	Galway, Queen's Coll...	4·87
„	Broughton-in-Furness..	10·12	„	Crossmolina, Enniscoe..	7·47
IX.	Ripon, Mickley	3·97	„	Collooney, Markree Obs.	4·08
„	Scarborough, South Cliff	3·19	„	Ballinamore, Lawderdale	...
„	East Layton [Darlington]	3·10	XXIII.	Lough Sheelin, Arley ..	2·98
„	Middleton, Mickleton..	3·67	„	Warrenpoint	4·24
X.	Haltwhistle, Unthank..	4·00	„	Seaforde	3·54
„	Bamburgh	2·54	„	Belfast, Springfield	4·36
„	Newton Reigny	4·55	„	Bushmills, Dundarave...	3·19
XI.	Llanfrechfa Grange .....	..	„	Stewartstown	4·19
„	Llandovery	6·13	„	Buncrana	3·88
„	Castle Malgwyn	4·64	„	Lough Swilly, Carrablagh	3·49

FEBRUARY, 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.	
				Dpth	Date		Deg.	Date	Deg.	Date		
		inches.	inches.	in.								
I.	London (Camden Square) ...	2.87	+ .99	.44	27	22	57.0	19	25.1	6	6	11
II.	Maidstone (Hunton Court)...	3.65	+ 1.85	.67	21	24	...	...	...	...	...	...
III.	Strathfield Turgiss	3.51	+ 1.51	.45	25	25	57.0	17	20.2	6	7	10
III.	Hitchin	3.08	+ 1.33	.60	21	19	56.0	19	25.0	5	10	...
IV.	Winslow (Addington)	2.42	+ .26	.33	21	20	57.0	19	24.0	6	9	11
IV.	Bury St. Edmunds (Westley)	3.05	+ 1.49	.98	21	18	54.0	19	18.0	6	...	...
V.	Norwich (Cossey)	2.12	+ .53	.70	21	13	...	...	...	...	...	...
V.	Weymouth (LangtonHerring)	3.66	+ 1.06	.46	27	22	53.0	18	28.0	25	4	...
VI.	Torquay, Babbacombe	4.74	+ 1.67	1.01	25	23	55.9	7	30.4	25	1	11
VI.	Bodmin (Fore Street)	6.49	+ 1.50	1.00	25	25	...	...	...	...	...	...
VI.	Stroud (Upfield)	3.37	+ .81	.59	15	20	55.0	19	27.0	24	6	...
VI.	ChurchStretton (Woolstaston)	4.03	+ 1.58	.58	25	24	53.5	19	25.0	24	11	11
VII.	Tenbury (Orleton)	3.63	+ 1.15	.56	25	21	58.3	19	25.6	6	8	11
VII.	Leicester (Barkby)	2.32	+ .51	.31	21	20	58.0	19	21.0	5	15	22
VII.	Boston	2.15	+ .47	.73	21	13	58.0	19	26.0	6	8	...
VII.	Hesley Hall [Tickhill].....	2.23	+ .73	.51	21	15	58.0	19	24.0	26	8	...
VIII.	Manchester (PlymouthGrove)	3.38	+ 1.33	.52	9	22	58.0	19	26.0	27	7	11
IX.	Wetherby (Ribston Hall) ...	1.83	+ .25	.53	27	9	...	...	...	...	...	...
IX.	Skipton (Arncliffe)	10.24	+ 5.55	1.94	9	21	...	...	...	...	...	...
IX.	Hull (PearsonPark)	2.84	+ 1.04	.48	21	16	57.0	19	25.0	26	12	18
X.	Newcastle (Town Moor)	2.66	+ 1.26	.91	26	17	...	...	...	...	...	...
X.	Borrowdale (Seathwaite).....	20.99	+ 8.35	4.96	13	22	...	...	...	...	...	...
XI.	Cardiff (Ely).....	5.72	+ 2.53	.67	25	22	...	...	...	...	...	...
XI.	Haverfordwest	5.20	+ 1.08	1.51	26	24	51.4	3	24.9	28	5	8
XI.	Aberystwith, Gogerddan.....	4.81	+ 1.55	.84	1	21	...	...	...	...	...	...
XI.	Llandudno	2.47	+ .55	.43	25	20	...	...	...	...	...	...
XII.	Cargen [Dumfries]	5.51	+ 1.86	1.29	13	20	50.8	19	19.6	28	6	...
XII.	Jedburgh (Sunnyside)	2.67	+ 1.16	.55	27	16	56.0	10	20.0	28	9	...
XIV.	Old Cumnock	4.41	+ .91	.78	7	19	...	...	...	...	...	...
XV.	Lochgilphead (Kilmory)	6.37	+ 1.18	1.37	9	22	...	...	17.0	24	16	...
XV.	Oban (Craigvarren)	6.08	...	.74	17	25	52.5	18	24.0	25	7	...
XV.	Mull (Quinish)	5.87	+ .40	.87	17	18	...	...	...	...	...	...
XVI.	Loch Leven Sluices	4.30	+ 1.55	.60	10	16	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis)	2.90	+ .80	.70	26	21	50.4	18	23.6	13	9	...
XVII.	Braemar	3.37	+ .01	.55	14	19	47.7	18	9.0	13	16	24
XVII.	Aberdeen (Cranford)	2.75	...	1.03	26	20	48.0	7, 20	23.0	12	11	...
XVII.	Strome Ferry.....	5.43	...	.84	9	19	...	...	...	...	...	...
XVII.	Cawdor [Nairn]	3.73	+ 1.50	.95	10	18	...	...	...	...	...	...
XIX.	Dunrobin	2.41	+ .32	.37	14	14	53.0	18	26.0	26	...	...
XIX.	S. Ronaldsay (Roeberry).....	3.23	+ .59	.76	14	24	47.0	18	25.0	24	8	...
XX.	Darrynane Abbey.....	6.02	...	.94	4	24	...	...	...	...	...	...
XX.	Waterford (Brook Lodge) ...	3.96	...	.73	25	23	55.0	2	22.0	28	6	...
XX.	O'Briensbridge (Ross)	3.66	...	.57	1	21	53.0	6, 19	25.0	28	6	...
XXI.	Carlow (Browne's Hill)	2.92	...	.43	1	23	...	...	...	...	...	...
XXI.	Dublin (FitzWilliam Square)	2.67	+ .32	.48	9	22	56.4	18	26.0	25	5	11
XXII.	Ballinasloe	3.32	+ .54	.52	1	23	50.0	6, 18	21.0	25	11	...
XXII.	Clifden (Kylemore)	10.07	...	1.01	15	23	...	...	...	...	...	...
XXIII.	Waringstown	2.94	+ .49	.56	13	19	57.0	8	20.0	24	10	11
XXIII.	Londonderry (Creggan Res.) ..	4.32	+ 1.29	.64	12	22	...	...	...	...	...	...
XXIII.	Omagh (Edenfel)	3.00	+ .31	.52	9	17	51.0	18	25.0	27	12	13

a And 14. b And 19. c And 25. d And 28. e And 26.

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

FEBRUARY, 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 ⁺ 01 or more fell.	Max.		Min.		In shade.	On screen.		
						Dpth	Date	Deg.	Date			Deg.	Date
I.	London (Camden Square) ...	2·87	+·99	in. 44	27	22	57·0	19	25·1	6	6	15	
II.	Maidstone (Hunton Court)...	3·65	+1·85	·67	21	24	...	...	...	...	...	...
III.	Strathfield Turgiss	3·51	+1·51	·45	25	25	57·0	17	20·2	6	7	16	
III.	Hitchin	3·08	+1·33	·60	21	19	56·0	19	25·0	5	10	...	
IV.	Winslow (Addington)	2·42	+·26	·33	21	20	57·0	19	24·0	6	9	15	
IV.	Bury St. Edmunds (Westley)	3·05	+1·49	·98	21	18	54·0	19	18·0	6	...	...
V.	Norwich (Cossey)	2·12	+·53	·70	21	13	...	...	...	...	...	...
V.	Weymouth(LangtonHerring)	3·66	+1·06	·46	27	22	53·0	18	28·0	25	4	...	
VI.	Torquay, Babbacombe... ..	4·74	+1·67	1·01	25	23	55·9	7	30·4	25	1	14	
VI.	Bodmin (Fore Street)	6·49	+1·50	1·00	25	25	...	...	...	...	...	...
VI.	Stroud (Upfield)	3·37	+·81	·59	15	20	55·0	19	27·0	24	6	...	
VI.	ChurchStretton(Woolstaston)	4·03	+1·58	·58	25	24	53·5	19	25·0	24	11	15	
VII.	Tenbury (Orleton)	3·63	+1·15	·56	25	21	58·3	19	25·6	6	8	11	
VII.	Leicester (Barkby)	2·32	+·51	·31	21	20	58·0	19	21·0	5	15	23	
VII.	Boston	2·15	+·47	·73	21	13	58·0	19	26·0	6	8	...	
VIII.	Hesley Hall (Tickhill).....	2·23	+·73	·51	21	15	58·0	19	24·0	26	8	...	
VIII.	Manchester(PlymouthGrove)	3·38	+1·33	·52	9	22	58·0	19	24·0	27	7	11	
IX.	Wetherby (Ribston Hall) ...	1·83	+·25	·53	27	9	...	...	...	...	...	...
IX.	Skipton (Arncliffe)	10·24	+5·55	1·94	9	21	...	...	...	...	...	...
X.	Hull (PearsonPark)	2·84	+1·04	·48	21	16	57·0	19	25·0	26d	12	18	
X.	Newcastle (Town Moor)	2·66	+1·26	·91	26	17	...	...	...	...	...	...
XI.	Borrowdale (Seathwaite).....	20·99	+8·35	4·96	13	22	...	...	...	...	...	...
XI.	Cardiff (Ely).....	5·72	+2·53	·87	25	22	...	...	...	...	...	...
XI.	Haverfordwest	5·20	+1·08	1·51	26	24	51·4	3	24·9	28	5	8	
XII.	Aberystwith, Gogerddan.....	4·81	+1·55	·84	1	21	...	...	...	...	...	...
XII.	Llandudno.....	2·47	+·55	·43	25	20	...	...	...	...	...	...
XII.	Cargen [Dumfries]	5·51	+1·86	1·29	13	20	50·8	19	19·6	28	6	...	
XIV.	Jedburgh (Sunnyside).....	2·67	+1·16	·55	27	16	56·0	10	20·0	28	9	...	
XIV.	Old Cunnock	4·41	+·91	·78	7e	19	...	...	...	...	...	...
XV.	Lochgilthead (Kilmory).....	6·37	+1·18	1·37	9	22	...	...	17·0	24	16	...
XV.	Oban (Craigvarren)	6·08	...	·74	17	25	52·5	18	24·0	25	7	...	
XVI.	Mull (Quinish).....	5·87	+·40	·87	17	18	...	...	...	...	...	...
XVI.	Loch Leven Sluices	4·30	+1·55	·60	10a	16	...	...	...	...	...	...
XVII.	Dundee (Eastern Necropolis)	2·90	+·80	·70	26	21	50·4	18	23·6	13	9	...	
XVII.	Braemar	3·37	+·01	·55	14	19	47·7	18	9·0	13	16	23	
XVIII.	Aberdeen (Cranford)	2·75	...	1·03	26	20	48·0	7, 20	23·0	12	11	...	
XVIII.	Strome Ferry	5·43	+·30	·84	9	19	...	...	...	...	...	...
XIX.	Cawdor [Nairn]	3·73	+1·50	·95	10	18	...	...	...	...	...	...
XIX.	Dunrobin	2·41	+·32	·37	14	14	53·0	18	26·0	26	...	...
XX.	S. Ronaldsay (Roeberry).....	3·23	+·59	·76	14	24	47·0	18b	25·0	24	8	...	
XX.	Darrynane Abbey	6·02	...	·94	4	24	...	...	...	...	...	...
XX.	Waterford (Brook Lodge) ..	3·96	+·12	·73	25	23	55·0	2	22·0	28	6	...	
XXI.	O'Briensbridge (Ross)	3·66	...	·57	1	21	53·0	6, 19	25·0	28	6	...	
XXI.	Carlow (Browne's Hill)	2·92	+·16	·43	1	23	...	...	...	...	...	...
XXII.	Dublin (FitzWilliam Square)	2·67	+·32	·48	9	22	56·4	18	26·0	25	5	13	
XXII.	Ballinasloe	3·32	+·54	·52	1	23	50·0	6, 18	21·0	25	11	...	
XXIII.	Clifden (Kylemore)	10·07	...	1·01	15	23	...	...	...	...	...	...
XXIII.	Waringstown	2·94	+·49	·56	13	19	57·0	8	20·0	24	10	17	
XXIII.	Londonderry (Creggan Res.)..	4·32	+1·29	·64	12	22	...	...	...	...	...	...
XXIII.	Omagh (Edenfel)	3·00	+·31	·52	9	17	51·0	18b	25·0	27	12	13	

a And 14. b And 19. c And 25. d And 28. e And 26.

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

METEOROLOGICAL NOTES ON FEBRUARY, 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.—A very showery month, with only three days on which R was not measured. A remarkable fall in barometric pressure occurred on the 20th and 21st, and a sharp frost on the 6th, the grass min. registering $15^{\circ} \cdot 8$; weather rough and stormy at the close of the month. Land very wet and sodden.

ADDINGTON.—A good deal of cold, stormy weather. Bar. very low from 20th to 27th; reading on 21st, at 9 a.m., $28^{\circ} \cdot 752$ in. (cor. and red.) On the 22nd, 23rd, and 24th, a remarkably even low temp. prevailed, the max. being 35° , 32° , and 34° , and the min. 35° , 32° , and 29° , a range of 6° only. On the evening of the 25th, a large lunar halo was seen, followed next morning by a heavy wind and rain storm. On the 23rd the ground was white with S, and a big flood occurred on the 26th.

BURY ST. EDMUNDS.—A mild month after the 7th. Only three wetter months of February have occurred since 1856, viz.: 1866, $3^{\circ} \cdot 36$ in.; 1879, $3^{\circ} \cdot 36$ in.; 1883, $3^{\circ} \cdot 24$ in.

LANGTON HERRING.—A changeable, unsettled and very wet month. R fell on 17 consecutive days from the 6th, and on none of these days was less than $\cdot 03$ in. recorded. Very stormy weather on the 10th and 14th, and at night on the 25th. The 25th and 28th were bright sunny days, but on the evening of the 25th, there was T and L, followed by R, and on the night of 28th, there was a high wind; the mean temp. at 9 a.m. ($41^{\circ} \cdot 5$), was $1^{\circ} \cdot 8$ above the average of 21 years. Solar halo on the 4th; lunar halo on the 28th.

BABBACOMBE.—A warm, wet, damp and windy month, with a large excess of S.W. winds. R on every day except 5, and on 18 consecutive days from 6th to 23rd; $2^{\circ} \cdot 12$ in. of R fell in the last 4 days, including $1^{\circ} \cdot 01$ in. on the 25th, most of which fell in heavy showers from 8.30 p.m. on 25th, to early morning on 26th, with T and H. Fine and sunny on 12th. Warm from 1st to 4th, 7th to 11th, 13th to 15th, and 18th to 21st. The shade max. rose to or above 50° on 11 days, and failed to reach 40° on one day only. The R is the greatest in February since 1884, when $5^{\circ} \cdot 10$ in. fell; the mean temp. ($43^{\circ} \cdot 3$), is the highest in February since 1885. Gales on 6 days; H on 5; slight S on 4 days; solar halos on 4 days; lunar halo on 28th; fog on 4 days.

BODMIN.—A mild month, with a large rainfall, and a large number of rainy days. Only 5 days on which there was frost, and a little H on 2 days. Rather stormy on the 9th, and also at the end of the month.

STROUD, UPFIELD.—L and T at 11.30 p.m. on 8th; S.W. gales on the 10th and 24th.

WOOLSTASTON.—A wet month, only 4 days without R. The last week was very cold and S fell heavily on the 22nd. Mean temp. $40^{\circ} \cdot 6$. Gales on 9th, 10th, and 24th; H on 9th.

TENBURY, ORLETON.—The wettest and warmest month of February since 1885, the mean being $1^{\circ} \cdot 7$ above the average of 32 years. The last few days were cold and cheerless, but the first part of the month was very warm and pleasant. Great gales on the night of the 9th and 26th; S on 22nd and 24th.

MANCHESTER, PLYMOUTH GROVE.—A fine month upon the whole. Very stormy on the 9th; slight S on the 24th and S and sleet on the 25th; thick fog on the morning of the 28th. Mean temp. 40° .

WALES.

HAVERFORDWEST.—One of the mildest and wettest Februaries in my record of 44 years. A short, sharp, and destructive TS occurred on the morning of the 15th; it lasted from 8.45 a.m. to 9.15 a.m.; the L was vivid and forked, and

a large tree was literally split into fragments ; the T was very appalling, and a storm of large H followed. This storm caused several horses to dash off, in wild affright on the road leading into town, resulting in such damage to one man, that he had to lose his leg. The month ended cold and stormy ; prevailing winds, S.W., W. and S.E.

GOGERDDAN.—Stormy and very mild throughout the month, with scarcely a gleam of sunshine.

SCOTLAND.

CARGEN.—A very variable and generally stormy month. The mean temp. of the first 20 days, was $2^{\circ}5$ above the average of the month, the last eight days, $5^{\circ}3$ below it. On the 26th S fell to a depth of 5 inches, with heavy sleet in the afternoon. A sharp TS, accompanied by heavy H, occurred on the night of the 7th, and a good deal of L was seen on the night of the 9th. A severe gale was experienced on the 14th, and strong winds on several occasions.

JEDBURGH.—Weather on the whole fairly pleasant, and although there were many rainy days, the heat of the sun soon dried it up. Farm work was little retarded by the frost, but no cereals were sown. Many spring flowers in bloom. T and L on the 8th, H showers on the 9th, S on the 26th and 27th.

OLD CUMNOCK.—From the 7th to the 11th very stormy. Two loud peals of T at 9 p.m. on the 7th. H on the 10th and 11th, S on 25th, 26th and 28th.

SOUTH RONALDSAY, ROEBERRY.—The first week was fine, but afterwards the weather was cold, wet and changeable.

IRELAND.

DARRYNANE ABBEY.—The first three weeks were wet and very mild. S fell at times on 25th. The last few days were cold, with sharp frost at night on 27th. H on the 11th and 16th.

WATERFORD, BROOK LODGE.—Only five days this month without B. Several heavy gales ; H on the 9th and 25th, S on 24th and 26th. Mean temp. $42^{\circ}2$.

O'BRIENSBRIDGE, ROSS.—A remarkable fall of six-tenths of an inch occurred in the bar. on the night of 20th, but neither B nor storm followed. The temp. was high until the 24th, but sharp frost was recorded on 28th. S on 25th, 26th and 27th.

DUBLIN.—The month was wet, cold, stormy and cloudy. R or S fell in measurable quantity on 22 days, and on four days the wind reached the force of a gale. The mean temp. was $42^{\circ}7$, or $0^{\circ}1$ below the average. S or sleet fell on seven days, H on six days, fogs occurred on three days. The amount of cloud (6.8) was in excess of the average. High winds occurred on 11 days, L was seen on the 7th, an aurora on the 16th, solar halos on the 15th and 28th, and lunar halo on the 28th.

EDENFEL.—With the exception of a few days of the first week, and the whole of the last week, the weather of the month was persistently wet with temp. rather above the average and a remarkably unsteady and low bar. The last week was fine and dry, except for some light drifting S on 26th.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCXXVII.]

APRIL, 1893.

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THE QUEENSLAND FLOODS.

WE regret that we cannot place before our readers any official details as to the rainfall which caused such terrible ruin in Brisbane at the beginning of February. For most of the following information we are indebted to various numbers of *The British Australasian*, and to a friend, who has sent us the Melbourne *Argus* of February 11th, 1893.

Two subjects occupy nearly half of that paper—"The Heat and the Bush Fires," and "The Queensland Floods." It is rather venturesome to jump at a conclusion from these two titles, but we shall not be surprised if, when we do get full details, both results are proved to have had one origin.

As regards the rainfall, the following are all the data we yet have :—

"Brisbane, February 23rd, 1893.—The following are particulars from the statistics issued by the Chief Weather Bureau, showing the rainfall for four days ending February 3rd. The figures for February 2nd are phenomenal, and exceed the records of any previous rainfall in any other part of the world :—

	inches.
January 31st	10·775
February 1st	20·056
February 2nd	35·714
February 3rd	10·760
Total	77·305

But the following paragraph says that the above record was not obtained at Brisbane at all !

"With regard to the phenomenal rainfall in the Blackall Ranges, the cause of the flood, taken at Crohamhurst by Mr. J. O. Jones (77·305 inches in four days, and 35·714 inches in one of these days), it is well to point out that the fall, tremendous as it is, does not constitute a world's record. On June 16th, 1876, there fell at Cherrapanji, Khasi Hills, Assam, 40·80 inches in twenty-four hours, and this stands as the record of reported rainfalls for this period."

"The rainfall at Brisbane itself up to Tuesday morning [January 31st or February 7th ?] amounted to 19·42 in., or 9·19 in. more than in the great flood of 1890."

“The total rainfall reported at the Brisbane Observatory from January 28th to February 20th was over 43 in., as compared with 5·30 in. for the corresponding period of 1892.”

The above two records seem much more consistent.

“Ipswich, February 4th.—The rainfall for the last 24 hours is 2·53 in.”

“Toowoomba, February 6th.—The rainfall at Bundaberg since the 29th to date is 25·43 in.”

“The rainfall at Coochin Creek, in the Blackall Ranges, and at Yandina, from the 31st January to 8th February, was 80 in. and 73·36 in. respectively.

“Fifty miles north of Brisbane, at Mooloolah, 67 inches of rain fell in three days.”

As regards general damage, the following narrative will give a general idea. The loss is put at £1,500,000.

“Descending the great mountain which hems in the tableland, no trace is to be seen of the flood which so recently overwhelmed the plains. The little mountain streams flow quietly on, the gullies are unscoured by torrents, and the permanent way of the railway is uninjured. All this affords a clear illustration of the way in which the cyclonic rainfall, phenomenal in its intensity, confined itself to the coast regions, leaving the mountain ranges comparatively untouched. Some idea of the intensity and local character of the rain may be formed from the fact that the Warill Creek, a tributary of the Bremer about four miles from Ipswich, was not even in flood, whilst the Bremer itself rose about 80 ft., and almost swallowed up the town. Residents compare the rainfall to a waterspout, which descended on the watershed of the Brisbane and Stanley rivers. Thus at Brisbane itself, up to Tuesday morning last, 19·42 in. of rain had fallen, or 9·19 in. more than during the great flood of 1890. Further north again the rain was still heavier, and at Mooloolah, 50 miles away on the north coast line, 67 in. of rain fell in three days. These facts alone are quite sufficient to account for the unprecedented character of the inundation, which surpasses any in the memory of black men, let alone white men

“The first trace of the flood which one meets in approaching Brisbane from the south is at Ipswich, the town which has suffered most severely by the calamity. The Bremer River, which is now flowing deeply and sluggishly between its banks, was backed up by the overcharged waters of the Brisbane streams, and rose to a height of 80 ft. above the normal level. This flooded the lower portion of the town to a depth of 34 ft.—16 ft. higher than the hitherto famous flood of 1890.

“The result, even as viewed from the railway train, is seen to be disastrous. Houses are upset in every direction. They have been carried hundreds of yards from their original sites, and landed promiscuously in other people's back yards, in paddocks, and even on public roads. In one place a church is seen lying on its side in unconsecrated territory, and in another the iron roof of a large and well-built mansion has parted from its body, and is lying half across the highway. The station at Ipswich shows signs of the severe trouble it has passed through. The platforms are built deep down in the cuttings, and reached by stairs from the roads above. The water entered and filled this hollow, rising to the level of the roadway. Hence the place was completely swamped out, and the refreshment rooms, waiting-room, and other offices are in a pitiable plight. Passing along the line one notices everywhere traces of

the flood. Fields are covered thick with a slimy deposit, which gives off a disagreeable odour. Wherever there are low-lying settlements, houses have been either destroyed or completely swamped out. At Goodna, a few miles from Ipswich, the mighty power of the waters has been made still more manifest. The place is near the junction of the Bremer and Brisbane rivers, and consequently the current was exceptionally strong. A large station-house has been lifted bodily from its foundation, carried across the railway line, and deposited on the goods platform. A gang of workmen are now employed in shifting the dismantled station back to its place. Fortunately the railway line to South Brisbane has not been seriously injured, though, as the Indooroopilly railway bridge has been carried away, all communication with the city on the main northern line is cut off.

“As we get deeper into the flooded districts the stench of drying mud becomes stronger and stronger. Hundreds of acres of valuable crops, maize, and potatoes and vegetables of all kinds, are covered with offensive deposits. Beautiful gardens, belonging to many residential villas in this suburb, are utterly ruined, and houses are more or less damaged. Even if the main building has escaped damage, the outbuildings are turned over and scattered in all directions. Fences are destroyed, and all cultivation for at least a season will be out of the question. The telegraph wires along the side of the line indicate the extent of the flood, since there are fringes of weeds and other vegetable matter hanging from them. Evidences of the disaster crowd upon one as the dwelling places become more numerous. The condition of the muddy back yards indicates the intense misery which has overtaken weary housewives, who are to be seen hanging out little scraps of linen and bedding to dry in the tepid atmosphere. One man is on the roof of his cottage cleaning mud out of the gutters; another, less fortunate, is endeavouring with the aid of several friends to set his capsized house on end again. This we see as we pass over the heads of people before reaching South Brisbane, the only terminal station which the city now possesses. The streets are still thick with shining mud, and there is confusion everywhere.

“It is by no means an easy matter to reach Brisbane itself, for, since the destruction of the Victoria-bridge—the yawning red wreck of which is just above us—the ferry provides the only means of crossing the river. ‘I never knew before how many people used the Victoria-bridge,’ said a local gentleman to me as he looked down on the crowded ferry-boat just arriving at the high wharf. The boats, which are run by the Government, will only carry a limited number of passengers. They are always crowded to the utmost extent, and the task of embarking and disembarking all these people is difficult and even dangerous.”

The above describes matters as they appeared to a visitor approaching Brisbane from the south. From the northern districts we have little information, but the following paragraphs show that damage extended nearly 200 miles to the north of Brisbane:—

“At Gympie, 116 miles N. of Brisbane, about 20 houses were washed out of the main street.”

“At Maryborough, 64 miles N. of Gympie, the bridge was washed away.”

MARCH, 1893.

THE character of March has been so abnormal as to call for a few pages summarizing its more salient features, in addition to the information contained in our regular tables of rainfall and temperature, and in the Observers' remarks.

To study the rainfall we have plotted several hundreds of returns on a map of the British Isles, but the slight rains, which together make up the total for the month, appear to have been so dependent on extremely local conditions that variations of one or two tenths of an inch are frequent in the records of contiguous stations, and these one or two tenths are, over a great part of the country, sufficient to double the total fall.

We will endeavour to roughly outline the chief features of the distribution, but owing to the before-mentioned cause, cannot attempt to be precise.

Over a belt of country stretching from Huntingdon to Northampton and Northampton to Oxford, several stations report less than $\cdot 1$ in., many stations in the East Midlands report less than $\cdot 2$ in., and a large area of country, bounded on the N. by a line running from the Wash to Hereford, and on the S. by a line from Swaffham to Weston-super-Mare, recorded less than $\cdot 25$ in. A line stretching from Newcastle to Plymouth would have to the E. of it the country over which the fall generally was less than $\cdot 5$ in., though isolated high lands produced more. To the W. of this line, S. of Yorkshire, we find no English record reaching an inch, but in the N.W. of the country larger falls are plentiful, and Seathwaite, Cumberland, had a fall of $8\cdot 67$ in., or very near its average.

In Wales the rainfall, like the country, is almost too irregular to be described in words, but it was generally considerably less than half the average, though records exceeding an inch are plentiful.

Scotland, like Wales, is difficult to deal with, but although we do not find a single plus sign in the table on page 46, and many stations show a considerable deficiency, the fall there was not phenomenal.

In the S.E. of Ireland the fall was less than $\cdot 5$ in. ; in the E. and S. was less than $\cdot 75$ in. ; but it increased N.W.-ward to $2\cdot 5$ in. in the extreme N.W.

The following table gives no less than 33 stations where the total fall did not exceed a quarter of an inch, 32 distributed over 17 counties of England, from York in the N. to Sussex in the S., and from Suffolk in the E. to Cornwall in the W., and one in Limerick.

Station.	County.	Rainfall		Station.	County.	Rainfall	
		Total.	Days.			Total.	Days.
		in.				in.	
Pitsford, Sedg- brooke.....	Northampton	·07	3	Droitwich (Holt Lock).....	Worcester....	·18	5
Oxford, Mag. Coll.	Oxford.....	·08	4	Scarborough	York.....	·18	5
Alconbury.....	Hunts.....	·09	3	South Cliff.....			
Castle Ashby... ..	Northampton	·10	4	Morvah, Bospor- thenis	Cornwall.....	·20	—
Eastbourne Ceme- tery.....	Sussex.....	·12	4	Steeple Aston	Oxford.....	·21	5
Steyping.....	„.....	·13	—	Banbury (Blox- ham Grove)....	„.....	·21	4
Winslow, Adding- ton Manor.....	Bucks.....	·14	4	Ipswich (Bishop's Hill).....	Suffolk.....	·21	—
Oxford (St. Giles)	Oxford.....	·14	5	Swaffham.....	Norfolk.....	·21	4
Denver.....	Norfolk.....	·14	3	Ross, The Graig.	Hereford.....	·21	7
Cheltenham (Southam Villa)	Gloucester ...	·14	5	Eastbourne, Os- borne Ho.....	Sussex.....	·23	6
Gloucester (Llan- thony Lock) ..	„.....	·14	4	Probus, Lamel- lyn.....	Cornwall.....	·23	4
Harlow (Sheering)	Essex.....	·16	6	Ashburton, Druid House..	Devon.....	·24	5
Henley-on- Thames.....	Oxford.....	·17	5	Ketton Hall [Stamford] ...	Rutland.....	·24	7
Tewkesbury (Upper Lode)...	Gloucester ...	·17	4	Limerick (Kil- cornan).....	Limerick.....	·24	4
Worcester (Bevere Lock).....	Worcester....	·17	5	Southend W.W.	Essex.....	·25	4
Llanvihangel Court.....	Monmouth....	·17	5	Weston-super- Mare.....	Somerset.....	·25	10
Torquay (Babba- combe).....	Devon.....	·18	6	Stroud, Upfield..	Gloucester ...	·25	7

As regards distribution in time, the description is fairly simple. Over the driest part of England rain fell only on the 1st, 2nd, and 3rd and on the 16th and 17th, and an absolute drought prevailed from the 18th to the end of the month. At Camden Square, and we believe over the greater part of the Midlands and Southern Counties, this drought has been prolonged to the time of writing (April 12th). At stations where the total was slightly greater, showers fell also on the 6th and 7th; still further increase of total corresponds with increased number of rainy days, the wet periods, 1st to 3rd and 5th to 7th, become merged into one, and the period 16th to 17th becomes prolonged, but over practically the whole of England except the north and west, the drought after the 18th was unbroken. In Wales the drought was generally broken by R on the 31st.

In Scotland, with the greater fall of rain the weather was generally more broken, a few fine days succeeding two or three wet ones somewhat irregularly, the wet or dry preponderating according to the normal character of the district. The drought, however, shows itself after the 17th or 18th, and in parts of the drier districts of the S. and E. continued to or beyond the close of the month.

In Ireland the wet periods were very similar to England—1st or 2nd to 3rd, 6th and 7th, and 15th to 18th—but showers intervened on the 12th, and the drought was generally broken up on the 31st. In the north the first two groups of days combine into a rainy period from 1st to 6th, and the drought is curtailed or disappears altogether.

The temperature, duration of sunshine, and other meteorological elements deserve—and will, we hope, receive—more thorough discussion than we are able to give them, inasmuch as we receive no detailed returns except those of rainfall, and have not the material for comparison with previous years.

We are therefore practically limited to a discussion of the Camden Square records, and have selected the following results for comparison :—

	Mean temp. at 9 a.m.	Absolute Shade Max. temp.	Absolute Shade Min. temp.	Mean Shade Max.	Mean Shade Min.	Absolute Max. in Sun.	Mean Max. in Sun.	Total Rain-fall.	Mean amount of Cloud.
1893, March...	44°·2	67°·6	25°·9	56°·6	36°·3	103°·4	86°·9	in. ·32	3·1
Highest in the previous 34 years.	46°·7	68°·7	29°·2	55°·5	39°·2	128°·7	91°·4	Lowest ·39	Lowest 4·8
No. of times 1893 has been exceeded	6	2	17	0	13	12	3	0	0
		1871	1868 1873 1879	1882	1859	1882	1882	1874	1863

From this it appears that the average shade max., the total rainfall, and the mean amount of cloud are the only records without precedent, and this is just what we should have expected. The beauty of the month has been due to the unexampled absence of cloud, with the consequent great amount of bright sunshine, resulting in high temperature by day, but a correspondingly low temperature, due to radiation, at night.

Our contemporary, *The Observatory*, contains some interesting notes as to the facts for Greenwich, of which we reprint the opening paragraphs :—

“ A SUNNY MARCH.—We are sufficiently familiar with the rough weather and winds of March to appreciate to the full the unexampled run of fine weather that we have lately enjoyed, and which still (March 30th) continues. A few particulars taken from the Royal Observatory registers may therefore prove interesting. The total amount of sunshine from March 18th to 29th inclusive was 100 hours exactly, the proportion of sunshine (constant sunshine = 1) being thus 0·68. The mean amount of cloud was only 1·2 on a scale 0–10. The mean maximum temperature was 57°·3, which is 6°·5 above the average for 50 years; the mean minimum temperature was 31°·2, or 4°·2 below the average of 50 years. The highest recorded tempera-

ture was $64^{\circ}3$ on March 23rd, and the lowest $24^{\circ}2$ on March 19th. The highest in 50 years during the same period was $70^{\circ}9$ on March 24th, 1871, and the lowest was $20^{\circ}0$ on March 26th, 1850. The mean temperature of the period (simple mean of maximum and minimum) was $44^{\circ}2$, or $1^{\circ}1$ above the average of 50 years.

“ There was a similar run of fine weather in 1892, but a little later in the year. From March 30th to April 11th the sunshine recorded amounted to 134.2 hours, the proportion of sunshine being 0.78. The mean amount of cloud was only 0.9. The mean maximum temperature was $65^{\circ}2$, and the mean minimum temperature $36^{\circ}0$, giving a mean temperature of $50^{\circ}6$, or $4^{\circ}0$ above the average of 50 years.”

ROYAL METEOROLOGICAL SOCIETY.

At the monthly meeting of this Society, held on March 15th, Dr. C. Theodore Williams (President) in the chair, Mr. Shelford Bidwell, F.R.S., delivered a lecture on “Some Meteorological Problems,” which was illustrated by numerous photographs and experiments. The lecturer said that one of the oldest and still unsolved problems of meteorology relates to the origin of atmospheric electricity. Many possible sources have been suggested, among them being the evaporation of water, and the friction of dust-laden air against the earth's surface. Having granted some sufficient source of electrification, Mr. Bidwell said that it is not difficult to account for the ordinary phenomena of thunderstorms.

Photography has shown that the lightning flash of the artists, formed of a number of perfectly straight lines arranged in a zig-zag, has no resemblance to anything in nature. The normal or typical flash is like the ordinary spark discharge of an electric machine; it follows a sinuous course, strikingly similar to that of a river as shown upon a map. The several variations from the normal type all have their counterparts in the forms taken by the machine spark under different conditions, and the known properties of these artificial discharges may be assumed to afford some indication as to the nature of the corresponding natural flashes. Thus, for example, the ramified or branched flash, from which, no doubt, the dreaded “forked lightning” derives its name, is probably one of the most harmless forms of discharge. Ever since the time of Franklin it has been customary to employ lightning rods for the protection of important buildings. According to Dr. Oliver Lodge, these are of no use in the case of an “impulsive rush” discharge, which, however, is of comparatively rare occurrence. Lightning conductors, however well constructed, cannot therefore be depended upon to afford perfect immunity from risk.

Mr. Preece is of opinion that the “impulsive rush,” though easily producible in the laboratory, never occurs in nature. Mr. Bidwell made some remarks as to the duration of a lightning flash, and the causes of its proverbial quiver, and suggested an explanation

of the characteristic darkness of thunder clouds, and of the large rain drops which fall during a thunder shower. The lecturer concluded with some observations concerning the probable cause of sunset colours, which he attributed to the presence of minute particles of dust in the air.

REVIEWS.

Modern Meteorology ; an outline of the growth and present condition of some of its phases, by FRANK WALDO, Ph.D., Member of the German and Austrian Meteorological Societies, &c. ; late Junior Professor, Signal Service, U.S.A ; with 112 illustrations. London. Walter Scott, Ltd., 1893. 8vo., xvi.—460 pages.

WE strongly advise all who desire to be instructed in the newest ideas on meteorological subjects, to buy this very one-sided, but for that very reason useful, book. In many respects we dislike it, but there is no work in the English language, which gives a tithe of the information which this does, as to what may be described as meteorology as viewed from a German standpoint ; and to all English meteorologists, who are not able to read the *Zeitschrift* regularly, this work will be most useful.

Our first complaint is against the title. Prof. Waldo says that his work was compiled at a distance of several hundred miles from any considerable meteorological library, and he explains that he is more familiar with the literature of Germany and America than with that of other countries. But it is strange that neither he nor his publisher had ever heard of *Modern Meteorology* as the title of the six lectures delivered before the Royal Meteorological Society in 1878, and published in 1879 ; and perhaps stranger still, considering how familiar Prof. Waldo is with German meteorology, that he had not heard of the English work in its German form as *Die Moderne Meteorologie*, as published at Brunswick in 1882. The only thing now to be done to avoid confusion, is to always quote the present work as *Waldo's Modern Meteorology*.

As an illustration of the unevenness, and of the utility, we may take the section upon thermometers, where eighteen pages are devoted to very instructive and interesting details as to the construction and verification of thermometers, and on the other hand where not one of the many forms of self-registering thermometers is even mentioned.

The section devoted to barometers is excellent, and spoiled only by some of the engravings being illegible.

As regards cup anemometers, Prof. Waldo is justly severe on the factor of 3, and, referring to Dohrandt's experiments at St. Petersburg, very neatly sums up the *status quo* in the following sentence :—

“These and other experiments have shown that anemometers of the size commonly used, record wind velocities about 20 per cent. too great, and though this has been known for nearly twenty years, yet no change has been made in the erroneous value introduced by Robinson, and the wind observations published by the various

meteorological institutions at the present time have only a relative but not absolute value."

In the rather short section upon rain gauges, there is one expression to which we strongly object. Prof. Waldo says: "In some of the best gauges there is a stop-cock at the bottom, through which the water may be drawn off without inverting the gauge." All taps and stop-cocks leak sooner or later—most of them before two winters have passed, and a leaky rain gauge is certainly not a good one.

The section on evaporation is very far from "modern." Prof. Waldo describes the Piche test tube and Wild's apparatus, but says nothing as to the important work of the French engineers, of Griffith at Strathfield Turgiss, or of his own countryman, Prof. Fitzgerald.

On the other hand, his descriptions and engravings of many of the principal meteorological observatories and establishments, are excellent. No one work in any language gives so much information upon the subject as this section.

The remainder of the work is devoted to the Thermodynamics of the Atmosphere, theories as to its general circulation and their relation to secondary circulations, and to the questions of secular change. Herein Prof. Waldo's familiarity with German, and with the works of German meteorologists, comes into full play, and the works of von Bezold, Hertz, Oberbeck, von Siemens, and Brückner, are brought fully before English readers. We ought, however, to point out, that this portion of the work will require very careful attention, because it is far from elementary, as the following paragraph, which is by no means exceptional, will illustrate:—

"Von Bezold now uses the so-called line of constant entropy as synonymous with the adiabatic curve; and he is thus able to show that by the decrease of entropy by isothermal expansion from one volume to another, if (see the diagram) we proceed along the isotherms which cut an adiabatic S_1 (line of constant entropy) a second adiabatic S_2 will be reached; the relations of expansion remaining constant."

Towards the end of his book, Prof. Waldo has devoted 16 pages to an epitome of Brückner's *Klimaschwankungen*, reviewed in the *Meteorological Magazine* for Dec., 1890 and Jan., 1891, the second notice finishing with these words:—

"By compiling this important work, Dr. Brückner has done good service, and we regret that we know of no English publisher who would venture upon such a publication in our own language."

Failing translation *in extenso*, Prof. Waldo's abstract is very acceptable.

Tyros must not imagine that this book is a complete text-book of modern meteorology, describing all the usual instruments, and explaining how to manipulate and observe them, and how to keep a record. The author did not aim at writing a book of instructions or an elementary treatise, but he and his publisher have given us, at a very moderate price, a large amount of useful information, much of which was previously not accessible in our own language.

A Record of the Rainfall at Uckfield, Sussex, from 1843 to 1892 inclusive; and also an account of the Great Snowstorm December 25th, 1836, by C. LEESON PRINCE, F.R.Met.Soc. 8vo. 1893.

A VERY pleasantly written and useful little book, embodying the results of 34 years' consecutive observations by the author, and of their continuation by a friend for the 16 immediately subsequent ones, thus making a series for half a century.

Curiously enough, although Mr. Prince is *longo intervallo* the father of Sussex meteorologists, he is not well up in the early history of rainfall observations in the county. He says:—

“With the exception of the record kept at Chilgrove, Chichester, which was commenced in the year 1834, I am not aware of any systematic registration of rainfall in this county previous to the commencement of my own register in July, 1842.”

It may be as well to give a list of earlier observations, as it may lead to the discovery of other records, or of additional years of those we possess.

The first record from Sussex known to us is that kept by Mr. Mossop in West Street, Brighton, of which we have the monthly values for one year only, 1790; we should be very glad to have more of that record.

From 1801 to 1813 a record was kept at, or near, Chichester, but for some of the years we have only the totals, and for 1806 we have not the total for the year, and only a few of the monthly totals.

In 1834 (as Mr. Prince states) the Chilgrove record was commenced, the continuation of which to the present time has been, and is, of extreme importance, being by far the oldest unbroken record in the S.E. of England.

Other Sussex records begun before 1842 are the following:—

Station.	Observer.	Period.	Remarks.
West Dean, Chichester	Rev. G. H. Woods	C 1834 to 1849 T ...	
Kingsham, „	—	C 1835 to 1837 imp. T	
Hastings.....	Mr. Phillips	C 1837 imp. to 1846 T	
Infirmary, Chichester	Mr. W. Hills.....	C 1838 imp. to 1873 T	
Petworth	--	1839 to 1858 ...	} Yearly totals only; } monthly values } wanted.

Any further information respecting these or other old Sussex records will be most acceptable.

The next preliminary point to be dealt with is, whether Miss Laura Day's record at Uckfield House may be regarded as a continuation of Mr. Prince's record in the town. Captain Noble's record at Forest Lodge, Maresfield, which is within two miles of both stations, covers the period from 1860 to 1891 inclusive, and we have taken out the differences for each year; they are not perfectly regular, but on the average we have—

	Forest Lodge. in.	Uckfield. in.	Excess of Forest Lodge in.
1860-76	31·76	30·51 Observatory	1·25
1877-91	32·01	30·21 House	1·80

From this it appears that the fall at Uckfield House is less than that

at Uckfield Observatory by 0·55 in.—say half an inch—but looking at the large variations in the relation of the three stations in individual years, we do not consider that it is possible to be sure of that half-inch, and we agree with Mr. Prince that the change of position [and of gauge] has not materially affected the results.

What then are the results? And first as to months:—

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Least Rain {	·23	·00	·11	·25	·18	·16	·08	·63	·02	·77	·70	·32 in.
Year {	'55 & '61	'91	'54	'54	'44	'58	'69	'83	'65	'79	'71	'43
Most Rain {	7·07	4·43	4·05	4·54	5·69	7·04	5·25	6·05	6·54	11·23	7·68	7·95 in.
Year {	'77	'81	'62	'56	'43	'52	'67	'48	'52	'65	'77	'76
Average ...	2·78	1·88	1·86	1·80	2·03	2·06	2·37	2·63	2·67	4·10	3·12	2·60 in.
Per cent...	9·3	6·3	6·2	6·0	6·8	6·9	7·9	8·8	8·9	13·7	10·5	8·7 in.

The average fall during the seasons is—

Winter.	Spring.	Summer.	Autumn.
7·22 in.	5·68 in.	7·05 in.	9·89 in.

As regards the years—

	Inches.	Ratio.
Greatest fall in one year (1852)	50·55	1·69
„ mean „ „ two consecutive years (1852-3) ...	41·12	1·37
„ „ „ „ three „ „ (1851-3) ...	35·50	1·19
Mean fall for 50 years	29·90	1·00
Least mean fall in three consecutive years (1845-7)	21·91	·73
„ „ „ „ two „ „ (1846-7)	21·35	·71
„ „ „ „ one year (1847)	17·58	·59

These fluctuations are unusually large, as the following comparison will show:—

	Wettest year.	Three Driest.	Two Driest.	One Driest.
	in.	in.	in.	in.
Symons (<i>Brit. Rain.</i> , 1883).....	1·45	·79	·74	·66
Binnie (<i>Proc. I.C.E.</i> , 1892	1·45	·78	·73	·66
Prince	1·69	·73	·71	·59

By this comparison we do not in the least suggest any suspicion as to the accuracy of the records—there is no reason whatever for so doing.

On the contrary, instead of finding any error in Mr. Prince's book, we have detected one in *British Rainfall*, 1883, where on p. 30, at Station 3, under the head of "Driest Year," the entry ought to have been, "59, 1847."

The average number of rainy days (0·01 in. and upwards) during the fifty years has been—

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
15	12	12	12	12	11	12	13	12	16	15	14

giving a total of 156 per annum; the lowest number was 113 in 1864 and in 1870, and the highest 211 in 1882. The variability in the number of days of rain is therefore only as 1 to 1·87, while the amount in the driest year is to that in the wettest as 1 to 2·88.

The account of the great Sussex snowstorm of 1836 is exciting enough to be useful to a sensational novelist, and adds one more to the many instances of truth being stranger than fiction. Mr. Prince has done well to put the sad and fatal facts on record, and we will not spoil his narrative by trying to epitomize it.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1892.

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	60·4	29	29·2	26	53·0	39·4	42·1	86	101·9	22·3	3·78	21	5·8
Malta	89·8	2	58·1	23	78·3	66·2	63·7	82	142·5	52·8	1·66	8	4·7
<i>Cape of Good Hope</i> ...	80·9	14	46·3	3	66·6	52·9	...	...	...	...	1·08	12	5·9
<i>Mauritius</i>	81·0	26	61·0	22	78·3	65·9	62·3	75	134·6	52·3	1·39	15	5·0
Calcutta	90·3	3	71·5	31	87·2	74·3	74·3	83	153·5	67·2	3·35	6	4·2
Bombay	92·1	17	74·5	17	87·0	77·0	75·7	82	141·5	65·4	1·89	6	4·6
Ceylon, Colombo ...	87·9	9	71·6	23	84·9	75·2	71·3	79	155·1	69·0	11·98	28	7·4
<i>Melbourne</i>	78·7	11	38·9	16	65·3	48·2	49·4	77	134·0	32·2	3·47	11	6·8
<i>Adelaide</i>	81·6	30	41·5	18	69·7	53·3	50·7	70	144·0	34·7	3·11	19	6·2
<i>Tasmania, Hobart</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Wellington</i>	68·0	11	39·0	4, 26	60·5	47·4	45·6	74	127·0	33·0	4·59	14	4·8
<i>Auckland</i>	72·0	31	46·0	4	64·8	52·1	52·5	81	139·0	37·0	3·98	13	6·4
Jamaica, Kingston	90·7	9	69·1	15	86·0	71·7	71·9	86	...	...	7·36	22	7·0
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto	73·1	3	29·9	24	55·8	39·6	41·1	77	...	...	1·35	14	6·1
New Brunswick, } Fredericton }	65·5	14	22·8	13	51·1	34·0	34·8	73	...	...	1·99	15	6·0
Manitoba, Winnipeg } British Columbia, } Esquimalt }	74·6	3	14·0	29 ^a	55·8	32·0	...	...	...	...	·84	9	5·7
	61·1	3	35·2	16	55·0	44·3	47·3	93	...	...	1·56	16	6·9

^a And 30.

REMARKS.

MALTA.—Mean temp. 70°·5. Mean hourly velocity of wind 7·7 miles. The sea temp. fell from 76°·8 to 73°·0. Thunderstorms on 15th and 24th; lightning on 5 days. J. SCOLES.

Mauritius.—Mean temp. of air 0°·2 below, of dew point 0°·6 above, and rainfall 41 in. below, their respective averages. Mean hourly velocity of wind 10 miles, or 1·4 mile below average; extremes, 28·4 on 15th and 0·0 on 30th; prevailing direction S.E. by E. to E. by S. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on 12 days; lightning only was seen on 7 days. J. C. H. CLARKE, Lt.-Col. R.E.

Melbourne.—Thunder and lightning on the 9th and 27th; thunderstorms on the 11th and 20th. R. L. J. ELLERY, F.R.S.

Adelaide.—The mean temp. was slightly under the average, but the month was characterised by very cool days (the mean max. being no less than 2°·8 below the average) and warm nights. Rains generally were heavy and well distributed over the Colony, especially over the northern areas, where, during the first half of the year, a severe drought prevailed. C. TODD, F.R.S.

Wellington.—The first three days very wet, fine from 4th to 10th, the middle of the month showery, and strong gales on 14th, 15th and 16th from N.W.; from the 23rd to the end of the month generally fine, with moderate winds and cool. Earthquake on 13th. R. B. GORE.

Auckland.—Rainfall, mean temp., and barometrical pressure all close to the average of October. T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL,
MARCH, 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.			in.
II.	Dorking, Abinger Hall.	·64	XI.	Builth, Abergwessin Vic.	1·69
„	Birchington, Thor	·46	„	Rhayader, Nantgwilt..	1·30
„	Brighton, Prestonville Rd	·34	„	Corwen, Rhug	·62
„	Hailsham	·37	„	Carnarvon, Cocksida ...	·75
„	Ryde, Thornbrough	·46	„	I. of Man, Douglas	1·01
„	Alton, Ashdell.....	·42	XII.	Stoneykirk, Ardwell Ho.	1·43
III.	Oxford, Magdalen Col...	·08	„	New Galloway, Glenlee	2·71
„	Banbury, Bloxham	·21	„	Melrose, Abbey Gate ..	1·15
„	Northampton, Sedgebrook	·07	XIII.	N. Esk Res. [Penicuik]	·95
„	Alconbury	·09	„	Edinburgh, Blacket Pl..	·88
„	Wisbech, Bank House..	·32	XIV.	Glasgow, Queen's Park.	·74
IV.	Southend	·25	XV.	Islay, Gruinart School..	3·98
„	Harlow, Sheering	·16	XVI.	Dollar	1·16
„	Colchester, Lexden.....	·41	„	Balquhider, Stronvar..	2·59
„	Rendlesham Hall	·33	„	Coupar Angus Station..	·83
„	Diss	·35	„	Dunkeld, Inver Braan..	·95
„	Swaffham	·34	„	Dalnaspidal H.R.S.	2·39
V.	Salisbury, Alderbury ...	·57	XVII.	Keith H.R.S.	·80
„	Bishop's Cannings	·40	„	Forres H.R.S.	·35
„	Blandford, Whatcombe .	·48	XVIII.	Fearn, Lower Pitkerrie.	·45
„	Ashburton, Holne Vic. ...	·38	„	Loch Shiel, Glenaladale	7·29
„	Okehampton, Oaklands .	·73	„	N. Uist. Loch Maddy ...	1·78
„	Hartland Abbey	·78	„	Invergarry	1·23
„	Lynmouth, Glenthorne .	·41	„	Aviemore H.R.S.	·97
„	Probus, Lamelley	·23	„	Loch Ness, Drumnadrochit	1·20
„	Wincanton, Stowell Rec.	·69	XIX.	Invershin	·73
„	Weston-super-Mare	·25	„	Scourie	3·70
VI.	Clifton, Pembroke Road	·38	„	Watten H.R.S.	·90
„	Ross The Graig	·21	XX.	Dunmanway, Coolkelure	·71
„	Wem, Clive Vicarage ...	·59	„	Fermoy, Gas Works ...	·47
„	Cheadle, The Heath Ho.	·78	„	Killarney, Woodlawn ...	·68
„	Worcester, Diglis Lock	·31	„	Tipperary, Henry Street	·72
„	Coventry, Coundon	·41	„	Limerick, Kilcornan ...	·24
VII.	Ketton Hall [Stamford]	·24	„	Ennis	·44
„	Grantham, Stainby	·38	„	Miltown Malbay.....	·75
„	Horncastle, Bucknall ...	·43	XXI.	Gorey, Courtown House	·44
„	Worksop, Hodsck Priory	·49	„	Mullingar, Belvedere ...	·61
VIII.	Neston, Hinderton	·56	„	Athlone, Twyford	·60
„	Knutsford, Heathside ...	·50	„	Longford, Currygrane ...	1·01
„	Lancaster, Rose Bank...	1·49	XXII.	Galway, Queen's Coll...	·86
„	Broughton-in-Furness ..	3·38	„	Crossmolina, Enniscoe..	1·68
IX.	Ripon, Mickley	·59	„	Collooney, Markree Obs.	1·55
„	Scarborough, South Cliff	·18	„	Ballinamore, Lawderdale	1·70
„	East Layton [Darlington]	·40	XXIII.	Lough Sheelin, Arley ..	1·01
„	Middleton, Mickleton..	1·25	„	Warrenpoint	1·10
X.	Haltwhistle, Unthank..	·95	„	Seaforde	1·06
„	Bamburgh	·51	„	Belfast, Springfield	1·38
„	Newton Reigny	1·67	„	Bushmills, Dundarave...	1·75
XI.	Llanfrechfa Grange	·29	„	Stewartstown	1·34
„	Llandoverly	·80	„	Buncrana	2·05
„	Castle Malgwyn	1·21	„	Lough Swilly, Carrablagh	2·50

MARCH, 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 -01 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
		inches.	inches.	in.								
I.	London (Camden Square) ...	·32	— 1·29	·13	1	6	67·6	31	25·9	19	4	22
II.	Maidstone (Hunton Court)...	·39	— 1·11	·26	1	5	...	...	...	...	...	...
III.	Strathfield Turgiss	·37	— 1·22	·11	1	11	67·1	30	20·8	19	14	24
IV.	Hitchin	·38	— ·96	·17	1	6	66·0	30 _a	23·0	18	12	...
V.	Winslow (Addington)	·14	— 1·58	·07	2	4	68·0	30 _a	20·0	19	19	23
VI.	Bury St. Edmunds (Westley)	·32	— 1·23	·11	1	5	62·0	31	22·0	20	...	...
VII.	Norwich (Cossey)	·43	— ·99	·23	1	5	...	...	...	...	...	...
VIII.	Weymouth (Langton Herring)	·32	— 1·58	·08	1	7	57·0	26	29·0	19	2	...
IX.	Torquay, Babbacombe	·18	— 2·77	·07	1	6	62·9	30	32·5	11	0	17
X.	Bodmin (Fore Street)	·39	— 3·39	·09	1	12	...	...	...	...	...	...
XI.	Stroud (Upfield)	·25	— 1·94	·10	2	7	64·0	29 _b	29·0	18 _g	3	...
XII.	Church Stretton (Woolstaston)	·72	— 1·41	·16	2	7	65·0	30	26·5	19	5	17
XIII.	Tenbury (Orleton)	·39	— 1·69	·12	1	7	68·1	30	23·0	19	17	18
XIV.	Leicester (Barkby)	·37	— 1·34	·10	1	6	69·0	30	18·0	18	19	22
XV.	Boston	·34	— 1·20	·15	1	4	72·0	29	22·0	19	12	...
XVI.	Hesley Hall (Tickhill)	·33	— 1·57	·15	1	6	68·0	25	22·0	19 _h	15	...
XVII.	Manchester (Plymouth Grove)	·65	— 1·57	·13	3	10	67·0	29	26·0	18	5	13
XVIII.	Wetherby (Ribston Hall) ..	·30	— 1·76	·11	17	4	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	2·63	— 2·47	1·16	1	8	...	...	...	...	...	...
XX.	Hull (Pearson Park)	·43	— 1·62	·18	1	6	65·0	24 _c	24·0	19	16	20
XXI.	Newcastle (Town Moor)	·59	— 2·04	·45	3	5	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite)	8·67	— 1·83	4·12	1	13	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	·41	— 2·57	·17	2	6	...	...	...	...	...	...
XXIV.	Haverfordwest	1·24	— 2·00	·79	1	9	61·5	30	26·0	20	11	16
XXV.	Aberystwith, Gogerddan	1·06	— 1·92	·30	6	9	...	...	...	...	...	...
XXVI.	Llandudno	·77	— 1·31	·20	2	7	...	...	...	...	...	...
XXVII.	Cargen [Dumfries]	1·76	— 1·54	·58	3	11	63·8	25	23·0	19	12	...
XXVIII.	Jedburgh (Sunnyside)	·80	— 1·16	·33	1	6	68·0	24 _c	21·0	19	14	...
XXIX.	Old Cunnock	1·76	— 1·37	·35	1	14	...	...	...	...	...	...
XXX.	Lochgilpead (Kilmory)	4·05	— ·41	·81	16	17	...	...	18·0	17	14	...
XXXI.	Oban (Craigvarren)	2·49	...	·38	15	16	62·0	24	29·8	17	4	...
XXXII.	Mull (Quinish)	3·15	— ·69	·35	3	20	...	...	...	...	...	...
XXXIII.	Loch Leven Sluices	1·00	— 1·97	·40	4	5	...	...	...	...	...	...
XXXIV.	Dundee (Eastern Necropolis)	1·05	— 1·35	·50	15	9	65·2	25	26·2	18	13	...
XXXV.	Braemar	·57	— 2·07	·16	9	9	61·0	25	17·3	19	18	24
XXXVI.	Aberdeen (Cranford)	·73	...	·29	1	11	62·0	21	26·0	17	8	...
XXXVII.	Strome Ferry	4·06	— ·57	·99	14	21	...	...	...	...	...	...
XXXVIII.	Cawdor [Nairn]	1·28	— ·76	·35	16	12	...	...	...	...	...	...
XXXIX.	Dunrobin	1·27	— ·98	·31	9	11	60·0	25	25·0	18	6	...
XL.	S. Ronaldsay (Roeberry)	1·80	— ·74	·23	1	19	56·0	23 _d	25·0	17	4	...
XLI.	Darrynane Abbey	1·02	...	·20	24 _a	13	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ..	·56	— 2·34	·18	31	7	58·0	7 _e	29·0	27	4	...
XLIII.	O'Briensbridge (Ross)	·63	...	·17	18	10	58·0	26 _f	30·0	12	4	...
XLIV.	Carlow (Browne's Hill)	·58	— 1·79	·12	31	12	...	...	...	...	...	...
XLV.	Dublin (FitzWilliam Square)	·29	— 1·72	·10	2	8	64·8	29	34·0	17	0	12
XLVI.	Ballinasloe	·60	— 2·03	·19	2	12	60·0	29	32·0	11 _i	4	...
XLVII.	Clifden (Kylemore)	2·47	...	·45	3	19	...	...	...	...	...	...
XLVIII.	Waringstown	1·30	— 1·05	·42	2	13	67·0	25	28·0	20	7	15
XLIX.	Londonderry (Creggan Res.) ..	2·27	— ·46	·42	1	16	...	...	...	...	...	...
L.	Omagh (Edenfel)	1·71	— ·80	·65	1	17	65·0	23	30·0	13 _j	4	7

a And 31. *b* And 30, 31. *c* And 30. *d* And 25. *e* And 23, 25, 30. *f* And 28, 30. *g* And 19, 20. *h* And 29. *i* And 12, 21, 22. *j* And 16.

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

METEOROLOGICAL NOTES ON MARCH, 1893.

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

ENGLAND.

HUNTON COURT.—[In the February table the total R should have been 3·46 in., not 3·65 in.]

STRATHFIELD TURGISS.—A very fine dry March, with hot sun by day and cold winds, and at night sharp frosts quite up to the end of the month.

HITCHIN.—The hottest and finest March in our record of more than 40 years. S on the 16th.

ADDINGTON.—The driest March on record here. From the 3rd until the end absolutely dry, with the exception of just enough R to measure on the 17th. Frost occurred on every night after the 17th, the days being beautifully fine and sunny. Blossom on plum trees was fully out during the last week.

BURY ST. EDMUNDS.—The finest month of March that I have known; the R the least in any March since observations commenced in 1857. The only other March with less than half an inch was 1875, when ·38 in. fell. Much bright sunshine, with high temp. and vegetation very forward. Horse chestnut in full leaf on 31st. S on 16th and 17th.

LANGTON HERRING.—A very beautiful, bright and sunny month. Although E fell on 7 days, the greatest fall was ·08 in., and there was absolute drought for the last 14 days. In the last 18 years in only 4 months has the R here been less; namely: Feb., 1891, ·03 in.; Nov., 1879, ·08 in.; May, 1876, ·18 in.; and July, 1885, 25 in. The mean temp. at 9 a.m., 44°·6, is 3°·3 above the average of 21 years. The fruit trees are between a fortnight and three weeks earlier than usual. Solar halo on 26th; lunar halos on 26th and 27th; fogs on 5 days.

BABBACOMBE.—A very warm, fine, sunny month, with very small R; light winds and a high and generally steady bar. Slight showers from 1st to 4th, on 6th, 7th and 9th and from 13th to 17th, but no R was gauged in the last 14 days. It was fine and sunny from 10th to 12th, 20th to 21st 23rd to 25th, and 28th to 30th. Warm from 1st to 16th, and 21st to 31st. The shade temp. rose above 60° on the last two days. The mean temp., 46°·9, mean shade max., 54°·5, min. in shade, 32°·5, and on grass, 25°·9, were higher, while the total R, ·18 in., and number of wet days 6, were less, than in any of the preceding 16 Marches. S.W. gale on the morning of 1st; solar halos on 7 days; lunar halos on 6 days; H on 17th; fog on 4 days

BODMIN, FORE STREET.—The driest and finest March on record. Very sunny and dry from the 17th to the end of the month, and some days exceedingly hot, especially 23rd, 24th, 25th, 29th and 30th; more like July than March. The hedges are decked with spring flowers, and the black thorn full of blossom.

WOOLSTASTON.—A beautiful month, very dry with a great deal of bright sunshine and frosty nights. Mean temp., 46°·6. S fell on the 16th. A very favourable month for the farmer.

ORLETON.—With the exception of 1852, the driest March recorded in 63 years, and also one of the warmest, the mean max. being the highest in March for 35 years, and the absolute max. the highest since 1858. A very large percentage of bright sunshine throughout, and from 19th to 25th, 7 days absolutely cloudless.

BOSTON.—The smallest recorded rainfall in March since 1850, when the present observations began, excepting 1856, when ·25 in. fell.

MANCHESTER.—For the first eight days the weather was generally damp and foggy, with drizzling rain. H showers on the 16th; a very winterly, cold, windy day, with S and H on 17th. From the 18th the weather was remarkably bright and sunny.

WALES.

Haverfordwest.—One of the finest, driest, and mildest March months recorded here. A very large percentage of sunshine and very little wind. Foliage very early, but owing to absence of rain and the night frosts, grass is exceedingly scarce; if the drought continues, hay will reach a fabulous price. Water is becoming very scarce. Only two drier Marches have occurred in the last 44 years, viz. : 1852, 1.21 in., and 1858, 1.07 in.

Gogerddan.—Very bright throughout the month, and very hot in the sun; scarcely a cloud to be seen.

SCOTLAND.

Cargen.—The first half of the month was wet and rather stormy. Two inches of S fell on 1st and $4\frac{1}{2}$ on the 16th. Early in the morning of the latter day a pretty sharp TS occurred, accompanied by heavy H . The latter half of the month was very fine, the max. temp. one day reaching $63^{\circ} 8$, which is a higher temp. in March than we have had for some years; and a temp. below freezing point occurred on most nights. The range of temp. during the latter part of the month was on several occasions 30° and upwards in 24 hours. N . and E . winds prevailed for 15 days.

Jedburgh.—There was much high temp during the day and low during the night, which checked vegetation a good deal. The dry state of the land and its pulverized condition, was favourable for sowing cereals. It is generally stated to have been the finest seed-time in the memory of man.

Old Cumnock.—Stormy on the 2nd and 14th; H and S on the 16th and 17th; slight frosts at night from 18th to 30th.

Roeberry.—The first part of the month, up to the 18th, was cold and stormy, the rest of the month very fine.

IRELAND.

Darrynane Abbey.—A very fine month, the R being less than one-third of the average of March for the 14 years 1870-79 and 1890-93, and the smallest during that period. On the whole a warm month, the last week quite summer-like; vegetation very forward.

Waterford, Brook Lodge.—Very dry. The driest March for at least 44 years. Mean temp. 46° . H on 15th and 16th; fogs on 4 days, thick on the night of the 23rd; lunar halo on the 29th.

O'Briensbridge, Ross.—A singularly lovely month. R far below the average, and very little frost. An abundance of sunshine and no equinoctial disturbances. Fog on the 30th, for a few hours in the forenoon.

Dublin.—A singularly dry, warm, sunny month, more like May than March. It broke the record as regards height of temp., deficiency of R , and clearness of sky and bright sunshine. The mean temp., ($48^{\circ} 1$), was $5^{\circ} 0$ above the average for the month, and no less than $9^{\circ} 0$ above that of March, 1892. It was even $0^{\circ} 8$ above the mean temp. of March, 1868 ($47^{\circ} 3$), which had proved the warmest March (since these records began in 1865) up to the present year. The deficiency of R was equally striking, the only comparable year for drought in March, being 1871, when, however, $\cdot 82$ in. of R fell on 12 days, against $\cdot 29$ in. on 8 days in the present month. Not one-half of the sky was on the average covered with clouds, and the air was often very dry, consequently the diurnal range of temp. was large; hot sunshine by day being followed by sharp nights. Dry smoke fog on 8 days; high winds on 11 days, reaching the force of a gale on the 1st; S or sleet on the 16th and 17th; and H on the 1st and 16th.

Edenfel.—A month without any of the characteristics of March, and that would have done credit to most Aprils and many Mays. The last week was especially warm and brilliant, with max. shade temperatures ranging from 61° to 65° on five days, a reading higher by 7° than had been made here in March for 29 years. Swallows seen on 5th April, the earliest ever noted.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCXXVIII.]

MAY, 1893.

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THE SPRING DROUGHT OF 1893.

ALTHOUGH not yet of nearly so long duration as some of the partial droughts which occurred in the early part of this century, the drought of 1893 is a very remarkable one, but at the date at which this article has to go to press the drought is unbroken, and therefore it is impossible to treat of it properly. On the other hand it would be wrong to let this number appear without some reference to a drought which has had no equal for more than thirty years. The severity and extent of the April portion of the drought is well shown by the regular and by the supplementary tables, and to keep our readers as fully informed as practicable we add some letters selected from the many with which we have been favoured. They are arranged in the sequence in which the stations occur in *British Rainfall*.

To the Editor of the Meteorological Magazine.

Sir,—I have to report the driest month for the 30 years during which I have observed rainfall.

	Old Gauge. in.		Snowdon. in.
April 6th	·01	Dew	—
„ 16th	·03	„	·03
	—		—
Total.....	·04		·03

The next driest are September, 1865, with ·06 in., February, 1891, with ·10 in., May, 1880, with ·18 in., and April, 1865, with ·24 in.
—Yours truly,

J. ELLIS MACE.

Tenterden, Kent, May 1, 1893.

SIR,—The drought of the last two months has been of an extraordinary character. On the 1st and 2nd of March rain fell, but only to the extent of ·06 in. From then to the 16th absolute drought prevailed, on the 17th ·01 in. fell, and from then till the 15th April absolute drought prevailed again. On the 16th of April ·15 in. fell, and rain fell on three other days in April. The total fall in March being ·07 in., and in April ·32 in. Thus there were two periods of absolute drought, the first being 14 days and the second 29 days in

length. There was partial drought for the whole two months, the number of days being 61, and the total rainfall $\cdot 39$ in. During the latter part of March and the beginning of April there were continuous heavy dews, which no doubt helped vegetation much.—I am, sir, your obedient servant,

C. A. MARKHAM, F.R.Met.Soc.

Sedgebrook, Northampton, May 5th, 1893.

SIR,—Seeing from the *Met. Mag.* that this neighbourhood stands about first for dryness in March, I think perhaps you may like a few details from me. My register tells as follows:—

Mar.	1	...	^{in.} ·05	...	Small showers of rain.
"	2	...	·03	..	" " "
"	3	...	·01	...	" " "
"	7	...	—	...	A very few drops of rain.
"	15	...	—	...	Drops at 8.30 a.m. on 16th.
"	16	...	·02	...	Very short shower of rain at 10 a.m.; and of snow at 8 a.m. on 17th.
"	17	...	·01	...	Smart snow shower at 4 p.m. NONE in gauge next morning; but I felt that it <i>ought</i> to go down as $\cdot 01$ in.
	Total		·12		
Apr.	12	...	—	...	Few drops; so few, that it was a question if any of them fell into the gauge. This was about 8.30 a.m. on 13th.
"	16	...	·10	...	This fall began with odd drops on afternoon of 16th, and most fell during small hours of the night following.
"	17	...	·01	...	Just enough to measure—mostly in evening of 17th.
"	20	...	·01	...	Just enough to measure; but very vivid lightning between 5 and 7 p.m. A horse killed about 6 miles away; and smart rain reported.
"	29	...	·02	...	Shower at 6.30 p.m.
	Total		·14		

Thus our absolute drought might be reckoned from 9 a.m. on March 17th till 4 p.m. on April 16th, and counting the snow of March 17th as rainfall, as I think I must do, the absolute drought extends from March 17th 4 p.m. to April 16th 4 p.m., *i.e.*, 30 full days.

The eight weeks ending 9 a.m., April 29th, gave only $\cdot 15$ in. in all, and the two complete months yielded $\cdot 26$ in.

One swallow does not make a summer, but have you noticed the very remarkable fulfilment for this year of the saying quoted in the *Standard* of February 3rd or 4th:—

“If Candlemas Day brings clouds and rain,
Winter is gone, and won't come again”!!!

Now February 2nd was in a special sense cloudy as well as rainy, low warm clouds from S.W.

My father, aged 84, remembers a spring like this, he is not sure whether it was 1825, 1826 or 1827, though he also remembers distinctly the hot dry summer of 1826. I infer from what I see in the papers that the hot dry spring was in 1826, and that, *quantum valcat*, the presumption is that the dry spring will lead to a dry summer,

instead of, as Professor Falb says, to an abnormally wet summer (only he doesn't say where).

But let me call your attention to these parallels within our own memory :—1868, very hot and dry ; 1872, very wet ; 1874, hot and dry. And then 19 years later :—1887, very hot and dry ; 1891, very wet ; 1893 should be hot and dry.

I remember the dry spring of 1880, and the floods of the summer and autumn.

I remember also the November floods of 1852, but not the spring of that year.

What is to be the end of it ? At any rate there can hardly be any hay in the midland counties.

I noticed ash trees and oaks distinctly in leaf on April 22, whereas in 1891, on June 1st, I could see none.—Yours very sincerely,

H. A. BOYS.

Easton Mauduit Vicarage, Northampton, May 1, 1893.

SIR,—This is so exceptional a year as regards rainfall that you may feel interested in the result of my measurements up to date :—

	in.	in.
Rainfall for JANUARY	1	30
" " FEBRUARY	2	62
" " March 1st	0	17
" " " 3rd	0	05
" " " 13th	0	04
" " " 17th	0	04
" " MARCH	—	0 30
" " April 16th	0	05
" " " 29th	0	03
" " APRIL	—	0 08
		4 30

Total for 4 months... 4 30

Yours faithfully,

FRED. CHANCELLOR.

Chelmsford, Essex, May 1st, 1893.

SIR,—I presume that some account of the drought which has been experienced here with little break since March 2nd will not be unacceptable to you. On 2nd March the fall was 0·21 in., and as the total for the month was exactly 0·40 in. only 0·19 fell during the 30 days of that month. However, I give you the details, such as they are, and they will show the whole matter :—

	Rain.		Rain.
	in.		in.
March 1st	0·21	April 4th.....	0·02
" 3rd	0·03	" 12th.....	0·01
" 13th	0·05	" 16th.....	0·05
" 17th	0·07		
" 18th	0·04		
	0 40	Total.....	0 08
Total.....	0 40		
The Monthly Gauge = 0·44		The Monthly Gauge = 0·08	

There was a slight shower at 7.30 p.m. on the 29th, but not enough "to wet the stones." The amount of evaporation from my sand gauge was

	in.	in.
March	—	1·60
Mean for March in previous 7 years ...	1·22	—
April	—	2·75
Mean for April in previous 7 years.. ...	1·81	—

May 1. The depression of 29th seems to have passed over here without leaving any rain or prospect of any at present, and the barometer is just 30 inches.—Yours sincerely,

SAMUEL H. MILLER.

Lowestoft, Suffolk, April 1893.

SIR,—I send you account of the partial drought which set in on March 2nd, and has continued to the present time:—

	Rainfall. in.		Rainfall. in.
March 1st	·28	April 5th	·01
„ 3rd	·03	„ 12th	·02
„ 7th	·01	„ 13th	·01
„ 13th	·03	„ 16th	·08
„ 16th	·05		
„ 17th	·04	Total...	·12
„ 18th	—		
Total...	·46		

Total for the two months ·58 in.

Thus for the period of 60 days (March 2nd to April 30th inclusive) the fall was ·30 in.

Total Drought, for 17 days..... March 19th to April 4th.

„ „ „ 14 „ April 17th to 30th.

The fall for April is the smallest I have registered here, the previous smallest being in February, 1891, with a fall of 0·14 in. The weather for both months has been sunny in the extreme, but the temperature has not been excessive, as in most parts of England. The highest was only 61° on the 1st and 15th. On the 23rd the thermometer at Cambridge registered 84°, and in London 82°: but at Yarmouth it did not exceed 56°; and so on many days, owing to searching E. winds.—Very truly yours,

W. C. STEWARD.

Hall Plain Chambers, Great Yarmouth, May 1st, 1893.

Unprecedented drought:—

March 16th to April 29th, on which day ·05in. of rain fell; 43 days.

Unprecedented heat:—

	Max. in shade.		Max. in shade.
April 20th	72	April 24th	65
„ 21st	75	„ 25th	72
„ 22nd	76	„ 26th	72
„ 23rd	70	„ 27th	68
In 1870, one day	75°.		

C. SOAMES.

Mildenhall Rectory, Marlborough, Wilts, May 1st, 1893.

SIR,—The last two months have been so remarkably dry that I think that you would be glad to see the amounts registered by me.

Date.	March. in.	April. in.
1st	·14	—
2nd	·07	—
3rd	·07	—
6th	·03	—
15th	·04	—
16th	·11	—
24th	—	·03
29th	—	·06
Total.....	<u>·46</u>	<u>·09</u>

I am, yours faithfully,

Sturminster Newton, Dorset.

A. R. HALLETT.

SIR,—You will be interested to know that the drought seems broken at last :—March 1st, ·41 in. ; 3rd, ·18 in. ; 6th, ·05 in. ; 14th, ·02 in. ; 15th, ·14 in. ; 16th, ·16 in. ; 17th, ·01 in. ; no more in March. April 1st, 0·08 in. ; 16th, ·22 in. ; 17th, ·08 in. ; 29th, ·12 in. (a heavy shower which was snow on hills) ; 30th, ·03 in. (light showers all drying up as fast as it fell) ; May 1st, ·01 in., but to-day it has really been raining steadily all afternoon. The severity of the drought was owing to the great dryness of the air. Even the ·22 in. and ·08 in. in the middle of April wetted only the surface, and till this morning the drought did not seem broken.

F. W. S.

The Vicarage, Aysgarth R.S.O., Yorks, May 2.

RAINFALL AT RODRIGUEZ AND SEYCHELLES.

To the Editor of the Meteorological Magazine.

SIR,—In 1883 you inserted in vol. xviii. of the *Meteorological Magazine*, p. 169, the rainfall observations made up to 1881 in the above-named islands. As Dr. Meldrum has published the continuation of the records to the end of 1890, I think that the following summary may be acceptable.

The seasonal and annual means are :—

	D.J.F. in.	M.A.M. in.	J.J.A. in.	S.O.N. in.	Year. in.	System.
Seychelles (10½ yrs.) ...	38·44	28·85	8·59	22·71	98·59	I.
Rodriguez (15½ yrs.) ...	14·09	13·70	10·99	5·56	44·34	VII.

Yours very truly,

V. RAULIN.

ROYAL METEOROLOGICAL SOCIETY.

The monthly meeting of this Society was held on Wednesday evening, April 19th, at the Institution of Civil Engineers, 25, Great George-street, Westminster, Dr. C. Theodore Williams (President) in the chair.

Dr. R. L. Bowles, Miss E. Brown, Dr. W. C. Falls, Mr. R. Lamont, and Mr. A. R. M. Simkins were elected Fellows of the Society.

The following papers were read :—

1. "The Direction of the Wind over the British Isles, 1876-80," by Mr. F. C. Bayard, F.R.Met.Soc. This is a reduction on a uniform plan of the observations made twice a day, mostly at 9 a.m. and 9 p.m., at 70 stations during the lustrum 1876-80; and the results are given in tables of monthly and yearly percentages.

The paper was illustrated by diagrams thrown on the screen, but their scale being rather small, and the paper not being in type, it was difficult to follow the author. The President, Rev. Clement Ley, Dr. Buchan, Messrs. Jackson, C. Harding, Inwards, and Dr. Ewart took part in the discussion, the latter referring to the marked effect of a sudden shift of wind from N.E. to S.W. on patients suffering from bronchial attacks.

2. "Notes on two Photographs of Lightning taken at Sydney Observatory, December 7th, 1892," by Mr. H. C. Russell, F.R.S., These photographs were taken with a half-plate view lens, mounted in a whole plate camera, and as a matter of course, there is some distortion at the edges. One of the flashes went down into the harbour, and the place is thereby so clearly marked that it was possible by the aid of the trigonometrical map to tell within 3 or 4 feet how far this point was from the observatory, viz., 2,100 feet, hence with the known focal length of the lens it was found that the length of this flash, as far as shown on this plate (probably not all of it), was 1,540 feet.

In the landscape there are white specks which represent the gas lamps in the streets. An examination of these points in the negative shows more clearly than can be seen in the print, that these images are distorted towards the centre of the plate; and it should be mentioned that the centre of these prints is not the centre of the field of view of the lens. The distortion can be clearly seen on the right hand side of No. 1, and it is very marked in the lightning flashes. When examined with a lens these streaks have all the appearance of the so-called ribbon flashes, and an important point which is clearly seen in the negative, but is not visible in the print, is that on the side towards the centre of the plate the deposit of silver is not so great as it is on the other side of the ribbon flash. In fact, it would appear that the distortion in thickness of the flash is due to the same cause as the extension of the gas lamps, and it is on the same side. It seems obvious from these photographs that at least some ribbon-like flashes as shown in photographs have no objective existence.

3. "Notes on Lightning Discharges in the neighbourhood of Bristol, 1892," by Dr. E. H. Cook. The author gives some particulars concerning two trees in Tyntesfield Park which were struck by lightning, one on June 1st and the other on July 18th, and also some notes concerning a flagstaff on the summit of Brandon Hill, which was struck on October 6th.

4. "Constructive Errors in some Hygrometers," by Mr. W. W. Midgley, F.R.Met.Soc. The author, in making an investigation into the hygrometrical condition of the air in a number of cotton mills in the Bolton district, found that the mounting of the dry and wet bulb thermometers and the position of the water receptacle did not by any means conform to the regulations of the Royal Meteorological Society, and were so arranged that they gave the humidity results much too high. The "Cotton Factories Act" of 1889 prescribes the maximum weight of vapour per cubic foot of air at certain temperatures as indicated by the dry and wet bulb hygrometer which is permissible; and the author alleges that many of the instruments at present used in the mills give indications having an error of 20 per cent. against the interests of the manufacturer.

Mr. Scott, Mr. Gaster, Mr. Marriott, and Mr. Symons took part in the discussion. Mr. Scott called attention to the fact that the Kew certificates referred to the thermometers before mounting, and not as made up into hygrometers. Mr. Gaster referred to some experiments he had made which showed that the proximity of the water vessel had no effect on the dry bulb, and which, therefore, were not in accord with Mr. Midgley's results.

REVIEW.

Observations in Meteorology. . . . being the result of a meteorological register kept for ten years (1883-92) at Newton Reigny, Cumberland
. . . by T. G. BENN, F.R.Met.Soc. 8vo., Simpkin and Co., London (1893), 48 pages.

Mr. Haviland has lately been writing a big book dealing with the prevalence of certain diseases in some parts of the Lake district. The pamphlet before us suggests another investigation, viz., why the climate of Carlisle induces observers to make long and accurate series of meteorological observations. We are not sure that we could find any other part of England to compare with a twelve mile radius round Carlisle for good and long-continued observations. Taking only the present century, we have valuable records in Carlisle itself from Mr. Pitt, Dr. Elliot, Mr. Atkinson (the maker of the first English map of the fall of rain) the Rev. Mr. Rees and Dr. T. Barnes, while well within the limit we have had Silloth, and still have Scaleby and Newton Reigny. It is not due (as might be imagined) to its being exceptionally wet, for there is nothing exceptional about the rainfall, and strangely enough, although in the

In Table X. he gives the mean of those of the old pattern as under:—

Mean temp.	{	at 3 in.	...	1 ft.	...	2 ft.	...	3 ft.	...	4 ft.
		45°·1		45°·9		46°·1		46°·2		45°·8

This indicates a maximum at about 3 feet and a decrease both above and below, but if we correct these readings according to the comparisons in the introduction we obtain a nearly steady rise:—

{	at 3 in.	...	1 ft.	...	2 ft.	...	3 ft.	...	4 ft.
	45°·1		45°·8		45°·8		46°·2		46°·1

The pamphlet is one which records good work, and will be useful for future generations.

RAINFALL AT CHICHESTER.

To the Editor of the Meteorological Magazine.

SIR,—You are aware that I have recorded the rainfall at Chichester during more than 50 years, but as you intimate in your *Meteorological Magazine* for April, 1893, that information relating to Sussex records would be acceptable, I beg to send a few particulars as to that in my possession. It was begun by Mr. Hills, the Curator of the Chichester Literary and Philosophical Society, with January, 1835, the gauge being at Kingsham until August, 1837. Then there was no record for five months, and from March, 1838, till December, 1873, he kept the record of a gauge on the lawn of the Infirmary. I was elected as physician to the Infirmary in 1840, and from 1841 till 1854 copied Mr. Hill's record. With 1854 I began to register from a gauge of my own at Westgate, which record has been uninterrupted up to this date.

Perhaps some notes drawn from my register by my son, G. Ashley Tyacke, might be of some interest to you.

The average annual rainfall at Chichester, calculated on 50 years, from 1839 to 1888 inclusive, is 28·57 inches.

The rainfall for each month is:—

Oct.	Nov.	Sept.	Jan.	Dec.	Aug.	July.	Feb.	June	May.	Mar.	April
3·60+	3·01	2·93	2·67	2·54	2·39	2·28	1·97	1·91	1·87	1·81	1·59—
+ Wettest.						— Driest.					

Table showing average rainfall up to end of each succeeding month:—

Jan.	Feb.	Mar.	April	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
2·67	4·64	6·45	8·04	9·91	11·82	14·10	16·49	19·42	23·02	26·03	28·57 in.

The above calculations will give a general idea of the monthly and annual rainfall at Chichester.

Yours sincerely,
N. TYACKE, M.D.

Westgate, Chichester, April 29, 1893.

RAINFALL IN BRISBANE.

To the Editor of the Meteorological Magazine.

SIR,—In connection with your article on “The Queensland Floods,” I have pleasure in sending you the actual rainfall in Brisbane itself from the 1st to the 18th February, the period which covered the three disastrous recurring floods. The reason why so much prominence was given to the fall at Crohamhurst in the *British Australasian* newspaper was because Mr. Clement Wragge, the Queensland Meteorological Officer, ascribes the terrible flood in the Brisbane River on Sunday, February 5th, mainly to this rainfall in the Blackall Ranges, which drains into the Stanley River, a tributary of the Brisbane. Mr. Jones emptied his gauges every three hours. Communication between his station and Brisbane was cut off, or he would have been able to warn Mr. Wragge what was coming, and so have enabled the Brisbane people to save their furniture and goods to a greater degree than was the case. During the period I have named above, the city of Brisbane and the town of Ipswich were visited by three distinct floods, the highest of which rose about 15 feet above the records. In Gundagai, New South Wales, one of the “lions” is the skeleton of a bullock high up in a gum tree, to which the inhabitants point with a just pride as giving an idea of the capacity of their local river in flood time, but the details from poor Queensland beat the bullock. There are vague traditions amongst the blacks of fearful floods in the dim past, and I have always thought that Australia, especially that most interesting and valuable portion, the eastern coast line, has something in reserve for us in the matter of climatic phenomena. It is but a matter of a few years that exact weather observations have been taken. I now proceed to give the rainfall at Mrs. Coxen’s station, Omega, Bulimba, Brisbane:—

	in.		in.		in.		in.
Feb. 1	11·60	Feb. 6.....	3·33	Feb. 11.....	4·36	Feb. 16.....	2·15
„ 2.....	4·80	„ 7.....	·86	„ 12.....	·73	„ 17.....	10·20
„ 3.....	5·20	„ 8.....	·27	„ 13.....	·10	„ 18.....	4·92
„ 4.....	4·35	„ 9.....	·06	„ 14.....	1·62		
„ 5.....	4·22	„ 10.....	·03	„ 15.....	·20	Total ...	59·00

Yours faithfully,

J. TROUBRIDGE CRITCHELL.

9, Cardigan Road, Richmond Hill.

April 22, 1893.

[We are much obliged to Mr. Critchell for making some of the facts plain; but we are surprised that Mr. Wragge has not issued the daily fall at all stations in the district affected. The Crohamhurst record may be correct, but it would be none the worse for support from other stations.—ED.]

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1892.

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	60·8	14	30·8	2	50·2	40·6	42·5	90	86·8	25·6	2·53	15	8·0
Malta.....	81·6	2	47·6	30	69·4	58·7	55·0	80	131·3	41·0	7·33	13	5·2
<i>Cape of Good Hope</i>	91·9	24	46·6	17	71·0	55·3	...	...	...	1·99	4	4·5	...
<i>Mauritius</i>	84·4	14a	65·0	18	81·9	68·6	64·9	73	140·0	57·1	1·84	18	5·4
Calcutta.....	84·8	5	54·2	27	80·0	61·2	61·8	77	144·7	44·5	1·74	2	1·2
Bombay.....	88·3	6	69·0	30	86·2	71·8	66·1	66	134·6	56·3	·67	1	0·7
Ceylon, Colombo	89·0	29	71·0	6	85·9	73·9	71·3	80	156·0	65·0	5·86	20	5·7
<i>Melbourne</i>	90·8	19	45·0	3	70·6	51·7	52·7	73	143·1	36·4	2·74	11	5·9
<i>Adelaide</i>	97·6	18	44·6	11	80·2	57·9	50·5	52	162·4	37·2	·63	8	4·4
<i>Tasmania, Hobart</i>.....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Wellington</i>	73·0	23	48·0	1c	66·5	54·9	52·7	75	130·0	40·0	1·65	14	4·3
<i>Auckland</i>	75·0	14b	53·0	2	70·3	57·5	58·2	83	139·0	42·0	4·65	15	5·5
Jamaica, Kingston.....	89·9	6	66·3	29	86·4	70·1	69·7	78	...	...	2·99	7	...
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto.....	52·4	16	14·3	23	40·3	29·9	30·9	80	...	...	2·18	27	8·9
New Brunswick, Fredericton	61·7	19	12·2	12	41·1	26·9	32·1	82	...	...	4·84	15	7·6
Manitoba, Winnipeg.....	43·9	2	—18·5	23	25·4	4·8	...	...	...	...	2·26	11	6·6
British Columbia, Esquimalt.....	53·1	3, 5	30·3	25	45·9	38·5	41·4	93	...	...	10·34	28	8·4

a And 29. b And 26. c And 17, 18.

REMARKS.

MALTA.—Mean temp. 62°·5. Mean hourly velocity of wind 9·1 miles. The sea temp. fell from 73°·0 to 66°·4. Thunderstorms on 10th, 11th, and 15th; lightning on 18th. Rainfall double the average. J. SCOLES.

Mauritius.—Mean temp. of air 0°·1 above, dew point 0°·6 above, and rainfall 10 in. below, their respective averages. Mean hourly velocity of wind 10·6 miles, or 0·3 miles below average; extremes, 26·3 on 14th and 2·1 on 27th; prevailing direction E. S. E. to E. by N. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on 13 days; lightning alone was seen on 9 days. In the interior of the island a distinct shock of earthquake for about 15 or 20 seconds was felt on the evening of 8th at Holmwood, Queensland, Maussagala, Hakgala, Udahena, &c., and a second slighter one was felt on the morning of the 23rd at the first three stations only. J. C. H. CLARKE, Lt.-Col. R. E.

Melbourne.—Thunder and lightning on the 4th and 5th; lightning in N. and S. on 21st, S. W. on 23rd. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 2°·2 above average of 35 years. R 34 in. below average. C. TODD, F.R.S.

Wellington.—On the whole fine weather during the month; frequent light showers, but small total rainfall. Prevailing N. W. winds, frequently strong. Earthquake on 9th at 8.30 a. m., slight, and on 30th, very slight. Mean temp. 4°·2 above the average; R 2·52 in. below average. R. B. GORE.

Auckland.—A wet and disagreeable month, the rainfall being nearly two inches above the average, and, with one exception, the highest recorded for the month. Mean temp. and barometrical pressure close to the average. T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL,
APRIL, 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.			in.
II.	Dorking, Abinger Hall.	·10	XI.	Builth, Abergwessin Vic.	·27
„	Birchington, Thor	·00	„	Rhayader, Nantgwillt..	·26
„	Brighton, Prestonville Rd	·06	„	Corwen, Rhug	·63
„	Hailsham	·06	„	Carnarvon, Cocksidia ...	·86
„	Ryde, Thornbrough	·04	„	I. of Man, Douglas	1·44
„	Alton, Ashdell	·06	XII.	Stoneykirk, Ardwell Ho.	1·65
III.	Oxford, Magdalen Col...	·05	„	New Galloway, Glenlee	1·39
„	Banbury, Bloxham	·21	„	Melrose, Abbey Gate ...	·76
„	Northampton, Sedgbrook	·32	XIII.	N. Esk Res. [Penicuick]	·90
„	Alconbury	·13	„	Edinburgh, Blacket Pl..	1·64
„	Wisbech, Bank House..	·17	XIV.	Glasgow, Queen's Park.	1·11
IV.	Southend	·00	XV.	Islay, Gruinart School..	3·18
„	Harlow, Sheering	·08	XVI.	Dollar.....	1·03
„	Colchester, Lexden.....	·07	„	Balquhider, Stronvar..	1·44
„	Rendlesham Hall	·04	„	Coupar Angus Station..	·72
„	Diss	·09	„	Dunkeld, Inver Braan..	1·34
„	Swaffham	·06	„	Dalnaspidal H.R.S. ...	2·11
V.	Salisbury, Alderbury ...	·10	XVII.	Keith H.R.S.	1·19
„	Bishop's Cannings	·00	„	Forres H.R.S.	·95
„	Blandford, Whatcombe .	·08	XVIII.	Fearn, Lower Pitkerrie.	1·06
„	Ashburton, Holne Vic....	·52	„	Loch Shiel, Glenaladale	3·59
„	Okehampton, Oaklands.	·54	„	N. Uist. Loch Maddy ...	1·39
„	Hartland Abbey	·51	„	Invergarry	1·55
„	Lynmouth, Glenthorne.	·14	„	Aviemore H.R.S.	1·16
„	Probus, Lamellyn	·07	„	Loch Ness, Drumnadrochit	1·61
„	Wincanton, Stowell Rec.	·14	XIX.	Invershin	1·59
„	Weston-super-Mare	·07	„	Scourie	1·36
VI.	Clifton, Pembroke Road	·07	„	Watten H.R.S.	·47
„	Ross, The Graig	·20	XX.	Dunmanway, Coolkelure	1·85
„	Wem, Clive Vicarage ...	·45	„	Fermoy, Gas Works ...	1·07
„	Cheadle, The Heath Ho.	·53	„	Killarney, Woodlawn ...	1·27
„	Worcester, Diglis Lock	·27	„	Tipperary, Henry Street	·80
„	Coventry, Coundon	·43	„	Limerick, Kilcornan ...	·89
VII.	Ketton Hall [Stamford]	·43	„	Ennis	1·16
„	Grantham, Stainby	·39	„	Miltown Malbay.....	2·12
„	Horncastle, Bucknall ...	·15	XXI.	Gorey, Courtown House	·34
„	Worksop, Hodsck Priory	·34	„	Mullingar, Belvedere ...	1·10
VIII.	Neston, Hinderton	·75	„	Athlone, Twyford	·86
„	Knutsford, Heathside...	·58	„	Longford, Currygrane...	·93
„	Lancaster, Rose Bank...	·35	XXII.	Galway, Queen's Coll...	2·13
„	Broughton-in-Furness...	1·56	„	Crossmolina, Enniscoe...	2·14
IX.	Ripon, Mickley	·61	„	Collooney, Markree Obs.	1·58
„	Scarborough, South Cliff	·61	„	Ballinamore, Lawderdale	1·72
„	EastLayton [Darlington]	·53	XXIII.	Lough Sheelin, Arley ..	1·04
„	Middleton, Mickleton..	·67	„	Warrenpoint	·95
X.	Haltwhistle, Unthank..	·78	„	Seaforde	1·49
„	Bamburgh	·76	„	Belfast, Springfield	1·97
„	Newton Reigny	·43	„	Bushmills, Dunderave...	1·47
XI.	Llanfrechfa Grange	·33	„	Stewartstown	1·50
„	Llandoverly	·11	„	Buncrana	1·16
„	Castle Malgwyn	·34	„	LoughSwilly, Carrablagh	1·48

APRIL, 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 '01 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	.24	- 1.50	.20	19	3	78.2	20	30.9	13	1	4
II.	Maidstone (Hunton Court)...	.02	- 1.63	.02	16	1	...	...	...	...	...	...
III.	Strathfield Turgiss .....	.12	- 1.48	.09	16	2	84.2	18	24.1	14	5	15
IV.	Winslow (Addington) .....	.11	- 1.81	.08	16	3	80.0	20	21.0	14	6	12
V.	Bury St. Edmunds (Westley)	.08	- 1.58	.07	16	2	73.0	20	25.0	4	...	...
VI.	Norwich (Cossey) .....	.10	- 1.61	.10	16	1	...	...	...	...	...	...
VII.	Weymouth (Langton Herring)	.15	- 1.73	.11	29	2	70.5	26	33.0	14	0	...
VIII.	Torquay, Babbacombe .....	...	...	...	...	4	...	...	...	...	...	...
IX.	Bodmin (Fore Street) .....	.28	- 2.79	.10	16	4	...	...	...	...	...	...
X.	Stroud (Upfield) .....	.04	- 2.11	.02	1, 16	2	80.0	21	33.0	13	0	...
XI.	Church Stretton (Woolstaston)	.34	- 2.00	.18	16	5	77.0	20a	32.0	12	1	13
XII.	Tenbury (Orleton) .....	.69	- 1.39	.42	1	5	79.8	21	26.0	14	5	11
XIII.	Leicester (Barkby) .....	.30	- 1.80	.18	16	5	83.0	19	20.0	13	9	21
XIV.	Boston .....	.15	- 1.56	.11	16	3	83.0	23	26.0	14	3	...
XV.	Hesley Hall (Tickhill) .....	.30	- 1.41	.18	16	4	78.0	20b	26.0	3	9	...
XVI.	Manchester (Plymouth Grove)	.47	- 1.24	.21	16	5	79.0	21	30.0	2	1	8
XVII.	Wetherby (Ribston Hall) ...	.67	- 1.18	.22	2	5	...	...	...	...	...	...
XVIII.	Skipton (Arncliffe) .....	.61	- 2.82	.16	16	5	...	...	...	...	...	...
XIX.	Hull (Pearson Park) .....	.38	- 1.54	.12	16	5	65.0	19c	10.0	10d	6	14
XX.	Newcastle (Town Moor) .....	.46	- 1.37	.27	16	7	...	...	...	...	...	...
XXI.	Borrowdale (Seathwaite)	1.59	- 5.55	.56	29	7	...	...	...	...	...	...
XXII.	Cardiff (Ely) .....	.20	- 2.21	.11	1	3	...	...	...	...	...	...
XXIII.	Haverfordwest .....	.40	- 2.23	.11	1	6	76.1	22	27.0	13	5	13
XXIV.	Aberystwith, Gogerddan .....	.53	- 2.03	.40	1	3	82.0	21	22.0	12	...	...
XXV.	Llandudno .....	.87	- .94	.47	16	5	...	...	...	...	...	...
XXVI.	Cargen [Dumfries]	1.07	- 1.16	.49	16	7	76.4	24	28.4	12	4	...
XXVII.	Jedburgh (Sunnyside) .....	.62	- 1.08	.17	15	7	71.0	20	26.0	12	5	...
XXVIII.	Old Cumnock	1.26	- .87	.38	16	9	...	...	...	...	...	...
XXIX.	Lochgilhead (Kilmory)	2.77	- .04	1.30	15	8	...	...	28.0	11	5	...
XXX.	Oban (Craigvarren) .....	...	...	...	...	...	...	...	...	...	...	...
XXXI.	Mull (Quinish)	1.80	- 1.18	.49	15	11	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	1.00	- 1.22	.60	16	4	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	1.45	- .60	.50	20	9	65.2	20	28.1	9	3	...
XXXIV.	Braemar	1.26	- 1.16	.40	15	10	71.0	24	23.0	9	12	23
XXXV.	Aberdeen (Cranford) .....	.66	...	.17	17	12	63.0	18	29.0	11	2	...
XXXVI.	Strome Ferry	1.90	- 1.02	.35	29	12	...	...	...	...	...	...
XXXVII.	Cawdor [Nairn]	1.59	+ .07	.58	15	13	...	...	...	...	...	...
XXXVIII.	Dunrobin	1.45	- .28	.53	29	10	61.0	23	31.0	16	...	...
XXXIX.	S. Ronaldsay (Roeberry) .....	.66	- .95	.22	2	12	63.0	19	32.0	10	1	...
XL.	Darrynane Abbey	1.26	...	.39	15	10	...	...	...	...	...	...
XLI.	Waterford (Brook Lodge) ...	.62	- 1.85	.40	17	4	70.0	25	28.0	14	4	...
XLII.	O'Briensbridge (Ross) .....	.96	...	.33	16	9	72.0	21b	32.0	2	1	...
XLIII.	Carlow (Browne's Hill) .....	.61	- 1.67	.23	17	8	...	...	...	...	...	...
XLIV.	Dublin (FitzWilliam Square)	1.05	- 1.07	.37	17	7	66.8	22	36.2	14	0	5
XLV.	Ballinasloe .....	.81	- 1.53	.22	30	9	68.0	22	31.0	3	2	...
XLVI.	Clifden (Kylemore)	2.35	...	.74	17	9	...	...	...	...	...	...
XLVII.	Waringstown	1.15	- 1.27	.68	16	5	74.0	24	29.0	9	6	9
XLVIII.	Londonderry (Creggan Res.) ..	1.30	- .94	.29	15	10	...	...	...	...	...	...
XLIX.	Omagh (Edenfel)	1.59	- .64	.77	16	7	70.0	22	30.0	9	2	5

a And 21. b And 24. c And 20, 27. d And 14.

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

METEOROLOGICAL NOTES ON APRIL, 1893.

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

ENGLAND.

STRATHFIELD TURGISS.—The driest April ever recorded at this station, with uninterrupted sunshine, but frost at night to the very end of the month. First swallow seen on the 2nd, cuckoo heard on the 12th, nightingale on the 16th. Horse chesnut in flower on 18th, and lilac on 21st.

ADDINGTON.—This month has been not only remarkable for its small rainfall, but also for the very high readings of the ther. during the latter part, the max. in shade reaching or exceeding 70° on seven consecutive days, and giving an average for that period of 76° . Between 1871 and 1892, both years inclusive, a max. of 70° and upwards has been recorded 13 times, and five out of the 13 occurred in 1874. This alone shows the exceptional heat. R was very much needed at the close, only one quarter of an inch having fallen during 61 days, that is since the end of February.

BURY ST. EDMUNDS.—The driest April registered since observations commenced in 1857; 1865 is next with $\cdot 37$ in. The drought is most serious in this part of Suffolk, the more so as vegetation is about a month more forward than usual. Lilacs in full bloom on the 19th. The hay crop must be very short, much barley is not sown, and a great deal that is, cannot come up.

LANGTON HERRING.—The absolute drought which began on March 18th extended to April 21st inclusive, 35 days; a few drops of R fell on April 16th, but so few, that none fell in either of my rain gauges. The longest absolute droughts previously were, 29 days from June 7th to July 5th, 1887, and 26 days from August 9th to September 4th, 1880. The total fall in March and April was only $\cdot 47$ in., the previous smallest fall in two successive months being $\cdot 82$ in. in November and December, 1879. It was the hottest as well as the driest April since observations commenced in 1874, the mean 9 a.m. temp. being 5° above the average of 21 years, and about equal to the average of May. High winds from E. on 21st and 22nd.

BODMIN, FORE STREET.—A very hot and dry month; only four wet days, and very little R on those days. A record month. Showers are much needed for every crop. Swallows plentiful. Only $\cdot 67$ in. of R registered in March and April.

WOOLSTASTON.—The drought continued throughout the month, R falling slightly on only five days. Till the 15th, the nights were very cold, with frost on the grass nearly every night. In the latter part of the month the temp. was that of summer. The blossom on the fruit trees was exceptionally fine, and the oaks were in full leaf and the hawthorn in blossom by the 3rd week. Cuckoo heard on 21st. Mean temp. $50^{\circ} \cdot 7$.

ORLETON.—Another remarkably fine, dry month; the driest April since 1854. The mean temp. of the month was $3^{\circ} \cdot 7$ above the average, and although April, 1865, '68 and '74 were all rather warmer, the mean of the maxima was far higher than in either of those years. The absolute max., $79^{\circ} \cdot 8$ on the 21st, was the highest ever recorded here in April. A very heavy and partial storm of R occurred on the evening of the 1st, but it only extended a very little distance on either side of this place. The earliest spring ever known here, apple trees in full bloom on 21st, cuckoo heard on 13th.

BARKBY.—Temp. for the month: Mean max. $65^{\circ} \cdot 5$; mean min. $34^{\circ} \cdot 7$; mean, $50^{\circ} \cdot 1$. Swallow seen on 10th, nightingale heard on 22nd, cuckoo on 20th. Heavy T and L on the 20th.

MANCHESTER.—The hottest and driest April in my record of 27 years. The whole month was fine summer weather, with the exception of the last three days, which were cold and windy.

WALES.

HAVERFORDWEST.—With the exception of April, 1854, when the total rainfall was .30 in. (in that April .01 in. fell on the 1st, absolute drought lasted till the 20th, when .26 in. fell, and on the 28th .03 in. fell), this is the driest April, and certainly the finest and warmest, in my record of 44 years. The temp. rose above 70° on five days, and on the night of the 22nd did not fall lower than 55°·1. During the period of great heat from the 21st to 27th, the air was very dry, the difference between wet and dry bulbs ranging from 9° to 12°. Fruit very forward, gooseberries as large as seen usually at the end of May. May in blossom on the 24th in conjunction with the gorse, a phenomenon never before seen here. Oak and ash in full leaf on the 25th, all other trees and shrubs fully one month earlier than usual. My currant trees laden with fully-formed fruit. No such April in living memory.

GOGERDDAN.—Bright and very dry throughout the month, with N.E. winds.

SCOTLAND.

CARGEN.—The mean temp., 49°·9, is 4°·2 above the average, and the highest recorded here since observations commenced 34 years ago. The max. temp. of the month, 76°·4, is the highest in April during the same period. There were 246 hours of sunshine (13 hours more than the average for June and July), the average for the month being 166 hours. The only April that offers a comparison with this month was in 1865, the mean temp. being 49°·4, the max. temp. 72°·9; hours of sunshine, 241; rainfall, .71 in. The oaks and a few ashes were in leaf at the close, horse chesnuts, lilacs, laburnums, &c., at least four weeks earlier than usual, and a Westeria on the garden wall was in full bloom at the end of the month. E. winds prevailed for 20 days. L on the evening of the 19th.

JEDBURGH.—The dryness has been great. Old men accustomed to notice peculiarities of weather are unanimous in the opinion that the like of this has not been within their recollection. The cereals have been sown in land highly favourable, and this has allowed the land to be thoroughly cleaned. The lands look well, and grass is far advanced. The tree and bush fruits look well, the bloom is far advanced, and promises an abundant crop. The swallow arrived on 23rd.

OLD CUMNOCK.—During the early part of the month heavy dews prevailed in the early morning, sometimes inclining to frost. Vegetation about three weeks earlier than last year. H on 29th and 30th.

MULL, QUINISH.—The earliest spring for many years. Cuckoo heard on 16th. Hawthorn in blossom on 29th, grass in abundance.

ROEBERRY.—A very fine month throughout; the finest April since 1878. R 1·13 in. less than the average of 26 years.

IRELAND.

DARRYNANE ABBEY.—Very fine and hot, especially the first three weeks, which were more like July than April. Vegetation very forward, hawthorn in flower fully a month earlier than usual, and roses which usually flower in June already in bloom.

WATERFORD, BROOK LODGE.—The driest April since 1854, when only .30 in. was registered. Mean temp., 50°·5.

O'BRIENSBRIDGE, ROSS.—Quite a summer month of brilliant sunshine and rapid vegetation. The oak was in full leaf before the end of the month, and all bulbous plants and flowering shrubs were fully 15 days in advance of an average season. Orchards and bush fruit very promising. Vivid L and some T on the 21st.

DUBLIN.—April proved a fitting sequel to the record-breaking March of 1893. Like its predecessor, it was characterised by drought, bright sunshine

and a high temp. The mean amount of cloud was only 4·0, falling at 9 p.m. to 3·3. So powerful was the heating power of the sun by day that, notwithstanding free radiation by night, the temp. did not fall below 36°·2 in the screen, and 28°·9 on the grass. The drought was happily interrupted in Ireland by copious falls of E on the 16th and 17th, and again on the 29th and 30th. In the matter of temp., April, 1893, breaks the record, the mean being 3°·7 above the average, and 1°·0 above the mean of the Aprils of 1865 and 1874, which had been the warmest since the present records began. Lunar halo on the 26th; fogs on the 6th and 17th; high wind on four days. No S or sleet, but H on the 29th. The temp. exceeded 50° in the screen on every day; it rose above 60° on 11 days, but never fell to 32°. The min. on the grass was 32° or less, on five nights.

EDENFEL.—Another month of marvellous serenity, and prevalence of warm, bright sunshine, and although the wind was from a polar or easterly quarter for 24 days, the amount of frost was insignificant. These conditions, coupled with a sudden and heavy rainfall on the 17th and 18th, produced a vegetation of extraordinary precocity and luxuriance, even ash and oak bursting into leaf at the close. All summer migrants about 14 days, and ordinary vegetation a full month, earlier than the average.

THE MAXIMUM SHADE TEMPERATURE IN APRIL, 1893.

I HAVE seen several statements as to the unprecedented heat of April 20th. It may have been without precedent at other stations, but was not so at Camden-square, as the following list of higher maxima in shade, in April, in previous years will show.

In 1893	the max.	on April 20th	was	78°2
„ 1859	„ „ „ „	7th	„	78·5
„ 1865	„ „ „ „	27th	„	81·4
„ 1866	„ „ „ „	27th	„	79·4
„ 1869	„ „ „ „	14th	„	78·5
„ 1870	„ „ „ „	20th	„	79·4
„ 1874	„ „ „ „	23rd	„	79·2

It has therefore been exceeded six times in the last 34 years, but as the most recent case occurred twenty years since it is not surprising that these instances have been forgotten.

Very much the same tale is told by the mean temperature at 9 a.m. in April. The mean in 1893 was 50°·8, the higher means have been :—

1865	.....	53·5	|	1869	.....	52·5
1866	.....	54·1	|	1870	.....	51·1
1867	.....	51·3	|	1874	.....	51·9

there being again six Aprils with higher mean temperatures at 9 a.m.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCXXIX.]

JUNE, 1893.

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THE DROUGHT.

ALTHOUGH at the majority of stations the "Partial Drought," which began with March and continued throughout April, was brought to an end by rain between the 15th and 21st of May; the period since then has again been very dry, and so continues (up to June 12th). This being the case, it seems unwise to attempt to write its history. But in case anyone should imagine that it is unprecedented, we give the figures for Greenwich for 1844 and for 1893 in identical arrangement:—

1844.		Total.	
		in.	days.
March (from 11th)	12th, '15; 14th, '36; 22nd, '07 ..	From 11th ...	'58 ... 21
April	12th, '17; 13th, '02; 26th, '04 .....	... ..	'23 ... 30
May	7th, '01; 9th, '02; 29th, '12 .....	... ..	'15 ... 31
June	5th, '02; 10th, '01; 17th, '02; 18th, '03 ...	To 23rd	'08 ... 23
		1·04	105
1893.		Total.	
		in.	days.
March (from 2nd)	3rd, '04; 4th, '10; 13th, '01; } 14th, '01; 16th, '07; 17th, '02	From 2nd ...	'25 ... 30
April	17th, '04; 20th, '06; 29th, '02 .....	... ..	'12 ... 30
May	1st, '01; 16th, '01; 17th, '30; 18th, '01; } 19th, '03; 20th, '02; 23rd, '02; 29th, '08; } 30th, '06 .....	... ..	'54 ... 31
June	4th, '01; 7th, '18	To 10th	'19 ... 10
		1·10	101

To the Editor of the Meteorological Magazine.

SIR,—The following figures will show that even in the centre of Ireland we have had a partial drought of severity and extraordinary duration, only 1·44 in. of rain having fallen from March 1st to May 16th inclusive, on 17 of the 77 days.

The copious fall (1·96 in.) from 17th—23rd May has been invaluable, and crops are now growing rapidly. Vegetation generally is a month earlier than usual.

1893.					
March	in.	April	in.	May	in.
March 1 ...	.02	April 15 ...	.14	May 17 ...	.20
„ 2 ...	.13	„ 16 ...	.26	„ 18 ...	.47
„ 3 ...	.06	„ 17 ...	.16	„ 19 ...	.43
„ 5 ...	.02	„ 22 ...	.01	„ 20 ...	.37
„ 7 ...	.02	„ 28 ...	.05	„ 21 ...	.26
„ 10 ...	.03	„ 30 ...	.03	„ 22 ...	.16
„ 13 ...	.07			„ 23 ...	.07
„ 18 ...	.27	May 1 ...	.07		—
„ 31 ...	.06	„ 15 ...	.04		1.96
	—				
	.68		.65		
			.11		
			1.44		

Yours truly,

M. FRASER.

Hazelfort, Shinrone, May 24th, 1893.

SIR,—The partial drought still continues, and it may be of interest to have the details. At present there is not the slightest sign of any change; in fact, everything points to a long continuance of the drought, which daily becomes more and more serious. The hay crop will be an almost entire failure, so will be the oat and root crops, and the difficulty will be to find a substitute for them at any reasonable rate.

1893.

March	in.	May	in.	June	in.	
March 13 ...	.09	May 17 ...	.09	June 4 ...	.13	Thunder shower p.m.
„ 16 ...	.04	„ 18 ...	.07	„ 6 ...	.03	
„ 17 ...	.08	„ 19 ...	.01		—	
April 16 ...	.05	„ 20 ...	.07			„, to the 10th .89 in 99 days!
May 16 ...	.04	„ 29 ...	.19			

Thus beating the Uckfield record for both 1844 and 1854, viz. :—

1844	March 14th to June 16th .....	.89 in. in 93 days.
1854	Feb. 6th ,, April 30th .....	.59 ,, ,, 84 ,,

Yours very truly, C. LEESON PRINCE.

The Observatory, Crowborough, Sussex, June 10th, 1893.

NEW ISSUE OF OLD METEOROLOGICAL BOOKS.*

It is given to some persons to dream dreams, to others to realize them. Having formed a considerable collection of works upon Meteorology from the very infancy of printing, it has long been a day-dream of ours to reprint some of the most rare, with a moderately literal translation, and a few notes. Our energetic correspondent Dr. Hellmann has not merely had a somewhat similar dream, but

* Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus herausgegeben, von Prof. Dr. G. Hellmann.

No. 1.—L. Reynman. Wetterbüchlein Von wahrer Erkenntniss des Wetters. 1510.

No. 2.—Blaise Pascal. Récit de la Grand Expérience de l'Equilibre des Liqueurs. Paris: 1648.

4to. Berlin: A. Asher and Co., 1893.

has realised it. Thanks to the help of the German Meteorological Society and of its Berlin branch, and doubtless to much gratuitous work on the part of Dr. Hellmann, and to the co-operation and resources of the great publishing house of A. Asher and Co., of Berlin, a series of publications has been commenced, most moderate in price (considering the beauty of their reproduction) and of the highest interest. Dr. Hellmann's plan differs from ours in that he does not give any translation, but on the other hand, he reprints in perfect facsimile, and he gives an introductory account of each work, which we do not think it an exaggeration to say is superior to anything which any other living person could write. In the prospectus Prof. Hellmann announces his intention to reprint in facsimile a few (perhaps a dozen at the most) of the rarest and most important early tracts and maps relating to Meteorology and to Terrestrial Magnetism, each being preceded by a bibliographical note, and, where possible, by a biographical account of the author and an explanation of the leading features of importance in the tract or map. The size of each part will be small quarto (about 10 inches by 8 inches), each being complete in itself. Not more than two will be issued in any one year, and, if we may judge from the two numbers now before us, the cost will be about 5s. each part.

We must now say a few words respecting the first two numbers of this series—numbers which we shall not be at all surprised to find in a year or two, like Merle's MS., worth three or four times their original cost.

No. 1.—This is the reproduction of one of the many "Wetterbüchlein" issued in the 16th century. They were really popular guides to the weather, partly astrological, and partly incorporations of popular weather proverbs. The one selected is believed to be the oldest book upon the weather printed in German, and is dated 1510; it is moreover, reproduced from the copy in Dr. Hellmann's library, which is believed to be unique.

The first twenty-five pages are devoted to a list (with copious notes) of other editions of, or resembling, the present work; this is followed by details as to the compilation and translation of the work, which occupy 16 pages more, and this is followed by the reprint itself, occupying a final 14 pages.

Dr. Hellmann is so thoroughly a master—in fact we may say *the* master—of his subject that it is very dangerous for any one to express any difference of opinion, but while we think that Dr. Hellmann has proved that Reynman quoted largely (as he himself says) from Bonatus, we should have pointed out that much of Bonatus is to be found in Aratus and other early writers.

Like Dr. Hellmann, we have tried, and failed, to trace the section entitled—

*Das wetter zuwissen durch die vier
quart des jars, als Diechtenperger setzt.*

The subject is treated so much in the style of Alkindus that we took down our copy, but have not found the passage. Considering, however, how careless persons were three or four centuries ago as to the spelling of names, we are not at all sure that this is not the right direction in which to search, because undoubtedly the section is much in the style of Alkindus's writing, and the printer of our copy of Alkindus was a Liechten Here is the title—

Astrorū { Alkind } de plunijs imbribus et
indices { Gaphar } betis : ac aeris mutatioe

Venetiis Anno Dñi. 1507.

Ex officina Petri Liechtenstein.*

Is it possible that Reynman wrote from memory, and substituted the printer's name (imperfectly) for that of the author? But if so, how is it that we cannot find the section? We must leave the solution to others.

No. 2.—This second reprint is that of a pamphlet entitled, "Récit de la grande Expérience de l'Equilibre des Liqueurs," by Blaise Pascal. Paris: 1648.

As most persons are aware, Pascal was the first to prove that the mercury in a barometer tube was supported by the pressure of the air, which he did by inducing a friend to fill two tubes with mercury, ascertain what they read, and that they agreed at Clermont Ferrand, and then to empty one and carry it to the top of the Puy de Dôme (3,550 feet above Clermont), fill it there, and see if on the top it read less, then return to the bottom and repeat the original measurement. This important experiment was made on September 19th, 1648, and up to the present moment we presume that few persons are aware that any account had been issued previous to the first edition of Pascal's "Traitez de l'Equilibre, &c.," Paris, 1663; but reference to the Preface and to the "Avertisement" on p. 164 of the "Traitez" will show that Pascal issued his pamphlet almost immediately after receiving the account of the successful experiments at Clermont, and further, that in the fifteen years between its issue

* We have spelled the second author's name Gaphar because the first letter closely resembles the form of G used at the end of the 15th century, but that there is some doubt about it is evident from the following amusing confusion:—

The tract was printed at Paris in 1540 by Kerver, with the name as Iaphar.

The Royal Society has a copy of the 1507 edition, and in both editions of the R.S. catalogue (1839 and 1883) the name is printed Gaphar.

In the Pulkowa catalogue (1860) it is printed Saphar.

In the "Bibliography of Meteorology," Part II., 1889, it is type written Japhar.

In the Crawford catalogue (1890) it is printed Saphar.

In the British Museum catalogue it is spelled Gaphar, with the Arabic name added, as [*i.e.* J'afar ibn Muhammad?]

We have, therefore, three authorities for G, two for S, and one each for I and for J.

and that of the "Traitez," all the copies had been distributed. And now, two hundred years later, Dr. Hellmann can trace only three copies of the original issue as being in existence, viz. :—(1) Bibliothèque Nationale, Paris; (2) Bibliothèque St. Geneviève, Paris; (3) Königlich Bibliothek, Breslau.

As this tract is reprinted in all three editions of the "Traitez" (1663, 1664, and 1698), and also in Pascal's collected works, the information cannot compete in rarity with No. 1, though it may surpass it in importance as a record of one of the great discoveries of the world, and in the present issue we have the advantage of Dr. Hellman's lucid introduction.

It is such a phenomenon to pick up a misprint in Dr. Hellmann's books that we must tell him of one. On p. 7, in reprinting the title of the "Traitez," he has "S. Jacques" where it should be "S. Iacques." It would be a happy thing for some of us if we never made a worse mistake.

THE REMARKABLE SEASON.

To the Editor of the Meteorological Magazine.

SIR,—The annexed table may perhaps be worthy of a place in your Magazine, as it shows the extraordinary character of the present Spring. The observations are all taken from plants or trees in my own garden, and in those cases marked with an asterisk, from the same individual plants or trees. The Spring is thus (omitting the snowdrop) 23 days earlier than the average of the last eight years.

	Average date, 1885-1892.	1893.	Difference.
	Day of year.	Day of year.	Days.
Flowering of Snowdrop	45	48	+ 3
" " Daffodil	103	87	-16
*Bursting of Chesnut buds.....	114	95	-19
* " " Sycamore buds.....	123	103	-20
*Flowering of Red Currants	123	96	-27
* " " Cherry	131	105	-26
* " " Pear	135	103	-32
* " " Apple	145	116	-29
* " " Strawberry	151	126	-25
* " " Common Rhododendron	157	131	-26

The rainfall for this station since March 5th inclusive (67 days) has only been 1.51 in., certainly not more than one-quarter of the average.—Yours very truly,

CHARLES L. BROOK.

Harewood Lodge, Meltham, Yorkshire, May 11th, 1893.

MAXIMUM SHADE TEMPERATURE IN APRIL, 1893.

THANKS to Mr. G. von U. Searle, we are able to correct an error on p. 64. The mean temperature at 9 a.m. in April, 1866, was $50^{\circ}\cdot 41$, not $54^{\circ}\cdot 1$ as there printed. The true value being below $50^{\circ}\cdot 8$, the entry for 1866 should be entirely struck out; but in the upper table the max. of $79^{\circ}\cdot 4$ is correct, and should stand.

The following letter raises another point:—

To the Editor of the Meteorological Magazine.

SIR,—I noticed with some surprise that the max. temp. at Camden Square on April 20th was only $78^{\circ}\cdot 2$. Here, in Stevenson screen, it reached $82^{\circ}\cdot 2$, being a higher reading than any recorded in April at Greenwich in 52 years.

The absolute drought lasted 30 days, March 17th to April 15th, exactly the same number of days as in 1887; the partial drought 78 days, February 28th to May 16th, with 0·63 in. of rain.

Yours very truly,

G. VON U. SEARLE.

30, *Edith Road, West Kensington, May 20th, 1893.*

[The first portion of this letter has led to our examining the maxima for April 20th, and the result is worthy of record. We will, in the first place, quote the maxima obtained in Stevenson screens only, arranging them from the coldest to the warmest:—

Royal Botanic Gardens	W. Sowerby	$77^{\circ}\cdot 5$
Camden Square	G. J. Symons.....	$78^{\circ}\cdot 1$
Royal Observatory, Greenwich	W. Ellis	$78^{\circ}\cdot 9$
Old Street, E.C.....	Rev. A. P. Hockin ..	$79^{\circ}\cdot 1$
Norwood	W. Marriott	$81^{\circ}\cdot 6$
West Kensington	G. von U. Searle	$82^{\circ}\cdot 2$

Apparently the smoke of London was drifting northwards, and so prevented the sun having its full power in North London. This is corroborated by the fact that at Greenwich the max. on the Glaisher stand was $1^{\circ}\cdot 1$ above that on the Stevenson, while at Camden Square the excess was only $0^{\circ}\cdot 1$ —strong evidence of the presence of haze.

This is rendered nearly certain by comparing the max. in sun at Greenwich and at Camden:—

	Max. temp. in Sun.		
	Greenwich.	Camden.	Greenwich excess.
20th	$128^{\circ}\cdot 5$	$113^{\circ}\cdot 7$	$14^{\circ}\cdot 8$

The usual excess of Greenwich above Camden Square is about 6° ; on the 20th it was more than double that; therefore, either it was exceptionally sunny at Greenwich, or exceptionally hazy at Camden Square.—ED.]

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, the 17th instant, at the Institution of Civil Engineers, 25, Great George Street, Westminster, Dr. C. Theodore Williams, President, in the chair.

Dr. H. R. Mill was elected a Fellow of the Society.

The following papers were read :—

(1) "The Mean Maximum and Mean Minimum Temperature of the Air on each day of the year, at the Royal Observatory, Greenwich, on the average of the fifty years 1841 to 1890," by William Ellis, F.R.S. Last year the author presented to the Society a paper giving tables of the mean temperature on each day of the year at Greenwich for the 50 years 1841-90, and the present paper gives the mean daily max. and min. for the same period. Mr. Ellis explained that the tables were calculated from the max. and min. of the photographic records, corrected to the values of the revolving stand. The following table gives the mean monthly temp. deduced from the means of the max. and min., as compared with the mean of 24 observations daily :—

Month.	Mean Temperature, 1841-1890.		Deviation of latter, 1841-1890.
	Mean from 24 Observations daily.	Simple Mean of Maximum and Minimum.	
January	38·53	38·37	—0·16
February	39·50	39·80	+0·30
March	41·68	42·37	+0·69
April	47·17	48·09	+0·92
May.....	53·10	53·93	+0·83
June	59·44	60·36	+0·92
July.....	62·45	63·57	+1·12
August	61·61	62·91	+1·30
September	57·19	58·24	+1·05
October	50·01	50·49	+0·48
November	43·21	43·20	—0·01
December	39·66	39·39	—0·27
THE YEAR	49·46	50·06	+0·60

The lowest mean max., mean min., and mean temperatures all occur on January 12th, except that there is an anomalous mean min. slightly lower on February 12th. The highest mean max. and the highest mean occur on July 15th, and the highest mean min. on August 13th, about which date there is also a rise in the mean max. and mean.

The mean max. occurs about April 17th and October 15th.
 „ „ temp. „ „ May 2nd „ „ 18th.
 „ „ min. „ „ „ 9th „ „ 20th.
 „ „ range „ „ March 25th „ „ 10th.

Dr. Buchan remarked that the decrease of temp. on February 12th and the increase about August 13th were not abnormal, but were secondary min. and max. coinciding in date with the min. and max. temp. of the sea surrounding our islands.

Mr. Symons said that the differences shown in the last column were very similar to the values given in Glaisher's tables for obtaining mean temp. from the readings of the max. and min., and that they would probably disappear if a Stevenson screen were used.

Mr. Southall stated that the date of mean temp. given in the paper was about half-way between that given by Howard in the "Climate of London," and by Mr. Glaisher from the earlier Greenwich records.

(2) "Notes on Winter," by Alexander B. MacDowall, M.A., F.R.Met.Soc. The first part of this paper consists principally of a collection of statements by different authorities as to the weather experienced in winter and the probability of the existence of cycles, &c. In the latter part of the paper the author discusses the question of periodicity of winter weather, the relation of summers to winters, &c. By classifying the winters of the past 78 years as very cold, cold, mild, and very mild, and comparing them with the preceding November and following March, &c., he arrives at the following conclusions:—A "very cold" November apparently tends to be followed by a winter colder than the average; and a "very mild" November by a winter milder than the average. A "very cold" winter tends to be followed by a summer cooler than the average; and a "very mild" winter by a summer hotter than the average. It appears also that summers before "very cold" winters have more often been cool than not.

Mr. Gaster and Dr. Buchan called attention to the fact that our temp. is very largely due to the frequency and duration of cyclones and anticyclones and the paths which they take, and that no system of forecasting which ignored them, could be satisfactory.

Mr. Harries pointed out that if a cold winter tends to be followed by a cool summer, and a cool summer to be followed by a cool winter, as long as the rule holds we cannot have warm seasons.

The President and Mr. Tripp also spoke.

(3) "Suggestions, from a practical point of view, for a new Classification of Cloud Forms," by Frederic Gaster, F.R.Met.Soc. This is an important paper which it is difficult to condense without injury, but the following extracts will give an outline of its contents:—

"I will first state briefly the principles on which the present proposal is based. Simultaneously with Capt. Wilson-Barker, one of our Fellows, I came to the conclusion (as stated in the discussion which followed his paper* on February 19th, 1890) that there are, in fact, only two main classes of cloud-forms, viz. : (1.) Those which arrange themselves in the form of sheets—whose vertical measurements are small when compared with the horizontal. To these he and I both apply the general terms *stratus* or *stratiform*. (2.) Those which rise up in heaps (like masses of cotton wool) from a horizontal base; and to these we apply the terms *cumulus* or *cumuliform*. If I

* *Quarterly Journal*, vol. xvi. p. 131.

understand him rightly, I may say we look upon cirrus and cirriform clouds as modifications of the stratiform, and believe that by adopting these terms, and supplementing them by a few well-known prefixes or affixes, we may describe all the forms at present recognised, and leave room for embracing others not yet clearly defined.

The prefixes and affixes employed in this paper are mainly the following :—

Detached, applied to sheet-clouds when the sheet is broken up into a number of more or less rounded cloudlets—such as is found in the conventional *cirro-cumulus* cloud.

Fracto, applied to clouds, or portions of clouds, with ragged edges.

Turreted, when portions of the cloud rise up abruptly from the base, in a turret-like form, at certain distances from one another.

Mammato when, instead of the rounded portion of certain clouds rising upward from a base, they hang downwards somewhat in the form of mammæ. Instances of this occur both in stratiform and cumuliform clouds.

Furrowed, applied to certain forms of stratus cloud, the under surface of which is in ridges, as though it had been ploughed, as a field.

Cirriform, to those clouds which, while appearing as sheets, or parts of sheets, have a distinct filamentary structure either in right or curvilinear lines, or take the form of feathers, delicate seaweed, &c.

With these principles in view I have drawn up the accompanying Table. [Too long to reproduce.] In it all the cloud forms with which I am acquainted as being satisfactorily identified are classed under four headings, viz. :

1. SURFACE CLOUDS, or those which appear commonly between the earth's surface and a level of about 2,000 feet, at which latter altitude the bases of some of the *cumulo-nimbi* (in Class 2) are occasionally found.
2. LOWER MEDIUM CLOUDS, commonly found at an altitude varying from 2,000 to about 10,000 feet from the earth.
3. HIGHER MEDIUM CLOUDS, including all varieties which usually float at an elevation ranging from 10,000 to about 22,000 feet.
4. HIGHEST (OR CIRRIFORM) LEVEL CLOUDS, or those found commonly at elevations exceeding 22,000 feet.

Columns are given in the Table furnishing :—(1) The names of each variety of cloud included in the classification ; (2) A short account of the principal characteristics of each as far as appearance goes ; (3) A reference to certain photograms or other pictures in

possession of well-known authorities, and in which the variety is portrayed ; (4) The names hitherto applied to the variety by some well-known authority ; and (5) A convenient abbreviation by which its appearance might be recorded in an ordinary Meteorological Register.

The limits of altitude separating class from class are by no means hard and fast lines, nor are the altitude values quoted to be taken as severely accurate, but rather as being a good approximation to the limiting heights of the zones in which the varieties in each class ordinarily appear over the northern half of Europe. Cirriform cloud is occasionally found at much lower levels than 20,000 feet ; in fact, some lower medium clouds have been observed to assume a cirrus like shape at times. Such occurrences are noteworthy, and point to an unusual condition—and a good observation of such an occurrence will naturally suggest to an investigator the necessity for considering what the conditions were which contributed to such an erratic development.”

The President remarked that cloud nomenclature seemed by general consent entirely based on Latin, and that that language showed a considerable paucity of suitable words.

A letter was read from the Rev. Clement Ley, urging the importance of simplicity in the classification of clouds, and suggesting that the proposals of the paper would not be acceptable internationally, as English words were used in some of the names, and that inasmuch as the names were not based on physical properties or structure, they were non-scientific.

Mr. Bayard suggested that, as a starting-point, a representative set of illustrations should be prepared and definitely named.

Admiral Maclear would hesitate to put the proposed classification before the observers of the Roy. Met. Soc., of the Met. Office, coast-guards, sailors, &c.

Mr. Symons asked how observers were to estimate the altitude of clouds, and Mr. Ellis spoke of the difficulty of training observers.

Dr. Buchan thought observers correctly named all the usual forms, but that the utmost confusion prevailed in their ideas of the altitude of clouds.

Mr. Gaster, in reply, agreed with all that had been said as to the difficulties of the subject, but as our knowledge of the direction and velocity of the wind at considerable heights was entirely dependent upon it, and comparable observations were at present non-existent, he felt that something must be done. He had purposely avoided any reference to physical characteristics for the sake of simplicity. He did not propose that observers should estimate the altitude of clouds, and had put it in the paper from the best available sources merely as an indication of the height at which the different forms were usually found.

REVIEW.

Borough of Southport. Meteorological Department. Report and Results of Observations for the year 1892, by J. BAXENDELL, F.R.Met.Soc., Meteorologist to the Corporation. 4to. Crompton, Southport: 1893. 16 pages.

WE do not remember having seen any earlier number of this Report, and we think that it is the first, though it does not say so. If it be the first, it is a very creditable one. On the other hand, we know that the Corporation of Southport was among the earliest to realize the fact that it was to the advantage of a town to know something about its climate, and we remember, quite ten years' since, finding in Hesketh Park a very fair set of meteorological instruments, and it is rather strange if no annual reports have been published.

As far as we can judge, the arrangements at Southport are now, with one exception, very satisfactory, and the Report indicates efficiency; but of course there are improvements which suggest themselves to an outside critic, and possibly some of them may be useful as suggestions for subsequent issues. We do not wish to hurt the feelings of any Southportian, but if we are to be favoured with a copy in future, and if any of our readers are to be enabled to get copies, it would be as well to explain where Southport is. We are quite aware that Mr. Baxendell gives the Lat. and Lon. with scientific accuracy, but for the general public a key map of the N.W. of England would be a useful addition. Again, if this report is intended for general distribution, why not give a map of the town, colouring the parks, and showing where the observations are made, and by some of the many mechanical processes reproducing some photographs of the instruments in position? This would cost a little, but they could be reprinted in subsequent issues, and would make the reports much more useful to non-residents.

Returning to strictly meteorological points. We hope that in the next issue it will be made clear to outsiders exactly where the various instruments are. Doubtless all Southportians interested in the subject know, but we cannot find out whether the Fernley Observatory is in Hesketh Park or not, or whether the "Fernley louvred structure" and the "Stevenson screen" are or are not in the same part of the town. Again, there are novel and useful values given on p. 12 [Why has the printer not paged the pamphlet?] of the level of subsoil water at "Southport" and "Birkdale"—a stranger would like to know in what part of Southport these levels are taken, and also where Birkdale is.

All the foregoing are merely suggestions for improvement and for rendering this useful publication generally as well as locally interesting.

But we have one serious complaint to make. Why should Southport, by making its rainfall day end at 9 p.m., break the rules as to the measurement of rainfall adopted at nearly every other station not merely in the British Isles, but throughout Europe?

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1892

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	54·5	15	16·7	27	41·4	31·4	32·6	85	66·2	12·1	1·37	11	6·0
Malta.....	69·9	9	48·7	8	64·9	54·6	50·7	79	117·0	43·0	2·07	13	6·0
<i>Cape of Good Hope</i> ...	82·9	12	50·9	14 ^a	72·4	57·7	...	...	...	...	3·02	6	5·5
<i>Mauritius</i>	84·6	13	67·6	19	83·2	71·0	67·9	76	136·5	62·0	6·24	15	5·5
Calcutta.....	79·5	31	49·0	10 ^b	75·8	52·4	52·8	71	132·5	38·5	·00	0	5·4
Bombay.....	88·7	18	66·8	3	84·2	69·9	66·0	70	133·9	54·7	·00	0	1·7
Ceylon, Colombo ...	90·6	11	67·3	27	86·9	72·4	70·2	78	158·0	62·0	·86	10	4·6
<i>Melbourne</i>	92·5	25	45·9	4	70·1	51·8	49·2	65	151·1	37·8	1·46	9	5·9
<i>Adelaide</i>	97·5	24	49·7	1	79·1	57·3	48·5	49	160·7	41·6	1·17	8	4·0
<i>Tasmania, Hobart</i>.....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Wellington</i>	74·1	26	45·0	22	67·8	53·8	49·8	67	145·0	37·0	4·36	11	3·8
<i>Auckland</i>	78·0	16	52·0	27	69·8	56·4	56·4	79	138·0	39·0	2·02	15	5·8
Jamaica, Kingston.....	87·8	6	63·8	26	85·4	67·1	66·0	78	...	...	·72	4	3·3
Trinidad.....	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto.....	42·4	8	8·4	26	31·0	20·4	22·4	80	...	...	1·24	21	7·4
New Brunswick, Fredericton.....	41·9	2	11·7	24	25·5	10·0	17·5	83	...	...	1·79	10	4·2
Manitoba, Winnipeg...}	33·0	2	36·8	25 ^b	8·4	11·3	...	...	...	...	·10	8	4·8
British Columbia, Esquimalt.....	51·4	31	18·7	21	42·9	35·3	37·7	92	...	...	4·88	27	8·0

^a And 15. ^b And 26.

REMARKS.

MALTA.—Mean temp. 58°·6. Mean hourly velocity of wind 10·5 miles. Thunderstorms, with hail, on 14th and 28th. The sea temp. fell from 66°·4 to 64°·0.

Mauritius.—Mean temp. of air 0°·4 below, dew point equal to, and rainfall ·97 in. above, their respective averages. Mean hourly velocity of wind 8·6 miles, or 2·3 miles below average; extremes, 20·0 on 31st and 1·8 on the 5th, 10th, and 22nd; prevailing direction, E. by N. Lightning on 6 days. Thunder and lightning on 2 days.

CEYLON, COLOMBO.—Thunderstorms on the 15th, and lightning only on the 3rd, 4th, 12th, 16th, and 24th.

Melbourne.—Thunder and lightning on the 7th; lightning on the 8th. Lunar halo on the 1st.

Adelaide.—Mean temp. 2°·9 below the average of 35 years. Rainfall 34 in. above the average, making the total for the year 21·53 in., or 1·15 in. above the average. The month was unusually cool, and on only two days did the temp. reach 90° in the shade.

Wellington.—The early part of the month was showery, with strong wind from N.W., 3·25 in. of rain falling on 4th; finer during the latter part of the month, but occasional showers and strong wind. Thunder and hail on 10th. Earthquake on 2nd, slight at 10.10 p.m. Mean temp. the same as the average; rainfall 43 in. above the average.

Auckland.—A seasonable month, but with mean temperature considerably below the average.

R. B. GORE.
T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL,
MAY, 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.			n
II.	Dorking, Abinger Hall.	.55	XI.	Builth, Abergwessin Vic.	3.51
„	Birchington, Thor .....	.66	„	Rhayader, Nantgwillt..	3.64
„	Brighton Prestonville Rd	.56	„	Corwen, Rhug	1.13
„	Hailsham .....	.63	„	Carnarvon, Cocksida ...	1.12
„	Ryde, Thornbrough	1.02	„	I. of Man, Douglas	1.52
„	Alton, Ashdell	1.05	XII.	Stoneykirk, Ardwell Ho.	1.16
III.	Oxford, Magdalen Col...	.77	„	New Galloway, Glenlee	2.82
„	Banbury, Bloxham	1.39	„	Melrose, Abbey Gate ...	2.32
„	Northampton, Sedgebrook	1.61	XIII.	N. Esk Res. [Penicuik]	1.20
„	Alconbury	1.17	„	Edinburgh, Blacket Pl..	1.37
„	Wisbech, Bank House..	1.01	XIV.	Glasgow, Queen's Park.	3.28
IV.	Southend .....	.89	XV.	Islay, Gruinart School..	1.93
„	Harlow, Sheering	1.12	XVI.	Dollar	1.63
„	Colchester, Lexden.....	.83	„	Balquhider, Stronvar..	3.71
„	Rendlesham Hall	1.65	„	Coupar Angus Station..	1.03
„	Diss	1.29	„	Dunkeld, Inver Braan..	1.19
„	Swaffham	1.13	„	Dalnaspidal H.R.S.	1.51
V.	Salisbury, Alderbury ...	.90	XVII.	Keith H.R.S.	1.63
„	Bishop's Cannings	1.38	„	Forres H.R.S.	1.19
„	Blandford, Whatcombe .	.91	XVIII.	Fearn, Lower Pitkerrie.	.97
„	Ashburton, Holne Vic. ...	...	„	Loch Shiel, Glenaladale	3.96
„	Okehampton, Oaklands.	1.96	„	N. Uist. Loch Maddy ...	1.86
„	Hartland Abbey	2.27	„	Invergarry	1.46
„	Lynmouth, Glenthorne.	2.78	„	Aviemore H.R.S. ....	.96
„	Probus, Lamellyn	1.06	„	Loch Ness, Drumnadrochit	1.03
„	Wincanton, Stowell Rec.	1.15	XIX.	Invershin	1.03
„	Weston-super-Mare	1.33	„	Scourie	2.67
VI.	Clifton, Pembroke Road	1.20	„	Watten H.R.S.	1.21
„	Ross. The Graig	1.66	XX.	Dunmanway, Coolkelure	2.77
„	Wem, Clive Vicarage ...	1.47	„	Fermoy, Gas Works ...	2.23
„	Cheadle, The Heath Ho.	2.28	„	Killarney, Woodlawn ...	.98
„	Worcester, Diglis Lock	2.48	„	Tipperary, Henry Street	2.46
„	Coventry, Coundon	2.04	„	Limerick, Kilcornan ...	1.76
VII.	Ketton Hall [Stamford]	.76	„	Ennis	1.30
„	Grantham, Stainby	1.06	„	Miltown Malbay.....	1.38
„	Horncastle, Bucknall ...	.92	XXI.	Gorey, Courtown House	1.02
„	Worksop, Hodsck Priory	1.56	„	Mullingar, Belvedere ...	2.15
VIII.	Neston, Hinderton	1.53	„	Athlone, Twyford	2.99
„	Knutsford, Heathside...	1.96	„	Longford, Currygrane...	...
„	Lancaster, Rose Bank...	2.37	XXII.	Galway, Queen's Coll...	1.25
„	Broughton-in-Furness..	2.86	„	Crossmolina, Enniscoe..	1.35
IX.	Ripon, Mickley	2.55	„	Collooney, Markree Obs.	1.53
„	Scarborough, South Ciiff	1.44	„	Ballinamore, Lawderdale	...
„	East Layton [Darlington]	2.16	XXIII.	Lough Sheelin, Arley ..	2.52
„	Middleton, Mickleton..	1.84	„	Warrenpoint	1.42
X.	Haltwhistle, Unthank..	2.62	„	Seaforde	1.46
„	Bamburgh	1.68	„	Belfast, Springfield	1.60
„	Newton Reigny	1.57	„	Bushmills, Dundarave...	1.38
XI.	Llanfrechfa Grange	3.32	„	Stewartstown	1.69
„	Llandoverly	2.32	„	Buncrana	1.57
„	Castle Malgwyn	1.12	„	Lough Swilly, Carrablagh	1.54

MAY, 1893.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which ·01 or more fell.	TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		Max.		Min.					
				inches.	in.			Dpth	Date	Deg.	Date	Deg.	Date.
I.	London (Camden Square) ...	·80	- 1·10	·35	17	8	78·6	12	38·2	31	0	0	
II.	Maidstone (Hunton Court)...	·93	- ·45	·65	29	6	...	...	...	...	...	...
III.	Strathfield Turgiss	1·01	- ·86	·34	18	10	79·7	3	33·2	...	0	5	
IV.	Hitchin	·93	- 1·02	·50	17	9	78·0	15	32·0	6,7	2	...	
V.	Winslow (Addington)	2·70	+ ·60	1·44	17	9	78·0	12	35·0	11	0	2	
VI.	Bury St. Edmunds (Westley)	1·03	- ·72	·34	29	7	...	...	...	...	...	...
VII.	Norwich (Cossey)	·89	- ·78	·10	16	10	...	...	...	...	...	...
VIII.	Weymouth(LangtonHerring)	1·13	- ·48	·58	18	6	73·0	29	40·0	8	0	...	
IX.	Torquay (Cary Green)	1·14	...	·31	16	9	72·7	12	43·3	21	0	0	
X.	Bodmin (Fore Street)	1·32	- 1·21	·54	19	9	...	...	...	...	...	...
XI.	Stroud (Upfield)	1·79	- ·25	·77	15	10	78·0	5	44·0	31	0	...	
XII.	ChurchStretton(Woolstaston)	2·81	- ·06	·99	19	13	74·5	5	36·5	8	0	2	
XIII.	Tenbury (Orleton)	2·11	- ·44	·62	18	10	78·7	5	33·8	11	0	1	
XIV.	Leicester (Barkby)	1·81	- ·16	1·33	17	8	79·0	4	28·0	10	3	7	
XV.	Boston	1·22	- ·50	·35	17	10	82·0	22	34·0	31	0	...	
XVI.	Hesley Hall (Tickhill).....	1·92	- ·12	·81	17	10	76·0	14	28·0	7	3	...	
XVII.	Manchester(PlymouthGrove)	1·94	- ·41	·80	17	12	80·0	13	39·0	10	0	0	
XVIII.	Wetherby (Ribston Hall) ..	2·34	+ ·39	·87	29	7	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	3·13	+ ·59	1·04	17	12	...	...	...	...	...	...
XX.	Hull (PearsonPark)	1·07	- ·81	·25	17	9	73·0	4	33·0	11	0	1	
XXI.	Newcastle (Town Moor)	1·93	+ ·18	·60	20	11	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	5·75	- 2·86	1·06	21	12	...	...	...	...	...	...
XXIII.	Cardiff (Ely).....	2·84	- ·01	·93	19	11	...	...	...	...	...	...
XXIV.	Aberfordwest	1·23	- 1·13	·35	21	10	74·5	6	37·5	8	0	1	
XXV.	Aberystwith, Gogerddan	2·02	...	·62	15	10	81·0	5	30·0	31	1	...	
XXVI.	Llandudno.....	1·75	- ·18	·48	1	11	...	...	...	...	...	...
XXVII.	Cargen [Dumfries]	2·46	- ·06	·89	17	12	75·8	14	35·4	30	0	...	
XXVIII.	Jedburgh (Sunnyside).....	2·47	- ·57	·75	20	12	79·0	14	33·0	10	0	...	
XXIX.	Old Cumnock	2·53	+ ·09	·66	18	12	...	...	...	...	...	...
XXX.	Lochgilthead (Kilmory)	2·75	- ·60	·57	17	16	...	...	38·0	1	0	...
XXXI.	Oban (Craigvarren) .....	...	...	...	...	...	...	...	...	...	...	...
XXXII.	Mull (Quinish)	3·02	+ ·07	·41	22	18	...	...	...	...	...	...
XXXIII.	Loch Leven Sluices	1·50	- 1·06	·30	19 ^a	8	...	...	...	...	...	...
XXXIV.	Dundee (Eastern Necropolis)	1·35	- ·31	·45	28	14	72·4	14	34·8	1	0	...	
XXXV.	Braemar	1·07	- 1·34	·21	12	12	68·2	14	27·8	2	3	5	
XXXVI.	Aberdeen (Cranford)	1·20	...	·19	11	17	70·0	14	33·0	1	0	...	
XXXVII.	Strome Ferry.....	2·69	- ·66	·48	11	18	...	...	...	...	...	...
XXXVIII.	Cawdor [Nairn]	1·25	- ·50	·22	12	15	...	...	...	...	...	...
XXXIX.	Dunrobin	1·28	- ·82	·25	3	14	65·0	27	32·0	2	1	...	
XL.	S. Ronaldsay (Roeberry).....	1·47	- ·25	·25	18	16	63·0	10	40·0	1c	0	...	
XLI.	Darrynane Abbey.....	1·44	...	·46	1	9	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	1·59	- ·64	·26	16	11	70·0	10	38·0	3	0	...	
XLIII.	O'Briensbridge (Ross)	2·46	...	·47	18	11	71·0	13	44·0	1	0	...	
XLIV.	Carlow (Browne's Hill) .....	...	...	...	...	...	...	...	...	...	...	...
XLV.	Dublin (FitzWilliam Square)	1·67	- ·26	·72	20	10	70·2	11	42·8	31	0	0	
XLVI.	Ballinasloe	2·40	- ·29	·56	21	10	68·0	5b	38·0	31	0	...	
XLVII.	Clifden (Kylemore)	3·12	...	·77	22	12	...	...	...	...	...	...
XLVIII.	Waringstown	1·18	- 1·26	·35	16	10	74·0	27	39·0	1	0	0	
XLIX.	Londonderry (Creggan Res.) ..	1·46	- 1·06	·26	17	15	...	...	...	...	...	...
L.	Omagh (Edenfel)	1·26	- 1·21	·24	1	11	73·0	14	40·0	30	0	0	

a And 21, 29. b And 13, 14, 28. c And 29.

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

METEOROLOGICAL NOTES ON MAY, 1893.

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

ENGLAND.

STRATHFIELD TURGISS.—The month of May was as exceptional in its weather as the two preceding months. Great heat occurred, 79°·7 being registered in shade on 3rd, and 94°·0 in the sun on the 12th, while the month ended with 29°·6 on the grass on 31st. Wild flowers unusually early in bloom. TSS on 15th and 18th. T on 28th. First rose in flower on 6th; wild convolvulus on 22nd.

ADDINGTON.—The long drought which set in on the 4th of March was fairly broken up on the 15th of May, thus lasting for 72 days, the total R during that time being only ·16 in. The weather was very fine until the 15th, followed by a succession of sharp TSS, that of the 17th accompanied by a great downpour of R. The end of the month was cold, with a frost on the last night, when dahlias and vegetable marrows were blackened.

BURY ST. EDMUNDS.—The drought still continues, what R has fallen having apparently done little good, and the agricultural outlook is worse than ever. Distant T on 20th, and T on 29th.

LANGTON HERRING.—The R for March, April, and May (1·60 in.) is the smallest for three consecutive months during 18½ years, the next smallest being 1·74 in. for November and December, 1879, and January, 1880. R fell on only 15 days in the three months, the smallest number previously being 20 in June, July, and August, 1887. There was absolute drought from April 30th to May 13th; on the 18th ·58 in. fell, which refreshed everything, but only ·03 in. fell after the 19th. The hottest May for 22 years, the mean temp. at 9 a.m. (57°·7) being 3°·9 above the average. High N.E. winds on 8th, 9th, and 10th. Fogs on 15th and 23rd. T and L on 16th.

TORQUAY, CARY GREEN.—A very fine and sunny month. Duration of bright sunshine 229 hours, equal to 48 per cent. of the possible amount. Sunshine was recorded on every day in the month, the greatest daily amount being 14 hours on 11th, equal to 93 per cent. of the possible duration.

BODMIN, FORE STREET.—High wind from the 6th to the 10th. Rather large H on the 20th. A mild, warm and dry month. Strawberries plentiful, and some cherries and raspberries ripe—very early. The last night of the month rather cold.

STROUD, UPFIELD.—During a TS on 15th ·65 in. of R fell between 3 p.m. and 4 p.m. A house was struck by L at Chalford, a cow killed at Stonehouse, and a colt killed near Stroud.

WOOLSTASTON.—The drought broke up on the 14th, and R fell every day for a week, but too late to save the hay crop, which will be very scanty. Mean temp. 56°·1.

ORLETON.—The warmest May recorded here in 37 years, the mean for the month being 5° above the average, and 1° above that of May, 1868. Country very much burnt up until the 15th, when a TS, with heavy R, occurred, and R fell each day for a week. The temp. reached 70° on 12 days. T on 15th, 16th, and 17th; L on 15th.

BARKBY.—T on 17th and 29th.

MANCHESTER.—Fine summer weather prevailed for the first 15 days; the 17th was rainy; T and L occurred on the 18th and 19th, and from 18th to 23rd was showery. The last week was fair, with the exception of the 29th, which was rainy. Mean temp. 56°·1.

HULL, PEARSON PARK.—Rainless from 3rd to 15th, then showery, with T, till 20th, followed by another rainless week.

WALES.

Haverfordwest.—The weather continued fair as in the preceding months, but on the whole not so warm. Great dryness of the air was shown by the wet and dry bulb thermometers, a difference of 10° being frequently observed. The amount of bright sunshine was also in excess, but the temp. did not at any time become excessive, though 70° was reached on four days. This truly remarkable season makes one think summer is over; gooseberries are ripe, currants ripe and full coloured, strawberries the same; pears fully 2 inches long, and in fact everything from three to five weeks before its time. The hawthorn, seldom in bloom with us before the 1st of June, long since vanished and haws formed; lilac, laburnum, rhododendrons, all nearly gone. What flowers shall we have for the summer when it comes? The usual cold spell about the 15th, absent. Such a magnificent May month has not been experienced here since 1847. The hay crop will be a sad failure.

Gogerddan.—Very dry, with bright sunshine throughout the month. A few T showers.

SCOTLAND.

Cargen.—In every respect an exceptionally fine month, the mean temp. being $3^{\circ}\cdot5$ above the average. There was only one day in which there was absolutely no sunshine. The winds, generally speaking, were light. About two inches of R fell between the 17th and 23rd, which greatly benefited vegetation, and all crops are luxuriant. Strawberries and cherries are ripe in several gardens, and new potatoes and peas have made their appearance at table. T on 18th and 19th, and T and L on 20th.

Jedburgh.—The weather during the month was highly favourable for all vegetation and seed planting, and the R in the middle of the month greatly improved pastures. Potatoes and bush and tree fruit look well. It is generally stated that vegetation in the memory of living man has never before been in such an advanced stage at the end of this month.

Roeberry.—Upon the whole a very fine month. Mean temp. $49^{\circ}\cdot6$.

IRELAND.

Darrynane Abbey.—Another dry, hot month. All crops looking well, and very forward, especially potatoes.

Waterford, Brook Lodge.—The first half of the month was very dry, with some east winds. T on the 21st. Mean temp. $55^{\circ}\cdot2$. In the two months from March 17th to May 16th, there were only seven rainy days, with 1·24 in. of R.

O'Briensbridge, Ross.—A fine month; no frost; refreshing showers from 15th to 23rd inclusive, and vegetation forward.

Dublin.—Like March and April, this month was singularly fine, warm, and for the most part dry. Unlike March and April, however, the amount of cloud was considerable, 6·2, compared with only 4·9 in March and 4·0 in April. Nor was the drought at all as severe as in the two previous months, R falling abundantly at the beginning and in the middle of the month. As regards temperature, this was a "record month," the mean temp. ($56^{\circ}\cdot7$) being $4^{\circ}\cdot7$ above the average, and $0^{\circ}\cdot9$ above that of May, 1868. Solar halos were seen on the 6th and 10th. High winds were noted on only 4 days, never attaining the force of a gale. T heard on the 15th, 20th, and 29th. No H, sleet, or S fell.

Waringstown.—Fine, warm, and dry; crops looking well, and grass good, but water in drinking places for cattle getting very low.

Edenfel.—The ideal May of which the poets have informed us, but which we have not experienced here for 30 years, at all events; warm, balmy, with nothing approaching to frost, and just sufficient R to promote a vegetation, earlier by a full fortnight than the average and luxuriant in flowers and foliage of all kinds, of a softness and richness quite unprecedented.

SYMONS'S

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JULY, 1893.

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THE DROUGHT OF 1893.

IT is, of course, impossible to deal exhaustively with so great a subject as the recent drought in the few pages of this magazine which can be devoted to it. We have therefore decided upon giving facts rather than description, and that necessarily makes the present number much fuller of tables than usual. It will be seen that we have given the daily fall for the four months of March, April, May, and June at twelve widely spread stations—seven in England, one in Wales, and two each in Scotland and in Ireland.

According to these returns, the only partial droughts at these stations exceeding 45 consecutive days were at—

Stowell Rectory, Somerset	74 days.
Hesley Hall, Tickhill.....	76 „
Sedgebrook, Northampton	77 „
Reigate, Surrey	77 „
Diss, Norfolk	80 „

But the following letter from Mr. Bicknell shows that at some places the fall on or about May 16th was not heavy enough to break the drought, and that at his station the partial drought lasted 110 days; and but for the above-mentioned rain of May 17th, a similar or even slightly greater duration would have been recorded for London, Reigate, Northampton, and other places. Mr. Bicknell's Beckenham station is not far from Greenwich, and we have therefore worked up the figures as published in the weekly returns of the Registrar General, and it appears that the fall there in the 113 days (March 2nd to June 22nd) was only 1·12 in., giving the longest partial drought on record in this country.

110 DAYS OF PARTIAL DROUGHT.

To the Editor of the Meteorological Magazine.

SIR,—The fall of over half-an-inch of rain on the night of the 22nd and 23rd inst., has at length put an end to the extraordinary drought of the last four months.

The following table shows the total from 4th March to 21st June (both included), to have been only 0·67 in., falling on 16 of the 110 days :—

1893.	in.	days.	1893.	in.	days.
March 4 ...	·01		May 1 ...	·01	
„ 13 ...	·02		„ 16 ...	·03	
„ 15 ...	·03		„ 17 ...	·13	
„ 16 ...	·04		„ 18 ...	·03	
	— ·10	..... 4	„ 19 ...	·01	
			„ 23 ...	·04	
			„ 29 ...	·11	
				— ·36	..... 7
April 16 ...	·02		June 4 ...	·04	
„ 20 ...	·04		„ 6 ...	·09	
„ 29 ...	·02			— ·13	..... 2
	— ·08	..... 3	Total ...	<u>0·67</u>	<u>16</u>

Yours truly,
PERCY BICKNELL.

Foxgrove, Beckenham, 25th June, 1893.

THE DROUGHT IN 1844.

To the Editor of the Meteorological Magazine.

SIR,—Permit me to point out what appears a small discrepancy. On page 65 of the *Met. Mag.* for June, you give the rainfall for Greenwich for 1844 as follows :—

April 0·23 May 0·15

On page 11, *British Rainfall*, 1879, the rainfall for 1844 is given as follows, viz. :—

April 0·35 May 0·30

or a total in one case of 0·38 and in the other of 0·65, which would considerably alter the comparison on page 65 of *Met. Mag.* for June.

Your truly,
CHARLES L. BROOK.

Harewood Lodge, Meltham, Yorkshire.

[WE regret very much that Mr. Brook is right, and that the Greenwich publications misled us. We took the figures given on page 65 from Mr. Glaisher's table in the *Proc. Met. Soc.*, Vol. V. (1871), pages 94 to 98, and took the further precaution of checking them against the volume of the *Greenwich Observations* for the year, where the readings are printed in extenso. But on re-examination we find that these are the readings of the gauge on the top of the Library! There was a gauge on the ground, and it gave the larger values of 0·35 and 0·30 in. as correctly given in *British Rainfall*, 1879, but that gauge was read only at the end of the month! It is a great pity that amid the millions of figures issued from Greenwich, there is nowhere a systematic statement of the record of each gauge from its erection to its abandonment.—ED.]

MARCH, 1893.

	<i>Surrey,</i> <i>Reigate,</i> <i>Holmets.</i>	<i>Northampton,</i> <i>Pitsford,</i> <i>Sedgebrook.</i>	<i>Norfolk,</i> <i>Duss.</i>	<i>Somerset,</i> <i>Templecombe,</i> <i>Stowell Rec.</i>	<i>Worcester,</i> <i>Tenbury,</i> <i>Orleton.</i>	<i>Nottingham,</i> <i>(Tickhill),</i> <i>Hesley Hall.</i>	<i>Lurham,</i> <i>Barnard Castle,</i> <i>Whorlton.</i>	<i>Cardigan,</i> <i>Aberystwith,</i> <i>Gogerddan.</i>	<i>Edinburgh,</i> <i>Blacket Place.</i>	<i>Inverness,</i> <i>Loch Ness,</i> <i>Drumadrochit.</i>	<i>Tipperary,</i> <i>Henry Street.</i>	<i>Cavan,</i> <i>Lough Sheelin,</i> <i>Arley.</i>
1	in. ·35	in. ·01	in. ·20	in. ·17	in. ·12	in. ·15	in. ...	in. ·04	in. ·37	in. ·07	in. ·06	in. ·06
2	...	·05	·01	·09	·10	...	·37	·13	...	...	·11	·30
3	·06	...	·06	·11	·07	·08	·04	·23	·07	·03	...	·08
4	...	...	·01	...	...	...	...	·02	·04	·01	...	·02
5	...	...	...	·01	...	...	...	...	...	·01	...	·01
6	...	...	...	·06	·05	·03	·03	·30	·08	·01	...	·01
7	...	...	...	·02	·01	...	...	·04	...	...	·05	·01
8	...	...	...	...	...	...	...	...	...	·02	...	...
9	...	...	...	·02	...	...	...	...	...	·22	..	...
10	...	...	...	...	...	...	...	...	...	·02	...	...
11	...	...	...	·01	...	...	...	...	...	·01	...	...
12	...	...	...	...	...	...	...	...	...	·02	...	...
13	·09	...	...	·01	...	...	...	...	...	·02	·04	..
14	·03	..	...	·03	...	...	...	...	...	·20	·01	·12
15	·07	...	...	·02	·02	·01	·09	·05	·17	·12	·05	·02
16	·06	..	·05	·14	·02	·04	·18	...	·05	·19	·02	·20
17	...	·01	·01	...	...	·02	...	·15	...	·04	·10	·01
18	...	...	·01	...	...	...	...	..	...	...	·07	·02
19	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	..	...	...	...	...	...	...	...	...
23	...	...	...	..	...	...	...	...	...	...	...	...
24	...	..	...	...	...	...	...	...	...	...	·03	...
25	...	...	...	...	...	...	...	...	...	·15	...	...
26	...	...	...	...	...	...	...	...	·05	...	...	...
27	...	...	...	...	...	...	·02	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	·10	·05	·06	·18	·15
Total	·66	·07	·35	·69	·39	·33	·73	1·06	·88	1·20	·72	1·01

APRIL, 1893.

	<i>Surrey,</i> Reigate, Holmfels.	<i>Northampton,</i> Pitstord, Sedgebrook.	<i>Norfolk,</i> Diss.	<i>Somerset,</i> Templecombe, Stowell Rec.	<i>Worcester,</i> Tenbury, Orleton.	<i>Nottingham,</i> [Trekhill] Hesley Hall.	<i>Durham,</i> Bernard Castle, Whorlton.	<i>Cardigan,</i> Aberystwith, Gogerddan	<i>Edinburgh,</i> Blacket Place.	<i>Inverness,</i> Loch Ness, Drumadrochit.	<i>Tipperary,</i> Henry Street.	<i>Caron,</i> Lough Sheelin, Arley.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
142	.02	...	.40	...	...	...	.01
202	...	...
3
4
5
676	...	...
7
8
9
1006	...	...
11
1202	...	...	...
1301	...	...	...	...	...	...	...	...	...
1403	...	...
1558	.40	...	.01
16	.05	.15	.07	.02	.10	.18	.31	.10	.31	...	.30	.56
1701	...	...	.08	.09	.05	...	.22	.05	.16	.14
1801	...	.27	.01	.01	.01
1907	.05	...	...
2012	...	...	...	...	.05	...	.02	.06	...	...
2115	...
2201	...	...	...	...	...	...	.02	.03
2302	...	...	...	...	...	...	...	...
24
25
26
2702	...	...	.01	...	...
2808	.04	.10	.06
2904	.01	.09	.08	.01	.09	...	.07	.08	.06	.02
3001	...	.03	.03	...	.04	...	.20
Total	.05	.32	.09	.14	.69	.30	.56	.53	1.64	1.61	.80	1.04

MAY, 1893.

	<i>Surrey,</i> Reigate, Holmets.	<i>Northampton,</i> Pitsford, Sedgebrook.	<i>Norfolk,</i> Diss.	<i>Somerset,</i> Templecombe, Stowell Rec.	<i>Worcester,</i> Tonbury, Orleton.	<i>Nottingham,</i> Tucknill, Hesley Hall.	<i>Durham,</i> Barnard Castle, Whorlton.	<i>Cardigan,</i> Aberystwith, Gogerddan.	<i>Edinburgh,</i> Blacket Place.	<i>Inverness,</i> Loch Ness, Drumnadrochit.	<i>Tipperary,</i> Henry Street.	<i>Cavan,</i> Lough Shacolin, Arley.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1	..	..	·06	·01	·07	·06	·02	·17	..	..	·02	·22
2	..	·05	·02	..	·10	·05	·14	·18	·15	·02	..	·07
3	..	·04	..	..	..	..	..	..	·02	·07	..	..
4	..	..	..	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..	..	..	..	..	..
10	..	..	..	..	..	..	..	..	..	·06	..	..
11	..	..	..	..	..	..	..	..	·02	·14	..	..
12	..	..	..	..	..	..	..	..	..	·04	..	..
13	..	..	..	..	..	..	..	..	..	..	..	..
14	..	..	..	·02	·02	..	..	·12	..	..	..	..
15	..	·15	..	·02	·52	..	..	·62	..	..	..	..
16	·01	·08	..	·13	·18	·04	·09	·21	..	·01	·57	·11
17	·04	1·03	·33	·21	·20	·81	1·25	·17	·51	·09	·28	·05
18	·43	·04	..	·50	·62	·09	·17	·06	..	·23	·53	·20
19	·08	·11	..	·15	·22	·38	·23	·15	·08	·07	·53	·71
20	·05	·07	·08	·01	·17	·03	·09	·27	·21	·07	·07	·62
21	·04	..	·52	..	..	..	·02	..	·06	..	·07	·15
22	..	..	·03	·03	·01	..	..	·07	·01	·03	·03	·28
23	..	..	..	·06	..	·01	·02	..	..	·06	·13	·06
24	..	..	..	·01	..	..	..	..	..	·04	..	..
25	..	..	..	..	..	..	..	..	..	..	..	..
26	..	..	..	..	..	..	..	..	..	..	..	..
27	..	..	..	..	..	..	..	..	..	·01	..	..
28	..	..	·01	..	..	·20	·01	..	·29	·01	..	..
29	·12	·04	·21	..	..	·25	·03	..	·02	..	·23	·05
30	..	..	·01	..	..	..	..	..	..	·08	..	..
31	..	..	·02	..	..	..	..	..	..	..	..	..
Total	·77	1·61	1·29	1·15	2·11	1·92	2·07	2·02	1·37	1·03	2·46	2·52

JUNE, 1893.

	<i>Surrey,</i> <i>Reigate,</i> <i>Holmets.</i>	<i>Northampton,</i> <i>Pitsford,</i> <i>Sedgebrook.</i>	<i>Norfolk,</i> <i>Diss.</i>	<i>Somerset,</i> <i>Templecombe,</i> <i>Stowell Rec.</i>	<i>Worcester,</i> <i>Tenbury,</i> <i>Orleton.</i>	<i>Nottingham,</i> <i>Trickhill</i> <i>Hesley Hall.</i>	<i>Durham,</i> <i>Barnard Castle,</i> <i>Whorlton</i>	<i>Cardigan,</i> <i>Aberystwith,</i> <i>Gogerdan.</i>	<i>Edinburgh,</i> <i>Blacket Place.</i>	<i>Inverness,</i> <i>Loch Ness,</i> <i>Drumnadrochit.</i>	<i>Tipperary,</i> <i>Henry Street.</i>	<i>Cavan,</i> <i>Lough Sheelin,</i> <i>Arley.</i>
1	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
2	...	...	...	...	...	...	...	...	...	...	...	...
3	·03	...	...	·05	...	...	·13	...	·03	·02	·21	·07
4	...	·02	·32	·08	·07	·30	·09	·25	...	·40	·14	·30
5	...	..	...	·16	·05	...	...	·10	·09	·21	...	·19
6	·04	...	...	·01	...	...	·09	...	...	...	...	·06
7	...	...	...	...	·05	...	...	...	·01	·01	..	...
8	...	...	...	...	...	...	·01	...	...	·01	...	...
9	...	...	...	...	...	...	...	...	...	...	...	·43
10	...	...	...	...	...	...	...	..	...	...	...	...
11	...	...	...	...	..	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	·04	...	...	...	·36	...	...	...	...
14	...	...	·06	·01	·67	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	·04	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	·01
17	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	·09	...	...
19	...	...	·46	...	...	...	·10	...	..	·02	...	...
20	...	...	·01	...	...	...	...	...	...	...	..	...
21	...	...	·07	...	...	·01	...	·45	...	·27	...	...
22	·25	·34	·39	·17	·31	·17	·14	·29	1·00	·39	·03	·15
23	·01	·17	·02	·50	·02	·15	·15	·15	·88	·32	·09	·10
24	·04	...	...	·11	·01	·02	·03	...	·01	·11	·11	·12
25	·01	...	...	·10	...	...	...	·40	·20	·01	...	·04
26	·09	·10	·13	·10	·27	·57	·19	·23	·12	...	·85	·20
27	·25	·01	·07	·14	·03	...	·02	·37	·06	·28	·20	·29
28	...	...	·01	·10	·03	·02	·02	...	·04	·20	·30	·49
29	...	...	...	·05	...	...	...	...	...	...	...	..
30	...	...	...	·01	...	...	...	...	...	...	..	...
Total	·72	·64	1·54	1·63	1·64	1·24	1·00	2·60	2·48	2·34	1·95	2·49

RAINFALL IN 1893.

To the Editor of the Meteorological Magazine.

SIR,—The amount and distribution of rain in this district during the last six months have been so different from what I understand has occurred in England, that I think it may interest you to receive a summary of it up to the present time.

The older people in the district tell me that they do not remember so “soft” a spring.

Month.	Rainfall. in.	No. of days on which rain fell.	Longest interval without rain.
January	4·78	21	5 days
February	7·38	22	3 „
March	4·55	21	5 „
April	3·34	12	8 „
May	2·96	16	6 „
June	1·12	10	8 „
	24·13 in.	102 days.	

Yours truly,
W. D. ANDERSON, M.D.

Ardsheal, Ballachulish, Argyleshire, July 10th, 1893.

THE SUMMER OF 1615.

To the Editor of the Meteorological Magazine.

SIR,—The following extract from Lyson’s “Derbyshire,” p. 304, taken from the parish register of Youlgreave, about three miles from Bakewell, may, at the present time, be of interest :—

“1615. A dry Summer.

“There was no rayne fell upp on the earth from the 25th day of March till the 2d day of May, and then there was but one shower ; after which there fell none tyll the 18th day of June, and then there fell an other ; after y^t there fell none at all till the 4th day of August, after which tyme there was sufficient rayne upp on the earth ; so that the greater part of this land, especially the South p^t were burnt upp both corne and hay. An ordinary sumer load of Hay was at 2*l.*, and little or none to be gott for money.

“This p^t of the peake was very sore burnt upp, onely Lankishyre and Cheshyre had rayne ynough all summer ; and both corne and hay sufficient.

“There was very little rayne fell the last winter but snowe only.”

I remain, yours truly,
C. MURRAY AYNSLEY.

St. Elmo, Southsea, July 6th, 1893.

REVIEWS.

The Mechanics of the Earth's Atmosphere. A collection of translations by CLEVELAND ABBE. Smithsonian Institution, Washington: 1891. Large 8vo, 324 pages.

Smithsonian Meteorological Tables. [Based on Guyot's *Meteorological and Physical Tables.*] Smithsonian Institution, Washington: 1893. Large 8vo, lix.—262 pages.

WE are very glad to see the Smithsonian Institution once more devoting some of its great powers to the publication of meteorological works. It is not easy to imagine two more solid foundations for future work than the above.

Professor Abbe's volume is a series of excellent translations of eighteen memoirs on, or closely related to, the mechanics and dynamics of the air, and may be said to embody the views of most of the greatest authorities upon the subject. This is a strong expression, but when we state that the list includes Bezold, Ferrel, Hagen, Helmholtz, Hertz, Kirchoff, Margules, Oberbeck, and Rayleigh, we know that we have proved our point. The papers are quite sufficiently difficult for all but advanced students, even in the translation which Prof. Abbe has now given to the world; in their original German their readers among English-speaking people must have been still more limited.

As regards the second work, it has the great recommendation of convenient size and many of the merits of its predecessors—the various editions of Guyot, so dear to meteorological workers; but, as stated in the Preface, it is not a re-issue of Guyot, but a new work set up *de novo* and corrected to the very last moment. Happily, in many cases the corrections are unimportant; for instance, Table 10 for reducing barometer readings to 32° is entirely reset, but at all ordinary temperatures the change is either *nil* or .001 in., and as far as we can see, the values given in the Royal Society Report in 1840 are in no case more than .003 in. in error. Would that all readings were as accurate as those old tables!

Seeing the degree of precision here adopted, we are rather surprised to find Guyot's table (D XXVI.) not merely robbed of its difference column, but entirely shorn of the third decimal and packed into half of page 119. We are inclined to agree with the Meteorological Council in regarding the thousandths of an inch of barometrical pressure as unimportant, and Table 33 looks as if Prof. Langley thought so too, but if so, why give Table 10 in such detail? The answer occurs to us, "Because, although .01 in. is near enough for meteorological work, for tracing storm paths, and such like matters, .01 in. means 10 ft. of altitude, and for hypsometric work greater precision is necessary." This may be the reason for the detail in Table 10, but if so, it is a strong argument for Table 33 having been given in its original form.

Table 46 is, we think, new. It is introduced by the following paragraph:—

REDUCTION OF SNOWFALL MEASUREMENT.

“The determination of the water equivalent of snowfall has usually been made by one of two methods—(a) by dividing the depth of snow by an arbitrary factor ranging from 8 to 16 for snow of different degrees of compactness; (b) by melting the snow and measuring the depth of the resulting water. The first of these methods has always been recognized as incapable of giving reliable results; and the second, although much more accurate, is still open to objection. After extended experience in the trial of both these methods, it has been found that the most accurate and most convenient measurement is that of weighing the collected snow, and then converting the weight into depth in inches. The method is equally applicable whether the snow as it falls is caught in the gage, or a section of the fallen snow is taken by collecting it in an inverted gage.”

“TABLE 46. — *Depth of water corresponding to the weight of snow (or rain) collected in an 8-inch gage.*

“The table gives the depth to hundredths of an inch, corresponding to the weight of snow or rain collected in a gage having a circular collecting mouth 8 inches in diameter—this being the standard size of gage used throughout the United States.

“The argument is given in avoirdupois pounds, ounces and quarter ounces in order that it shall be adapted to the customary graduation of commercial scales.”

In the first place, we are glad of the incidental remark as to the “standard size of gauge used throughout the United States.” Very little information as to the patterns of rain-gauge used in the United States is to be found in any publication we have ever seen, and in bygone years some very extraordinary patterns were used. This paragraph implies a much improved state of affairs, though we suppose that even the “standard” gauges are in many cases on roofs. However, our subject now is snow, not rain. We are not sure that Mr. Curtis (who signs the Introduction) is right as to the superiority of “weighing” over “melting,” and we are certain that the use of a Sidebottom snow-gauge is the best plan. It is all very well saying that it is easily done in any laboratory, but every observer has not a laboratory, and by the time that the snow, ice, and water are all scraped out of the gauge into the scale pan some error will have crept in; and if it be suggested that the snow need not be disturbed, but the gross weight taken, and then the weight of the empty can allowed for, we think that there will be both more trouble and more liability to error than by the addition of a known quantity of hot water.

Tables 64 to 69 inclusive are extremely handy, more so than those in the *Tables Météorologiques Internationales*, and than any that we have ever seen. We notice that occasionally the third decimal differs from the International Tables, thus proving the accuracy of

both, and that the Smithsonian ones have been worked independently because the difference is due to the following different values being taken :—

<i>Tables Internationales</i>	1 millimetre = 0·03937079 inch.
Smithsonian Tables	1 ,, = 0·03937 inch.

It is these 79 hundred millionths of an inch which occasionally toss the last figure up in the International Tables.

In Table 92 there is some terrible mistake which we cannot understand. It is not a misplaced decimal, not the misprint of a square mile for an acre, but the values are all about 4,000 times too small. Nearly thirty years ago, in *British Rainfall*, 1865, Appendix page vi., we gave a table headed, "On the weight and bulk of rain," in which, among other data, we gave—

1 inch over one acre = 22623 gallons, or 101 tons weight.

Table 92 is said to be computed on the assumption that—

1 inch over one acre = 5·828648 gallons, or 16·65328 tons per square mile.

though how these extraordinary figures have been arrived at we cannot imagine.

Rejecting the fractions of a gallon and reducing all the values to the fall over an acre, we have—

	One inch over an acre equals		
	Gallons.		Tons.
<i>British Rainfall</i> , 1865	22623	.....	101
Smithsonian Tables	6	.....	0·03

When, in 1865, working our table, we took the contents of an Imperial gallon as 277·268 cubic inches, we see that in the present work the value of 277·463 has been adopted. Having this, the calculation is very simple :—

An acre contains 6,272,640 square inches.
 One inch of rain over an acre is therefore 6,272,640 cubic inches.
 An Imperial gallon contains 277·463 cubic inches.
 Then—
$$\frac{6,272,640}{277·463} = 22607 \text{ gallons per acre.}$$

which differs from our former value by only the 16 gallons, which represent the difference between 277·268 in. and 277·463 in.

And so with respect to the weight in tons per square mile, adopting their own constant it works out to about 64,640 tons, whereas they give 16½.

We very much regret that such an error should have slipped into a work of great importance and utility—a work which, as far as we have tested it, is in other respects absolutely perfect.

ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of this Society for the present session, was held on Wednesday evening, June 21st, at the Institution of Civil Engineers, 25, Great George-street, Westminster. Dr. C. Theodore Williams, President, in the chair.

Mr. R. H. Scott, F.R.S., read a paper on "Fifteen Years Fogs in the British Islands, 1876-1890," which was a discussion of the fog observations made at the stations which appear in the *Daily Weather Report*. The winter is the foggiest season, and the greatest numbers of fog observations are reported from London, Yarmouth, Oxford and Ardrossan. In the summer half-year the fog prevalence attains a local maximum in two different districts, viz.: at Scilly, St. Ann's Head, and Roche's Point, in the South-West; and at Sumburgh Head and Wick in the North. These are evidently sea fogs, accompanying warm weather. Mr. Scott has made a collation of the observation of fog and the force of the wind, and finds that fog almost invariably occurs only with calm or very light winds. The author says that it seems to be generally assumed that fogs in London are increasing in frequency and in severity. From the observations, it appears that there is no trace of a regular increase, either in the monthly or in the annual curve. All that can be said, is, that taking the three lustral periods of 5 years each, the last of these, 1886-90, comes out markedly the worst, the successive totals being 262, 250, and 322. A long and animated discussion followed, in which the following gentlemen took part:—The President, Admiral Maclear, Honourable F. A. Rollo Russell, Dr. Marcet, Rev. Clement Ley, Messrs. R. H. Curtis, Gaster, Bruce, Brodie, Dixon, Symons, Inwards, and Marriott. The discussion turned chiefly upon the definition of fog, dew and mist, and it is not an exaggeration to say, that there was no agreement whatever among the various speakers. The question of the "personal equation" of the observers was also referred to, and more than one speaker called attention to the extremely discordant results for neighbouring stations.

A paper on "Upper Currents of Air over the Arabian Sea," by Mr. W. L. Dallas, F.R.Met.Soc., of the Indian Meteorological Office, was also read, in which it is shown that there exists a regular arrangement in the vertical succession of the upper currents, and that the Doldrum region, and not the geographical equator, is really the dividing line between the currents of the northern and southern hemispheres.

Mr. E. D. Archibald, M.A., F.R.Met.Soc., gave an address on "Australian Climate and Weather," dealing at some length with the different climates of the various Colonies of the Continent, and also of the North and South Islands of New Zealand. His paper was illustrated by a number of lantern photographs.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 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	52·7	31	15·4	5	40·0	30·9	32·8	89	69·1	10·0	1·44	17	7·3
Malta.....	65·4	10	39·0	19	57·7	46·6	43·8	81	106·5	36·5	6·64	20	5·7
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	85·4	18	67·6	31	82·9	73·1	70·6	81	141·0	60·4	12·55	25	6·9
Calcutta	79·9	16 ^a	45·9	28	74·7	54·1	54·0	72	133·6	39·0	·70	2	1·8
Bombay.....	86·8	9	61·1	31	81·1	66·3	62·4	68	132·7	51·7	·00	0	0·7
Ceylon, Colombo	91·0	4	68·5	31	87·5	71·6	69·6	76	155·5	60·0	5·40	10	3·2
<i>Melbourne</i>	95·5	26	45·1	25	76·6	55·2	52·4	63	144·6	34·2	·19	4	5·2
<i>Adelaide</i>	105·6	3	52·8	24	84·0	60·1	50·3	47	166·4	43·5	·03	4	4·0
<i>Sydney</i>	88·2	13	57·5	16	75·3	63·3	60·6	72	150·7	46·2	4·57	19	5·2
<i>Wellington</i>	82·0	24	44·5	8	69·9	55·6	53·1	71	150·0	39·0	3·37	15	5·0
<i>Auckland</i>	81·5	26	54·0	6	73·4	60·9	60·8	81	143·0	40·0	5·05	15	5·8
Jamaica, Kingston.....	90·8	15	65·3	9	85·6	67·3	64·4	73	...	...	·38	2	2·6
Trinidad	88·0	b	63·0	5, 8	85·8	65·5	67·4	78	143·0	59·0	3·43	13	...
Toronto	39·8	29	—17·8	11	21·5	6·4	12·3	85	...	—22·0	2·99	24	7·0
New Brunswick, Fredericton	50·8	2	—22·5	23	18·9	—3·8	7·0	82	...	...	3·81	9	4·0
Mantoba, Winnipeg ...	25·0	8	—42·5	26	1·9	—21·6	...	...	...	...	1·88	16	5·0
British Columbia, Esquimalt	51·3	1	—1·5	31	40·5	31·2	34·2	89	...	...	4·56	18	7·0

a 17th and 18th. b Various.

REMARKS.

MALTA.—Atmospheric pressure was unusually low, and the rainfall nearly double the average. TSS on 3 days; H on 8 days. Mean temp. 51°·1. Mean hourly velocity of wind 11·4 miles. J. SCOLES.

Mauritius.—Mean temp. of air 0°·8 below, mean dew point 0°·8 above, and rainfall 5·41 in. above, their respective averages. Mean hourly velocity of wind 11·9 miles, or 0·7 mile above average; extremes, 37·3 on 27th, and 2·2 on 24th and 29th; prevailing direction, E.S.E. to E. T on 3 days, L on 8th, T and L on 4 days. From the 18th to the 28th two cyclones passed at safe distances from the island one from N. to E. and S.E., and the other from N. to N.W. and W. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on the 14th and 26th; L alone was seen on the 19th and 22nd. F. C. H. CLARKE, Lt.-Col. R.E.

Melbourne.—Distant T on the 13th and 19th; L on the 18th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 2°·5 below the average of 36 years. Very little rain fell, the total being ·82 in. below the average. C. TODD, F.R.S.

Sydney.—Mean temp. 2°·1 below the average of 35 years; humidity 0·4 below, and rainfall ·89 in. above, the average. Very heavy gale from S.S.W. to S.E., January 1st to 3rd. H. C. RUSSELL, F.R.S.

Wellington.—The early part of the month was showery, then fine from 6th to 15th, with N.W. winds, strong on 11th and 12th; from 16th to 18th heavy E, and the remainder of the month fine, with intervals of showery days, and strong winds from N.W. on 20th, 21st and 24th. Earthquakes on 13th, at night (slight E. to W.), and on 28th, at 6·4 a.m. (slight from S.E.) R. B. GORE.

Auckland.—An unusually wet January, the rainfall being nearly double the average of 26 years. Barometrical pressure and mean temp. close to the average. T. F. CHEESEMAN.

T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL,
JUNE, 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.	·83	XI.	Builth, Abergwessin Vic.	3·97
„	Birchington, Thor	·55	„	Rhayader, Nantgwilt..	3·90
„	Brighton, Prestonville Rd	...	„	Corwen, Rhug	2·29
„	Hailsham	·73	„	Carnarvon, Cocksida ...	2·62
„	Ryde, Thornbrough	1·56	„	I. of Man, Douglas	1·41
„	Alton, Ashdell	·82	XII.	Stoneykirk, Ardwell Ho.	1·67
III.	Oxford, Magdalen Col...	·67	„	New Galloway, Glenlee	2·03
„	Banbury, Bloxham	·97	„	Melrose, Abbey Gate ...	2·24
„	Northampton, Sedgebrook	·64	XIII.	N. Esk Res. [Penicuick]	4·70
„	Alconbury	·72	„	Edinburgh, Blacket Pl..	2·48
„	Wisbech, Bank House..	1·62	XIV.	Glasgow, Queen's Park.	2·40
IV.	Southend	·64	XV.	Islay, Gruinart School..	1·43
„	Harlow, Sheering	·59	XVI.	Dollar	2·05
„	Colchester, Lexden.....	·64	„	Balquhider, Stronvar..	2·51
„	Rendlesham Hall	·75	„	Coupar Angus Station..	1·87
„	Diss	1·54	„	Dunkeld, Inver Braan..	2·29
„	Swaffham	1·23	„	Dalnaspidal H.R.S.	2·34
V.	Salisbury, Alderbury ...	·69	XVII.	Keith H.R.S.	2·08
„	Bishop's Cannings	2·34	„	Forres H.R.S.	2·34
„	Blandford, Whatcombe .	1·31	XVIII.	Fearn, Lower Pitkerrie.	·96
„	Ashburton, Holne Vic...	1·64	„	Loch Shiel, Glenaladale	...
„	Okehampton, Oaklands. .	·74	„	N. Uist. Loch Maddy ...	2·10
„	Hartland Abbey	1·07	„	Invergarry	1·05
„	Lynmouth, Glenthorne. .	·64	„	Aviemore H.R.S.	2·55
„	Probus, Lamellyn	1·05	„	Loch Ness, Drumnadrochit	2·34
„	Wincanton, Stowell Rec.	1·63	XIX.	Invershin	1·40
„	Weston-super-Mare	·72	„	Scourie	1·65
VI.	Clifton, Pembroke Road	1·20	„	Watten H.R.S.	1·05
„	Ross, The Graig	1·08	XX.	Dunmanway, Coolkelure	2·86
„	Wem, Clive Vicarage ...	1·66	„	Fermoy, Gas Works ...	1·24
„	Cheadle, The Heath Ho. .	1·40	„	Killarney, Woodlawn ...	1·52
„	Worcester, Diglis Lock	·89	„	Tipperary, Henry Street	1·95
„	Coventry, Coundon	1·11	„	Limerick, Kilcornan ...	1·22
VII.	Ketton Hall [Stamford]	1·00	„	Ennis	1·40
„	Grantham, Stainby	·82	„	Miltown Malbay.....	1·11
„	Horncastle, Bucknall ...	1·59	XXI.	Gorey, Courtown House	1·60
„	Worksop, Hodsck Priory	·93	„	Mullingar, Belvedere ...	2·15
VIII.	Neston, Hinderton	2·09	„	Athlone, Twyford	2·67
„	Knutsford, Heathside ...	1·62	„	Longford, Currygrane ...	2·68
„	Lancaster, Rose Bank...	1·61	XXII.	Galway, Queen's Coll...	2·06
„	Broughton-in-Furness..	1·58	„	Crossmolina, Enniscoe..	2·12
IX.	Ripon, Mickley	1·60	„	Collooney, Markree Obs.	2·54
„	Scarborough, South Cliff	1·65	„	Ballinamore, Lawderdale	2·65
„	East Layton [Darlington]	1·08	XXIII.	Lough Sheelin, Arley ..	2·49
„	Middleton, Mickleton..	1·25	„	Warrenpoint	1·86
X.	Haltwhistle, Unthank..	2·32	„	Seaforde	·99
„	Bamburgh	1·11	„	Belfast, Springfield	1·30
„	Newton Reigny	2·11	„	Bushmills, Dundarave...	1·57
XI.	Llanfrechfa Grange	·90	„	Stewartstown	2·64
„	Llandovery	2·43	„	Buncrana .....	...
„	Castle Malgwyn	1·52	„	Lough Swilly, Carrablagh	1·92

JUNE, 1893.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which -01 or more fell.	TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		In shade.		Max.		Min.		On grass.	
				Dpth	Date			Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	.73	- 1.28	.24	22	9	90.4	19	38.3	1	0	0
II.	Maidstone (Hunton Court)...	1.05	- .57	.61	22	10	...	...	...	...	...	...
III.	Strathfield Turgiss .....	.80	- 1.00	.21	22	14	90.3	19	32.9	1	0	2
III.	Hitchin .....	.78	- 1.08	.29	22	7	86.0	19	37.0	2	0	0
IV.	Winslow (Addington) .....	.76	- 1.10	.37	22	7	88.0	19	33.0	1	0	1
IV.	Bury St. Edmunds (Westley)	1.41	- .38	.76	19	8	79.0	16a	42.0	1,3	0	...	
V.	Norwich (Cossey)	1.41	- .14	.50	22	8	88.0	20	...	...	...	...
V.	Weymouth (LangtonHerring)	.59	- 1.64	.19	26	5	83.0	19	45.0	1	0	...	
VI.	Torquay (Cary Green) ...	.71	...	.27	26	6	79.2	19	46.0	1	0	0
VI.	Bodmin (Fore Street)	1.06	- 1.69	.27	22	9	...	...	...	...	...	...
VI.	Stroud (Upfield)	1.41	- .98	.34	14	10	86.0	18a	...	...	...	...
VII.	ChurchStretton(Woolstaston)	1.79	- .76	.30	14	13	78.5	18	43.0	1	0	0	
VII.	Tenbury (Orleton)	1.64	- .97	.67	14	11	85.5	17	34.2	1	0	1	
VII.	Leicester (Barkby) .....	.73	- 1.62	.25	22	7	89.0	19	36.0	11	0	0
VIII.	Boston	1.19	- .70	.35	19	9	85.0	19	40.0	1,3	0	...	
VIII.	Hesley Hall [Tickhill].....	1.24	- .68	.57	26	7	87.0	18	39.0	1,12	0	...	
IX.	Manchester (PlymouthGrove)	1.52	- 1.13	.70	26	10	90.0	18	42.0	1	0	0	
IX.	Wetherby (Ribston Hall) ...	.98	- .91	.40	27	7	...	...	...	...	...	...
X.	Skipton (Arncliffe)	2.87	- .49	.68	23	11	...	...	...	...	...	...
X.	Hull (Pearson Park)	1.20	- .55	.53	26	8	84.0	19	39.0	2	0	0	
X.	Newcastle (Town Moor)	1.03	- .61	.23	23	10	...	...	...	...	...	...
XI.	Borrowdale (Seathwaite).....	6.11	- .47	1.43	28	13	...	...	...	...	...	...
XI.	Cardiff (Ely) .....	.72	- 1.71	.24	22	8	...	...	...	...	...	...
XI.	Haverfordwest	1.33	- 1.23	.78	27	6	85.6	19	35.3	2	0	0	
XI.	Aberystwith, Gogerddan	2.60	...	.45	21	9	86.0	17	33.0	1	0	...
XII.	Llandudno	2.14	+ .37	.69	26	7	74.0	18	43.2	1	0	...	
XII.	Cargen [Dumfries]	2.07	+ .12	.48	23	10	83.0	18	39.0	5	0	...	
XII.	Jedburgh (Sunnyside).....	2.50	+ .76	.90	23	10	87.0	18	40.0	3	0	0	
XIV.	Old Cumnock	1.74	- .12	.47	23	10	...	...	...	...	...	...
XV.	Lochgilphead (Kilmory).....	1.09	- 2.01	.30	6	7	...	...	38.0	1	0	...
XV.	Oban (Craigvarren) .....	...	...	...	...	...	...	...	...	...	...	...
XV.	Mull (Quinish) .....	.65	- 2.64	.15	3	12	...	...	...	...	...	...
XVI.	Loch Leven Sluices	3.10	+ 1.35	1.30	25	5	...	...	...	...	...	...
XVI.	Dundee (Eastern Necropolis)	2.05	+ .55	.85	22	11	86.0	18	42.3	2	0	...	
XVII.	Braemar	2.73	+ .74	.90	22	11	82.5	18	35.4	1	0	0	
XVII.	Aberdeen (Cranford)	3.95	...	1.33	22	12	77.0	16	44.0	9	0	...	
XVIII.	Strome Ferry	1.91	- 1.15	.67	28	13	...	...	...	...	...	...
XVIII.	Cawdor [Nairn]	3.14	+ 1.74	1.12	22	14	...	...	...	...	...	...
XIX.	Dunrobin	1.34	- .68	.44	4	9	79.5	18	45.0	23	0	...	
XIX.	S. Ronaldsay (Roeberry).....	.55	- 1.21	.18	22	11	72.0	16	44.0	2	0	...	
XX.	Darrynane Abbey	1.73	...	.71	26	11	...	...	...	...	...	...
XX.	Waterford (Brook Lodge) ...	1.66	- .41	1.12	26	8	81.0	19	40.0	1,2	0	...	
XXI.	O'Briensbridge (Ross)	1.92	...	.41	27	11	79.0	18	50.0	24c	0	...
XXI.	Carlow (Browne's Hill)	1.62	- .22	.63	25	11	...	...	...	...	...	...
XXI.	Dublin (FitzWilliam Square)	1.72	+ .06	.49	26	12	74.7	19	46.9	23	0	0	
XXII.	Ballinasloe	2.29	- .01	1.01	9	12	77.0	17b	42.0	23	0	...	
XXII.	Clifden (Kylemore)	4.73	...	1.21	28	15	...	...	...	...	...	...
XXIII.	Waringstown	1.80	- .27	.26	28	12	86.0	18	44.0	3	0	0	
XXIII.	Londonderry (Creggan Res.)..	1.94	- .48	.38	27	13	...	...	...	...	...	...
XXIII.	Omagh (Edenfel)	1.87	- .60	.65	27	14	79.0	18	44.0	6,11	0	0	

a And 19. b And 18. c And 25.

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

METEOROLOGICAL NOTES ON JUNE, 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.—Distant TS on the 14th and T on the 20th.

HITCHIN.—The hottest month since July, 1868. Mean temp. 60°·0.

ADDINGTON.—A very fine month, but deficient in E, the fall being the least recorded in June with the exception of 1874, when only ·62 in. was recorded. Very high day temp. from 14th to 19th, the shade max. ranging from 80° to 88°. The nights were cool throughout. Pastures are very much dried up, and the hay crop is very light; indeed, many fields that were shut up for hay are thrown open for the cattle again; a poor look-out for the coming winter.

BURY ST. EDMUNDS.—A hot, dry month. Severe TS on 19th, but the rain did not extend far. The drought has apparently set in again worse than ever.

LANGTON HERRING.—On only five days did R fall, this being the driest June in 19 years, with the exception of 1887, when the fall was ·36 in. on three days. The hottest June for 19 years (with the exception of June, 1878, the mean temp. of which was 0°·2 higher), the shade max. on 19th being the highest recorded in June in 19 years, and the highest on any day since July, 1885. Fogs on 6th, 26th, and 27th. High winds on 23rd, 24th, and 28th. T on 15th. Distant T on 16th and 26th. During the last four months only 2·19 in. of R has fallen, the deficit being 5·42 in.

TORQUAY, CARY GREEN.—There was no day during the month without sunshine, the total duration being 294 hours, equal to 60 per cent. of the possible amount; the greatest daily amount was 14 hours on the 30th, equal to 89 per cent. of the possible duration.

BODMIN, FORE STREET.—Very dry and fine until the 12th and 13th, when a little R fell, then dry again to the 22nd, and showery to the 29th. Very hot on the 17th, 18th, and 19th. The drought broke up on the 22nd, and the rain was very acceptable and much needed for all crops.

STROUD, UPFIELD.—Distant T and L at noon on 4th. TS from 2.40 p.m. to 3.10 p.m. on 14th; ·30 in. of R fell in half an hour, and a house near was struck by L. TS from 4.40 to 6 p.m. on 15th, with very vivid L.

WOOLSTASTON.—A dry, hot month, very little R falling till the 14th, when there was a heavy storm of T and L, and it became intensely hot for some days; from the 22nd to 28th R fell daily. The hay crop is almost a complete failure. Mean temp. 58°·5.

ORLETON.—A very fine, hot, dry month, with the exception of a few days from the 8th to the 12th inclusive, the mean temp. of the whole, being 1°·3 above the average of 32 years. A very large proportion of bright sunshine occurred, as in the three previous months, and many very hot days. Very dry, most of the R falling in heavy storms. Heavy TS on the 14th. T on 2nd, 3rd, and 19th. Fog on 7th.

BARKBY.—Very hot and very dry. The different kinds of flowers quite three weeks in advance of average time. Hay crops very deficient, about one-fourth of the average. Total rainfall for the half-year, 7·05 in.

MANCHESTER.—Summer weather prevailed up to the 19th; on the 20th it was dark and gloomy till noon, and the rest of the month was changeable. The 25th was cold and windy. Mean temp. 61°·5. T on 3rd and 4th.

WALES.

HAVEFORDWEST.—A very fine month, the temp. above the average. Very droughty up to the 27th, when a heavy fall of R took place, only to be followed by increasing heat and return of drought. A great fall of temp. took place about the 20th, followed by R. TSS occurred in several parts of the country, and considerable rainfalls, but unfortunately not in this locality. Prevailing winds N.N.W., E., and S.E.

SCOTLAND.

CARGEN.—The mean temp. of the month ($59^{\circ}\cdot3$) is $2^{\circ}\cdot9$ above the average. This has only once been slightly exceeded in the past 34 years, the mean temp. of June, 1865, being $59^{\circ}\cdot4$. Considerable variations of temp. took place, the mean of the five days (15th to 19th) being $66^{\circ}\cdot2$, while for the five days 22nd to 26th it was $53^{\circ}\cdot1$. A very heavy H storm was experienced in the district on the 9th, but was not felt at this station. At The Grove the hailstones were lying 4 to 6 inches deep after the storm. The winds during the month were exceptionally light, and only on the 27th was anything like a strong breeze experienced. The hours of sunshine were considerably above the average. T and L occurred on the 8th and 9th, and T was heard on the 14th. Crops generally are looking well and in an unusually advanced state, more particularly the root crops, which present a very promising appearance. The rainfall for the first six months of the year is $4\cdot14$ in. below the average.

JEDBURGH.—The temp. was high throughout the month. The R towards the end, which was much needed, freshened all crops. Pastures which were getting dried up are now fresh and healthy; cereals look well, also turnips.

MULL, QUINISH.—The smallest rainfall in June since 1874, when $\cdot52$ in. was recorded. The drought has done no harm here; hay is in first-rate order, and strawberries are finer than for some years past.

BRAEMAR.—T and heavy R on 8th, the shower covering a radius of only 3 miles; $\cdot82$ in. fell in half an hour.

ABERDEEN.—Exceptionally dry till the 20th, followed by considerable rains.

ROEBERRY.—The driest June since 1871. Mean temp. in shade, $53^{\circ}\cdot9$.

IRELAND.

DARRYNANE ABBEY.—A very hot month, without measurable R between the 5th and 22nd.

WATERFORD, BROOK LODGE.—But for the heavy rainfall on the 26th, this would have been the driest June since 1887. The temp. was much higher than for some years, so that fruit ripened much earlier. The hay crop is very short, and turnips are likely to be a failure. Thick fog on the 7th, 8th, 9th, 10th, and 15th, and T on the 9th.

O'BRIENSBRIDGE, ROSS.—Brilliant summer weather, with high temp., up to the 24th, then lower temp. and useful R. Severe T and L for two hours on the 11th, and T and L on 14th.

DUBLIN.—The fourth month in succession with a mean temp. above the average and a rainfall below the average. The month did not "break the record" as regards either high temp. or scanty rainfall, but was in all respects most favourable. R fell freely from the 3rd to the 6th inclusive, and from the 22nd to the 28th inclusive, but the weather was otherwise dry, except for local thunder-showers on the 15th. Mean temp. $59^{\circ}\cdot9$, $2^{\circ}\cdot1$ above the average. High winds were noted on 7 days, but the force of a gale was attained only on the 28th. The temp. reached or exceeded 70° in the screen on 5 days, compared with 17 days in 1887, only 1 day in 1888, 10 days in 1889, only 2 days in 1890, 6 days in 1891, and 4 days in 1892. T was heard on the 15th. A solar halo was seen on the 11th.

EDENFEL.—With the exception of an insignificant break during the first week, and a rather more decided one during the last, the weather of June was as perfect as that of its predecessors since the 1st of March. The timely and sufficient rains in the period alluded to have still further aided the prolific vegetation of the year; a full average hay harvest has been secured in perfect order, and the crops to follow give an equal promise of a full and early return.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCCXXI.]

AUGUST, 1893.

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THE DROUGHT OF 1893.

ALTHOUGH, under the arbitrary definition necessarily adopted in *British Rainfall* and in this Magazine, the great drought terminated about the end of the third week in June, that month was decidedly dry, and it was necessary to wait for July, to see whether Nature's drought, unlimited by human definitions, had really come to an end.

The rainfall of July was only slightly below the average—except in Ireland—and we think that few would contend that the drought still continues, though no doubt certain stations recorded comparatively little rain, and the great deficiency of the earlier months is far from made up. The *effects* of the deficiency are too far-reaching for human skill to calculate their limit.

Last month we gave the daily fall at twelve widely distributed representative stations,* and we now purpose dealing with only two points, which may be briefly described as the *mean* result and the *extreme* result.

We have put into tabular form the differences from the average of the rainfall at 43 out of the 50 stations, printed in our monthly tables of rainfall and temperature, for the months of March, April, May, June, and July, and give the average values first for each month separately, and then for the three months March to May, and for the four months March to June. The records are grouped into England and Wales (24 stations), Scotland (12 stations), and Ireland (7 stations):—

Rainfall and departure from the average of the ten years, 1880–89.

ENGLAND AND WALES. (Average of 24 Stations):—

	March.	April.	May.	June.	July.	3 months, March to May.	4 months, March to June.
	in.	in.	in.	in.	in.	in.	in.
Total rain	·88	·37	1·85	1·44	3·40	3·10	4·53
Deficiency from average	1·65	1·88	·54	·89	·13	4·07	4·96
Per cent. of average	35	16	77	62	96	43	48

* Mr. C. L. Brook has pointed out that on p. 81 the duration of the drought at Reigate, Surrey, should be 98 days—from March 16th to June 21st.

Rainfall and departure from the average of the ten years, 1880-89.—(con).

SCOTLAND. (Average of 12 Stations):—

	March.	April.	May.	June.	July.	3 months, March to May.	4 months, March to June.
	in.	in.	in.	in.	in.	in.	in.
Total rain	1·88	1·40	1·99	1·91	3·50	5·27	7·18
Deficiency from average	1·13	·79	·41	·21	+·02	2·33	2·54
Per cent. of average	62	64	83	90	101	69	74

IRELAND. (Average of 7 Stations):—

Total rain	1·05	1·02	1·68	1·84	2·83	3·74	5·59
Deficiency from average.....	1·46	1·28	·69	·28	·69	3·43	3·70
Per cent. of average	42	44	71	87	80	52	60

It will be seen that, in the table, the first line for each country gives the average total rainfall for the stations in that country for each month and for the two groups of months. The second line gives the deficiency of that average fall, as compared with the average of the corresponding month, or group of months, for the ten years 1880-89. The third line is the value in the first line expressed as a percentage of the average of the ten years.

Assuming that the 24 stations fairly represent England and Wales, we find that in March the rainfall was only one-third of the average, in April one-sixth, in May three-quarters, and in June two thirds, while in July it reached nineteen-twentieths of the average. In the three months March to May considerably less, and in the four months slightly less, than half the average, fell. This, of course, is taking the country as a whole, at many individual stations the result would be much more striking—*e.g.*, at Bodmin in the three months, only one-fifth of the average fell, and in the four months, only one-quarter.

In Scotland as a whole the drought was not striking. In no month was the fall as little as half the average, while for the three months, and four months, the values very nearly reach three-quarters of the average. The July fall was slightly in excess.

Although the deficiency in Ireland considerably exceeded that in Scotland, the drought was—as would naturally be expected—of less intensity there than in England. The falls in March and April were less than half the average, and the three and four month groups give respectively, a little more than half, and less than two-thirds, of the average.

The oft-quoted definitions of drought practically preclude—we think rightly—the possibility of a drought being recorded at a wet station, but the figures previously quoted for Bodmin probably show a greater relative deficiency than occurred at many of the stations included in the following table, which is based on all the records which we have received, and we believe embraces all cases of 100 or more days with a total rainfall not exceeding ·01 in. per diem.

This table contains no fewer than 37 entries, is thoroughly self-explanatory, and requires little comment. It shows that the intensity of the drought was most prolonged in the south-east of England, the

STATION & COUNTY.	PARTIAL DROUGHTS.			
	Began.	Ended.	Lasted.	Amount.
<i>Surrey.</i>				
Coulsdon Grange	March 2	June 21	112	1.12
Leatherhead (Oxshott)	" 2	" 21	112	1.11
Addington (Hares Bank)	" 2	" 21	112	1.00
" (Park Farm)	" 3	" 21	111	1.11
" Hill	" 3	" 21	111	1.09
Wallington	" 2	" 21	112	1.08
Beddington (Riverside)	" 2	" 21	112	1.05
Croydon (Waddon House)	" 2	" 21	112	1.01
" (The Whitgift)	" 2	" 21	112	1.11
" (Brimstone Sew. Works)	" 1	" 21	113	1.12
" (Park Hill)	" 2	" 21	112	1.12
" (Addiscombe)	" 3	" 21	111	1.07
" (Duppas House)	" 4	" 21	110	1.04
Wimbledon Sewage Works	" 2	" 21	112	1.02
South Norwood (Selhurst Road)	Feb. 28	" 21	114	1.10
West Norwood (Thornlaw Road)	March 1	" 21	113	1.10
Wandsworth Com. (Patten Road) ..	" 2	" 21	112	1.01
Brixton (Acre Lane)	Feb. 28	" 21	114	1.09
<i>Kent.</i>				
Westerham (The Fishponds)	March 4	" 20	109	1.08
Keston (Bradfield)	" 2	" 22	113	1.13
" Tower	" 4	" 21	110	1.08
Hayes (Layham's Farm)	" 4	" 21	110	1.06
" Common (The Warren)	" 2	" 21	112	.95
Orpington (Kent Waterworks)	" 4	" 21	110	1.10
Bickley (Highfield)	" 2	" 21	112	.98
Bromley	" 2	" 21	112	1.08
Wilmington (Kent Waterworks) ..	" 1	" 25	117	1.16
Beckenham (Foxgrove)	Feb. 28	" 21	114	.99
Forest Hill (Dartmouth Road)	" 28	" 21	114	1.06
" (The Nurseries)	" 28	" 21	114	.96
Eltham	" 28	" 21	114	.93
Greenwich (Royal Obs.)*	March 2	" 21	112	1.11
Deptford (Kent Waterworks)	Feb. 28	" 21	114	1.02
<i>Sussex.</i>				
Hailsham ..	March 1	" 22	114	1.11
<i>Bucks.</i>				
Slough (Langley)	" 1	" 23	115	1.11
<i>Essex.</i>				
Southend (Waterworks)	" 2	" 21	112	1.02
Bradwell-on-Sea (Down Hall)	" 2	" 18	109	1.04

stations being distributed over Surrey, Kent, Sussex, Hants, Bucks, and Essex. The records in Surrey and Kent are disproportionately augmented by the fact that in addition to the returns received direct from observers, we have used the very valuable tables of the Croydon Microscopical Club, so promptly issued by Mr. F. C. Bayard. The periods are in very close agreement throughout, running from the 1st or 2nd of March to June 21st.

* This entry is from Mr. Bayard's tables, where the readings are printed to two places of decimals. The "Quarterly Return of the Registrar General" quotes .911 in. on 110 days, and "The Observatory" .967 in. on 109 days.

ARFORD HOUSE, HEADLEY, HANTS.—You may care to have the result of my observations here, as follows :—

1893.
32 days absolute drought, ending April 17th.
29 " " " " May 16th.
20 " " " " June 23rd.
72 " partial " with 20 in. of R, March 2nd—May 12th.
A. F. PARBURY.

LANGLEY, SLOUGH, BUCKS.—I send you account of rainfall measured during the drought. It is the driest period recorded here in the last 21 years; the nearest approach being 72 in. of rain in 73 days, ending 15th August, 1887.

	1893.	in.	|	1893.	in.
March	13		May	..... 64
April	05		June (to 23rd)	29

Partial drought lasted 115 days with 111 in. of rain.
Absolute " " " " 29
During 72 days ending May 14th, only 09 in. fell.
" 110 " " " June 21st, " 81 in. "

R. H. MAJOR.

EASTON, STAMFORD.—Now we have been blessed with a little rain since July 1st, I send a statement of the rain here for the last eight months (from October, 1892, to June 30th, 1893), amounting in all to only 6.97 in., very little more than one-third of the year's average:—

	in.	|		in.
1892. November	..... 89		1893. March	..... 25
" December	..... 91		" April	..... 33
1893. January	..... 1.21		" May	..... 70
" February	..... 1.84		" June	..... 84

Total 8 months = 6.97 in.

This, I should think, is about as small a quantity as in any part of England. During the first 11 days of this month we have had .99 in., and are now hoping the drought is at an end.

HENRY WATKINS.

BRADWELL-ON-SEA, SOUTHMINSTER, ESSEX.—The drought having now apparently broken up, I send you my register of rain since the end of February. Omitting March 1st, the rainfall here for 109 days was 1.04 in. on 13 days.

ROBERT PAGE.

HEAVY RAINS FOLLOWING THE DROUGHT.

(In order of date.)

BIRMINGHAM.—A severe thunderstorm broke over our Belvide Reservoir, near Brewood, at 4.30 p.m., on the 14th June, and lasted till 6.30 p.m., during which time the rain gauge we have fixed there registered 2.38 in.

GEO. R. JEBB.

ROCKDALE, DUNGANNON, CO. TYRONE.—I have to tell you of an unprecedented fall of rain here yesterday. It began about 12.30 p.m.; at 7 o'clock 3.33 in. was measured, and it was by no means raining all the time. I was from home about 20 miles away, where we had only a few slight showers. I could hardly believe my gardener when he

told me the quantity of rain he had measured, so I myself to-day measured the monthly gauge, which is 50 ft. lower than the daily, and always registers each month from 15 to 20 per cent. more than it. I give the rainfall of each up to this morning :—

Daily.		Monthly.
June 4th	..... 0·12 in.	
„ 5th	..... 0·14 „	
„ 6th	..... 0·11 „	
„ 22nd	..... 0·06 „	
„ 23rd	..... 0·01 „	
„ 24th	..... 0·03 „	
„ 26th	..... 0·46 „	
„ 27th	..... { 3·33 } 3·57	
	—————	
	4·50 in.	5·05 in.

This shows for the monthly gauge an even greater quantity than my gardener measured. We have had to June 1st :—

	Daily.	Monthly.
January	2·85 in.	.. 3·24 in.
February	4·34 „	.. 5·10 „
March.....	1·39 „	... 1·72 „
April	1·34 „	... 1·62 „
May	1·11 „	... 1·37 „
	—————	—————
	11·03 in.	13·05 in.

I may mention that since I began to keep the gauge on January 1st, 1875, the greatest falls in 24 hours have been 1·90 in. on 3rd March, 1876 ; 1·71 in. on 26th Sept., 1882 ; and 1·70 in. on 12th August, 1883. In 18½ years we have had one inch of rain in 24 hours only 19 times before yesterday. J. C. LOWRY.

TEAN VICARAGE, STOKE-ON-TRENT.—A TS this afternoon (July 3rd) has brought us 1·78 in. of rain. It is to be hoped we shall hear no more of the drought at any rate in this district.

Rainfall in May.....	2·50 in.
„ June	1·51 „
„ July 1—3	1·88 „
	—————
	5·89 in.

G. T. RYVES.

HEATH HOUSE, CHEADLE, STAFFORDSHIRE.—On July 3rd, 1·97 in. of rain fell within an hour, 3.40 p.m. to 4.40 p.m. J. C. PHILIPS.

EDITH ROAD, W. KENSINGTON.—Last night (11th) 1·57 in. of rain fell—in a very short time, I fancy, but unluckily being night, I could not keep account. G. VON U. SEARLE.

CRANMER HALL, FAKENHAM, NORFOLK. — Rainfall here on July 11th, 4·48 in. A thunderstorm broke over this house about 2 p.m. on the 11th, and 2·40 in. fell in about 75 minutes. Further heavy rain fell during the evening and night, making the record fall for 24 hours. The total rainfall for the four months, March to June, was only 3·61 in. LAWRENCE J. JONES, Bart.

LITTLE SAXHAM RECTORY, BURY ST. EDMUNDS.—The storm we had last Wednesday week (July 12th) was most severe. We had

some rain about 11.15 p.m. on Tuesday (11th). About 1 a.m. on Wednesday we had a heavy shower with distant thunder and vivid flashes of lightning; about 7.30 a.m. it began to pour and continued some time; about 8.30 it left off for about 10 minutes, and then another shower fell; at 9 a.m. it held up for about 2 or 3 minutes, at which hour I registered the enormous amount of exactly 3 inches. I scarcely got into the house before the rain came down harder than ever, and continued till 10.45 a.m. As it was then only raining slightly, I went and took the amount, and found 2.05 in. extra had fallen since 9 a.m., thus making 5.05 in. in under 12 hours. It went on raining gently for a time, so that the whole rainfall was 2.10 in. from 9 a.m. Wednesday to 9 a.m. on Thursday. There seems to have been a waterspout over a field about half-a-mile distant; a portion of the field was completely washed away, the main gullies being over 4 ft. wide. At the bottom of the field for about 18 yards wide it looked exactly like a sea-shore. A platelayer on the line said he saw two clouds meet and then apparently double over. H. J. KILNER.

[The local character of these great rainfalls at Cranmer Hall on the 11th, and at Little Saxham Rectory on 11th and 12th, is shown by the following records from other stations in Suffolk and Norfolk:—

	July 11th.	July 12th.	
Bury St. Edmunds (Westley).....	1.40 in. ...	.40 in.	
Diss .....	.12 ,, ...	.35 ,,	
Harleston (Rushall Vicarage).....	.60 ,, ...	.63 ,,	
Wymondham .....	.12 ,, ...	.20 ,,	
Denver.....	1.18 ,, ...	.39 ,,	
Swaffham (London Street)	1.37 ,, ...	.47 ,,	
"	1.39 ,, ...	.48 ,,	
Costessey .....	.86 ,, ...	.47 ,,	Ed.]

TEAN VICARAGE, STOKE-ON-TRENT.—Rainfall of past 24 hours as measured at 9 a.m. to-day (July 12th), 1.31 in., making 3.54 in. since July 1st. Range of shaded thermometers in June rather remarkable: min., 36°; max. 88°·6—in Glaisher's stand. G. T. RYVES.

REDLANDS, EMSWORTH, HANTS.—During a thunderstorm to-day, (July 12th) from 2.30 p.m. to 2.55 p.m., in 25 minutes, .78 in. of R fell—direction, N.—N.E. F. JACOMB HOOD.

HORWOOD, BIDEFORD, N. DEVON.—The rainfall here on two days last week was so large that I think it will interest you. On the 11th it was 2.57 in., the largest amount I have registered in one day during the twenty years I have had a rain-gauge. Of this amount 2.42 in. fell between 1 p.m. and 6 p.m. On the 15th there fell 2.03 in., which fell during the night. There was very little thunder, and not any lightning. JOHN DENE.

WELLINGTON, SOMERSET.—An exceptionally heavy fall of rain occurred here last night (15th), amounting to 1.49 in.

F. J. BURNETT.

HALSE HOUSE, NEAR TAUNTON.—Another heavy fall of rain. On Friday last, July 21st, there fell an inch between 4 p.m. and 5.30, and came rushing down the five roads that meet below my

house faster than it could flow away. This is the fourth heavy fall this month. I have measured on the

12th.....	1·24 in.		20th.....	1·16 in.
16th....	1·45 in.		22nd	1·35 in.

The falls on 12th and 16th both occurred at night. In all during this month we have had 6·42 in., after a drought of four months.

R. C. A. PRIOR.

HEENE, WORTHING.—The falls of rain here during July have been both heavy and exceptional. The total fall was 5·01 in., being 3·18 in. above the average for 20 years, and I find it is the “wettest” July since the commencement of registration in 1852. On 15th–16th it commenced to rain about 6 a.m., and continued until 11·45 a.m., 1·13 in. falling in just over 2½ hours. On 26th, another sharp thunder shower occurred, 0·25 in. falling torrentially for 20 minutes.

WILLIAM J. HARRIS.

DROUGHTS IN PAST YEARS.

To the Editor of the Meteorological Magazine.

SIR,—Annexed I hand particulars of a partial drought of 95 days which occurred at Beverly-road, Hull, in the winter of 1857-58, including an absolute drought of 15 days, December 24th to January 7th, inclusive.

	1857.		1858.	
	Nov. in.	Dec. in.	Jan. in.	Feb. in.
Rainfall...	·15	·25	·29	·26
	On 5 last days of Nov.	31 days.	31 days.	28 days.
		Days.		in.
November		5	.....	·15
December		31	.....	·25
January		31	.....	·29
February		28	.....	·26
Total.....		95		·95

In this winter occurred also an engineer's drought of 10 months, as shown in the following table:—

Rainfall, Beverly Road, Hull.

Year.	Month.	Fall. in.	Average of 30 Years. in.	in.		
1857... ..	September.....	2·01	.....	2·63	.....	— ·62
„	October.....	·79	.....	2·86	.....	—2·07
„	November.....	1·04	.....	2·42	.....	—1·38
„	December.....	·25	.....	2·50	.....	—2·25
1858	January.....	·29	.....	1·84	.....	—1·55
„	February.....	·26	.....	1·64	.....	—1·38
„	March.....	·95	.....	1·85	.....	— ·90
„	April.....	·97	.....	1·63	.....	— ·66
„	May.....	2·60	.....	1·78	.....	+ ·82
„	June.....	·69	.....	1·97	.....	—1·28
		9·85		21·12		—11·27

The fall of the five months of October to February was only 2·63 in., or 23·4 per cent. of the average fall.—Yours sincerely,

HAROLD SMITH.

Ingleside, Kenley, Surrey, May 4th, 1893.

To the Editor of the Meteorological Magazine.

SIR,—It may perhaps interest your readers, as you have given an extract from the annals of 1615 of remarkable drought, if I give you another, extracted from the Annals of Waverley Abbey, Rolls Series, p. 351.

There had been drought in 1253, and great dearth in consequence in 1254. But in 1260 we read as follows:—

“The drought was so great and so persistent in the summer that barley and oats in many places failed to come up almost until the autumn. But then the rain becoming tolerably abundant, thus late the grain begun to spring and send forth spikes; but as the heat of the sun was naturally failing, when it was plain the crops could never ripen, to the great and inestimable loss of the owners they were mown and given to the animals for fodder.”

Your obedient Servant,
JOHN SLATTER.

Whitchurch, Oxon, 20th July, 1893.

REVIEW.

Katechismus der Meteorologie. Dritte Auflage, gänzlich umgearbeitet
von Prof. Dr. W. J. van BEBBER. J. J. Weber, Leipzig, 1893
12mo., xii.—260 pages and 63 engravings.

THIS is a new edition of one of Weber's large series of illustrated catechisms—and a very good one. Prof. van Bebbber stands so high that there is little chance of any material error creeping in; the book is well arranged, well printed, and well illustrated; for though some of the engravings are hard, all unmistakably show that which they are intended to teach, and that is of much more importance than mere prettiness. We have noticed only two omissions, and of them, one—any reference to the formation of “anchor ice”—is quite reasonable in a very elementary work. The other omission is probably an oversight, viz.: “Sunshine recorders.” We are sorry to find Prof. van Bebbber representing the Piche evaporimeter; much respect as we have for M. Piche, we have none for the records of his instrument. Prof. Mascart seems to be the only leading meteorologist on the Continent who realizes the conditions necessary for obtaining trustworthy results as to evaporation. The French engineers in the early part of this century grasped the situation, a few Englishmen and Americans have followed, and Prof. Mascart is among the last recruits, but on the Continent generally, observers are still using tiny little vessels, such as were severely ridiculed by Mr. Isaac Fletcher a quarter of a century since.

However, we are not writing an article on evaporation, but the notice of the best elementary book upon meteorology which we have seen; one which has the rare merit of being written in so popular a manner, that everyone could follow it from the first word to the last.

UNUSUAL ICEBERGS.

FOR more than a year past mariners all the world over have displayed more than usual interest in the frequent reports relating to the abnormal quantities of ice which have been sighted in the southern oceans. Englishmen, with their vast shipping interests in every quarter of the globe, cannot afford to ignore the facts which are coming to hand almost daily about the surprising prevalence of icebergs, especially in the South Atlantic. Three years ago the neighbourhood of the Grand Banks of Newfoundland was studded with these dangers to navigation, the spring and summer of 1890 being considered amongst the most remarkable ice-seasons on record in the locality. Since the dissolution of the last of the bergs in the following autumn the North Atlantic has been singularly free from ice, only a few pieces having been seen this year. In southern regions it would almost seem as if some great convulsion—an earthquake, or an Antarctic Krakatoa eruption—had occurred under a range of Alpine ice-mountains, from which an incredible number of huge masses were detached and hurled into the sea, to be drifted by currents from the southern solitudes across the Antarctic Circle, and northwards into the direct tracks of vessels in the Atlantic, Indian and Pacific Oceans. A good number of bergs have been seen from ships bound to Australia, running down their easting in the usual latitude. In the South Pacific they have been still more numerous, and exceptionally far north, several being sighted a few hours' steaming time from Lyttelton, New Zealand, and some sailing ships making for Cape Horn being compelled to head northwards along the east coast of New Zealand to pass Chatham Island before setting the course to the eastward. Some idea of the extent of this obstruction may be formed from the fact that it necessitated a steam-ship losing two days in making a detour to regain its proper course. The Pacific and Indian Ocean ice, however, would appear to be relatively trifling in quantity when compared with what has been seen in the South Atlantic. A cold current is known to set from the Antarctic region in a north-easterly direction past Cape Horn towards the Falkland Islands, and on this stream hundreds, if not thousands of gigantic bergs have been floating leisurely into mid-ocean, many of them as far north as the thirty-seventh parallel of south latitude. Some have drifted eastward to about the meridian of fifteen degrees west, and it is likely, therefore, that ere long vessels outward bound to the East and to the Antipodes, round the Cape of Good Hope, will fall in with these dangers. Transatlantic navigators have often seen Greenland ice on the Newfoundland Banks a few miles in circumference, and from fifty to two hundred and fifty feet high, but the largest of these blocks dwarf into insignificance beside the monsters from the South Pole. Ships working up from the Horn have run into thick fog, and after a time, the fog dispersing, they discover themselves to be surrounded by innumerable icebergs, of every shape, size, and height. Two or three captains have reported, from the time occupied in sailing, that some of these bergs are at least fifty miles in length, those of ten miles and upwards being numerous. One ship sailing past a line of bergs found as she proceeded that the line was interminable, presently curving round like an immense horseshoe, no outlet being discovered until the other extremity of the bay was reached, some fifty miles distant from the opposite end. The fields of ice have been seen for a distance of four hundred miles. Bergs two hundred feet high are common, several have been reported as a thousand feet, and the summit of one

ice island is said to be one thousand five hundred feet above the water-line—that is, ten times the height of Queen Anne's Mansions, in Westminster. Fortunately, the casualties through collision with the bergs have been unexpectedly few. The *Templemore* ran against one and was abandoned by her crew, but she was still afloat a week later, when she was boarded by men from the *Selkirkshire*. The *Arthurstone*, now lying in the West India Docks shows severe damages to her bow, and some half-dozen other vessels have reported actual collision, but no very serious injuries. But there have been hairbreadth escapes, and captains at the docks relate most thrilling accounts of the dangers they have passed through—finding themselves hemmed in between mountains of ice with only a few feet clear on either side, huge masses of ice falling into the sea from great heights, and now and again a whole berg toppling over. As a sight, nothing can be grander or more tremendous than these majestic icebergs, but there is not a mariner who would knowingly steer toward an icefield of the description now drifting about the South Atlantic. The only way to avoid the danger is for homeward-bound vessels from the Pacific to steer well to the westward near the Falklands. Those who have acted on this advice have seen no trace of ice.—*Morning Post*.

[We reprint the above because we believe the extent and the size of the Southern icebergs to have been most unusual, and the general facts much as stated, but we feel sure that the *heights* have been very much exaggerated, an iceberg 1,500 ft. out of the water is a monster which would require very deep water to float in.—ED.]

THE LEICESTERSHIRE EARTHQUAKE.

To the Editor of the Meteorological Magazine.

SIR,—Yesterday evening (August 4th) we had a shock of earthquake here. I was sitting quietly in my house reading, when I heard a rumbling noise, like thunder, at a *great* distance, and noticed the house shaking. This noise and shaking also lasted from five to seven seconds. Time, 6 h. 41 m. p.m. Barometer 29·67 in. Wind W. ; sky almost clear in S., detached clouds in other parts. Many persons in this village felt the earth tremor, and Mr. Coventry's man heard the rumbling noise also, and went outdoors, thinking a carriage was approaching, but found none.

W. H. DIVERS.

Ketton Hall Gardens, near Stamford, August 5th, 1893.

[Letters in the local Press report the earthquake to have been felt also at—Fletton, near Peterborough, *Hunts* ; Barnack and Walcot, near Stamford, *Northampton* ; Uppingham (at 6.39 p.m.), West Deyne, North Luffenham, Edith Weston, and Oakham (about 6.45 p.m.), *Rutland* ; Leicester, Charnwood Forest, Seagrave, near Loughborough (about 6.45 p.m.), and Hose, near Belvoir, *Leicester* ; Colston Bassett, Cotgrave, Cropwell Bishop, and Shelford (about 6.45 p.m.), *Notts*. These places cover an area roughly 50 miles from N.W. to S.E., and 12 miles from N.E. to S.W.—ED.]

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1893.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.									
England, London	57·0	19	25·1	6	47·1	35·9	37·6	87	86·8	20·1	2·87	22	6·7
Malta.....	68·9	25	41·7	6	61·2	49·1	46·5	81	122·1	36·3	1·77	7	4·1
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	85·3	18	69·0	7	83·8	72·4	69·4	78	137·8	63·9	2·42	18	5·4
Calcutta	80·7	17	46·9	2	74·2	56·8	57·1	76	139·0	37·7	4·30	7	3·9
Bombay.....	85·0	9	57·9	8	80·3	65·2	61·4	68	133·2	49·3	·14	2	0·6
Ceylon, Colombo ...	90·7	14	65·8	8	87·1	71·4	69·6	79	150·0	53·0	2·36	10	2·0
<i>Melbourne</i>	103·1	9	48·6	11	77·0	56·8	...	61	155·5	37·1	·25	3	3·8
<i>Adelaide</i>	108·0	2	51·6	16	87·1	60·4	49·6	43	161·8	41·3	·00	0	1·6
<i>Sydney</i>	84·2	14	56·3	22	75·4	64·5	61·8	77	153·0	47·2	3·18	19	5·8
<i>Wellington</i>	75·3	10	49·0	19	68·2	56·1	52·7	72	145·0	39·0	4·13	13	5·2
<i>Auckland</i>	81·0	10	53·0	4	73·8	61·0	61·5	81	142·0	49·0	7·06	14	6·0
Jamaica, Kingston.....	89·5	2	65·3	19	85·6	67·6	65·3	74	...	...	·88	6	5·5
Trinidad	88·0	18 ^a	63·0	1	86·1	67·1	67·6	75	138·0	59·0	1·5	10	...
Toronto	40·1	28	— 6·3	20	27·6	9·4	17·2	83	...	—11·0	3·62	23	7·0
New Brunswick, } Fredericton	46·9	15	—20·5	6,9	24·0	1·5	7·3	76	...	...	3·80	12	4·0
Manitoba, Winnipeg ...	19·5	23	—48·0	1	3·6	—20·8	...	...	...	...	1·52	9	5·0
British Columbia, } Esquimalt	49·0	21	5·5	2	39·1	29·5	33·0	91	...	...	6·57	22	8·0

^a And 20th.

REMARKS.

MALTA.—Mean temp. 54°·1 ; mean hourly velocity of wind 11·5 miles. Lightning on 4th and 23rd. J. SCOLLES.

Mauritius.—Mean temp. of air 0°·7 below, mean dew point 0°·7 below, and rainfall 3·88 in. below, their respective averages. Mean hourly velocity of wind 8·6 miles, or 2·6 miles below average ; extremes, 28·5 on 20th, and 1·6 on 26th and 27th ; prevailing direction, E. to E.N.E. Lightning on 5 days ; thunder on 8 days. A cyclone passed N. & N.W. of Mauritius from the 18th to the 21st, and did considerable damage at Tamatave on the 21st. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on 7 days, and lightning alone was seen on the 28th. F. C. H. CLARKE, Lt.-Col. R.E.

Melbourne.—Hot wind on the 9th and 18th ; thunder and lightning on the 2nd ; smoke haze from Bush fires on the 10th, 11th, 12th, 26th, 27th and 28th ; dust storm on 18th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·1 above the average of 36 years. No B fell in Adelaide during the month, while the average of 36 years is ·65 in. C. TODD, F.R.S.

Sydney.—Mean temp. 0°·9 below, mean humidity 3 below, and rainfall 2·32 in. below their respective averages for 35 years. H. C. RUSSELL, F.R.S.

Wellington.—Fine, with occasional showers during the first half of the month, but strong N.W. wind from 10th to 20th ; the latter part of the month showery, with fresh S. wind. Earthquakes on 10th, 12th and 18th. Mean temp. 0°·4 below, and rainfall ·59 in. above, the average. R. B. GORE.

Auckland.—A rainy and unsettled month ; strong N.E. gale from the 7th to the 9th, and unusually violent N.E. gale on the 24th, doing much damage to shipping. Total rainfall more than twice the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Fair in the early part of the month, and fine afterwards. Mean hourly velocity of wind 4·5 miles. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
JULY, 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.	2·64	XI.	Builth, Abergwessin Vic.	4·63
„	Birchington, Thor	2·73	„	Rhayader, Nantgwillt..	4·49
„	Brighton, Prestonville Rd ..	...	„	Conway, Rhug	2·99
„	Hailsham	3·75	„	Carnarvon, Cocksida ...	2·47
„	Ryde, Thornbrough	5·82	„	I. of Man, Douglas	4·00
„	Alton, Ashdell	2·77	XII.	Stoneykirk, Ardwell Ho.	4·16
III.	Oxford, Magdalen Col... ..	3·50	„	New Galloway, Glenlee	3·48
„	Baubury, Bloxham	3·34	„	Melrose, Abbey Gate ...	2·48
„	Northampton, Sedgebrook ..	3·51	XIII.	N. Esk Res. [Penicuick]	2·95
„	Alconbury	2·89	„	Edinburgh, Blacket Pl..	2·53
„	Wisbech, Bank House.. ..	2·71	XIV.	Glasgow, Queen's Park..	2·19
IV.	Southend	2·25	XV.	Islay, Gruinart School..	3·18
„	Harlow, Sheering	1·55	XVI.	Dollar	2·42
„	Colchester, Lexden	2·11	„	Balquhider, Stronvar..	3·95
„	Rendlesham Hall	2·32	„	Coupar Angus Station ..	2·85
„	Diss	2·69	„	Dunkeld, Inver Braan..	3·35
„	Swaffham	4·86	„	Dalnaspidal H.R.S.	5·54
V.	Salisbury, Alderbury	3·06	XVII.	Keith H.R.S.	3·94
„	Bishop's Cannings	4·09	„	Forres H.R.S.	3·01
„	Blandford, Whatcombe ..	4·11	XVIII.	Fearn, Lower Pitkerrie..	2·77
„	Ashburton, Holne Vic.	5·97	„	Loch Shiel, Glenaladale	7·39
„	Okehampton, Oaklands.. ..	6·14	„	N. Uist, Loch Maddy ...	2·69
„	Hartland Abbey	5·53	„	Invergarry	3·26
„	Lynmouth, Glenthorne.. ..	4·32	„	Aviemore H.R.S.	1·59
„	Probus, Lamellyn	4·03	„	Loch Ness, Drumnadrochit	2·36
„	Wincanton, Stowell Rec. ..	3·92	XIX.	Invershin	3·66
„	Weston-super-Mare	3·81	„	Scourie	4·56
VI.	Clifton, Pembroke Road ..	3·75	„	Watten H.R.S.	4·14
„	Ross, The Graig	2·92	XX.	Dunmanway, Coolkelure	3·53
„	Wem, Clive Vicarage	2·14	„	Fermoy, Gas Works ...	3·48
„	Cheadle, The Heath Ho.	4·96	„	Killarney, Woodlawn ...	3·44
„	Worcester, Diglis Lock ..	1·73	„	Tipperary, Henry Street	1·08
„	Coventry, Coundon	1·85	„	Limerick, Kilcornan ...	1·91
VII.	Ketton Hall [Stamford] ..	2·41	„	Ennis	3·04
„	Grantham, Stainby	3·24	„	Miltown Malbay	3·21
„	Horncastle, Bucknall	2·39	XXI.	Gorey, Courtown House	2·10
„	Worksop, Hodsck Priory ..	3·98	„	Mullingar, Belvedere ...	2·30
VIII.	Neston, Hinderton	2·80	„	Athlone, Twyford	3·22
„	Knutsford, Heathside	2·59	„	Longford, Currygrane..	3·71
„	Lancaster, Rose Bank... ..	3·41	XXII.	Galway, Queen's Coll... ..	3·96
„	Broughton-in-Furness.. ..	5·54	„	Crossmolina, Enniscoe..	3·24
IX.	Ripon, Mickley	2·22	„	Collooney, Markree Obs.	2·51
„	Scarborough, South Cliff ..	2·57	„	Ballinamore, Lawderdale	3·51
„	East Layton [Darlington] ..	2·48	XXIII.	Lough Sheelin, Arley ..	3·15
„	Middleton, Mickleton.. ..	2·45	„	Warrenpoint	2·38
X.	Haltwhistle, Unthank.. ..	2·80	„	Seaforde	2·31
„	Bamburgh	2·23	„	Belfast, Springfield ...	3·17
„	Newton Reigny	3·17	„	Bushmills, Dundarave... ..	4·04
XI.	Llanfrechfa Grange	3·51	„	Stewartstown	2·78
„	Llandoverly	3·79	„	Buncrana	3·85
„	Castle Malgwyn	2·03	„	Lough Swilly, Carrablagh	5·82

JULY, 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 -01 or more fell.	Max.		Min.		In shade.	On Grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
		inches.	inches.	in.								
I.	London (Camden Square) ...	2.46	- .22	.46	8	17	90.7	7	47.3	15 ^b	0	0
II.	Maidstone (Hunton Court)...	2.37	+ .19	.35	16	16	...	...	...	...	...	...
III.	Strathfield Turgiss	2.08	- .31	.54	11	15	86.2	7	45.5	29	0	0
IV.	Hitchin	2.36	- .36	.36	26	17	87.0	9	43.0	28	0	...
V.	Winslow (Addington)	4.00	+ .71	1.08	21	19	87.0	7	46.0	18 ^c	0	0
VI.	Bury St. Edmunds (Westley)	3.79	+ 1.22	1.40	11	18	83.0	12	45.0	28	0	...
VII.	Norwich (Cossey)	4.32	...	.86	11	14	...	...	...	...	...	...
VIII.	Weymouth (Langton Herring)	4.48	+ 2.33	1.37	15	14	76.0	1	51.0	18	0	...
IX.	Torquay (Cary Green) ...	3.75	...	1.22	4	16	76.9	2	52.6	28	0	0
X.	Bodmin (Fore Street)	4.70	+ .09	1.04	4	23	...	...	...	...	...	...
XI.	Stroud (Upfield)	3.13	- .44	.55	19	20	91.0	2	52.0	31	0	...
XII.	Church Stretton (Woolstaston)	2.37	- .60	.40	8	16	80.0	7	46.0	15	0	0
XIII.	Tenbury (Orleton)	1.85	- 1.01	.54	11	18	85.6	7	46.0	18	0	0
XIV.	Leicester (Barkby)	2.70	- .29	.84	2	18	91.0	8	41.0	22 ^d	0	0
XV.	Boston	3.65	+ .86	1.06	8	15	88.0	7	48.0	29	0	...
XVI.	Hesley Hall (Tickhill).....	3.38	+ .71	.88	12	20	88.0	8	41.0	28	...	...
XVII.	Manchester (Plymouth Grove)	...	...	...	...	...	...	...	...	...	0	...
XVIII.	Wetherby (Ribston Hall) ..	1.32	- 1.86	.68	9	6	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	5.14	- .50	1.41	18	22	...	...	...	...	...	...
XX.	Hull (Pearson Park)	2.37	- .22	.94	8	14	77.0	2, 8	40.0	28	0	0
XXI.	Newcastle (Town Moor)	3.38	- .14	1.67	8	15	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	10.46	- .53	3.20	18	22	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	3.55	- .51	.70	19	15	...	...	...	...	...	...
XXIV.	Haverfordwest	2.71	- 1.50	.47	12 ^a	11	80.7	2, 7	44.4	1	0	0
XXV.	Aberystwith, Gogerddan	3.42	...	.54	18	15	84.0	6	39.0	26	0	...
XXVI.	Llandudno	2.50	- .50	1.21	8	12	79.0	6	52.0	15 ^e	0	0
XXVII.	Cargen [Dumfries]	2.96	- .97	.96	18	14	80.0	7	43.0	21	0	...
XXVIII.	Jedburgh (Sunnyside).....	3.19	- .25	.47	8	21	82.0	7	42.0	20	0	...
XXIX.	Old Cumnock	4.74	+ 1.22	1.92	8	18	...	...	...	...	...	...
XXX.	Lochgilhead (Kilmory)	6.31	+ 2.01	2.13	8	18	...	...	39.0	22	0	...
XXXI.	Oban (Craigvarren) .....	...	...	...	...	...	...	...	...	...	...	...
XXXII.	Mull (Quinish) .....	...	...	...	...	...	...	...	...	...	...	...
XXXIII.	Loch Leven Sluices	2.50	- 1.12	.70	20	8	...	...	...	...	...	...
XXXIV.	Dundee (Eastern Necropolis)	3.40	- .06	.85	8	18	73.2	8	44.6	23	0	...
XXXV.	Braemar	3.16	- .05	.72	18	23	74.0	7	42.2	...	0	0
XXXVI.	Aberdeen (Cranford)	3.25	...	.62	11	17	74.0	24	45.0	31	0	...
XXXVII.	Strome Ferry	3.74	- .55	.79	18	18	...	...	...	...	...	...
XXXVIII.	Cawdor [Nairn]	2.55	- .75	.42	17	22	...	...	...	...	...	...
XXXIX.	Dunrobin	3.01	+ .16	.67	18	17	69.0	7, 8	47.0	27	0	...
XL.	S. Ronaldsay (Roeberry).....	2.89	+ .53	.83	18	16	66.0	2	47.0	26 ^d	0	...
XLI.	Darrynane Abbey	2.98	...	.36	6	21	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	1.63	- 1.90	.55	10	17	76.5	3	46.0	15	0	...
XLIII.	O'Briensbridge (Ross)	2.05	...	.42	7	20	73.0	23	50.0	25	0	...
XLIV.	Carlow (Browne's Hill)	1.75	- 1.77	.32	18	13	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	2.04	- .64	.87	12	14	74.5	23	50.0	22	0	0
XLVI.	Ballinasloe	3.42	- .13	.82	18	16	74.0	2, 3	44.0	21	0	...
XLVII.	Clifden (Kylemore)	3.87	...	.62	18	22	...	...	...	...	...	...
XLVIII.	Waringstown	2.91	+ .61	.69	9	14	80.0	1, 21	48.0	26	0	0
XLIX.	Londonderry (Craggan Res.)	4.47	+ .35	1.22	9	24	...	...	...	...	...	...
L.	Omagh (Edenfel)	3.64	- .08	.73	18	18	76.0	1	43.0	20	0	0

a And 16. b And 28. c And 23. d And 27. e And 29.

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

METEOROLOGICAL NOTES ON JULY, 1893.

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

ENGLAND.

SCRATHFIELD TURGISS.—A warm showery month, with abnormal agricultural conditions. The entire vegetable world a month in advance of any previous record. There will be no autumn flowers, they have all bloomed already; no hay anywhere. Distant TS on the 12th, and T on the 26th. Wheat cut on 13th.

HITCHIN.—The hottest July since 1868.

ADDINGTON.—The early part of the month was very warm, the max. in shade rising above 80° six times before the 9th; from that date until the end cooler. T rather frequent, and a sharp TS on 9th.

BURY ST. EDMUNDS.—A month of very partial storms. T on 8th, 11th, 25th, 30th and 31st.

LANGTON HERRING.—The wettest July since the register began in 1875, the previous wettest being in that year, when 3·66 in. fell. On the 15th 1·37 in. fell, the greatest fall in 24 hours since Aug. 20th, 1891. Mean temp. at 9 a.m. (63°·5) 0°·7 above the average of the 21 years. TS on the 4th, and T on 13th and 29th. Solar halo on the 2nd.

BODMIN, FORE STREET.—A rather wet month after the 4th, on which day 1·04 in. fell. There were 23 rainy days, which quite changed the appearance of the country. Wheat harvest very early, beginning in this district before the 12th.

WOOLSTASTON.—A beautiful summer month. Harvest commenced some weeks earlier than usual. Mean temp. 60°·5.

ORLETON.—A fine warm month; with one exception, the warmest July since 1878, the mean temp. being about 1°·3 above the average of 32 years. Many very hot days at the beginning of the month, the temp. rising to or above 70° on 20 days. T on 5 days; L on 1 day; lunar halo on 22nd.

BARKBY.—Although more R fell than in the preceding months, it was in such small quantities, and at such intervals, that the wind and warmth dried it up before it could soak the ground. T on the 2nd, 8th, 11th, 17th, 26th and 31st. Mean temp. 63°.

HULL, PEARSON PARK.—TSS on 2nd, 8th, 9th and 30th.

WALES.

HAVERFORDWEST.—A very fine, warm month; sunshine above the average, and temp. above 80°·0 on two days, and above 70° on 11 days; the night temp. was high throughout. From the 9th to 31st R fell frequently in small quantities. The hay crop was a disastrous failure; the root crops in some localities promise fairly; grass lands have recovered in a manner scarcely hoped for; apples and pears abundant, also plums and blackberries, all at least one month before their time. Wind N.N.W., S.W. and E. No TSS. Corn harvest commenced; crops very light.

GOGERDDAN.—Showery and very growing weather during the last three weeks.

SCOTLAND.

CARGEN.—The temp. of the first ten days was considerably above the average; afterwards it was much lower, and the mean of the month (59°·3) is only slightly above the average. The severe T and H storm which occurred at noon on the 8th was the marked meteorological incident of the month, and it is rarely that a storm of such severity is witnessed in this country. The hailstones were of extraordinary size, many measuring 1 to 1½ in. in diameter. Pieces of ice of irregular shape, measuring 2½ and 3½ in., are reported as having fallen in many places. Great destruction of glass, gardens and crops in the district resulted. The large hailstones showed a remarkable formation; the nucleus was of opaque white ice about the size of a pea, this was surrounded by perfectly clear ice—the clear ice being apparently an aggregation of separate

hailstones closely compacted round the nucleus—with a thin outer coating of white ice. The latter may have been owing to attrition. T on the 7th, 8th, 10th, 11th and 24th. Harvest operations commenced on the 22nd, and were general at the close.

JEDBURGH.—The weather was favourable, for though a good deal of R fell, it was required by the crops, and hay was saved with little or no injury. Cereals, turnips and potatoes look well, and corn cutting will be general early in August if the weather keeps good. T and L on the 8th, 9th and 25th.

ROEBERRY.—The first half of the month was very dry, the drought breaking up on the 14th, after which fine rains fell, which were much required for the crops, as they were beginning to assume a stunted appearance. Mean temp. in shade 55°·6.

IRELAND.

DARRYNANE.—Much cooler, and rather windy. R still below the average.

WATERFORD. BROOK LODGE.—About the average number of rainy days for July, but the R a good deal less than the average. Harvest about three weeks earlier than usual. T and L on 12th, T on 13th.

O'BRIENSBRIDGE, ROSS.—A most favourable month, the R being so distributed that no delay occurred to hay harvesting. Temp. average. Winds moderate, mostly N.W. and S.W. Slight T on 10th.

DUBLIN.—A changeable, rather showery, but warm month, of high mean temp., and almost average R, with a decided prevalence of N.E. and N.W. winds. Mean temp. 61°·6 or 1°·0 above the average. High winds were noted on 9 days, but did not attain the force of a gale. Severe TSS occurred on 12th, and distant T was heard on the 13th.

EDENFEL.—Although July was not as summer-like as June, or even May, the weather was fresh, fine and generally favourable, and while the R was ample, it was not persistent enough to seriously impede the late hay harvest. The corn harvest has commenced in the county at an earlier date than within 40 years.

EXTRAORDINARY STORM IN WALES.

ON Saturday afternoon, June 10th, an extraordinary storm was experienced in the neighbourhood of the Welsh gold mines, Gwynfynydd and Cwmhesian, situate about nine miles from Dolgelly. About two o'clock a severe thunderstorm broke over the place, accompanied by a deluge of rain, which, coursing down the precipitous hillsides, carried away footpaths and greatly damaged the parish and occupation roads. The storm continued for about an hour, and when it had ceased the miners were startled by hearing a roaring sound from the upper reaches of the Gwynfynydd Valley, and presently a huge torrent of water was seen rolling down the bed of the Mawddach, bringing with it stones and other *débris*. The water, which was from 3 ft. to 4 ft. deep, struck the bridge near the Morgan Mine, leaping over the buttresses into the roadway, and finally thundering over the Mawddach fall, a height of 85 ft., into the salmon pool below, which rose 6 ft. in as many minutes. The tributary streams of the Mawddach—the Eden and the Cair—were unaffected by the storm, and it is believed that the sudden and unprecedented flood was occasioned by the bursting of a waterspout in the higher reaches of the Gwynfynydd Valley. Fortunately no material damage was done, except to the roads, which in many places are impassable.

<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>Deron.</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		
Arnccliffe	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.

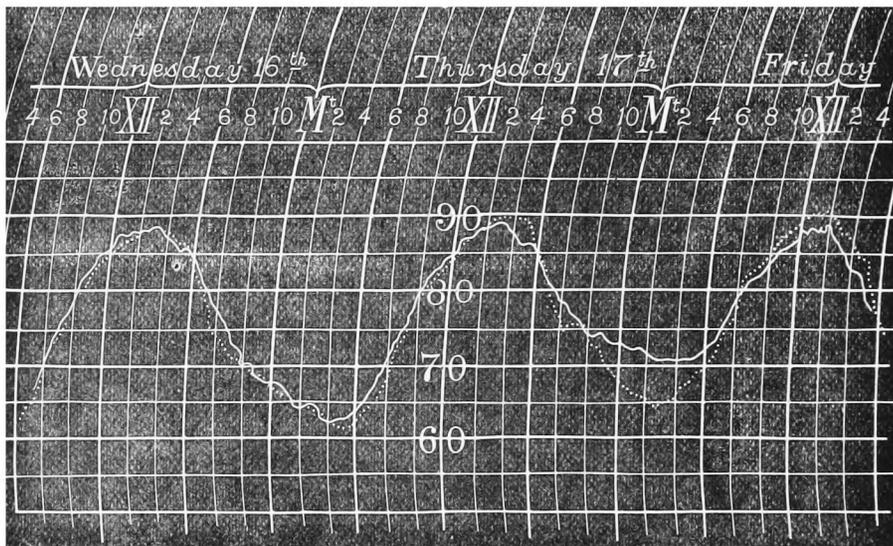
Under the title "Maximum Shade Temperature in April, 1893," on page 70 of the present volume, we showed that on April 20th the maximum temperature at the Botanic Gardens, Regent's Park, was only 77°·5; at Camden Square, 78°·1; at Greenwich, 78°·9; at Old Street (in the heart of the City) it was 79°·1 (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</i>	<i>Stevenson's</i>	<i>Grass.</i>	<i>Glaisher's</i>	<i>Stevenson's</i>	<i>(! Acre Lane, Brixton.)</i>
<i>Stand.</i>	<i>Screen.</i>		<i>Stand.</i>	<i>Screen.</i>	<i>Stevenson's</i>
					<i>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
	<hr style="width: 100px; margin: 0 auto;"/>
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 $12^{\circ}1$ 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.		+ 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.		+ 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
Cape of Good Hope ...	93·8	13	55·0	30	79·6	60·6	62·0	78	...	...	·13	3	3·0
Mauritius.....	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
Melbourne.....	105·5	2	43·3	25	76·4	54·0	...	65	151·1	34·2	1·45	4	4·1
Adelaide	105·3	1	47·5	23	84·2	60·1	50·2	46	157·5	37·5	·59	3	2·9
Sydney	81·3	7	54·8	13	73·2	62·0	61·0	85	148·3	42·3	10·01	22	6·3
Wellington	71·0	23	44·0	19	64·4	50·8	47·4	70	136·0	35·0	7·22	13	4·7
Auckland	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. R. B. GORE.

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, Lamelbyn	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 >01 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	28d	0	...
	Norwich (Cossey)	1.90	...	.43	3	13	...	...	...	...	...	...
V.	Weymouth (Langton Herring)	1.01	— .92	.23	20	10	75.0	15	48.0	28d	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	13b	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).....	13.53	+ 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) .....	...	...	...	...	...	...	...	...	...	...	...
	Mull (Quinish)	3.67	— .48	.36	21a	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	...
XVIII.	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 (Roeberry)	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	13c	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; T S 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°·6, was 2°·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°·0. T and L on 9th and 10th.

ORLETON.—A very fine month, hotter than any August since 1867; temp. more than 4°·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°·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 18·88 in. In the first eight months of 1859 the fall was only 18·04 in., and in that year the drought was absolute from the 9th April to 27th; no R fell in May; on the 3rd June ·30 in. fell, after which none fell until July 9th, when ·30 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 B 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.

WARINGTOWN.—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.

SYMONS'S
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METEOROLOGICAL MAGAZINE.

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THE CHICAGO METEOROLOGICAL CONGRESS.

OUR American friends are never content to do things on the scale of the Old World. They resolved that their Exhibition should be the locale for some Congresses, but we could never understand how the whole science of meteorology could be discussed in three days, and they have not accomplished the impossible. But they have done one remarkable thing, they have drawn from many of the most able meteorologists of the Old World and of the New, and from both hemispheres, nearly *one hundred and thirty memoirs*, and they, as will be seen below, purpose printing them in full. Judging by those that we have seen, we anticipate a publication of surpassing ability and interest. Dreadfully poor as was the exhibit (!) of British meteorological instruments, and indeed, if we have been correctly informed, of meteorological instruments by Europeans generally, the Chicago Congress will leave its mark upon meteorology if the Memoirs that we have seen are even approximately typical, and if all are printed.

As regards the Congress, it seems to have done its best with the overwhelming mass of material placed before it. Mr. Fassig has been kind enough to send us an account, whence the following has been abstracted:—

THE METEOROLOGICAL CONGRESS,
Held at Chicago, August 21st to 24th, 1893.

“Monday, August 21st, at 10 a.m., the Congresses of the Department of Science and Philosophy of the Congress Auxiliary of the Columbian Exposition were formally opened at the Memorial Art Institute of Chicago with an address of welcome by the President, Mr. C. C. Bonney, followed by responses from representatives of the various special congresses.

“At the close of this general session the different divisions met in rooms assigned to them, the Division of Meteorology, Climatology, and Terrestrial Magnetism meeting in Room xxxi., in which the regular sessions were held daily (from 10 a.m. to 2 p.m.) from August 21st to August 24th.

“The Chairman of the Congress not being able to be present in person on the first day, Prof. F. H. Bigelow, representing Prof.

Mark W. Harrington, opened the session at 11 a.m. of the 21st with a few words of welcome and a statement of the objects of the Congress.

"The Congress had no legislative authority. The main purpose, as previously announced, was to collect together a series of memoirs 'outlining the progress and summarizing the present state of our knowledge of the subjects treated,' prepared by writers of authority in their respective lines of research, and to print them in full in the English language.

"The meetings, while thus making the reading and discussion of papers a matter of secondary importance, were by no means lacking in interest or profit to those who were present. Few of the papers could be read in full, owing to their great number; about 130 were read by title, in abstract, or in full.

"Among so many papers of merit, a simple list of which would occupy several pages, individual mention cannot be fairly attempted.

"While the papers were read in general session, they were assigned, in the printed program, to various sections according to the subject, each section being placed in charge of a responsible chairman.

"Section A.—Prof. C. A. Schott, U.S. Coast Survey, and Mr. H. H. Clayton, U.S. Weather Bureau, Chairmen. *Instruments, their History and Relative Merits, and Methods of Observation, especially Methods of Observing in the Upper Air.*

"Section B.—Prof. Cleveland Abbe, U.S. Weather Bureau, Chairman. *Theoretical and Dynamic Meteorology; the Study of Thunderstorm Phenomena in Various Countries.*

"Section C.—Prof. F. E. Nipher, Washington University, Chairman. *Sketches of the Climate of Different Portions of the Globe.*

"Section D.—Major H. H. C. Dunwoody, U.S. Army, Chairman. *The Relation of the various Climatic Elements to Plant and Animal Life.*

"Section E.—Lieut. W. H. Beehler, U.S. Hydrographic Office, Chairman. *Marine Meteorology, Ocean Storms and their Prediction, Methods of Observation at Sea, and International Co-operation.* During the reading of a paper on the work of the Hydrographic Office of the Navy, Lieut. Beehler had on exhibition a fine bust of Lieut. Maury, by the sculptor Valentine, of Richmond, Va.

"Section F.—Prof. Charles Carpmæl, Director of the Canadian Meteorological Service, and Mr. A. Lawrence Rotch, Director of the Blue Hill Observatory, Chairmen. *The Improvement of Weather Services and the Progress of Weather Forecasting.*

"Section G.—Prof. F. H. Bigelow, U.S. Weather Bureau, Chairman. *Atmospheric Electricity and Terrestrial Magnetism and their Cosmical Relations.*

"Section H.—Prof. Thomas Russell, of the U.S. Lake Survey, Chairman. *Rivers, and the Prediction of floods.*

"Section I.—Oliver L. Fassig, Librarian U.S. Weather Bureau, Chairman. *Historical Papers and Bibliography, with Special Reference to the History of Meteorology in the United States.*

“ Prof. Mark W. Harrington, Prof. F. H. Bigelow, Capt. P. Pinheiro (of Rio Janeiro), and Lieut. W. H. Beehler, successively presided over the meetings.

“ At the close of the last session a resolution was offered calling for recommendations by the Congress relating to—(a) *International Co-operation in Observations of Auroræ*; (b) *Simultaneous Greenwich Noon Observations daily at all Stations on Land and Sea, in addition to Observations at other times*; (c) *Investigation of the Earth's Magnetic Polar Current and the Exact Determination of the Solar Rotation*. As the Congress had no legislative authority, it was agreed to hold a special session for the consideration of these questions, after adjournment, on the following day.

“ Preparations have been begun for the printing of the papers, and an effort will be made to complete the work at an early date.”

REVIEWS.

On Hail. By the Hon. ROLLO RUSSELL, F.R.Met.Soc. With two photographs of hailstones. London: Edward Stanford, 1893. 8vo. xvi.—224 pages, and two photographs.

OWING to a circumstance mentioned on page v. of this work, it would, we think, hardly be in good taste for us to allow either praise or censure of it to appear in this Magazine; but to a statement of its contents no one could object, and it would be absurdly punctilious, and unfair to the author, to the publisher, and to our readers, to omit to notice so important a work.

The book consists roughly of three equal portions: (1) Records of hailstorms from 1680 to 1893; (2) Theories as to the formation of hail and rain; (3) The author's own views.

The subjects of the several chapters are:—

1. Descriptions of hailstorms and hailstones.
 2. Temperature, cloud and wind at great altitudes.
 3. Electricity and hail.
 4. Theories of hail.
 5. Properties of vapour, water and ice, and conditions of the air which may be connected with the formation of hail.
 6. Summary of characteristics of hailstorms and hailstones.
 7. The development of a hailstorm.
 8. Conclusions.
- Appendices.

To give some idea of the labour devoted to this work, we may mention that the “List of authors quoted” includes 178 names, from Julius Cæsar and Fromondus, down to those of the leading authorities of the present day in both hemispheres.

Certain Climatic Features of the two Dakotas. Illustrated with 163 tables, charts, and diagrams. By JOHN P. FINLEY. 4to, 204 pages, and about 96 plates. Washington: 1893.

MANY of the arrangements in the United States are puzzling to us. Here is a handsome quarto, nearly an inch thick, and as far as we can trace from the details given, it was written and delivered in *fifty-seven days*. On February 26th, 1892, by a joint resolution, Congress ordered it to be printed, and yet it contains observations up to the end of the previous December! If that was not rushing the work, we do not know what is. No wonder that Lieutenant Finley in the introduction says: "In the time given me for the preparation of this report I have attempted to accomplish the work with as much care and thoroughness as circumstances would permit."

We have a high opinion of Lieutenant Finley's work upon "Tornadoes." He now comes forward in another branch of meteorology, and not only so, but, unless our memory is at fault, this is the first large work upon Climatology issued since the meteorological work of the United States was transferred to the Department of Agriculture; it therefore becomes in some sort a type of what we may look for in the future. We do not forget the remark already quoted, but it seems to us that the MSS. must have been prepared before the resolution as to its printing was passed; and in any case it is evident that what has happened once may occur again. We therefore accept it as a specimen.

First as to typography and maps; both are very similar to what we have had from the Signal Office, but the numerals on both the temperature and rainfall maps are of so bad a form that, in spite of their great size, they are not more clear than they would have been if well formed and of half the size; there is another point, but upon it opinions may differ—we should not have given the rainfall to the hundredth of an inch, but only to the nearest tenth; the hundredths are all very well (when one is sure that they are correct) in tables, but rarely or never should go on maps, where distinctness is the first consideration; on the map of total yearly rainfall we should have preferred to see the fractions entirely omitted.

The next subject for consideration is the material upon which the work is based; obviously, the author is in no way responsible for paucity of data, but he is so for the use he makes of them. It seems to us that the bulk of this book has been produced by the original sheets being given out to subordinates with instructions to fill up certain forms, and that they have obeyed orders strictly—too strictly, and have thereby sometimes given some rather useless statements.

Appendix No. 2 resembles the well-known table in "Blodget," but the important column giving the period covered by the record is omitted; it would have been a useful indication of the value to be attached to the various returns, and if, further, the names of the stations on the map had been printed in sizes of letters proportionate

to the duration of the observations, one would have had, without further thought, indication of the weight to be attached to the various values shown on the maps.

Dakota is, as most of our readers are aware, a vast country lying to the south of Winnipeg (known to the readers of this Magazine as one of the stations in our Climatological tables); it may not inaccurately be described as being in the very middle of the North American continent. Moreover, it has only very recently been taken from the Indians, and brought within the pale of civilization; consequently the observations consist of two kinds—of those made at the military forts which were established many years ago to keep the Indians in check, and of observations made by the new occupants of the country. To deal satisfactorily with such data requires much time and thought, and to rush it, is to produce work which cannot be free from error. We recognise fully the difficulty of impressing upon the non-scientific mind that it is not possible to turn out accurate meteorological values at the rate of so many pages a day; but the difficulty, if not boldly faced in the first instance, will, as the proverb says, “come home to roost.” Apparently some one ordered this paper to be got out with all speed. From Lieutenant Finley's remarks we gather that he had no option in the matter, and the result is that we have a big book, but that we might have had a better one.

We ought to give some illustrations: In Appendix 5, mean monthly rainfall, it will be seen that in N. Dakota, for January all stations but one have less than an inch; for Richardton, however, the mean is given as 2.25 in.; on turning back to p. 51 (where, by the bye, it is misprinted Richardson), the high mean seems to be chiefly due to the entry of 4.00 in. for January, 1888; on examining the records for that month at other stations we cannot find one within hundreds of miles with even one inch; and it therefore seems probable that either there was a new observer or that the decimal was misplaced. Further investigation has, however, landed us in further difficulty. Appendix No. 7 gives the monthly depth of unmelted snow at each station, and it is evident that it has not been included in the “annual precipitation,” because (to adhere to the same station), in January, 1885, the snow is given as 44.00 in. (which would yield probably quite three inches), and yet in the table of “total precipitation” we find for that month 1.90 in. ! We have always been uncertain as to the American practice in this matter, and hope that it may now be made quite clear. It is a startling surprise to us to find that our American friends *do not consider snow to be* “precipitation” *unless it melts at once*, but that seems to be the case. Of course it results therefrom that their maps of rainfall all show means less than would be quoted for stations in the Old World having the same precipitation, by amounts representing the fall of snow during cold periods. As far as we can make out, for Dakota this means an addition of about ten per cent. to the

precipitation; on this hypothesis the mean annual rainfall in N. Dakota is about 20 in., and in S. Dakota about 25 in.

We are very sorry to seem to do nothing but find fault with this book, which is undoubtedly a very storehouse of information; but it keeps irritating us. We wished to give some information as to extreme temperatures, and on turning to the list of appendices we found: "No. 47.—Annual maximum and minimum temperature, and mean annual range of temperature." But No. 47 is quite different, and the first and fifth words must be erased. There does not seem to be any table of extremes. We have therefore gone through Appendices No. 65 and 66, with the result that we find that most stations have maxima exceeding 100° , and some with 105° to 114° ; and as regards minimum, -40° (the freezing point of mercury) is by no means unusual, and we have seen several cases of -50° and one of -55° at Fort Stevenson in January, 1881.

Want of space, not lack of interesting matter, compels us to conclude our notice of this work. It would have been much better if the records of 1892 could have been added, and another year have been devoted to the higher branches of the work; but it is by far the best book upon the subject, and one which no future writer upon Dakota can ignore.

The Climate of Chicago. By HENRY A. HAZEN, Professor of Meteorology, U.S. Department of Agriculture. Weather Bureau, Bulletin No. 10. 8vo. Washington: 1893. 136 pages, 4 charts, and 23 engravings.

AFTER explaining the position of Chicago, on a level plateau, slightly above, and at the southern end of, Lake Michigan, about 600 ft. above sea level, Prof. Hazen proceeds to describe the data upon which his work is based. There is a record of temperature at Fort Dearborn, near the shore, from July, 1832, till December, 1836; there are six months of 1844; there is the whole of 1857, and a continuous record from November, 1859, to the present time. After stating, this, Prof. Hazen writes:—

"It would be very interesting and of considerable value in discussing temperatures for an extended period, if we could obtain interpolated values for the time during which there are no records. This could be done with considerable accuracy if we had a long series of observations at a neighbouring station which lapped over those at Chicago. Unfortunately, there are no records of this description near Chicago, but we have a continuous series at two or more stations* which overlap each other; and by using these it has been possible to interpolate a series of values, and to make a complete record from 1830 to 1891. In Table XIX., wherever a record has been kept at Chicago, the temperature is given to the nearest tenth of a degree, but in all interpolated values only the nearest degree is given."

* We cannot trace any information as to which they were, or how far off.—Ed. M. M.

Reference to Table XIX. shows that out of the first 31 years—*i.e.*, 372 months—76 months were observed, and 296 were “interpolated.”

Table XXXIV., on page 57, monthly precipitation is even a worse case of theory. It gives monthly totals from 1843 to 1891. In the first 24 years—*i.e.*, 288 months—only 11 were observed, and 277 were “interpolated.”

We are glad to see that Prof. Hazen makes very little use of these portions of the tables, but we should have respected and trusted his work much more had he not given us these remarkable specimens of “interpolation”; we do not think that they could be matched in the whole literature of European meteorology.

Taking the records for the twenty years during which the observations seem to have been unexceptionable (save for the position of the thermometers, now *241 ft. above ground*—they have tall buildings in Chicago), we have the mean temperature as under. We add, for comparison, the latest figures that we have seen for Greenwich:—

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR.
Chicago ...	24 ^o ·5	27 ^o ·7	34 ^o ·8	46 ^o ·1	56 ^o ·3	66 ^o ·4	71 ^o ·9	71 ^o ·0	63 ^o ·8	52 ^o ·3	38 ^o ·6	29 ^o ·9	48 ^o ·7*
Greenwich.	38·5	39·5	41·7	47·2	53·1	59·4	62·5	61·6	57·2	50·0	43·2	39·7	49·5
Diff	+14·0	+11·8	+6·9	+1·1	-3·2	-7·0	-9·4	-9·4	-6·6	-2·3	+4·6	+9·8	+0·8
Rainfall } Chicago }	in. 2·12	in. 2·20	in. 2·52	in. 3·09	in. 3·72	in. 3·59	in. 3·57	in. 2·96	in. 2·77	in. 3·00	in. 2·66	in. 2·13	in. 34·40†

As regards extremes of temperature, we find that 100° in the shade was recorded on July 16th, 1887, and -20° on January 9th, 1875.

Greatest daily rainfall, 4·14 in., on July 26th, 1878. The observer says that he thinks that two-thirds of it fell in three hours, between 11.30 p.m. of 25th, and 2.30 a.m. of 26th—[*i.e.*, 2·36 in. in 3 hours]—much damage was done, and the sewers were choked, though their guaranteed capacity is one inch of rainfall per hour.

Prof. Hazen has spared no trouble in tabulating the data, and has, we think, brought out nearly all that there is to tell. He recognises the need of better observations; and now that meteorology in the U.S. is under the Department of Agriculture, we hope that the thermometers and rain gauges will not remain many more years among the chimney pots. Not, however, to be abandoned until a reasonable period has elapsed for comparison with others, in better homes on grass plots at the model farms and schools.

Sur la Prévision du temps et sur l'enchaînement des situations atmosphériques Par PAUL GARRIGOU-LAGRANGE. 8vo. Limoges, Ducourtieux, 1893. 35 pages and two plates.

M. GARRIGOU-LAGRANGE has two appointments, each of which is likely to lead the holder to take a deep interest in weather fore-

* Works out to 48°·61, but probably 48·7 is the mean when the months are given to a second place of decimals.

† Works out to 34·33 in. ; probably the 5's in the third place have all been thrown up.

casting; he is Secretary of the Société Gay Lussac (which gives its attention to matters aeronautical), and he is Secretary to the Meteorological Commission for the Department of la Haute-Vienne.

In the opening sections of his paper, the author points out that weather forecasting as at present carried on is largely a race between the telegraph and the storm, and he pleads for a broader mode of treatment, viz., the study of the general type of circulation prevailing on successive days, and storing these records for future study, so that the forecasts should be based chiefly on the hypothesis that because once a certain type was followed by certain weather, the same type will be followed by similar weather when the moon is in the same position. We are not sure about this, but, as we have often said in these pages, we wish success to every honest worker, and that we believe M. Garrigou Lagrange to be.

He has adopted a plan (very similar to that used, we believe, in New Zealand) of drawing a series of isobaric maps, with the "highs" and "lows" in different positions, and giving to each a number, so that, *e.g.*, Type 7 has a cyclone in mid-Atlantic, another in Northern Russia, and a "high" in Arctic Siberia. Then he tabulates the relative frequencies of the various types in months and seasons, and how frequently, *e.g.*, Type 7 is succeeded by Type 3, and the circumstances attending this succession. This has led him to think that the declination of the moon is a factor not to be neglected. There are other suggestions in the paper, but we have endeavoured to state its general aim, and now leave it to the study of those occupied with this class of work.

Sociedad Meteorologica Uruguaya. Revista mensual de meteorologia practica. Tomo II. Num. I. Enero de 1893. 8vo. Montevideo.

ALTHOUGH we have not had the pleasure of seeing the first volume of this work, we are glad to call attention to the number which we have received, and to find that although affairs in South America are at present rather disturbed, scientific work is going on. We know that it is not to be expected that in tropical countries things should be as prompt as in northern climes, and therefore we are not surprised that the returns in the January number are those for the previous July; we hope that by degrees they will be brought nearer up to date. But we are delighted to find that already there are as many as 30 stations at work in Uruguay; indeed, there seem to be 36, for the six principal stations, viz., Montevideo, Mercedes, Durazno, Isla de Flores, Salto, and Maldonado, do not appear upon page 7, which we think is a pity. It would be useless to offer any remarks upon the results of a single month; we therefore confine ourselves to wishing the Meteorological Society of Uruguay and its *Revista* a long and prosperous career.

THE EXCESSIVE HEAT.

DR. FALB AND HIS FORECASTS OF WEATHER.

(FROM A SPECIAL CORRESPONDENT.)

WE rarely occupy these pages with what is irreverently called "paste and scissors work"—*i.e.*, with reprints—but the following article, which appeared in the *Newcastle Daily Journal* of August 23rd, seems to us one in favour of which the rule may well be relaxed.—ED.

"The accurate definition of that much-abused term meteorologist is a pressing need of to-day. It is at present applied indiscriminately to all sorts and conditions of men, provided that they are in some way interested in the weather. He who reads a barometer and thermometer regularly every day at certain hours, and enters the readings in a note-book, not infrequently dubs himself meteorologist. And this more especially if he have at any time totalled up these records of facts, obtained monthly averages, and read a depressingly practical paper thereon at a meeting of some Meteorological Society. Everyone seems to regard himself, or herself, as a born meteorologist, perish the term; and who is there to decide as to the exact signification of this loosely applied term? A thorough meteorologist must of necessity be fairly familiar with many branches of science; and, if we rightly narrow our definition in this manner, it might not be difficult to demonstrate that there are but a select few on our planet to whom the description is peculiarly appropriate. Weather work has unfortunately come under the domination of German methods, and the perception of laws is becoming a vanishing quantity owing to an undeviating attention to microscopic detail. It appears to be of more importance to be sure that the readings from standard instruments shall be true to the thousandth part of an inch than it is to know when similar readings will occur again. As a consequence the State supported weather offices of Europe are able to tell the exact error of a thermometer or barometer in use by every one of their observers, yet are quite unable to predict with certainty the weather twenty-four hours in advance.

"Dr. Falb of Berlin has been introduced to the British public as 'the German meteorologist,' but the result of his vapourings has proved up to the hilt that the American humourist was not far wrong when he advised fallible mortals never to prophesy unless they know. Dr. Falb was 'reluctant to make prophecies which are only guesses,' so that the inconveniently warm weather of the past few days over Europe is only so much the worse for his theory. We were to have in England heavy rainfall throughout July, August and September, especially in September, which is to be 'exceptionally, abnormally, thoroughly wet.' If adjectives stand for anything, then certainly September ought to be a most miserable month; but there is a great virtue in an *if*. We happen to remember another so called meteorologist, Wiggins of Canada, who was good enough to forecast that on a specified day the North Atlantic Ocean would be vexed by a hurricane of such awful intensity that of all the vessels along its path none but Cunarders could possibly survive. Passengers postponed their embarkation, ships in our docks were made fast over night with extra hawsers, and even ancient mariners awaited somewhat anxiously what the morrow would bring forth. We need scarcely say that a genial sun rose in a cloudless sky, climbed calmly to his maximum altitude, and sank below the horizon, on as fine a day as the most exacting could desire. As a matter of fact, reports

received subsequently from steamships crossing the North Atlantic in every direction conclusively proved that gentle breezes and fine weather prevailed all over the ocean on that day. The very name of Wiggins now acts upon navigators after the manner of the proverbial red rag upon a bull.

“Dr. Falb’s positive assertions as to the coming weather have received great attention, and some degree of credence, in various lands ; for both the ‘many-headed’ and the ‘classes’ are equally afflicted with an insatiable craving for weather foreknowledge. Nevertheless, the predictions of old-time seers may be not less deserving of credit, which, after all, is but faint praise. It is not improbable that men more nearly approached precision in local weather forecasting prior to the introduction of costly meteorological instruments and weather departments. That traveller’s tale of the shepherd who foretold rainy weather on the ground that he had noticed an old ram to be twitching his tail considerably, as he invariably did just previous to a downpour of rain, is merely a rude expression of the truth that personal observation lies at the root of weather forecasting. Christmas Day last year happened to fall on a Sunday, and in the Harleian Manuscripts is distinctly laid down what kind of weather may be looked forward to by dwellers in our islands during the ensuing year. It is just possible that the doggerel rhymes of our forefathers, there given, are as worthy of belief as the more pretentious predictions of the German forecaster.

‘ If that Christmas day fall upon Sunday, know well all
That winter season shall be easy, save great winds aloft shall fly ;
The summer after also be dry, and right seasonable. I say,
Beasts and sheep shall thrive right well, but other victuals shall fail.’

Farmers may not quite agree to the truth of the last line, but perhaps he who penned it was a meteorologist among farmers, a farmer among meteorologists, and only both when in the company of those who are neither. We do not propose to holloa till out of the wood, and September, of course, may be sufficiently damp to afford Dr. Falb a grain of comfort. An Irishman, asked if the day were to be wet or fine, warily replied that it might rain or it might not, he could not say for certain, but, anyhow, it would be one or the other. Just so. If the forecaster happen to be correct, the whole world is girdled with the news ; should he, however, make an outer, policy demands that he shall lie low ; and, if he miss altogether, then he will wait for better luck. Aristotle calls meteorology the ‘sublime science,’ presumably because ignorance of its laws lends enchantment to the view, as with other things.

“The summer of 1893 will be remarkable for the excessively high air temperatures recorded over Europe on several successive days, and the inconvenience of pedestrians and others exposed to the rays of the sun. Having shivered to the northward of the Arctic circle, and to the southward of Cape Horn in the depth of a southern winter ; and gasped for breath under a vertical sun in the tropical regions of Atlantic, Pacific, and Indian Oceans, we unhesitatingly prefer the former. It is possible to become warmer by means of exercise, and the wearing of suitable clothing ; but almost useless to attempt to become cooler in the tropics. The heat recently in England has successfully rivalled that of far sunnier climes. Such high temperatures, however, are not altogether exceptional in these latitudes, although from fifteen to twenty degrees Fahrenheit above the mean daily maximum temperatures for August. In 1859, during August, the London river was most

mal-odorous, and a temperature of 92 degrees was reached. Nine years later the maximum air temperature in the shade exceeded 90 degrees for several consecutive days, and in 1886, from the 4th to the 6th of July, similar high readings were obtained over our islands. The average temperature of the air in the shade for August at eight o'clock in the morning at London is 61 degrees, yet at that hour on the 8th of last month the temperature was 80 degrees, and last Friday morning (18th) the thermometer in the open air, out of the direct rays of the sun, actually showed 84 degrees, or no less than 23 degrees above the average for August deduced from observations made during the twenty years 1871-90! The maximum temperature for the same day was 92 degrees, or 20 degrees above the highest temperature of the air in the shade likely to be experienced in August in London. The air temperature was 70 degrees, or 18 degrees above the average, at Shields, at 8 o'clock in the morning of the same day; and the maximum official temperature there for the twenty-four hours was 78 degrees, or 14 degrees above the average daily maximum for the month of August at Shields. Cambridge has had higher air temperature readings in the shade this month than any other place in England. The mean temperature there during the hot spell has been from four to six degrees above that of other parts of the country. France has had even a fiercer sun-bath than we on this side of the silver streak, and maximum temperatures of 102 and 106 degrees of the air in the shade have been registered at Rochefort.

"We are not troubled with such trying changes in air temperature as the United States, or ships making New York from the equator in winter. A sailing ship 200 miles south-east of that port may enjoy a temperature of 70 degrees, yet on arrival two days later be plunged into the rigours of winter, with snow squalls and the thermometer below freezing point. Many will doubtless be chronicling the maximum temperature this summer, and performing curious arithmetical operations therewith; yet very few will seriously endeavour to discover a plan whereby it would be possible to predict such another season, say six months in advance. The scaffolding at present conceals from view the structure being reared by weather workers; and it is high time that the finished temple of the struggling science should stand alone on a firm foundation like that of astronomy.

SUN SPOTS AND AIR TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—In the communication by A. B. M. on "Sun Spots and Air Temperature," contained in the September number of the Magazine, no mention is made of the years actually employed in forming the separate means. It is not enough to speak of minimum and maximum years of sun spots, or even to say (if he had said it), that Wolf's years were used. What is best of all in such cases is that it should be definitely stated what years were taken as minimum years, and what years as maximum years. Perhaps A. B. M. would be so kind as to supply this information. Others would then be better able to deal with or verify the figures he has obtained.

W. E.

September 28th, 1893.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 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	78·2	20	30·9	13	65·6	40·4	40·1	65	117·8	25·2	·24	3	3·2
Malta.....	77·7	28	47·2	17	66·9	53·1	52·7	81	134·1	41·9	·25	3	4·3
<i>Cape of Good Hope</i> ...	98·7	5	43·2	24	73·1	53·6	56·5	82	...	...	1·99	9	4·6
<i>Mauritius</i>	82·6	6	66·0	5	80·2	70·3	69·2	84	134·2	59·6	10·06	20	6·5
Calcutta	96·5	18	69·7	23	92·3	75·1	74·5	75	157·9	63·0	·17	1	3·4
Bombay.....	94·6	16	74·1	1	89·3	77·9	73·1	72	142·8	65·8	·02	2	2·8
Ceylon, Colombo	89·2	...	70·8	24	87·5	75·2	70·7	75	157·0	60·0	20·39	19	4·9
<i>Melbourne</i>	77·5	11	40·0	3	76·9	51·5	...	78	131·9	34·0	2·07	14	6·4
<i>Adelaide</i>	86·1	11	42·9	27	70·7	52·1	49·3	64	145·6	35·5	1·98	16	4·8
<i>Sydney</i>	73·6	1	47·4	3	67·9	56·0	56·0	87	135·3	40·6	5·68	23	4·8
<i>Wellington</i>	69·0	3	45·0	10a	62·9	53·1	51·7	79	130·0	34·0	3·91	16	5·2
<i>Auckland</i>	72·0	4	49·5	5	68·3	56·1	57·4	84	129·0	47·0	3·79	14	5·8
Jamaica, Kingston.....	87·3	7	67·2	1	84·7	69·4	68·2	80	...	...	1·29	6	5·5
Trinidad	92·0	7	64·0	10	88·9	67·5	70·6	84	153·0	58·0	3·61	14	...
Toronto	69·3	8	22·4	2	47·4	32·1	30·6	71	...	13·0	4·27	14	7·0
New Brunswick, Fredericton	56·3	29	6·1	3	45·0	24·6	23·0	59	...	...	2·30	12	6·0
Manitoba, Winnipeg...	56·3	30	0·7	2	37·5	16·3	...	...	...	...	2·30	14	7·0
British Columbia, Esquimalt	58·6	28	31·4	19	50·5	39·5	40·2	85	...	...	5·40	21	8·0

a And 11th.

REMARKS.

MALTA.—Mean temp. 58°·8 ; mean hourly velocity of wind 9·1 miles. L was seen on 9th. J. SCOLES.

Mauritius.—Mean temp. of air 1°·6 below, dew point 0°·9 above and rainfall 4·11 in. above, their respective averages. Mean hourly velocity of wind 8·4 miles, or 2·2 below average ; extremes, 25·4 on 30th, and 1·7 on 4th ; prevailing direction, E.S.E. L on 11th and 15th ; T and L on 12th, 14th, 19th and 20th ; and T on 13th and 26th. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on 11 days, and lightning alone was seen on 2 other days. J. C. H. CLARKE, Lt.-Col. R.E.

Melbourne.—Thunderstorm on the 16th, and with heavy rain squalls on the 25th, and lightning on six other days. Dense fog at 11 p.m. on the 30th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 2°·8 below the average of 36 years. Good rains, general over the settled districts of the colony ; at Adelaide ·34 in. more than the average. Mean bar. the lowest on record, being ·168 in. below the average. C. TODD, F.R.S.

Sydney.—Temp. 2°·7 lower than, humidity 9 above, and rainfall ·35 in. less than, the average. Thunder and lightning on 10 days. H. C. RUSSELL, F.R.S.

Wellington.—The first part of the month was generally fine, with occasional showers and prevailing N.W. winds, strong on 5th. From the 17th to the end of the month very showery, rain falling every day ; wind chiefly light from S., and very unpleasant weather. Fogs on 3 days. Slight earthquake on 21st, at 10.29 a.m. Mean temp. 1°·0, and rainfall ·39 in., above the average. R. B. GORE.

Auckland.—Commencement and close of the month fine, the remainder showery and unsettled. Rainfall about half an inch, and mean temp. slightly, above the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Fair, with a little B. Mean wind 92 miles per diem, or 24 more than the average. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
SEPTEMBER, 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.	1·30	XI.	Builth, Abergwessin Vic.	4·53
„	Birchington, Thor	2·56	„	Rhayader, Nantgwillt..	4·26
„	Brighton, Prestonville Rd	...	„	Corwen, Rhug	3·34
„	Hailsham	4·70	„	Carnarvon, Cocksidia ...	2·91
„	Ryde, Thornbrough	2·97	„	I. of Man, Douglas	2·67
„	Alton, Ashdell	2·26	XII.	Stoneykirk, Ardwell Ho.	2·44
III.	Oxford, Magdalen Col...	·52	„	New Galloway, Glenlee	2·32
„	Banbury, Bloxham	·68	„	Melrose, Abbey Gate...	1·13
„	Northampton, Sedgebrook	·77	XIII.	N. Esk Res. [Penicuick]	2·25
„	Alconbury	·65	„	Edinburgh, Blacket Pl..	1·67
„	Wisbech, Bank House..	·70	XIV.	Glasgow, Queen's Park.	3·25
IV.	Southend	1·49	XV.	Islay, Gruinart School..	4·95
„	Harlow, Sheering	·75	XVI.	Dollar	1·24
„	Colchester, Lexden	1·08	„	Balquhider, Stronvar..	4·54
„	Rendlesham Hall	1·24	„	Coupar Angus Station..	1·10
„	Diss	·87	„	Dunkeld, Inver Braan..	1·39
„	Swaffham	·78	„	Dalnaspidal H.R.S. ...	4·48
V.	Salisbury, Alderbury ...	1·89	XVII.	Keith H.R.S.	6·96
„	Bishop's Cannings	1·35	„	Forres H.R.S.	4·03
„	Blandford, Whatcombe ..	2·41	XVIII.	Fearn, Lower Pitkerrie.	2·80
„	Ashburton, Holne Vic. ...	3·85	„	Loch Shiel, Glenaladale	13·03
„	Okehampton, Oaklands.	2·96	„	N. Uist. Loch Maddy ...	7·00
„	Hartland Abbey	3·48	„	Invergarry	6·56
„	Lymouth, Glenthorne.	3·90	„	Aviemore H.R.S.	3·72
„	Probus, Lamellyn	2·49	„	Loch Ness, Drumnadrochit	3·39
„	Wincanton, Stowell Rec.	2·27	XIX.	Invershin	3·34
„	Weston-super-Mare .....	...	„	Scourie	8·14
VI.	Clifton, Pembroke Road	1·81	„	Watten H.R.S.	4·96
„	Ross, The Graig	·89	XX.	Dunmanway, Coolkelure	4·10
„	Wem, Clive Vicarage ...	1·84	„	Fermoy, Gas Works ...	1·21
„	Cheadle, The Heath Ho.	2·76	„	Killarney, Woodlawn ...	...
„	Worcester, Diglis Lock	...	„	Tipperary, Henry Street	2·52
„	Coventry, Coundon	1·35	„	Limerick, Kilcornan ...	2·97
VII.	Ketton Hall [Stamford]	1·20	„	Ennis	3·50
„	Grantham, Stainby	1·10	„	Miltown Malbay	4·36
„	Horncastle, Bucknall ...	·97	XXI.	Gorey, Courtown House	·70
„	Worksop, Hodsck Priory	·85	„	Mullingar, Belvedere ...	1·54
VIII.	Neston, Hinderton	2·68	„	Athlone, Twyford	2·08
„	Knutsford, Heathside ...	2·64	„	Longford, Currygrane ...	1·67
„	Lancaster, Rose Bank ...	4·88	XXII.	Galway, Queen's Coll ...	1·83
„	Broughton-in-Furness..	7·65	„	Crossmolina, Enniscoe..	3·84
IX.	Ripon, Mickley	1·38	„	Collooney, Markree Obs.	3·61
„	Scarborough, South Cliff	1·52	„	Ballinamore, Lawderdale	2·42
„	East Layton [Darlington]	1·29	XXIII.	Lough Sheelin, Arley ..	1·55
„	Middleton, Mickleton ...	2·99	„	Warrenpoint	1·41
X.	Haltwhistle, Unthank..	3·07	„	Seaforde	1·48
„	Bamburgh	2·12	„	Belfast, Springfield	2·54
„	Newton Reigny	3·07	„	Bushmills, Dundarave ...	4·53
XI.	Llanfrechfa Grange	1·98	„	Stewartstown	2·01
„	Llandovery	3·69	„	Buncrana	3·92
„	Castle Malgwyn	2·07	„	Lough Swilly, Carrablagh	5·46

SEPTEMBER, 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 '01 or more fell.	Max.		Min.				
				inches.	in.		Dpth	Date	Deg.	Date	Deg.	Date	In shade.	On Grass.
I.	London (Camden Square) ...	1.07	- 1.44	.22	26	10	81.6	6	35.3	24	0	1	
II.	Maidstone (Hunton Court)...	2.57	- .02	.98	29	12	...	...	...	...	...	...
III.	Strathfield Turgiss	1.43	- 1.02	.37	8	...	75.4	..	34.2	24	0	2	
IV.	Hitchin	1.10	- 1.40	.52	8	11	77.0	6	37.0	12	0	..	
V.	Winslow (Addington) .....	.75	- 1.92	.19	28	10	80.0	6	33.0	24	0	4
VI.	Bury St. Edmunds (Westley)	1.18	- 1.52	.45	8	9	71.0	7	40.0	24	0	...	
VII.	Norwich (Cossey)	1.34	- 1.32	.50	27	12	78.0	6	39.0	3	0	...	
VIII.	Weymouth (Langton Herring)	2.04	- .38	.74	28	13	71.0	7	40.0	24	0	..	
IX.	Torquay (Cary Green) ...	1.27	...	.58	28	12	74.5	6	39.0	24	0	0
X.	Bodmin (Fore Street)	3.62	- .85	.82	28	18	...	...	...	...	...	...
XI.	Stroud (Upfield) .....	.90	- 2.01	.26	28	13	78.0	15	41.0	21	c	0
XII.	Church Stretton (Woolstaston)	2.09	- .41	.36	8, 28	16	73.5	5	38.0	21	0	2	
XIII.	Tenbury (Orleton)	1.32	- 1.29	.32	28	15	77.3	6	31.7	21	1	3	
XIV.	Leicester (Barkby)	1.74	- .90	.53	8	11	78.0	6	30.0	11	d	4	
XV.	Boston .....	.54	- 2.23	.17	8	9	77.0	4	36.0	22	0	7
XVI.	Hesley Hall (Tickhill).....	1.22	- .94	.24	7	14	77.0	4	30.0	12	1	...	
XVII.	Manchester (Plymouth Grove)	3.86	+ .39	.85	8	18	80.0	5	37.0	20	d	0	
XVIII.	Wetherby (Ribston Hall) ..	1.85	- .61	1.02	26	11	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	4.98	+ .22	.96	28	17	...	...	...	...	...	...
XX.	Hull (Pearson Park)	1.81	- .63	.42	26	15	77.0	4, 5	33.0	12	0	3	
XXI.	Newcastle (Town Moor)	1.80	- .98	.31	25	13	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	13.91	+ 2.18	2.26	28	22	...	...	...	...	...	...
XXIII.	Cardiff (Ely).....	2.64	- 1.10	.91	28	15	...	...	...	...	...	...
XXIV.	Haverfordwest	1.96	- 2.44	.52	29	13	71.9	6	28.5	21	2	4	
XXV.	Aberystwith, Gogerddan.....	5.01	+ .74	.76	28	16	74.0	3	30.0	10	...	...
XXVI.	Llandudno	2.88	+ .66	.65	20	23	71.5	4	44.0	23	0	...	
XXVII.	Cargen [Dumfries]	2.64	- .92	.46	25	15	71.6	14	32.0	11	1	...	
XXVIII.	Jedburgh (Sunnyside).....	1.94	- .75	.48	8	12	74.0	1	29.0	12	4	...	
XXIX.	Old Cumnock	3.64	- .19	.48	28	20	...	...	...	...	...	...
XXX.	Lochgilhead (Kilmory).....	5.15	+ .02	.50	25	20	...	...	28.0	9	4	...
XXXI.	Oban (Craigvarren) .....	...	...	...	...	...	...	...	...	...	...	...
XXXII.	Mull (Quinish)	4.85	- .18	.47	6, 28	19	...	...	...	...	...	...
XXXIII.	Loch Leven Sluices	1.60	- 1.19	.60	30	7	...	...	...	...	...	...
XXXIV.	Dundee (Eastern Necropolis)	1.60	- .91	.50	21	15	75.8	4	32.2	23	0	...	
XXXV.	Braemar	3.46	+ .60	1.26	21	22	72.2	4	28.8	11	3	11	
XXXVI.	Aberdeen (Cranford)	3.40	...	.88	21	21	73.0	5	31.0	25	1	...
XXXVII.	Strome Ferry.....	8.46	+ 3.59	1.10	12	23	...	...	...	...	...	...
XXXVIII.	Cawdor [Nairn]	4.03	+ 1.28	1.01	20	22	...	...	...	...	...	...
XXXIX.	Dunrobin	4.55	+ 1.96	.75	7	20	68.0	5	32.0	23	1	...	
XL.	S. Ronaldsay (Roeberry).....	4.88	+ 2.22	.97	12	23	66.0	5	34.0	22	0	...	
XLI.	Darrynane Abbey.....	3.67	...	.71	6	20	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	1.21	- 1.71	.25	27	14	73.0	2	30.0	21	1	...	
XLIII.	O'Briensbridge (Ross)	2.77	...	.63	29	14	70.0	3, 4	32.0	21	1	...
XLIV.	Carlow (Browne's Hill)	1.27	- 1.55	.20	6a	14	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	.73	- 1.24	.17	6	14	72.0	5	38.2	21	0	2	
XLVI.	Ballinasloe	1.60	- 1.19	.27	7	17	68.0	3, 4, f	33.0	12	0	...	
XLVII.	Clifden (Kylemore)	4.82	...	.53	25	19	...	...	...	...	...	...
XLVIII.	Waringstown	1.87	- 1.29	.44	6	14	76.0	4	34.0	10	e	0	
XLIX.	Londonderry (Creggan Res.)	4.69	+ .91	.60	20b	24	...	...	...	...	...	...
L.	Omagh (Edenfel)	2.77	- .61	.35	22	21	73.0	...	36.0	...	0	0	

a And 28 & 29. b And 25. c And 24. d And 21. e And 11. f And 14.

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

METEOROLOGICAL NOTES ON SEPTEMBER, 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.—This month kept up the peculiarity of the season, being warm, bright, and dry. The flower world all passed and gone in earlier months, but the insects and birds flourished amazingly. TL and H on the 8th.

HITCHIN.—S on the 23rd.

ADDINGTON.—Another month of dry weather. From 1st to 24th not quite one-quarter of an inch fell; after the 24th a little R each day to the 29th. Total fall the least registered in September since the observations commenced in 1871. The 5th, 6th, 7th, and 14th very fine, hot days; nights of 13th, 21st, 24th, and 25th, very cold, tender plants being cut down on 24th. Total R from January 1st 30 in. more than in the corresponding period of 1892.

BURY ST. EDMUNDS.—A hot, dry month, and rain much wanted. Many complaints of want of water from heavy land parishes, wells and ponds being dry. Distant T on 27th.

LANGTON HERRING.—The first half of the month was fine and dry, and up to the 19th the drought was as severely felt as at any time of the year, but in the last three days 1.14 in. of R fell. Mean temp. at 9 a.m. ($58^{\circ}3$) $0^{\circ}3$ above the average. T on the 8th and 22nd.

BODMIN, FORE STREET.—Dry and hot for the first five days, then showers to the 10th, followed by a dry week, and then R again to the end. Cold from the 18th to the 26th, and H, more than half an inch deep, on the 21st.

STROUD, UPFIELD.—T and L at night on 8th. L and T in afternoon on 22nd.

WOOLSTASTON.—The early part of the month was very hot and dry. A sharp storm of T and L occurred on the 8th, after which it became much colder, and for some days after the 20th very cold. Mean temp. $55^{\circ}4$.

TENBURY, ORLETON.—Very fine and warm till the 20th, with many hot days and practically no R. From the 20th to the end much colder. Mean temp. of the month about $0^{\circ}7$ above the average. Slight frosts on the 12th, 13th, and 21st. Fog on 11th, 16th, and 21st. T on 22nd.

LEICESTER, BARKBY.—Still very dry; great scarcity of water. Mean temp. of the month 55° . L and T on 8th, 23rd, and 27th.

MANCHESTER.—From the 2nd to the 5th summer weather prevailed. On the 8th a heavy TS occurred, and damage was done to a building in Market Street. Fine autumn weather on 7th, 9th, 10th, and 11th. Thick fog till 10 a.m. on 12th. Mean temp. $55^{\circ}3$.

HULL, PEARSON PARK.—TSS, with H, S, and R on 8th and 23rd, and with R only on 27th.

WALES.

HAVERFORDWEST.—During the first seven days very fine bright weather prevailed, the temp. on four days rising to 70° . Some R fell in the second week, and the weather, though fine and bright, was much cooler. It was again very fine and warm to the 20th, the temp. rising to $69^{\circ}2$ on 16th, but on 21st the max. was only $58^{\circ}9$, and frost on that and the following night killed dahlias, &c. During the remainder of the month broken weather prevailed, with a falling bar. Prevailing winds N.W., W., and S.E.

GOGERDDAN.—Very changeable throughout, with H storms and T about the 22nd.

SCOTLAND.

CARGEN.—The weather during the month was exceedingly variable. In the first week the temp. was considerably above the average, while in the second week it was much below it. A considerable fall of S took place on the 23rd, and heavy H showers occurred on 21st. Mean temp. $1^{\circ}5$ below the average. T on 18th, 21st, and 30th. L on 29th and 30th. Ripe strawberries were gathered, and rhododendrons, azaleas, honeysuckle, laburnum, and wild roses flowered.

JEDBURGH.—The temp. fell considerably after the 10th, though the prevailing wind was S.W. Cereals all got in in good order, and fully average crops.

OLD CUMNOCK.—T on the 8th and 29th. H on 22nd.

CAWDOR.—S at night on 22nd, and H on 25th.

ROEBERRY.—The first ten days fine, afterwards wet and cold. Mean temp. 47°·8.

IRELAND.

DARRYNANE ABBEY.—A fairly good month, with rainfall below the average. Strong N.W. gale, with T and vivid L at night on 7th. Strong N.W. gale and heavy sea on 29th.

WATERFORD, BROOK LODGE.—Snow on Knockmealdown mountains on 20th. Heliotropes, begonias, and dahlias damaged by frost on 21st.

O'BRIENSBRIDGE, ROSS.—More than half the month very fine; light showers on three days, and copious rains on 11 days. Much variation of temp., the first frost occurring on 21st.

DUBLIN.—Favourable throughout. A month of average temp., with fresh W. and N.W. winds and frequent showers, but no heavy rains. At times the nights were very sharp and even frosty, but there was much bright sunshine by day. Mean temp. 55°·9. High winds were recorded on 14 days, but there were no gales. Aurora on 1st; L on 8th and 21st.

OMAGH, EDENFEL.—The month commenced with fine summer-like weather, which, with a short break, continued for a fortnight. Thenceforward it was generally raw, rainy, and unsettled, with low night temp., but no frost. There was a considerable second display of rhododendron and apple blossom, with some excellent ripe strawberries.

NEWSPAPER METEOROLOGY.

To the Editor of the Meteorological Magazine.

SIR,—With reference to the returns of maximum temperatures, August 13th to 19th, in your Magazine of this month, and your remark as to the desirability of verified instruments being used, and placed in a similar position, I hope that this most important suggestion will induce all observers who send their results to you to state specifically the kind of stand or "screen" they use, and the maker of their instruments. I presume it is hopeless to expect similar information to be sent to the public press generally by the numerous contributors of meteorological data. My thermometers have been for some years in a Stevenson screen, and my maximum in the hot week last month, viz., 86°·0, entirely corroborates your remark as to readings above 90° being confined to the eastern parts of England; but an observer residing within five miles (in a direct line) of this place, and at a very similar altitude, reported to a local paper of considerable circulation a maximum of over 90° in the same week, without, of course, giving any particulars as to his thermometer or its position. It is much to be regretted that such confusing data should be published, as tending to most misleading and fallacious records of meteorological phenomena being circulated and *preserved* in the public press, for many people make a practice of cutting out these paragraphs and keeping them *as a record* of a very hot or a very cold season, as the case may be.—Yours very faithfully,

B. T. GRIFFITH-BOSCAWEN.

Trevalyn Hall, Rossett, North Wales, Sept. 30th, 1893.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

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RAINFALL IN PERSIA.

WE have just been favoured by Mr. A. Hontum Schwindler with the results of his rainfall measurements since he began them at Teheran, in November, 1891. The gauge is about $4\frac{1}{2}$ inches in diameter, and having been supplied by Dr. Hann, is no doubt perfectly accurate; the receiving surface is 13 inches above ground and 3,850 feet above sea-level. It is in a large garden, and unsheltered except slightly from the S., from which quarter rain rarely falls.

Mr. Schwindler makes the following remark:—

“The rainfall here was formerly very much less, say up to 10 or 11 years ago; it then did not, I think, exceed five inches per annum, but it is now about ten. The great increase is no doubt due to the many gardens which have sprung up within the last 10 years in, and outside, the city, and perhaps also to the formation, 10 years ago, of a lake 50 miles south of Teheran. The lake has a length of 22 miles, and is from 3 to 6 miles broad.”

The following are the returns converted into English inches:—

YEAR.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1891 ...	—	—	—	—	—	—	—	—	—	—	1·34	2·76	—
1892 ...	1·29	·75	1·43	1·03	·14	·00	·00	·00	·00	·71	3·23	·87	9·45
1893 ...	2·16	·25	·63	2·67	·39	·00	·06	·53					

We were under the impression that these were the first observations made in Teheran, but that appears not to be the case.

We append all the Persian rainfall returns of which we are aware. If any of our readers can tell us of any more, we shall be glad to add them in a subsequent number. We can trace in the vast territory of the Shah only the following localities where any records have been kept:—

Ooromiah in the N.W. Latitude $37^{\circ} 28' N.$, Longitude $45^{\circ} 8' E.$, and 7,334 feet above the sea.

According to Loomis, a record for one year (he does not say which) was kept here, and the total was 21·51 inches.

Bushire, on the Eastern shore of the Persian Gulf. Latitude $28^{\circ} 59' N.$, Longitude $50^{\circ} 49' E.$, and 25 ft. above sea.

Observations have been made here regularly from 1878 onwards, and published in the annual volumes on the Meteorology of India.

We have extracted them all, and append them with the mean for the whole period:—

YEAR.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	YEAR.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1878...	2·12	2·13	·26	·35	·00	·00	·00	·00	·00	·00	·00	·00	4·86
1879...	1·71	1·67	1·42	·36	·00	·00	·00	·00	·00	·00	·00	1·21	6·37
1880...	·39	4·01	·14	·15	·00	·00	·00	·00	·00	·00	1·35	12·67	18·71
1881...	·13	4·54	·97	·22	·00	·00	·00	·00	·00	·00	2·57	1·36	9·79
1882...	2·26	·66	·98	1·52	·00	·00	·00	·00	·00	·00	·00	1·61	7·03
1883...	4·01	5·55	·47	1·06	·00	·00	·00	·00	·00	·00	2·02	8·97	22·08
1884...	2·20	3·99	·77	1·95	·00	·00	·00	·00	·00	·00	1·59	4·05	14·55
1885...	12·90	4·73	1·92	1·70	·00	·00	·00	·00	·00	·00	·16	2·24	23·65
1886...	3·74	6·66	·62	·50	·00	·00	·00	·00	·00	·00	·00	·76	12·28
1887...	3·44	·99	·17	·00	·00	·00	·00	·00	·00	·00	1·12	7·16	12·88
1888...	4·99	2·13	·23	·42	·00	·00	·00	·00	·00	·00	2·37	1·13	11·27
1889...	4·86	·87	·72	·00	·12	·00	·00	·00	·00	·00	·00	·02	6·59
1890...	2·07	1·87	3·61	2·12	·00	·00	·00	·00	·00	·00	1·95	6·74	18·36
Mean	3·45	3·06	·94	·80	·01	·00	·00	·00	·00	·00	1·01	3·69	12·96

Lastly, we have in the "Annalen" issued by the Russian Government a series of observations made at Teheran between 1883 and 1890. Strictly speaking, they were not all made in Teheran, but for all practical purposes they may be so regarded. It is generally known that the Persian Gulf is almost, if not quite, the hottest place in the world. Teheran is far from the Gulf, and nearly 4,000 feet above it, but Teheran itself is so hot and dry in the summer that it is deserted by all who are able; and the observer, Dr. Tscherepnin, who was probably attached to the Russian Embassy, always left Teheran in the last week of May, and did not return until some time in September or October, and he took his instruments with him. He did not go far, only to Sergende, about 8 miles N., and about a thousand feet higher. In all ordinary cases such a removal would have been fatal to the value of the record, but while Dr. Tscherepnin was at Sergende the rainfall was usually infinitesimal. We therefore treat the observations as if all made in Teheran. At Teheran the gauge was 5 ft. above the ground, and at Sergende in a raised garden, which was 10 ft. above the general level. Dr. Tscherepnin died rather suddenly on July 18th, 1888, and after a few fragmentary observations the record seems to have terminated.

Monthly Rainfall at Teheran, Lat. 35° 41' N., Lon. 51° 25' E., Alt. 3,714 ft?

YEAR.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	YEAR.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1883...	—	—	—	—	—	—	—	—	—	—	—	·47	—
1884...	3·22	2·43	1·38	1·26	·63	·35	·00	·00	·00	·62	·52	·79	11·20
1885...	3·82	·49	1·81	2·51	2·29	1·02	·00	·00	·16	·43	·94	·42	13·89
1886...	·74	3·15	1·85	2·22	·19	·00	·00	·00	·00	·20	·85	1·29	10·49
1887...	1·79	4·81	·78	·71	·15	·00	·00	·00	·00	·65	·04	2·05	10·98
1888...	·71	2·72	1·88	·94	1·04	·04	·04	·31	·00	—	1·42	—	—
1889...	—	—	—	—	—	—	—	—	—	—	—	—	—
1890...	—	—	—	—	·43	·13	·29	·08	·04	—	·52	2·96	—
Mean	2·39	2·72	1·46	1·68	·81	·34	·00	·00	·04	·47	·59	1·14	11·64

Of stations outside Persia, but useful from their proximity, there are two :—

Lenkoran, on the Russian shore of the Caspian, in Lat. 38° 46' N., and in Lon. 48° 51' E., where observations made for the nine years. 1848–56, gave a mean of 47·40 inches, and for the six years, 1874–78 and 1880, gave 45·00. The average monthly values are about as under* :—

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
4·37	2·83	3·66	2·67	1·53	·87	1·16	1·91	8·15	8·70	6·65	4·37

Mascot (or *Muscat*) on the Western shore of the Persian Gulf, in Lat. 23° 29' N., and Lon. 58° 33' E., where the fall in the season 1883–84 was 7·24 inches, and in 1884–5, 4·98 inches, scarcely any rain falling except between November and March, both inclusive.

The foregoing returns are insufficient to establish definite conclusions, but to us they seem to show :—

- (1.) That as the new observations at Teheran indicate a mean fall of about 10 inches, and the old Russian observations at Teheran indicate a mean fall of about 11 inches, the fall there is probably between 10 and 12 inches.
- (2.) That nearly all of it falls in the winter half of the year.
- (3.) That N. of the great mountain range between Teheran and the Caspian the fall is nearly four times as great, and although the fall in summer is small, it is there much greater than in Persia.
- (4.) That at Bushire, on the Eastern shore of the Persian Gulf, the fall, both as to amount and distribution, much resembles that at Teheran.
- (5.) That at the S.W. extremity of the Persian Gulf, at Muscat, the fall is very small, and analogous to that at Kurrachee (Karachi).

In conclusion, we must express our regret that, from Ispahan (the Oxford and the Cambridge of Persia) there are no records to be found. From the position which our correspondent, Mr. Hontum Schwindler, holds, we think it not improbable that he may be able to induce some one at Ispahan to take up the subject. It would be to the credit of Persia, and to the benefit of all students of physical geography and climatology, if he should do this.

THEOPHRASTUS.

It will be remembered that last year we mentioned that the translation of the two treatises by Theophrastus, "Concerning Winds" and "Of the Signs of Rain, &c.," had been undertaken by Mr. J. G. Wood. The translation is completed, and a form is enclosed with this Magazine which those who desire a copy are requested to fill up and return.

* Die Regen-verhältnisse des Russischen Reiches von H. Wild, 1887.

THE BRITISH ASSOCIATION AT NOTTINGHAM.

THE above meeting, in spite of the great zeal of, and the very excellent arrangements made by, the local secretaries, was not nearly equal to that held in the same town in 1866, as is sufficiently indicated by the fact that in 1866 there was £1,751 voted as grants for scientific purposes, and in 1893 there was only £705 available for similar objects—a decrease of 60 per cent.

This is not the place to discuss the causes of this decline ; we have to deal merely with the papers, and to report those which fell most nearly within the province of this Magazine.

SOLAR RADIATION.

The ninth report of the Committee on the Best Means of Recording the Direct Intensity of Solar Radiation, was read by its author, Professor McLeod. The work does not advance very much. Mr. Casella has constructed a thermometer with a lenticular bulb, colourless, and not green glass. On May 22nd, the green and white bulbs were tested, and it was found that the white bulb indicated an excess—above the temperature of the case—of only two thirds of that marked by the green thermometer. This is no disadvantage ; it rather facilitates the reduction of the results. As the simultaneous observation of the three thermometers is not an easy operation, an attempt has been made to replace them by two thermo-electric junctions. If such an instrument, in connection with a galvanometer, could be made photographically self-recording, we should have a real intensity meter. Ordinary galvanometers would not be suitable, being influenced by earth magnetism and other magnetic disturbances. Experiments with a D'Arsonval galvanometer have so far not given satisfactory results.

PHOTOGRAPHY OF METEOROLOGICAL PHENOMENA.

The third report of the Committee on the Application of Photography to the Elucidation of Meteorological Phenomena, drawn up by Mr. A. W. Clayden, the secretary, was read in his absence by the chairman, Mr. G. J. Symons, F.R.S. Owing to the new duties of the secretary, who had been appointed principal of the Technical and University Extension College at Exeter, the work had progressed slowly. A good deal of work has been done, however, and wider interest is being taken in the matter. The double film plates do not appear to offer special advantages for cloud photography, so that the black mirror and the slow plate are recommended. Mr. Greenwood Pim has sent excellent photographs of clouds on the High Alps. The collection of cloud photographs is so extensive that only pictures of high-level clouds are solicited. As to the classification of clouds, no general understanding has been arrived at, so that the report recommends the division of clouds simply into three groups—cumulus, stratus, cirrus—and the grouping of the varieties by numbers. The lightning photographs confirm the author's views about the narrow ribbon structure, which seems to represent the true form of the flash. This question is discussed at some length. Mr. Clayden distinguishes between the flash, lasting a mere fraction of a second, though longer than generally assumed, and not resolvable into components, and the discharge, consisting of series of flashes, following about the same or related paths with considerable rapidity, and lasting, altogether, two and three, up to seven seconds. This Mr. Clayden

determined, with the aid of Mrs. Clayden, by observing the second hand of his watch. The hands moved steadily, not in a series of jerks, as would have been the case if the continuity of illumination had been an illusion due to persistence of vision. Swaying tree tops and other objects can also be watched. An argument commonly advanced to prove that all duplicated flashes are due to movement of the camera, is that the track to be followed by successive flashes is marked out by the first, which creates a path of minimum resistance in the form of a partial vacuum. But such a tube of rarefied air would be moved by the wind. Velocities of 3, 18, and 34 miles an hour would in one second cause a displacement of 4 ft., 26 ft., and 50 ft., and in three seconds, of 13 ft., 79 ft., and 150 ft. Mr. Clayden thinks that the bends and breaks in flashes, especially near the ground, are caused by these air currents, and that the major thickness of the ribbon in one particular direction need not be ascribed to marginal deformation and focal errors. The flashes of one discharge vary in brilliancy; the persistent luminosity may be the flame of burning nitrogen. For the completion of an atlas of typical clouds, the Committee asked for a grant of £35, last year's grant of £15 not having been drawn. [But they did not get it.—ED.]

The full report of the Committee on

EARTH TREMORS,

an abstract of which was communicated by Mr. Symons, will be a valuable contribution to this literature. Brief accounts are given of Wolf's nadirane, Bertelli's tromometer, Milne's tremor recorder, and detailed descriptions of the new bifilar pendulum of Mr. Horace Darwin, and of the horizontal pendulum of Dr. E. von Rebeur-Paschwitz. Mr. H. Darwin's instrument was shown by the inventor. It is a simplified form of the one used by himself and Professor G. H. Darwin twelve years ago at Cambridge. The mirror forms the bob of a pendulum, and is suspended by two hooks on fine silver wire, the ends of which are attached to supports which are about 12 in. apart in a vertical and 1-200th of an inch in a horizontal direction. Any tilt of the ground will cause the upper support to move through a greater distance than the lower, and will produce a deflection of the mirror unless the movement be along a line parallel to its plane. The mirror and its frame are inclosed in a brass tube, little wider than the mirror, filled with paraffin oil. This arrangement makes the mirror dead-beat and insensible to vibrations of a short period, such as produced by passing carts or trains and by neighbouring earthquakes, whilst the instrument would indicate the dying-out pulsations of an earthquake, slow secular changes of level, and tilts arising from atmospheric pressure. Such an instrument has, since April, been put up by the secretary, Mr. Davison, who was not present, in the cellar of his house at Birmingham. The observations are made with a telescope and a gas jet 10 ft. away. A movement of less than 1-300th of a second can be detected, that is, the vertical angle of an isosceles triangle of 1 in. base and 1,000 miles length of side. The heat effects are very troublesome; the gas jet expands the brass tubes, causing an apparent tilt in one direction, and generates convection currents in the paraffin, giving rise to a far greater deflection in the other sense. For photographic reproduction an induction spark will therefore have to be used. Dr. Copeland will fit up such an instrument in the new observatory being built near Edinburgh. Mr. Horace Darwin described a newer and smaller instrument, about 1 ft. high, devised by Mr. Davison, in which extraordinary precautions are taken to avoid all heat effects and other

disturbances. To bring the points of supports into as nearly a vertical position as desirable, levers of 10 ft. ending in left and right-handed screws are turned ; the frame of the mirror is adjusted by means of a screw under the control of a pneumatic bell arrangement of Mr. Horace Darwin's. Professor Oliver Lodge recommended water vapour for the chamber, and the rotating screen of Mr. Boys for equalising radiation from right and left, giving a uniform though not constant temperature. Diurnal tremors, he thought, might be charged to the tides ; he suspected that something of the kind happened at Birkenhead and Liverpool. Mr. Ranyard objected that there should be two tremors instead of one daily in that case ; Professor Everett believed in expansion of the earth's crust.

The next report, read by Professor Milne, F.R.S.,

EARTHQUAKE AND VOLCANIC PHENOMENA OF JAPAN,

dealt with the same problems, and contained little about what people generally understand by earthquakes and volcanoes. The report records hundreds of observations for each different group, made by means of the Gray-Milne seismograph, and by the horizontal pendulum, for continuous photographic record, which Professor Milne last year described as new, but which he soon afterwards learned had been used for some time by Dr. von Rebeur-Paschwitz, at Potsdam and elsewhere. Throughout the report, parallels are drawn between the observations of Dr. von Paschwitz and Professor Milne. The former's pendula are heavy and adjusted for periods of 12 and 18 seconds, Professor Milne's exceedingly light. The report discusses daily tiltings, temperature and barometric effects, possible relationship with magnetic movements, and geologic structure. The direction of the earthquakes is generally at right angles to the mountain side, as if the sides moved like the sides of a roof hinged to its ridge. Earthquakes are so frequent in Japan that chemical balances by Oertling and Bunge could be used as indicators ; at times, any accurate quantitative work, as well as astronomical observations, become impossible. The list of earthquakes for February, 1893, numbers 101. These earthquakes have the nasty habit by their horizontal reciprocating motion of snapping, walls and piers at the base. Now Professor Tatsumo has calculated the proper section for such structures, and built walls, and Mr. C. A. W. Pownall, M.I.C.E., has constructed brick arches for the bridges of the Usui Pass, about 110 ft. high, which as yet have answered very well ; these piers taper in curves from the base upwards.

BEN NEVIS.

An abstract of the report of the Ben Nevis Committee was given by Dr. Peddie. The pressure curves for clear and for foggy weather are quite distinct. Between 7 p.m. and 4 a.m., fog pressure is higher than with clear sky, and attains its maximum at midnight ; between 5 a.m. and 6 p.m. fog pressure is lower, the minimum being about noon. During anti-cyclonic periods, the temperature difference between the observatory at the top and at the foot becomes less ; occasionally a higher temperature is registered at Ben Nevis. When the anti-cyclone gives way, the temperatures assume their normal difference. These alterations can be brought about by a fall of temperature at the top, or a rise at Fort William, the temperature of the other observatory remaining stationary.

SUNSPOTS AND AIR TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—I willingly comply with “W. E.’s” request. The years taken as maximum sunspot years are these:—1769, 1778, 1788, 1804, 1816, 1830, 1837, 1848, 1860, 1870, 1883. Those taken as minimum:—1766, 1775, 1784, 1798, 1810, 1823, 1833, 1843, 1856, 1867, 1878, 1889.

It is generally understood, I believe, that whatever correspondence may have been noticed, in these regions, between variations of air temperature and those of sunspots, there has been, in recent years, a plain departure from it. The point I wanted to consider was whether, taking as long a series of years as possible, one would find a clear balance of temperature on one side or the other.

It occurred to me lately to look through the *Annual Summary*, and note in how many weeks of each year the mean temperature for the week rose above some given limit. I do not know whether you will consider the following results of this somewhat rough mode of measurement worth giving. The figures relate to 65° as limit; and I have smoothed them by means of three-year averages:—

	Mean temp. of week over 65°.	Smoothed.		Mean temp. of week over 65°.	Smoothed.		
1860.....	0	.....	...	1877.....	0	.....	3·0
1861.....	1	.....	·3	1878.....	4	.....	1·3
1862.....	0	.....	·7	1879.....	0	.....	1·7
1863.....	1	.....	·7	1880.....	1	.....	1·3
1864.....	1	.....	2·0	1881.....	3	.....	1·3
1865.....	4	.....	2·3	1882.....	0	.....	1·0
1866.....	2	.....	2·3	1883.....	0	.....	1·7
1867.....	1	.....	3·3	1884.....	5	.....	2·0
1868.....	7	.....	3·7	1885.....	1	.....	2·7
1869.....	3	.....	4·3	1886.....	2	.....	2·7
1870.....	3	.....	3·0	1887.....	5	.....	2·3
1871.....	3	.....	2·7	1888.....	0	.....	1·7
1872.....	2	.....	2·3	1889.....	0	.....	·0
1873.....	2	.....	2·0	1890.....	0	.....	·0
1874.....	2	.....	2·0	1891.....	0	.....	·0
1875.....	2	.....	3·0	1892.....	0	.....	1·3
1876.....	5	.....	2·3	1893.....	4	.....	—

These figures cannot be thought favourable on the whole to the view in question. The recent group of cool summers is well remembered; but from the present point of view we seem to have had a sort of cooling process since the end of the sixties. The smoothed curve has three waves, culminating in 1869, 1875 (or 1877), and 1885 (or 1886), with the decreasing values 4·3, 3·0, 2·7; while minima occur at 1873 (or 1874), 1882, and (say) 1889, with values 2·0, 1·0, 0. This is, of course, only one way of looking at the matter.—Yours faithfully,

A. B. M.

THE RECENT EARTHQUAKE.

To the Editor of the Meteorological Magazine.

SIR,—Will you allow me to ask the help of your readers in obtaining materials for a memoir on the recent earthquake felt in Wales and the West of England on November 2nd ?

My object in this memoir is to trace as accurately as possible the boundary of the area over which the shock was felt, or the accompanying sound heard, and to draw lines through all places at which the shock was of approximately the same intensity. It would be of great service to know simply the names of as many places as possible where the shock was felt, or the accompanying sound heard. Still more useful would it be to have answers to any of the questions printed below, especially to those numbered 2, 3, 5 and 6. I shall be most glad and thankful to receive accounts from any places whatever ; and I may add that no exact account, however scanty the information given, can fail to possess some value, or to help in throwing light on the nature and origin of the shock.

1.—Name of the place where the earthquake was observed.

2.—Time at which it was felt, if possible to the nearest minute.

3.—Nature of the shock : (a) Were two distinct shocks felt, separated by an interval of a few seconds ? (b) If so, which was the stronger ? (c) What was the duration of each, and of the interval between them ? (d) Was the sound heard during this interval ?

4.—How many seconds did the shock last, not including the accompanying sound ?

5.—Was the shock strong enough (a) to make doors, windows, fire-irons, crockery, &c., rattle ; (b) to cause the chair, &c., on which the observer was resting to be perceptibly raised or moved ; (c) to make chandeliers, pictures, &c., swing, or to stop clocks ?

6.—(a) Was the shock accompanied by any unusual rumbling sound ; and, if so, what did it resemble ? (b) Did the beginning of the sound precede, coincide with, or follow, the beginning of the shock, and by how many seconds ? (c) Did the end of the sound precede, coincide with, or follow, the end of the shock, and by how many seconds ? (d) Were the strongest vibrations felt before, at, or after the instant when the sound was loudest, and by how many seconds ?

Yours obediently, CHARLES DAVISON.

373, *Gillott Road, Birmingham.*

P.S.—At the Editor's request, I add a few lines as to the extent of the area disturbed by this earthquake. As far as I can judge from a hasty glance at the records already received, the disturbed area seems to have been nearly, but not quite, the same as that of the earthquake of August 18th, 1892. If anything, it is somewhat greater ; but this may be due to the occurrence of the shock at a more favourable hour for observation. It was certainly noticed

further both to the east, north and west, having been felt at Bournemouth, Marlborough and Birmingham, at several places in the south of Lancashire, and in Ireland, in the counties of Kilkenny and Waterford. On the other hand, it was, I believe, less perceptible in the south of Cornwall than the shock of last year, and this seems to point to a more northerly position for the centre of disturbance.

THE DROUGHT AND HEAT OF 1893.

To the Editor of the Meteorological Magazine.

SIR,—The drought which ended for a time on 21st June, being followed by nearly the average rainfall during July, reasserted itself early in August—the 22 days from 5th to 26th of August inclusive only yielding 0·20 in. of rain, and the first 15 days of September only 0·12 in.

The following figures show how remarkably dry each of the first three quarters of the year has been ; while the total of 9·39 in. for the 9 months is probably the smallest on record :—

	in.		in.
January	1·46	}	4·85
February	2·99		
March	·40		
April	·08		
May	·36		
June	·98		
	Half Year =		6·27
July	1·73	}	3·12
August	·42		
September	·97		
	Nine Months =		<u>9·39</u>

The exceptional heat of 6th to 22nd August also deserves recording—the maxima of the 17 consecutive days ranging from 75°·7 to 93°·7, a mean max. of 83°·9 for that period ; of just 85° for the 15 days from 7th to 21st ; and of 87°·1 for the 11 days from 8th to 18th, the mean temperature of the same 11 days being 72°·1, and the hottest day of all the 18th, with a max. of 93°·7, the very remarkable min. of 68°·5, and a mean of 81°·1.

All my thermometers are on a Glaisher stand.

The effects of such a season on vegetation have been in many cases phenomenal. For instance, there is a good second crop of ripe strawberries early in *October* at Eastbourne, Hampstead, Cambridge, and elsewhere.—Yours truly,

PERCY BICKNELL.

Foxgrove, Beckenham, October, 1893.

P.S.—In the middle of the month strawberries were abundant in the Cambridge market, one grower (at Histon) alone gathering over a ton ; while gooseberries were said to be not long over, and apple trees to be bearing a second crop of fruit then “as large as walnuts.” Strawberries continued plentiful almost to the end of the month, and fine raspberries were gathered in Cambridge and Lancashire, and as late as the 29th near Ongar, Essex.

October 31st.

OCTOBER RASPBERRIES AND STRAWBERRIES.

To the Editor of the Meteorological Magazine.

SIR,—You will be interested to hear that a small dish of ripe raspberries was gathered in the garden here on October 27th.—Yours faithfully,

R. C. CANN LIPPINCOTT.

Over Court, near Bristol, October 31st, 1893.

[We add the following confirmatory notes from the *Journal of Horticulture*.—ED.]

Whitcroft, Pershore, Worcestershire.—I have picked several small dishes of raspberries this month, finer and quite as good flavoured as they were in the summer, and very highly coloured. I also gathered some on October 27th.—JAS. WICKETTS.

Hollingbourne House, Maidstone, Kent.—On September 18th I gathered a good dish of ripe raspberries, left others, some just colouring, but whether they will ripen is a question. The fruit is from the summer fruiting varieties, but the crop was a very light one, the hot dry season having a great effect upon this particular fruit.—G. R. HEMMINGS.

Cambridge, October 24th.—As an illustration of the very exceptional character of the season we forward some fresh gathered strawberries, being now busy picking and preserving our second crop this year. We have already, during October, gathered 1 ton 5 cwt., and as the plants have still a large quantity of blossom and green fruit, we expect to be able to pick double the weight if this mild weather continues.—S. CHIVERS & SONS.

The Gardens, Brockley Hall, Kent.—During the last week in September and up to the present time I have gathered about four and half dozen of ripe strawberries from plants grown out of doors. I have noticed only two sorts fruiting—viz., 'Black Prince' and 'Vicomtesse Héricart de Thury,' although one plant of 'Latest of All' bore two or three fruit. Some of the fruit were quite equal in flavour and size to those of the summer. To-day (October 25th) I find that there are about one and half dozen of good sized fruits, but many have decayed during the wet weather.—G. WALLIS.

REVIEWS.

Pubblicazioni della Specola Vaticana. Fascicolo II. and III., 4to: Tipografia Vaticana, Roma, 1891 and 1893, xxii.—306 pages and 20 plates; and xxx.—442 pages and 39 plates.

WE cannot trace having received or noticed Fascicolo I. of this excellent series, but we can speak most highly of the two which we have. Everyone who has ever had the pleasure of meeting Padre Denza, knows what energy he throws into all that he undertakes. When, therefore, the present Pontiff, Leo XIII., had decided that the observatory at the Vatican—originally founded in 1582 by Pope

Gregory XIII.*—should be rebuilt and equipped with good instruments, and that Padre Denza should be the Director, there was no doubt as to the quality or quantity of the work which would be issued from it.

The present volumes amply confirm our anticipations. In materials, in printing, and especially in the abundance and beauty of their illustrations, they have few rivals. As regards the plates of clouds by Signor Manucci in Fascicolo III., we have seen nothing approaching them for beauty and for fidelity.

The work of the observatory is divided into sections—Astronomy and Meteorology, to which Terrestrial Magnetism has been added. The observatory is housed in two separate buildings—one in the Vatican, in the old observatory of Pope Gregory, and the other in the Leonine Tower on the top of the hill. As far as we can gather, it appears that the whole cost of fitting up the buildings, and providing splendid instruments, and of the endowment, has been defrayed personally by the present Pope, either out of his own resources, or from the offerings forwarded at his Jubilee. Be that as it may, it is beyond all question that it is to Leo XIII. that science is indebted for the establishment of a first-class observatory, and for very handsome annual volumes of results.

Report on the present state of our knowledge respecting the General Circulation of the Atmosphere. Presented to the Meteorological Congress at Chicago, August, 1893, by L. TEISSERENC DE BORT. London: Edward Stanford, 1893. 4to, 20 pages, and 15 maps and diagrams.

M. TEISSERENC DE BORT, who is well known as one of the staff of the French Meteorological Office and as General Secretary of the Meteorological Society of France, seems to us to have rendered considerable service to meteorologists by the preparation of this paper. The views expressed in it are in many respects similar to those of Ferrel, but the present paper, although dealing with many abstruse points, has the singular merit of extreme lucidity. One could rarely find a page, even in what Ferrel regarded as a popular work, in which one or more mathematical equations did not occur. In the present paper we do not see one from beginning to end, and yet the author gives a clear account of Ferrel's work, attacks weak portions of it, and carries on the investigation considerably further than Ferrel had done.

The way in which M. Teisserenc de Bort works in his previous researches on the distribution of cloud over the globe, and the pretty little plates in which he gives views of the Eastern and Atlantic hemispheres of the earth, as seen from (say) Mars, and compares them with Jupiter, as photographed at Paris in 1886, can only be done justice to by those who have this nicely printed memoir before them.

* The author of the Gregorian Calendar, now used almost everywhere except in Russia.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 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	78·6	12	38·2	31	70·2	47·4	46·3	67	127·9	34·0	·80	8	4·4
Malta.....	81·9	30	52·5	8	74·4	59·6	57·8	77	137·3	47·0	·15	2	4·3
<i>Cape of Good Hope</i> ...	84·1	31	37·1	20	67·1	50·8	52·3	82	...	...	2·49	10	5·1
<i>Mauritius</i>	80·3	1	61·1	23	71·7	67·6	65·7	81	132·2	53·4	4·13	23	5·5
Calcutta.....	96·9	20	66·4	7	89·2	75·3	75·5	80	159·0	66·8	17·11	11	5·7
Bombay.....	91·8	27	75·3	29	89·8	79·9	75·5	75	149·0	73·2	6·30	6	3·3
Ceylon, Colombo	88·7	3	71·3	15	85·4	76·9	72·9	78	150·5	70·0	10·32	26	7·6
<i>Melbourne</i>	72·5	4	35·9	15	62·3	49·9	49·2	78	121·8	28·5	4·00	18	7·3
<i>Adelaide</i>	77·1	24	43·8	19	65·9	52·3	48·5	68	134·2	37·5	3·56	15	5·8
<i>Sydney</i>	70·2	30	43·7	17	64·5	52·0	50·7	84	121·0	32·0	1·35	15	4·1
<i>Wellington</i>	65·7	5	41·0	28	61·1	50·5	48·0	76	120·0	30·0	3·16	16	4·5
<i>Auckland</i>	70·0	16	48·5	20	64·2	54·6	54·9	86	122·0	44·0	3·73	23	6·7
Jamaica, Kingstou.....	87·9	21	69·2	13	86·0	71·7	70·4	80	...	...	2·67	10	5·6
Trinidad	93·0	15 ^a	66·0	30	88·1	70·2	71·3	78	141·0	64·0	11·35	23	...
Toronto	73·2	21	37·6	24	61·0	42·9	42·6	70	...	31·2	3·86	13	6·0
New Brunswick, Fredericton	83·7	12	27·4	8	63·7	39·7	40·2	64	...	...	3·26	15	6·0
Manitoba, Winnipeg ...	81·6	31	18·0	1	64·0	38·0	...	...	...	...	2·23	5	5·0
British Columbia, Esquimalt	66·2	15	40·1	24	58·4	45·1	46·4	85	...	...	2·40	22	7·0

^a And 17th.

REMARKS.

MALTA.—Mean temp. 65°·4; mean hourly velocity of wind 8·7 miles. J. SCOLES.

Mauritius.—Mean temp. of air 0°·6 below, dew point 1°·5 above, and rainfall ·10 in. above, their respective averages. Mean hourly velocity of wind 9·7 miles, or 0·3 below average; extremes, 27·1 on 26th, and 0·0 on 21st; prevailing direction, E.S.E. Lightning on 14th and 15th; thunder and lightning on 16th, 17th, 18th and 19th. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on the 5th, 6th, 7th, 8th, 11th and 12th.

F. C. H. CLARKE, Lt.-Col. R.E.

Melbourne.—Frost on the 15th; lunar halo on 24th; lightning in S.E. on the 8th, and S.W. on the 22nd. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean pressure 0·141 in. below the average, and the lowest with one exception in 36 years. Mean temp. 1°·4 above the average; rainfall, ·60 in. above the average at Adelaide, and very heavy over the country to the North—some stations recording 9 to 10 inches for the month. C. TODD, F.R.S.

Sydney.—Temp. 0°·2 below, rainfall 3·96 in. below, and humidity 9°·1 above their respective averages. H. C. RUSSELL.

Wellington.—From the 4th to the 25th generally showery, with intervals of fine, bright days; fine and bright in the early and latter parts of the month. Prevailing N.W. and S.E. winds, generally moderate in force. Fog on 20th; earthquakes on 12th, 13th, 18th and 27th. Mean temp. 3°·8 above the average. R. B. GORE.

Auckland.—A warm, moist and disagreeable month; but with no heavy falls of rain, save one of 1·23 in. on the 21st. Mean temp. more than 2° above the average; rainfall about ·25 in. below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Fair. Rain only one-half of the average, although the rains generally were above the average. Mean hourly velocity of wind 3·9 miles.

ROBT. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
OCTOBER, 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.	4.30	XI.	Builth, Abergwessin Vic.	6.95
„	Birchington, Thor	2.46	„	Rhayader, Nantgwilt..	6.69
„	Brighton, Prestonville Rd	...	„	Corwen, Rhug	3.01
„	Hailsham	4.75	„	Carnarvon, Cocksida ...	4.32
„	Ryde, Thornbrough	5.01	„	I. of Man, Douglas	4.63
„	Alton, Ashdell	4.59	XII.	Stoneykirk, Ardwell Ho.	2.60
III.	Oxford, Magdalen Col...	2.56	„	New Galloway, Glenlee	5.88
„	Banbury, Bloxham	2.60	„	Melrose, Abbey Gate ...	1.73
„	Northampton, Sedgebrook	2.88	XIII.	N. Esk Res. [Penicuick]	3.65
„	Alconbury	3.90	„	Edinburgh, Blacket Pl..	2.51
„	Wisbech, Bank House..	2.89	XIV.	Glasgow, Queen's Park.	5.02
IV.	Southend	2.76	XV.	Islay, Gruinart School..	6.96
„	Harlow, Sheering	1.75	XVI.	Dollar	3.53
„	Colchester, Lexden.....	1.92	„	Balquhider, Stronvar..	7.23
„	Rendlesham Hall	2.00	„	Coupar Angus Station..	2.30
„	Diss	2.17	„	Dunkeld, Inver Braan..	3.15
„	Swaffham	2.17	„	Dalnaspidal H.R.S.	6.86
V.	Salisbury, Alderbury ...	4.19	XVII.	Keith H.R.S.	3.03
„	Bishop's Cannings	4.36	„	Forres H.R.S.	3.65
„	Blandford, Whatcombe.	4.88	XVIII.	Fearn, Lower Pitkerrie.	3.65
„	Ashburton, Holne Vic....	4.31	„	Loch Shiel, Glenaladale	16.55
„	Okehampton, Oaklands.	4.72	„	N. Uist. Loch Maddy ...	6.83
„	Hartland Abbey	5.54	„	Invergarry	10.30
„	Lynmouth, Glenthorne.	5.36	„	Aviemore H.R.S.	3.48
„	Probus, Lamelbyn	4.53	„	Loch Ness, Drumnadrochit	4.31
„	Wincanton, Stowell Rec.	3.40	XIX.	Invershin	4.32
„	Weston-super-Mare .....	...	„	Scourie	8.64
VI.	Clifton, Pembroke Road	5.49	„	Watten H.R.S.	5.36
„	Ross, The Graig	2.09	XX.	Dunmanway, Coolkelure	4.19
„	Wem, Clive Vicarage ...	2.09	„	Fermoy, Gas Works ...	2.39
„	Cheadle, The Heath Ho.	1.73	„	Killarney, Woodlawn ...	3.92
„	Worcester, Diglis Lock	1.53	„	Tipperary, Henry Street	4.27
„	Coventry, Coundon	3.61	„	Limerick, Kilcornan ...	...
VII.	Ketton Hall [Stamford]	2.48	„	Ennis	3.77
„	Grantham, Stainby	2.26	„	Miltown Malbay.....	4.81
„	Horncastle, Bucknall ...	1.10	XXI.	Gorey, Courtown House	2.50
„	Worksop, Hodsck Priory	1.69	„	Mullingar, Belvedere ...	2.11
VIII.	Neston, Hinderton	2.03	„	Athlone, Twyford	2.65
„	Knutsford, Heathside...	2.63	„	Longford, Currygrane...	3.71
„	Lancaster, Rose Bank...	6.10	XXII.	Galway, Queen's Coll...	4.89
„	Broughton-in-Furness..	8.06	„	Crossmolina, Enniscoe..	3.79
IX.	Ripon, Mickleby	1.34	„	Collooney, Markree Obs.	4.01
„	Scarborough, South Cliff	...	„	Ballinamore, Lawderdale	3.37
„	EastLayton [Darlington]	1.15	XXIII.	Lough Sheelin, Arley ..	3.31
„	Middleton, Mickleton..	2.37	„	Warrenpoint	2.14
X.	Haltwhistle, Unthank..	2.74	„	Seaforde	1.75
„	Bamburgh	2.01	„	Belfast, Springfield	3.12
„	Newton Reigny	3.81	„	Bushmills, Dundarave...	5.19
XI.	Llanfrechfa Grange	3.36	„	Stewartstown	3.02
„	Llandoverly	6.01	„	Buncrana	5.23
„	Castle Malgwyn .....	...	„	LoughSwilly, Carrablagh	6.26

OCTOBER, 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 '01 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
		inches.	inches.	in.								
I.	London (Camden Square) ...	3·87	+ ·98	1·16	9	16	66·3	16	27·8	31	2	2
II.	Maidstone (Hunton Court)...	3·37	— ·09	1·15	11	16	...	...	...	...	...	...
	Strathfield Turgiss	3·17	+ ·33	·59	9	24	64·1	16	25·6	31	2	6
III.	Hitchin	3·62	+ ·55	1·19	9	16	65·0	16 ^a	27·0	31	3	...
	Winslow (Addington)	2·31	— ·78	·73	7	14	67·0	16	24·0	31	2	6
IV.	Bury St. Edmunds (Westley)	2·80	— ·47	·73	9	13	64·0	16	28·0	31	...	...
	Norwich (Cossey)	2·01	— 1·83	·37	21	15	...	...	...	...	...	...
V.	Weymouth (Langton Herring)	4·05	+ ·51	1·03	17	19	64·0	16	31·0	31	1	...
	Torquay (Cary Green)	2·84	...	·52	17	18	64·7	21	33·6	31	0	1
	Bodmin (Fore Street)	5·60	— ·40	1·02	10	25	...	...	...	...	...	...
VI.	Stroud (Upfield)	2·38	— ·65	·44	21	14	68·0	16	26·0	31	2	...
	Church Stretton (Woolstaston)	3·10	— ·67	·70	10	16	66·5	21	29·0	31	1	6
	Tenbury (Orleton)	2·44	— ·77	·45	13	16	67·2	21	24·8	31	4	8
VII.	Leicester (Barkby)	2·23	— ·92	·50	7	13	69·0	15	19·0	30	4	11
	Boston	2·27	— ·84	·87	9	14	66·0	1	26·0	31	2	...
	Hesley Hall [Tickhill].....	1·42	— 1·68	·67	7	11	69·0	21	27·0	31	2	...
VIII.	Manchester (Plymouth Grove)	2·98	— ·39	·45	10	17	66·0	16	24·0	30	3	3
IX.	Wetherby (Ribston Hall) ...	1·95	— 1·18	·55	8	11	...	...	...	...	...	...
	Skipton (Arncliffe)	6·13	+ ·10	1·24	15	21	...	...	...	...	...	...
	Hull (Pearson Park)	1·62	— 2·03	·37	10	13	66·0	15 ^a	29·0	30 ^c	2	6
X.	Newcastle (Town Moor)	·81	— 2·31	·17	7	13	...	...	...	...	...	...
	Borrowdale (Seathwaite).....	18·63	+ 8·04	3·71	15	23	...	...	...	...	...	...
XI.	Cardiff (Ely).....	6·94	+ 2·40	1·54	4	20	...	...	...	...	...	...
	Haverfordwest	4·49	— ·66	·69	11	22	61·9	16	27·3	31	3	...
	Aberystwith, Gogerddan	5·67	+ ·32	·86	13	19	66·0	21	22·0	30 ^c	...	...
	Llandudno	3·40	+ ·01	·34	14	21	...	...	...	...	...	...
XII.	Cargen [Dumfries]	4·30	+ 1·04	·66	25	23	61·8	16	25·4	31	3	...
	Jedburgh (Sunnyside).....	1·75	— ·90	·49	24	10	63·0	16	25·0	31	4	...
XIV.	Old Cumnock	5·87	+ 2·47	·70	24	27	...	...	...	...	...	...
XV.	Lochgilphead (Kilmory).....	9·27	+ 4·48	1·84	24	29	...	...	24·0	30	7	...
	Morvern (Ùrinnin)	11·37	...	1·68	24	30	...	...	...	...	...	...
	Mull (Quinish)	9·31	+ 4·02	1·20	24	28	...	...	...	...	...	...
XVI.	Loch Leven Sluices	2·70	— ·26	·80	25	8	...	...	...	...	...	...
	Dundee (Eastern Necropolis)	2·60	+ ·36	·65	13	12	62·5	15	28·0	31	2	...
XVII.	Braemar	2·99	— ·62	1·26	8	18	59·9	15	29·0	31	2	17
	Aberdeen (Cranford)	2·39	...	·42	8	16	64·0	16	31·0	31	3	...
XVIIII.	Strome Ferry .....	...	...	...	...	...	...	...	...	...	...	...
	Cawdor [Nairn]	3·55	+ ·82	·76	8	21	...	...	...	...	...	...
XIX.	Dunrobin	4·49	+ 1·18	·63	8	21	...	...	30·0	31	2	...
	S. Ronaldsay (Roeberry).....	6·75	+ 3·02	·85	4	31	57·0	2	33·0	29	0	...
XX.	Darrynane Abbey.....	3·12	...	·56	16	23	...	...	...	...	...	...
	Waterford (Brook Lodge) ...	2·32	— 1·50	·45	17	18	64·5	16	28·0	30	5	...
	O'Briensbridge (Ross)	3·30	...	·51	13	19	62·0	17	31·0	31	3	...
XXI.	Carlow (Browne's Hill)	2·32	— ·97	·78	17	19	...	...	...	...	...	...
	Dublin (Fitz William Square)	1·03	— 2·35	·32	14	16	67·7	21	31·7	31	1	8
XXII.	Ballinasloe	3·17	+ ·18	·64	14	20	59·0	20	28·0	31	2	...
	Clifden (Kylemore)	8·27	...	1·55	14	27	...	...	...	...	...	...
XXIII.	Waringstown .....	...	...	...	...	...	...	...	...	...	...	...
	Londonderry (Creggan Res.)...	5·15	+ 1·48	·49	5	28	...	...	...	...	...	...
	Omagh (Edenfel)	4·37	+ 1·27	·47	25	27	61·0	14 ^b	23·0	30	6	11

a And 21. b And 15 & 20. c And 31.

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

METEOROLOGICAL NOTES ON OCTOBER, 1893.

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

ENGLAND.

STRATHFIELD TURGISS.—A genial month, with copious showers during the first fortnight, but the country was still very dry, and the rivers low at the close. A sharp snap of frost occurred on the 30th and 31st. Swallows seen for last time on the 2nd. Red Admiral butterfly flying on the 21st. Min. on grass on 31st, 18°·9.

ADDINGTON.—A fine open month, with a moderate rainfall, which kept vegetables of all kinds growing in a very marked manner, and a good many strawberries were gathered. No frost in shade until the 30th, but very sharp on the morning of the 31st, killing all tender plants, the min. on grass falling to 21°. T on 5th, 6th, and 7th, and very heavy R from 5 p.m. to 7 p.m. on the latter day.

BURY ST. EDMUNDS.—A lovely autumnal month, very mild till the 30th. Great complaints of want of water in many parishes in West Suffolk, and much illness. TS on the 5th.

LANGTON HERRING.—The weather from the 1st to the 11th was wet and mild, with very little variation of temp. from day to day. T and L on 7th, 8th, and 17th. The 14th, 15th, and 16th were very close and damp. The 30th and 31st were bright, dry, and cold. The mean temp. at 9 a.m. (51°·6) is 1°·6 above the average.

BODMIN, FORE STREET.—A rather wet month, and heavy falls of R on the 2nd and 10th. Some days rather warm, but cold in the last week. Frost on the mornings of 13th and 31st.

STROUD, UPPFIELD.—L and T on 2nd, 3rd and 5th; L on 4th and 6th. Large flakes of S at night on 31st.

WOOLSTASTON.—A splendid autumn month. Mean temp. 49°·7.

TENBURY, ORLETON.—A fine month; mean temp. about 1° above the average. Some days very warm, particularly from the 14th to 17th inclusive. Very severe frost on 30th and 31st. Fog on 5 days. T from 3.30 to 4 p.m. on 1st.

LEICESTER, BARKBY.—A wonderfully fine month; more grass than in summer. Mean temp. 49°·0. T during the first week, and hard frost during the last week. R a good average, but falling mostly at night. L and T on 3rd.

MANCHESTER.—T on the 1st. Thick fog up to 10 a.m., then bright and sunny, on 30th and 31st. Fine autumn weather prevailed during most of the month, but there were periods of both summer and winter weather. Mean temp. 49°·3.

SEATHWAJTE.—Falls of R exceeding an inch occurred on 7 days; exceeding two inches on 2 days; and exceeding three inches on one day. In the three days, 13th to 15th, 6·35 in. fell.

WALES.

HAVERFORDWEST.—A changeable month, and the wettest since February; still, there were many fine days, as much of the R fell at night. General appearance of the country very much improved. Frost occurred about the 11th and 19th, and again on the 30th and 31st. The Precelly range was white with S on the morning of the 31st. The wind was boisterous at times, but never reached the force of a gale; prevailing directions, S.W., S.E., and N.W. L on 5th.

GOGERDDAN.—Stormy throughout the month, with very growing weather.

SCOTLAND.

CARGEN.—The meteorological conditions of the month approached very nearly the average. The mean temp. was half a degree below the average. Pretty hard frosts were experienced on the last two nights of the month, which

quite destroyed the blooms of the very unusual number of flowering plants we have had this autumn. A TS occurred on the 5th, and a solar halo was seen on the 15th.

JEDBURGH.—The weather continued remarkably fine during the month, and allowed all out-door work to go on unchecked. The potato crop was lifted in good order. Grass as fresh looking as in midsummer. Turnips a fair crop.

ROEBERRY.—A very wet month, not one rainless day; the wettest recorded for 26 years. Mean temp. $47^{\circ}9$.

IRELAND.

DARRYNANE ABBEY.—A rather dry month so far as total goes, but few really fine days. Mild on the whole. Slight frost on 5th.

WATERFORD, BROOK LODGE.—Mean temp. $48^{\circ}4$. Springs very low. Strawberries ripe in the garden on 22nd. T on the 2nd.

O'BRIENSBRIDGE, ROSS.—The min. temp. on the night of the 16th was 55° , the max. on the succeeding day 62° , an unusually small range in mid October. The month closed with one of the brightest days of a fine season, after a slight frost.

DUBLIN.—A favourable month, of average mean temp and atmospheric pressure. There was an overwhelming prevalence of westerly and south-westerly winds, which kept the rainfall far below the average on the leeward side of the Dublin and Wicklow mountains. On the 20th and 21st there was a remarkable wave of heat. On the 30th and 31st the cold was equally decided. Mean temp. $50^{\circ}0$, slightly above the average ($49^{\circ}7$). A lunar corona was seen on the 24th. Aurora borealis on the 29th. High winds were noted on 9 days, and attained the force of a gale on the 25th and 28th. The atmosphere was more or less foggy on the 7th, 18th, and 20th. L was seen on the evenings of the 3rd, 4th, 5th, and 30th. H fell on the 26th.

OMAGH, EDENFEL.—The raw rainy weather of the first fortnight gave way to an extremely mild spell on the 14th, the mean temp. of the following day reaching 59° —an unprecedented record here in October. The remainder of the month continued wet and unsettled, but the almost total absence of frost till the last week, enabled the gradually maturing foliage to exhibit an unusual splendour of autumn tints.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

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MARCH TO OCTOBER, 1893.

THE following article is the outcome of a spare half-hour devoted to a cursory examination of the Camden Square records for the past season, and is most discursive in character.

As far as observational records go, we may clear the ground by stating that it deals chiefly with the last 11 years, and that the instruments are practically, and we believe absolutely, identical in themselves, in position, in exposure, and in surroundings, except for the growth of distant trees and of our leviathan city. One apology should be added: in almost all cases where the word "mean" appears it is incorrectly used for "average"; this effects a considerable saving of space and does not obscure the meaning. The eight months, March to October, include the most striking characteristics, inasmuch as February and November were practically normal, except for the absence of fog in the latter month.

We have ignored, perhaps, the most striking feature of the season—rain—because it has been repeatedly discussed in the *Magazine* and will be further dealt with in *British Rainfall*; but records of max. in sun and in shade, and amount of cloud, if they are worth observing, should be worth discussing for such a season as we have just passed through, and they constitute a large part of what goes to make up weather.

To begin with a comparison of the monthly mean values:—

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
Mean 1883-92...	47 ^o ·7	55 ^o ·9	63 ^o ·6	70 ^o ·6	72 ^o ·3	71 ^o ·8	66 ^o ·7	56 ^o ·2	... 63 ^o ·1
1893	56·6	65·6	70·2	74·9	74·5	77·1	67·9	59·3	... 68·3
Difference.....	+8·9	+9·7	+6·6	+4·3	+2·2	+5·3	+1·2	+3·1	... +5·2

MEAN MAX. IN SUN (black bulb in vacuo):

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Mnth.
Mean 1883-92..	77 ^o ·1	92 ^o ·2	101 ^o ·2	111 ^o ·0	113 ^o ·8	111 ^o ·4	100 ^o ·5	80 ^o ·3...	98 ^o ·4
1893.....	86·9	101·9	112·0	116·4	115·6	117·8	105·4	88·2...	105·5
Difference	+9·8	+9·7	+10·8	+5·4	+1·8	+6·4	+4·9	+7·9...	+7·1

In both these cases we find that 1893 exceeded the average of the previous 10 years in each month, the excess of the Shade max. averaging $5^{\circ}2$ and ranging from $1^{\circ}2$ in September to $9^{\circ}7$ in April; while the Sun max. shows an average excess of $7^{\circ}1$, ranging from $1^{\circ}8$ in July to $10^{\circ}8$ in May.

MEAN AMOUNT OF CLOUD, (mean of the 9 a.m. and 9 p.m. observations):

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
Mean 1883-92 ...	6.3	5.7	5.7	5.6	6.1	5.5	5.4	5.8	5.8
1893	3.1	3.1	4.3	4.4	6.0	4.9	4.7	5.0	4.4
Difference.....	-3.2	-2.6	-1.4	-1.2	-0.1	-0.6	-0.7	-0.8	-1.4

Here we find a deficiency every month; considerable in the first four months, but only slight in the second half of the period under discussion.

Next comes the comparison of the extremes with averages of the corresponding extremes, *i.e.*, the highest reading in each month of 1893 with the average of the highest reading in each of the ten preceding corresponding months.

EXTREME MAX. IN SHADE :

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
Average 1883-92.	60.6	67.7	78.2	82.7	83.4	83.7	77.0	65.6	74.9
1893.....	67.6	78.2	78.6	90.4	90.7	93.6	81.6	66.3	80.9
Difference	+7.0	+10.5	+0.4	+7.7	+7.3	+9.9	+4.6	+0.7	+6.0

EXTREME MAX. IN SUN (black bulb in vacuo) :

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
Mean 1883-92.	100.4	111.0	122.1	126.6	127.8	125.7	118.7	104.1	117.0
1893	103.4	117.8	127.9	134.3	130.3	131.9	123.4	106.3	121.9
Difference.....	+3.0	+6.8	+5.8	+7.7	+2.5	+6.2	+4.7	+2.2	+4.9

Again we have plus signs in every instance, giving strong evidence of the exceptional character of the season, for not only the mean values, but also the extreme values, are above the average every month.

We will now apply the severe test of comparing the highest reading for each month of 1893 with the absolute highest reading in the corresponding month during the preceding ten years.

EXTREME MAX. IN SHADE :

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
10 Years, { Year	1884	1885	1892	1883	1885	1884	1886	1886	
1883-92 { Value...	68.0	72.8	84.7	85.6	90.4	92.0	84.2	78.8	82.1
1893	67.6	78.2	78.6	90.4	90.7	93.6	81.6	66.3	80.9
Difference	-4	+5.4	-6.1	+4.8	+3	+1.6	-2.6	-12.5	-1.2
Instances exceeding } 1893	1	0	5	0	0	0	1	3	

EXTREME MAX. IN SUN (black bulb in vacuo) :

		Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN
		1885	1892	1892	1887	1886&'87	1887	1889	1886	8 Months.
10 Years,	Year...	1885	1892	1892	1887	1886&'87	1887	1889	1886	
1883-92	{ Value	105.9	118.7	130.2	130.4	133.4	129.2	125.6	112.2	... 123.2
1893	.....	103.4	117.8	127.9	134.3	130.3	131.9	123.4	106.3	... 121.9
Difference	.....	-2.5	-9	-2.3	+3.9	-3.1	+2.7	-2.2	-5.9	... -1.3
Instances	} exceeding									
1893		.....	2	1	1	0	2	0	1	2

The last two tables, at first sight, appear to indicate a gradual falling off, for the extreme shade maxima are unprecedented in only four months, and the extreme sun maxima in only two. This comparison, of course, is little guide to the character of a month, for it is judging it not by one day even, but by one single reading. But even by this comparison, taken for what it is worth, the season as a whole is unprecedented, for in no other year of the ten have unequalled shade max occurred in more than two months, or unequalled sun max. in more than one. 1887, so well remembered for its "Queen's weather," gives three instances of the highest reading in the preceding 10 years, viz., June, July, and August, so that before 1893 it was a "record" year, yet its max. are exceeded in two out of the three months—June and August.

We have already quoted the average shade and sun maxima for 1893 in comparing them with means of the previous ten years, but we repeat them for the sake of clearness in order to compare them with the extreme mean values of each month for the ten years 1883-92.

AVERAGE SHADE MAX. :

		Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN
		1884	1892	1892	1887	1887	1884	1890	1886	8 Months.
Highest	Year.....	1884	1892	1892	1887	1887	1884	1890	1886	
1883-92	{ Value ...	52.7	59.6	66.4	73.8	78.9	77.1	70.1	60.3	... 67.4
1893	.....	56.6	65.6	70.2	74.9	74.5	77.1	67.9	59.3	... 68.3
Difference	.....	+3.9	+6.0	+3.8	+1.1	-4.4	0	-2.2	-1.0	... +0.9

Only three of the months of 1893 have been exceeded by any corresponding month in ten years ; no other year has more than one unequalled month, and 1887 is again surpassed.

AVERAGE SUN MAX. (black bulb in vacuo) :

		Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN
		1890	1892	1890	1892	1887	1886	1890	1891	8 Months.
Highest	Year.....	1890	1892	1890	1892	1887	1886	1890	1891	
1883-92	{ Value ...	81.7	100.4	106.6	115.4	123.1	114.6	104.4	83.3	... 103.7
1893	.....	86.9	101.9	112.0	116.4	115.6	117.8	105.4	88.2	... 105.5
Difference	.....	+5.2	+1.5	+5.4	+1.0	-7.5	+3.2	+1.0	+4.9	... +1.8

Seven out of the eight months are shown to be unprecedented in ten years. In other words, out of the 11 years dealt with, there is

only one year which exceeds 1893 in any month, and this is July, 1887, a month which stands alone; for whereas July, 1887, was the best month of that year, July may be safely characterized as the worst month of the summer of 1893.

MEAN AMOUNT OF CLOUD (mean of the 9 a.m. and 9 p.m. observations):

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN
	1883	1885	1892	1890	1887	1887	1884	1886&91	8 Months.
Lowest Year ...	1883	&85	1892	1890	1887	1887	1884	1886&91	1890
1883-92 (Value ...)	5.4	3.2	4.8	4.6	4.0	3.6	4.6	5.1	... 4.4
1893	3.1	3.1	4.3	4.4	6.0	4.9	4.7	5.0	... 4.4
Difference.....	-2.3	-1	-5	-2	+2.0	+1.3	+1	-1	... 0

Here six out of the eight months of 1893 are unprecedented for cloudlessness, and curiously the average for 1893 corresponds exactly with that of the least cloudy corresponding months in ten years. July, 1887, again shows great superiority over July, 1893.

We have, thus far, confined ourselves to maximum temperatures, and confess to a feeling that these are a truer guide to the character of the past season than mean temperatures, at any rate, for ordinary mortals who spend their nights in bed, and we are not sure that it is not the same as regards the crops, though that is a question for botanists; but we fancy that vegetation is not so much checked by low temperature at night, due to radiation (frosts of course excepted), as it is advanced by the greater duration of sunshine by day. Nevertheless, we have extracted the mean temperature in similar form.

MEAN TEMPERATURE (mean of shade max. and min.):

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN
	1883	1885	1892	1890	1887	1887	1884	1886&91	8 Months.
Average 1883-92 ...	40.7	47.0	54.2	60.7	62.9	62.5	58.4	49.3	... 54.4
1893.....	46.4	53.0	58.8	63.2	64.8	66.7	58.5	52.1	... 57.9
Difference	+5.7	+6.0	+4.6	+2.5	+1.9	+4.2	+0.1	+2.8	...+3.5

Here, again, every month shows a considerable excess over the average.

MEAN TEMPERATURE (mean of shade max. and min.):

	Mar.	April.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN
	1884	1885	1889	1889	1887	1884	1890	1886	8 Months.
Highest Year ...	1884	1885	1889	1889	1887	1884	1890	1886	
1883-92 (Value ...)	45.1	49.0	57.8	63.1	67.3	65.8	60.7	54.1	... 57.9
1893	46.4	53.0	58.8	63.2	64.8	66.7	58.5	52.1	... 57.9
Difference.....	+1.4	+4.0	+1.0	+0.1	-2.5	+0.9	-2.2	-2.0	... -0.1

Five months—March, April, May, June, and August—are unprecedented, but July, 1887, again is unapproached. The final mean is curious, and looks as if our arithmetic were faulty; the exact figures are 57°·94 and 57°·87, diff. 0°·07, so that reduced to one place of decimals, they are as in the table. Here again the mean

of the eight months of 1893 is curiously near to the mean of the most favourable corresponding months in the ten years.

One more comparison we have made, that of the difference between the readings of the black bulb in vacuo and the bright bulb in vacuo, which we are told gives the best value for the heating power of the sun's rays.

EXCESS OF BLACK BULB SUN MAX. OVER BRIGHT BULB SUN MAX. :

	Mar.	April.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
Average 1882-93	21.3	26.1	26.8	28.6	29.5	28.2	24.2	17.6	25.3
1893	22.3	25.8	30.2	29.4	29.3	29.0	26.8	21.2	26.8
Difference... ..	+1.0	-0.3	+3.4	+0.8	-0.2	+0.8	+2.6	+3.6	+1.5
Highest Year... 1883	1892	1885	1892	1887	1886 & '91	1887	1887	1887	
1883-92 \ Value ..	25.9	29.2	29.5	32.4	31.7	30.1	26.3	19.7	28.1
1893	22.3	25.8	30.2	29.4	29.3	29.0	26.8	21.2	26.8
Difference.....	-3.6	-3.4	+0.7	-3.0	-2.4	-1.1	+0.5	+1.5	-1.3

It is not easy at first sight to grasp the meaning of this table, for it must be remembered that it contains not positive results for the various months, but the difference between two sets of readings for the same month, so that a month might have a very high mean shade temp. and a very high mean sun temp., and yet, owing to slight haze (the natural resultant of hot and dry weather), exhibit a low value. We are not sure that it would not be best described as a table of the diathermancy of the air, but this, after all, is only the complement of the solar radiation.

The table shows excesses in six months, and unprecedented values in three, but appears to indicate that although in several months the sun heat was great, the warmth of the period as a whole was due rather to prolonged sunshine than to excessive solar radiation.

We may sum up by saying that the eight months as a whole were altogether unprecedented in the ten preceding years, and that the abnormal conditions were much accentuated in the first half of the period, though well marked in the second half. The first four months may also be safely quoted as individually unprecedented in the ten years, though some one element may have given a higher extreme value in other years. July, 1893, is so clearly inferior to July, 1887, that it may be of interest to compare the two :—

	July, 1887.	July, 1893.
Mean shade temp.	67.3	64.8
„ „ max.....	78.9	74.5
„ sun „	123.1	115.6
Absolute shade max.	88.8	90.7
„ sun „	133.4	130.3
Mean amount of cloud	4.0	6.0

It will be seen that the only item which shows superiority in 1893 is the absolute max. in shade.

August, 1893, is quite unparalleled in the ten years, and in some particulars in 36 years. The shade temp. at 9 a.m. on the 18th,

84°·3, was 3°·5 higher than any other 9 a.m. reading; the shade max. on 16th, 17th and 18th were 90°·7, 92°·7 and 93°·6 respectively, this being the only instance of 90° being reached on three consecutive days; while the summer as a whole yields the only instance of five days with shade maxima exceeding 90°.

September and October though exceptional, were not unprecedented, for the first was slightly inferior to September, 1890, and the latter decidedly inferior to October, 1886.

We have heard it suggested that, going back further than the ten years dealt with, we should find a very near parallel to 1893 in 1878; we therefore give the mean values for the eight months, March to October, of that year:—

	Mean shade temp.	Mean shade max.	Mean sun max.	Absolute shade max.	Absolute sun max.	Mean amount of cloud.
1878.....	56·5	65·1	103·9	75·4	120·0	6·0
1893.....	57·9	68·3	105·5	80·9	121·9	4·4
Difference ...	+1·4	+3·2	+1·6	+5·5	+1·9	-1·6

1893 shows superiority in every instance.

THE MINIMUM IN WINTER ON THE SUMMIT OF ARARAT.

Ciel et Terre contains an interesting note respecting the above. It is rather out of date, for it is an observation made in 1889 published at the end of 1893, but it is none the less welcome. The following are the leading facts:—

On August 13th, 1888, M. E. Markow placed near the summit of Mount Ararat (16,919 ft.) a minimum thermometer. On July 25th, 1889, some officers of a regiment quartered at the foot of the mountain ascended to the summit, and found that the thermometer was undamaged and read -50° C. ($= -58^{\circ}$ F.).

That the reading should be just -50° C. is suspicious, and indicates a want of care in the observation, and it is not stated whether the index was reset, nor what the thermometer indicated as the then existing temperature.

The article goes on to state that when M. Markow's proposal became known, it was said that it must fail; that the first tempest would carry the thermometer away, or the first avalanche or fall of the rocks would shatter it. It did not; and then *Ciel et Terre* proceeds to urge that mountaineers could render service to meteorologists by placing thermometers on analagous peaks.

We may remind our readers* that on a much lower peak than Ararat, but one where very likely the wind is quite as rough, viz., on Y Glyder Fach, 4 miles E.N.E. of Snowdon, and 3,262 ft. above the sea, Mr. Piffe Brown not merely placed a minimum thermometer in

* See *Quar. Jour. R. Met. Soc.*, xix. (1893), p. 149.

1867, but has read it almost every year since that date, but *it has never fallen even to zero*, the lowest being 9° for the winter 1891-92. So also at Ben Nevis, 4,404 ft., the lowest in the years 1884-89 was 6°·4 on February 10th, 1889, while zero is not at all unusual at low stations in Scotland.

On the whole, while not forgetting the definition of the "Frosty Caucasus," we hope that further efforts will be made towards ascertaining with precision the minimum on Mount Ararat.

ROYAL METEOROLOGICAL SOCIETY.

THE first meeting of this Society for the present Session was held on Wednesday evening, November 15th, at the Institution of Civil Engineers, Great George Street, Westminster, Dr. C. Theodore Williams (President) in the chair.

Twenty-three new Fellows were elected.

Mr. F. J. Brodie, F.R.Met.Soc., read a paper on "The Great Drought of 1893, and its attendant Meteorological Phenomena." The author confined his investigation to the weather of the four months March to June, during which period the absence of rain was phenomenal; barometric pressure was greatly in excess of the average; temperature was high, with a large diurnal range; and the duration of sunshine was in many places the longest on record. The mean temperature over England was about 4° above the average. Along the south and south-west coasts the sunshine was between 50 and 60 per cent. of the possible duration. The rainfall was less than half the average amount over the southern and eastern parts of England, the extreme south of Ireland, and a portion of Durham and Northumberland; while over the Southern Counties of England generally the fall amounted to less than one-third of the average. The smallest number of days with rain was at the North Foreland, where there were only 18.—A rather prolonged discussion followed, in which the President, Mr. Symons, Dr. Buchan, and Messrs. Baldwin Latham, C. Harding, Gaster, and Southall took part.

Mr. W. Marriott, F.R.Met.Soc., gave an account of the "Thunder and Hail Storms" which occurred over England and the South of Scotland on July 8th, 1893. Thunderstorms were very numerous on that day, and in many instances were accompanied by terrific hailstorms and squalls of wind. It was during one of these squalls that a pleasure boat was capsized off Skegness, 29 persons being drowned. About noon a thunderstorm, accompanied by heavy hail and a violent squall of wind, passed over Dumfries, and along the valley of the Nith; many of the hailstones measured from 1 in. to 1½ in. in length. At the same hour a similar storm occurred at Peterborough. From about 2 until 10 p.m. there was a succession of thunderstorms over the north-east of England and south-east of Scotland, and at many places it was reported that the thunderstorms

were continuous for nine hours. Two storms were remarkable for the immense hailstones which fell during their prevalence over Harrogate and Richmond, in Yorkshire. The hailstones were 4 and 5 inches in circumference, and some as much as 3 inches in diameter. Great damage was done by these storms, all windows and glass facing the direction from which the storm came being broken. It is computed that within a radius of five miles of Harrogate not fewer than 100,000 panes of glass were broken, the amount of the damage being estimated at about £3,000. The thunderstorms in the northern part of the country travelled generally in a north-north-westerly direction at the rate of about 20 miles an hour. They appear to have taken the path of least resistance, and consequently passed over low ground and along river valleys and the sea coast. Several storms seem to have followed each other along the same track.

RAINFALL IN PERSIA.

[In the article in our last, we quoted two rainfall records outside of Persia, because they afforded some indication of what probably occurred in that country. Our esteemed correspondent, Prof. Raulin, has taken even a wider range, so that his letter might almost be headed Rainfall of Western Asia; but as his returns relate primarily to the previous article, we retain the heading.—ED.]

To the Editor of the Meteorological Magazine.

SIR,—I have read with much pleasure your article on the rainfall of Persia. It seems to me that starting with Lenkoran, at the S. W. angle of the Caspian, you might also have quoted Astrabad and Aschur-Ade, at the S. E. angle, and, further east, the returns from Merv and Sultan-Bend. You might also have added those made at Mosul and Baghdad, and in the eastern part of the plateau of Iran; in Baluchistan, at Peshin, Quetta and Kelat. The following are the stations and mean values:—

STATION.	COUNTRY.	Lat. N.	Lon. E.	Altitude. Feet.	PERIOD OF OBSERVATION.	
					Date.	Duration. Yrs. Ms.
Astrabad	Turkestan	36 52	54 26	—70	1858, 1873-9	7 7
Aschur-Ade ...	„	36 54	53 55	80	1883-86	2 3
Merv	„	37 35	61 47	686?	1885-90	1 4
Sultan Bend ...	„	37 0	62 22	860?	1889-91	2 0
Mosul.....	Kurdistan	36 19	43 9	—	1854-55	2 0
Baghdad	Turkey in Asia	33 19	44 26	—	1887-90	3 3
Peshin	Baluchistan ...	30 27	67 0	...	1885-90	6 0
Quetta	„	30 11	67 3	5501	1878-90	13 0
Kelat	„	28 53	66 28	6514	1879-90	12 0

[We add to Prof. Raulin's table the means of the returns given in our last number, and also those for two Indian stations, so as (in conjunction with the map) to render the information complete. The figures on the map indicate the mean annual rainfall to the nearest inch.—ED.]

	Jan. in.	Feb. in.	Mar. in.	April in.	May. in.	June. in.	July. in.	Aug. in.	Sep. in.	Oct. in.	Nov. in.	Dec. in.	YEAR. in.
Astrabad	2·01	·78	1·18	1·08	1·08	·55	·71	1·37	2·56	1·53	1·34	2·09	16·28
Aschur-Ade ...	1·65	1·40	1·42	1·04	1·74	·90	1·14	·55	1·58	1·26	1·18	2·44	16·30
Merv	·99	·87	2·12	1·18	·10	·00	·00	·00	·00	·39	·13	·58	6·36
Sultan Bend....	2·36	·87	·00	·78	·52	·01	·00	·00	·00	·12	·42	1·11	6·19
Mosul	3·18	2·36	1·54	1·60	·25	·04	·00	·00	·00	·52	·66	2·03	12·18
Baghdad	·52	2·75	2·00	1·86	·22	·01	·00	·35	·00	·00	·32	2·21	10·24
Peshin.....	3·07	1·35	1·48	1·10	·28	·05	·30	·04	·00	·00	·99	·92	9·58
Quetta	1·83	1·50	1·92	1·21	·37	·09	·62	·62	·16	·07	·32	·61	9·32
Kelat	1·69	1·78	1·77	·65	·25	·04	·51	·61	·01	·06	·44	·58	8·39
Teheran (1) ...	2·39	2·72	1·46	1·68	·81	·34	·00	·00	·04	·47	·59	1·14	11·64
„ (2) ..	1·72	·50	1·03	1·85	·26	·00	·03	·26	·00	·71	2·28	1·81	9·45
Ooroomiah	1·69	2·83	4·06	5·22	2·43	·43	·00	·48	·65	1·48	·95	1·29	21·51
Bushire	3·45	3·06	·94	·80	·01	·00	·00	·00	·00	·00	1·01	3·69	12·96
Lenkoran	4·37	2·83	3·66	2·67	1·53	·87	1·16	1·91	8·15	8·70	6·65	4·37	46·87
Muscat	—	—	—	—	—	—	—	—	—	—	—	—	6·11
Hyderabad (3).	·28	·20	·13	·18	·14	·40	2·68	3·14	·68	·00	·14	·03	8·00
Karachi (4).....	·69	·25	·15	·16	·18	2·90	1·75	·76	·05	·21	·19	·05	7·34

The observations at Ooroomiah were made by the Rev. D. T. Stoddart, in the village of Seir, at the altitude of 6,225 feet, from Feb., 1853, to March, 1854, and are given in *Silliman's Amer. Jour. of Science*, 2nd series, vol. xx., p. 256.

I agree with you in regretting that there are no records from Ispahan; but why should we expect more from the Persians than from the Chinese? How many centuries more must elapse before they equal the Japanese?—Yours very truly,

V. RAULIN.

Montfauçon, d'Argonne (Meuse).

- (1) Russian Observations.
- (2) Mr. Hontum Schindler's Observations.
- (3) Lat. 25° 25' N., Lon. 68° 27' E.; Altitude 134 feet.
- (4) Lat. 24° 47' N., Lon. 67° 4' E.; Altitude 49 feet.

REVIEWS.

Weather Lore. A Collection of Proverbs, Sayings, and Rules concerning the Weather, compiled and arranged by RICHARD INWARDS, F.R.A.S., F.R.Met.Soc. London: Elliot Stock, 1893. 8vo. X.—190 pages and 2 plates.

It is not always easy to hide anything. Mr. Inwards, in the year 1869, brought out *Weather Lore*; why he has not called the present far larger work the Second Edition we know not, but he has effaced himself in the excellent Bibliography which occupies five pages of the present work; he does not put "Second Edition" on the title page, or mention the existence of the early edition anywhere except (accidentally?) on page vii., where he says, "In this Second Edition I have been able," &c.

Mr. Inwards certainly has no need to be ashamed of the little volume of 1869, for it was better than any similar work then in

existence, just as the present one is indisputably the best upon the subject yet issued in any country.

Having pronounced our verdict, we proceed with a few comments, and to mention one or two microscopic faults.

The frontispiece, a series of clouds grouped according to the altitudes usually ascribed to them, is instructive, but cloud forms are always puzzling, and we can imagine observers feeling some difficulty in deciding between Alto Cumulus and Cirro Cumulus. In another edition (without waiting another 24 years) we hope to see the clouds produced upon a blue ground.

On page vii. the author says: "The Shepherd of Banbury, who in the last century wrote a short list of outdoor signs of coming changes in the state of the air." This is a common, in fact nearly universal, error. In Mr. Inwards's Bibliography the edition of 1764 is quoted, and that is the ground for the expression "in the last century," but the *real* first edition was published nearly 100 years earlier, viz., in 1670.

We have never before seen the following lines, but we do not quite see that they relate to the weather:—

" In Aprill, the Koo-coo can sing her song by rote ;
 In June, of tune she cannot sing a note :
 At first, Koo-coo, Koo-coo, sing still can she do ;
 At last, Kooke, Kooke, Kooke, six Kookes to one Koo."

Haywood, 1587.

On page 64 there is either a misprint or a joke, we do not know which ; we suspect a trick of the printer:—

"Acosta observes that in Peru, which is a bery [*sic*] windy country, there is most wind at the full moon."—*Bacon*.

[*Note*.—There is no special wind in Peru that I ever experienced.—R.I.]

Mr. Inwards evidently enjoys a joke, as witness the end of the following:—"Cats with their tails up and hair apparently electrified, indicate approaching wind—or a dog."

There are remarkably few mistakes or misprints ; the only repeated one is that the Hon. Rollo Russell never gets the final "l."

The collection is without precedent as to the number of proverbs collected, and as they are well arranged, and there is an index with more than 2,000 entries, we do not see how, in its own province, it can be surpassed.

Specola Vaticana, 1890. Fascicolo I. 4to. Roma, 1891. 180 pages.

Specola Vaticana. Classificazione delle Nubi. 4to. Roma, 1893. 14 pages, 12 plates.

PADRE DENZA has, with his usual promptitude and kindness, sent Fascicolo I. of the Pubblicazioni, and thus rendered our set perfect. This first volume is naturally smaller than the later ones, but it is of value as giving the history of the Vatican Observatory, and many incidental bits of information. For instance: in the middle of this century lived A. Perrey of Dijon, the greatest worker and writer

upon the subject of Earthquakes that the world has yet seen. Perrey formed a splendid library and died, and we knew not where his books were, but Padre Denza, when writing on quite a different subject, says, "Nella Biblioteca sismica del Perrey, acquistata della Sezione del Club Alpino Italiano in Napoli, trovasi," &c. So Perrey's library is safe in Naples; long may it remain so.

The second article is a history of Celestial Photography from Arago's first mention of the subject before the French Academy on August 19th, 1839, down to the present day, and to the co-operation of the Vatican Observatory in the great work of photographing the whole of the stars, the Vatican Observatory will have to take 1,000 negatives.

This article is followed by a report by Padre Lais on the result of his visit to Paris to make himself familiar with the practice of Celestial Photography, and this by others on a Solar Eclipse, on Shooting Stars, on Geodynamics, and one on the Photography of Clouds, by the Engineer Sig. F. Mannucci, who from the very beginning has taken quite front rank as an expert.

In fact, the second work at the head of this list is devoted to Sig. Mannucci's splendid photographs of clouds, and is a reprint (with additions) from Fasci. III. It is very handy to have it separate, and our only regret is that as "we have seen nothing approaching them for beauty and for fidelity," we are not able to state whether copies can be purchased. It would certainly be desirable.

NOVEMBER RASPBERRIES.

To the Editor of the Meteorological Magazine.

SIR,—I am able to bring the record of this abnormal fruit season down to Nov. 12th, on which day I had given to me at Colchester, a bunch of ripe raspberries just gathered in a garden in the neighbourhood of that town. It may be of interest to add that in the middle of September, at Budleigh Salterton, S. Devon, I saw a laburnum tree in full flower, being, of course, the second flowering of this year.

Yours truly,

R. MELDOLA.

6, Brunswick Square, W.C., Nov. 17th, 1893.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 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	90·4	19	38·3	1	74·9	51·4	49·2	65	134·3	35·0	·74	9	4·5
Malta.....	87·2	30	59·5	10	80·6	65·0	62·4	73	141·4	54·5	·15	2	2·6
<i>Cape of Good Hope</i> ...	66·2	25	38·9	20	61·2	49·1	50·7	90	...	...	4·60	17	7·7
<i>Mauritius</i>	76·0	10	59·0	29	74·2	63·6	59·5	74	123·2	49·6	2·53	20	4·5
Calcutta	91·9	3	75·4	1	87·6	78·1	78·4	86	157·4	73·9	25·65	15	7·7
Bombay.....	91·3	9	74·3	21	85·9	78·2	76·5	83	145·1	72·7	21·47	21	7·6
Ceylon, Colombo	86·4	...	74·0	4	85·0	77·2	71·5	77	153·5	70·0	11·01	17	7·0
<i>Melbourne</i>	62·3	11	33·0	26	55·0	43·1	44·2	85	113·9	26·0	3·21	14	7·3
<i>Adelaide</i>	64·6	9	36·5	25	59·0	45·8	45·1	76	124·3	30·0	3·86	21	6·1
<i>Sydney</i>	64·7	12	41·7	21	59·0	48·9	48·3	89	108·0	28·8	7·78	15	5·0
<i>Wellington</i>	69·0	1	34·0	11	55·8	45·1	41·8	73	104·0	24·0	3·23	15	4·6
<i>Auckland</i>	65·5	2	41·5	11	59·3	48·9	48·8	82	112·0	30·0	5·07	18	7·0
Jamaica, Kingston.....	89·6	30	69·2	6	86·8	72·6	70·8	78	...	...	1·80	9	6·8
Trinidad	91·0	2, 30	66·0	10 ^a	89·1	69·0	73·1	80	143·0	63·0	10·19	22	...
Toronto	90·7	19	48·5	7	76·8	56·5	58·2	75	...	42·0	1·83	14	5·0
New Brunswick, Fredericton	85·0	30	39·0	28	74·7	49·8	52·0	66	...	...	2·32	6	5·0
Manitoba, Winnipeg }	92·8	13	40·6	9	76·6	54·6	...	...	...	...	3·87	18	6·0
British Columbia, Esquimalt	80·0	5	42·2	1	62·8	47·8	48·7	80	...	...	1·73	16	6·0

^a And 11th.

REMARKS.

MALTA.—Mean temp. 71°·7; mean hourly velocity of wind 8·8 miles. Thunderstorms on 2nd and 10th; a few hailstones on the 2nd. J. SCOLES.

Mauritius.—Mean temp. of air 1°·6 below, dew point 1°·2 below, and rainfall 47 in. above, their respective averages. Mean hourly velocity of wind 11·3 miles, or 0·2 mile below average; extremes, 25·1 on 6th, and 1·9 on 21st; prevailing direction, E. S. E. C. MELDRUM, F. R. S.

CEYLON, COLOMBO.—Lightning was seen on the 1st, 3rd and 4th; a thunderstorm occurred on the 5th. D. G. MANTELL.

Melbourne.—Dense fog on the 8th, 9th and 10th; sharp frost and ice on the 24th and 26th. R. L. J. ELLERY, F. R. S.

Adelaide.—Mean temp. 1°·2 below the average of 36 years. R 1·08 in. in excess of the average. C. TODD, F. R. S.

Sydney.—Temp. 0°·4 below, humidity 11 above, and rainfall 2·18 in. above, their respective averages. H. C. RUSSELL, F. R. S.

Wellington.—Showery in the early part of the month, and strong N.W. wind up to the 4th; fine weather about the middle of the month, then showery from 19th to 24th, and from 25th to the end, fine; prevailing winds N.W. and S.; snow and hail on 9th and 10th; foggy on the 16th; earthquake on 15th. Mean temp. 1°·4 above, and rainfall 1·90 in. below, the average. R. B. GORE.

Auckland.—A showery and disagreeable month. Rainfall, mean temperature and barometric pressure all above the average of 26 years. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Fair, with half the average rainfall. Mean hourly velocity of wind 4·4 miles. Earthquakes on the 2nd and 4th. ROBT. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
NOVEMBER, 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.	2.68	XI.	Builth, Abergwessin Vic.	5.11
	Birchington, Thor	3.13		Rhayader, Nantgwiltt..	4.25
	Brighton, Prestonville Rd	...		Corwen, Rhug	3.89
	Hailsham	2.58		Carnarvon, Cocksida ...	3.45
	Ryde, Thornbrough	2.46		I. of Man, Douglas	2.31
	Alton, Ashdell	2.84	XII.	Stoneykirk, Ardwell Ho.	3.56
III.	Oxford, Magdalen Col...	1.53		New Galloway, Glenlee	3.89
	Banbury, Bloxham	1.83		Melrose, Abbey Gate...	2.76
	Northampton, Sedgebrook	1.88	XIII.	N. Esk Res. [Penicuick]	2.75
	Alconbury	1.83		Edinburgh, Blacket Pl..	1.74
	Wisbech, Bank House..	3.18	XIV.	Glasgow, Queen's Park.	3.07
IV.	Southend	2.32	XV.	Islay, Gruinart School..	3.48
	Harlow, Sheering	2.54	XVI.	Dollar	2.05
	Colchester, Lexden	2.37		Balquhiddier, Stronvar..	4.24
	Rendlesham Hall	3.75		Coupar Angus Station..	1.63
	Diss	3.44		Dunkeld, Inver Braan..	2.09
	Swaffham	3.39		Dalnaspidal H.R.S. ...	4.26
V.	Salisbury, Alderbury ...	1.96	XVII.	Keith H.R.S.	3.81
	Bishop's Cannings	2.42		Forres H.R.S.	2.82
	Blandford, Whatcombe.	2.01	XVIII.	Fearn, Lower Pitkerrie.	3.45
	Asburton, Holne Vic....	3.50		Loch Shiel, Glenaladale	11.80
	Okehampton, Oaklands.	3.72		N. Uist. Loch Maddy ...	4.57
	Hartland Abbey	2.54		Invergarry	4.87
	Lynmouth, Glenthorne.	3.59		Aviemore H.R.S.	3.25
	Probus, Lamellyn	3.43		Loch Ness, Drumnadrochit	4.00
	Wincanton, Stowell Rec.	2.28	XIX.	Invershin	2.97
	Weston-super-Mare .....	...		Scourie	9.51
VI.	Clifton, Pembroke Road	2.50		Watten H.R.S.	5.03
	Ross, The Graig	1.22	XX.	Dunmanway, Coolkelure	4.34
	Wem, Clive Vicarage ...	1.49		Fermoy, Gas Works ...	2.56
	Cheadle, The Heath Ho.	1.47		Killarney, Woodlawn ...	3.37
	Worcester, Diglis Lock	1.06		Tipperary, Henry Street	2.79
	Coventry, Coundon	1.92		Limerick, Kilcornan ...	2.35
VII.	Ketton Hall [Stamford]	1.93		Ennis	1.91
	Grantham, Stainby	2.25		Miltown Malbay	2.87
	Horncastle, Bucknall ...	2.22	XXI.	Gorey, Courtown House	1.55
	Worksop, Hodsck Priory	2.06		Mullingar, Belvedere ...	1.23
VIII.	Neston, Hinderton	1.32		Athlone, Twyford	1.32
	Knutsford, Heathside...	1.65		Longford, Currygrane...	1.41
	Lancaster, Rose Bank...	1.87	XXII.	Galway, Queen's Coll...	2.97
	Broughton-in-Furness..	4.39		Collsmolina, Enniscooe..	3.36
IX.	Ripon, Mickley	1.76		Crolooney, Markree Obs.	2.95
	Scarborough, South Cliff	3.96		Ballinamore, Lawderdale	2.53
	East Layton [Darlington]	1.83	XXIII.	Lough Sheelin, Arley ..	1.47
	Middleton, Mickleton..	1.95		Warrenpoint .....	...
X.	Haltwhistle, Unthank..	2.61		Seaforde	1.57
	Bamburgh	1.81		Belfast, Springfield	2.53
	Newton Reigny	2.32		Bushmills, Dundarave...	2.58
XI.	Llanfrechfa Grange	1.69		Stewartstown	1.80
	Llandoverly	3.30		Buncrana	3.03
	Castle Malgwyn	3.43		Lough Swilly, Carrablagh	3.80

NOVEMBER, 1893.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which "01 or more fell.	TEMPERATURE.				No. of Nights below 32	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		In shade.		Max.		Min.		In shade.	On grass.
				Dpth	Date			Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	2·17	— '49	'59	14	15	59·8	3	27·8	1	10	13	
II.	Maidstone (Hunton Court)...	2·61	— '32	'62	14	16	...	...	...	...	...	...
III.	Strathfield Turgiss	2·09	— '63	'57	14	15	60·5	3	24·0	13	11	18	
IV.	Hitchin	2·34	— '34	'62	25	19	58·0	3	25·0	4, 12	16	...	
V.	Winslow (Addington)	2·25	— '68	'48	18	15	60·0	3	23·0	1	14	19	
VI.	Bury St. Edmunds (Westley)	3·12	+ '57	'85	18	14	55·0	3	20·0	5	...	...
VII.	Norwich (Cossey)	4·12	+ 1·55	'80	18	20	...	...	...	...	...	...
VIII.	Weymouth (Langton Herring)	1·55	— 2·11	'40	30	13	58·0	2a	28·0	19c	10	...	
IX.	Torquay (Cary Green) ...	1·85	...	'57	16	14	60·8	3	30·0	23	3	11	
X.	Bodmin (Fore Street) .....	...	...	...	...	...	...	...	...	...	...	...
XI.	Stroud (Upfield)	2·19	— 1·14	'57	17	19	57·0	3	27·0	18	10	...	
XII.	Church Stretton (Woolstaston)	1·72	— 1·80	'50	25	14	58·5	3	24·0	19	13	17	
XIII.	Tenbury (Orleton)	1·45	— 1·69	'38	25	15	60·5	3	22·0	1	11	14	
XIV.	Leicester (Barkby)	1·91	— '38	'47	18	15	59·0	3	17·0	4	14	22	
XV.	Boston	2·63	+ '43	'72	18	18	56·0	3	26·0	27	2	...	
XVI.	Hesley Hall [Tickhill]	1·60	— '42	'38	17	17	59·0	3	24·0	5	14	...	
XVII.	Manchester (Plymouth Grove)	2·41	— '59	'77	25	17	56·0	3	26·0	4, 5	13	15	
XVIII.	Wetherby (Ribston Hall) ...	1·08	— '99	'42	19	10	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	4·60	— 2·15	'64	26	24	...	...	...	...	...	...
XX.	Hull (Pearson Park)	3·20	+ 1·19	'77	18	22	56·0	17	25·0	5, 23	17	19	
XXI.	Newcastle (Town Moor)	2·60	+ '20	'48	6	22	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite)	11·54	— 3·25	2·25	25	18	...	...	...	...	...	...
XXIII.	Cardiff (Ely)	2·69	— 2·22	'63	1	16	...	...	...	...	...	...
XXIV.	Haverfordwest	4·26	— 1·60	1·39	18	18	55·6	17	27·0	1	9	12	
XXV.	Aberystwith, Gogerddan	4·44	— '67	'98	25	12	55·0	3	20·0	4	16	...	
XXVI.	Llandudno	3·30	+ '21	'52	16	17	56·8	4	...	...	...	...
XXVII.	Cargen [Dumfries]	1·78	— 2·78	'49	1	10	55·0	28	26·0	5	12	...	
XXVIII.	Jedburgh (Sunnyside)	2·86	+ '36	1·00	5	16	57·0	16	26·0	27	5	...	
XXIX.	Old Cumnock	3·40	— 1·57	'48	3	14	...	...	...	...	...	...
XXX.	Lochgilthead (Kilmory)	5·67	— 1·62	1·08	24	15	...	...	19·0	30	19	...
XXXI.	Morvern (Drimnin)	5·47	...	1·26	16	19	...	...	...	...	...	...
XXXII.	Mull (Quinish)	4·41	— 2·58	1·02	16	16	...	...	...	...	...	...
XXXIII.	Loch Leven Sluices	1·90	— 2·06	'70	4	8	...	...	...	...	...	...
XXXIV.	Dundee (Eastern Necropolis)	1·25	— 1·45	'50	3	10	55·2	28	26·8	23	13	...	
XXXV.	Braemar	3·05	— 1·53	'51	5	21	53·0	28	18·7	21	17	26	
XXXVI.	Aberdeen (Cranford)	4·22	...	1·26	16	22	55·0	29	24·0	30	9	...	
XXXVII.	Strome Ferry .....	...	...	...	...	...	...	...	...	...	...	...
XXXVIII.	Cawdor [Nairn]	3·73	+ '88	'94	17	22	...	...	...	...	...	...
XXXIX.	Dunrobin	5·15	+ 2·31	1·63	17	18	55·0	28	24·0	25	14	...	
XL.	S. Ronaldsay (Roeberry)	5·97	+ 2·55	1·71	17	23	47·0	10b	18·0	18	10	...	
XLI.	Darrynane Abbey	3·44	...	1·09	16	16	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	2·34	— 1·33	'67	16	17	59·0	3	28·0	1d	8	...	
XLIII.	O'Briensbridge (Ross)	2·59	...	'49	25	14	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	1·91	— 1·15	'46	16	14	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	1·87	— '96	'82	16	17	57·6	3	30·8	7	3	18	
XLVI.	Ballinasloe	1·97	— 1·94	'38	16	15	52·0	3	28·0	6	13	...	
XLVII.	Clifden (Kylemore)	5·06	...	1·47	16	16	...	...	...	...	...	...
XLVIII.	Waringstown	1·90	— 1·20	'41	16	15	58·0	3	22·0	6	12	19	
XLIX.	Londonderry (Creggan Res.) ..	3·37	— 1·15	'65	16	19	...	...	...	...	...	...
L.	Omagh (Edenfel)	2·37	— 1·50	'60	16	17	54·0	3, 28	21·0	14	12	19	

a And 3, 4. b And 21, 24. c And 24. d And 5, 27.

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

METEOROLOGICAL NOTES ON NOVEMBER, 1893.

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

ENGLAND.

STRATHFIELD TURGISS.—On the whole a pleasant month, but chiefly characterised by the sudden and severe changes of temperature and sharp paroxysms of cold of short duration, and by a severe and long-lasting storm from the N. W. on the 18th and subsequent days. S on 18th.

ADDINGTON.—The weather during the month was of a very varied and uncertain description, with frequent rapid and great changes of temperature. A difference of 15 degrees occurred in the max. of the 17th and 18th. The 18th was a very wild day; S began to fall about 11 a.m., and driven by a very high wind, formed great wreaths 3 ft., 4 ft., and 5 ft. deep, on the south side of all hedges running E. and W. It was impossible to tell how deep the S would have lain had it been still, but on the morning of 19th the gauge yielded .48 in. of R and melted S.

BURY ST. EDMUNDS.—A month of sudden and frequent changes both of temp. and pressure. No fog. S on 18th, 19th, 22nd, 26th, and 30th.

LANGTON HERRING.—The changes of temp. were sudden and great. The min. on the 1st was 30°; from the 2nd to the 4th the weather was very mild. A cold spell lasted from the 6th to the 15th, with N.E. and E. winds, which were very high on the 8th, 9th, and 10th. On the 18th and 19th there was a great storm, but no serious damage was caused in this locality. S fell on the 18th. From the 20th to the end of the month the temp. was very variable. Fogs on 14th, 15th, and 30th. Mean temp. at 9 a.m., 41°·6, or 2°·6 below the average of 21 years.

STROUD, UPPFIELD.—Earthquake felt at 5.45 p.m. on the 2nd. Gale on 17th. Severe gale on the 18th, with S and R, about half an inch of S laying on the ground. H storm on the 22nd; flakes of S on 30th.

WOOLSTASTON.—A cold month, with a good deal of frost. A shock of earthquake was distinctly felt on the 2nd about 5.50 p.m.; the direction appeared to be from the N.E. Heavy gales occurred between the 16th and 19th, and a wild blizzard raged on the 18th from noon to night, with driving S and sleet. Violent storms of H on the 22nd, and S on the 30th. Mean temp. 40°·3.

TENBURY, ORLETON.—A rather cold, but dry month, the mean temp. being nearly 0°·5 below the average. A great gale occurred on the 18th and 19th, accompanied by S, which drifted very much. Fog on the 2nd, 13th, 14th, and 21st.

LEICESTER, BARKBY.—A fine month, but variable in temp.; some beautiful sunsets. Water still short, and has to be carted to stock in the fields; most exceptional in this month. S on the 18th, 19th, and 30th, nearly 4 ft. deep not far from here. Mean temp. of month 39°·6.

MANCHESTER.—Fog on the 21st, and thick fog all day on the 14th; damp and foggy on the 15th, 28th, and 30th. Slight S showers on the 18th and 23rd. Fine autumn weather prevailed on the 3rd, 9th, 10th, 12th, 13th, and 29th. Very stormy from 16th to 19th, but very little property destroyed and no lives lost. Mean temp. 41°·0.

SEATHWAITE.—Falls of R exceeding an inch occurred on 5 days; exceeding two inches on the 25th. S on the hills on the 6th. Great storm on the 18th.

WALES.

HAVERFORDWEST.—A changeable, wet, stormy month, at times very cold, with very sharp frosts; the Precelly range three times environed with S from one end to the other. Four grass readings below 23°, lowest 21° on the 12th. On the 17th, 18th, and 19th a terrible gale blew; it commenced from S.E. with R, increasing in violence throughout the 18th; many trees blown down and houses stripped; the greatest force of the gale was from the N.N.W. to

N.N.E., consequently it did not do so much damage here as a westerly gale. The month ended fine and calm; wind very fresh on the night of the 30th.

GOGERDDAN.—Very changeable throughout the month. Wind from N.E. or N.W. H and S on several days.

SCOTLAND.

CARGEN.—The latter part of the month was very unsettled, the fluctuation of temp. and pressure being very marked; in 12 hours (27th–28th) the range of temp. was $26^{\circ}2$, and on the 17th and 18th the difference in pressure was nearly 1.2 inches. The gale on the 18th, which caused so much havoc in most parts of Britain, was comparatively little felt in this district, and the damage to trees, &c., was trifling; it was remarkable as coming from the N.E., a quarter severe gales very seldom come from. Easterly winds prevailed for 18 days. The mean temp. for the month was about $0^{\circ}5$ below the average.

JEDBURGH.—The weather was on the whole pleasant for the month, with no interruption to out-door work. The wind on 17th, 18th, and 19th was very high, but no damage to property resulted, except a few trees blown over or broken.

ABERDEEN, CRANFORD.—Violent gale on 18th; wind about 90 miles per hour; great destruction to plantations and loss of life at sea.

ROEBERRY.—On the 17th, after raining more or less all day, with a moderate S.E. wind, at about 5.45 p.m. the wind suddenly sprang up from the N.E. and blew a terrific gale all night, accompanied by R and sleet.

IRELAND.

DARRYNANE ABBEY.—A fine month, except a few days in the middle and at the end. A very strong gale on night of 16th and 17th.

WATERFORD, BROOK LODGE.—A great deal of N.E. wind. Heavy gales about the 18th. Mean temp. $42^{\circ}8$, nearly four degrees less than last year. S on the Comeraghs and Carlow mountains on the 19th.

O'BRIENSBRIDGE, ROSS.—An unusually fine month. Low temp. during the middle, with frequent slight frosts. Strong gales from N.W. on 17th and 18th.

DUBLIN.—This was a generally favourable month. Its leading characteristics were a prevalence of northerly winds, a tolerably low mean temp., an absence of calm and fog, a moderate R, but a high percentage of cloud. The storm from the 16th to 19th inclusive deserves special mention. The cyclonic depression which caused it was of great intensity, the bar. falling in its centre to about 28.5 in. on the morning of the 17th. The wind velocity during the northerly gales of this depression was great everywhere, but it was altogether exceptional at Holyhead, where the anemometer registered more than 1,800 miles of wind in 24 hours, and in one hour upwards of 85 miles. A slight shock of earthquake was felt at Greystones, Co. Wicklow, at 5.35 p.m. on the 2nd. Mean temp. $43^{\circ}8$, $0^{\circ}9$ below the average. High winds were noted on 15 days, but attained the force of a gale on only four occasions, the 16th, 17th, 18th, and 29th. Fogs on 5 days. A lunar halo was seen on the 21st. S or sleet fell on 4 days. H on 5 days.

BALLINASLOE.—Heavy R and gale on the 16th and 17th, and gale all day on the 25th.

OMAGH, EDENFEL.—The month commenced in dull, rainy weather, which gave way on the 6th to 10 days of rainless and generally bright weather, without much frost. On the 16th the bar. dropped 1.2 in. during the day, but it was not till the evening of the 17th that a northerly gale, exceeding in violence any since January 26th, 1884, commenced, and continued till evening of 18th, uprooting trees and doing much damage. The remainder of the month was raw, rainy, and unsettled, with extremely variable temperature.

SYMONS'S
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SNOW CRYSTALS.*

WHEN Dr. Hellmann writes upon a fresh subject, it may be taken for granted that we shall have a bibliography of it, superior to what anyone else could give us—and the present volume confirms the reputation. It has generally been supposed that Olaus Magnus in 1555, was the first to mention the form of snow crystals as well as the first to engrave them. But Dr. Hellmann points out that Albertus Magnus, who lived 1193-1280, had called attention to the star-like form of snow and quotes the words (*figura stellæ*) as from Albertus's Meteorology, Book I., chapter 10. Book I., chapter 10, treats of comets—it should be Book II., chapter 10; and we think that it would have been well to quote also the fuller description given earlier in the same chapter.

In the edition of 1494 (the only printed one which we have), the words are :—

“Sed figura pruine est cut radii qdam ad vnû centrum reducti vel vnâ lineam ex vtraque parte circûstantes.”

Which may be roughly rendered :—

“The form of snow is that of a series of radii starting from a centre, or lines from a circumference meeting at a centre.”

On p. 53, Dr. Hellmann quotes Bierens de Haan's report of an edition of Engelman, dated 1743, and says, that perhaps there never was such a book. That is also our opinion. Engelman's edition of 1747, makes no reference to any earlier one, and his edition of 1771, is distinctly stated to be the second. We think that Bierens de Haan probably confused with Engelman's book another Dutch one, which was published in the year, he states, 1743, viz. : N. Duin's *Aammerkingen en Aanteekeningen, van drie meer dan gemeene strenge Winters*. But though, of course, there are many references to snow, it is totally different from Engelman's work, and we have not seen a word in it as to the *form* of snow.

* *Schneekrystalle ; Beobachtungen und Studien*, von Prof. Dr. HELLMANN. Royal 8vo. R. Mückenberger, Berlin, 1893. 66 pages, numerous engravings, and 8 plates reproducing micro-photographs.

As regards engravings of snow crystals, Dr. Hellmann gives faithful reproductions from the works of—

Olaus Magnus	...	...	1555
Descartes	...	...	1637
E. Bartholinus	...	...	1660
Hooke	...	...	1665
Martens	...	...	1675
D. Rosetti	...	...	1681
Scoresby	...	...	1820
Glaisher	...	...	1855

With reference to some of the later ones he seems to think that they are rather too beautiful. The plan of drawing complicated patterns has usually been to draw accurately the branches from one of the six radii and subsequently to draw the other five radii with identical branches. This, of course, produces perfect symmetry, but Dr. Hellmann questions whether such perfect symmetry is usual.

The only direct photograph of snow which we had seen, prior to receiving Dr. Hellmann's book, was one taken by Mr. A. W. Clayden, and if we remember it aright, the majority of the crystals were imperfect. To us, however, that seems a probable fact, because both by contact with other crystals in their fall earthwise, and by contact with the surface on which they fall, such extremely delicate structures may suffer much injury. Moreover, there is the ever-present difficulty as to their melting; they must not merely be formed at a low temperature, but *all* the air strata through which they pass, must be below 32° F., and the air must not be very dry, or the crystals will lose some of their finer needles by evaporation, or very moist, or additional spiculæ may be irregularly attached. All this is evident, and it being so, we think that, at any rate in the state of knowledge when Engelman, Scoresby, and Glaisher brought out their exquisite engravings, they did wisely in representing perfect crystals.

Now that photography can be used, much more can be done, and doubtless before long will be. It is very nice to have the indisputable photographs which Dr. Neuhass has taken, and we wish him much success. The chief difficulty appears to be to obtain a sufficiently strong light to illuminate the crystals and yet to avoid warming them.

We cannot find space for telling in detail the various inferences which Dr. Hellmann draws from the photographs, but his book is an epoch making one. He closes the period of geometrical perfection in the representation of snow crystals, and carries us a good way into the new period in which the photograph perpetuates their appearance, and enables us to study their life history, not in a garden, with the temperature at zero, but in the comfort of a study. Dr. Neuhass must find out how to prevent the crystals thawing, and thereby complete the benefit he has conferred on meteorologists, for beautiful as were the geometrical figures, it will be still better to have the absolute facts.

The work may almost be called an *edition de luxe* so excellent are the paper, the printing, and the reproductions of the micro-photographs.

UNUSUAL SNOW CRYSTALS.

To the Editor of the Meteorological Magazine.

SIR,—When I left home at 8.30 this morning snow was falling in single crystals and small flakes, the flakes consisting as a rule of any number of crystals up to eight or ten; the fall continued, decreasing gradually till about 9.15 a.m., the temp. during this time being about 23°.

The crystals were very varied, both in form and size, and exhibited some features which appeared to me worthy of record. They varied in diameter from * $\frac{2}{24}$ inch (2.12 millimetres), up to the largest size which it has been my good fortune to examine, one measuring exactly * $\frac{8}{24}$ inch (8.47 millimetres), and another * $\frac{7}{24}$ inch (7.41 millimetres.) Some half-dozen crystals, $\frac{1}{8}$ inch in diameter, were seen with the spiculæ radiating in all directions, and two of $\frac{3}{16}$ inch, the rays in the two larger specimens being of the usual arborescent pattern, whereas the rays of the smaller forms were simple needles—as in the case described in the *Met. Mag.* for January, 1893. These crystals might conveniently be called spherical snow crystals, and this name will enable me to describe as hemispherical five or six other crystals examined; they were similar in size and structure to the two larger spherical ones just described, but what may be called the main crystals, formed a flat base, on which were arranged two half-crystals on the same side. I endeavoured to count the number of rays in the spherical crystals, and although it was a rather severe test for the eyesight, I am satisfied that 14 is the correct number.

Another frequent form, was the ordinary crystal with additional spiculæ on both sides, at right angles to it. Although, during the three-quarters of an hour, I examined many hundred crystals, I did not see any of what may be described as “the axle and pair of wheels” pattern, or any hexagonal discs.

It may be worthy of remark that the temp. was comparatively near to that on January 1st, 1893, when I observed the spherical crystal before mentioned, as described in the *Met. Mag.*, January 1893.

Yours very truly,

H. SOWERBY WALLIS.

25, Northwood-road, Highgate, January 6th, 1894.

* These uncouth fractions are used because they are the graduations of the pocket scale with which the crystals were measured.

THE FROST OF JANUARY 5TH & 6TH.

THIS frost was not, we think, comparable with those of 1881, 1867, or 1860—in fact, except at isolated stations, we do not think that it was much worse than that of 1893; but recent events usually produce a strong impression, and we shall therefore be expected to say something about it.

In the first place, we reprint from the *Morning Post* a report as to the minimum at Greenwich Observatory:—

“The Astronomer Royal reports that at Greenwich Observatory the minimum was 12°·8. In the previous 53 years during which meteorological observations have been recorded there, there have been only nine years in which the reading of the 5th was beaten, the actual values being:—

1894	.....	Jan. 5	.....	12°·8
1881	.....	„ 17	.....	12·7
1878	.....	Dec. 25	.....	12·2
1870	.....	„ 25	.....	9·8
1867	.....	Jan. 5	.....	6·6
1860	.....	Dec. 25	.....	8·0
1855	.....	Feb. 19	.....	11·1
1847	.....	„ 12	.....	11·2
1845	.....	„ 12	.....	7·7
1841	.....	Jan. 9	.....	4·0

Prior to this date members of the staff registered temperatures in the neighbourhood, and in the Belville Journals there is an entry of a temperature of 3°·0 at 9 a.m. on January 15th, 1820, the minimum being supposed to be zero. On January 20th, 1838, however, the lowest readings of the century were registered, all being below zero—at Blackheath, $-2\frac{1}{2}^{\circ}$; at Greenwich, -4° ; near Deptford Bridge, -5° ; at Lewisham, -6° ; and at Beckenham, -8° or -10° . This was known as “Murphy’s Winter,” from the almanack maker’s prediction that January 20th would be the coldest day.”

From this we may see that at Greenwich a similarly low temperature is reached about every six years.

The peculiarity of the recent frost was the coldness during the day-time on January 5th. In London, until evening, the temperature did not exceed 18½°, and similar or greater cold prevailed over the South of England. The temperature rose a little after 6 p.m., and the true max., as read at 9 p.m., was 19°·8. This, in London, has been exceeded only once in 35 years, and that once was as far back as January 4th, 1867, when the max. was only 16°·9. In corroboration of this we may refer to the letter from our regular correspondent at Weymouth (on p. 188) and to the following temperatures sent by Mr. R. H. Barnes from Parkstone, Dorset:—

	7 a.m.	min.	9 a.m.	Noon.	3 p.m.	6 p.m.	7 p.m.	9 p.m.
January 5th.....	14·6	13·5	14·1	14·7	15·7	16·2	17·0	15·1

FROST IN THE ISLE OF WIGHT.—Mr. C. Orchard, Bembridge, observes:—“The weather here last week was very severe. On Thursday, January 4th, the N.E. wind was very piercing, blowing half a gale, with temperature about

26° all the day. On Thursday night some snow fell, and the wind kept up, while the thermometer fell to 15°, the frost, which penetrated dwelling houses and stores, as well as glass structures, freezing in places that have never been known before by the oldest inhabitant; in fact it seemed a perfect blizzard. The damage to plants and roots, such as potatoes in stores, cannot yet be estimated. Fires, lamps, and stoves entirely failed to keep the frost from the greengrocers' shops and stores in Ryde and the other towns in the island, the contents in most cases being frozen quite hard."—*Journal of Horticulture.*

Mr. Pile, of Cranbrook, Kent, gives the max. as 23°, and says that the only lower one for 22 years was 22° on December 30th, 1890. This max. of 23° was probably at night, because Mr. Mace, of Tenterden, says: Max. *during the day* 19°, but rose to 21° between 7 and 10 p.m.

Mr. Padwick, of the Manor House, Horsham, gives the temperature at 11 a.m. as 13°.

At Ivedon, Honiton, Devon, Mr. Stanley had almost exactly the same temperatures as in London, viz. :—

	Min.		9 a.m.		Max. up to 6 p.m.
Ivedon.....	14°0	.....	15°0	.....	18°0
Camden Square.....	13°1	.....	14°3	.....	18°4

Much further to the North, the Rev. H. A. Boys, of Easton Mauduit, Northampton, gives :—

	9 a.m.	Noon.	Max.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	9 p.m.	Min.	10 p.m.
Jan. 5th...	17°5	18°5	18°8	17°5	18°2	17°5	16°0	10°5	10°3	13°0

At Addington, near Buckingham, Mr. Mathison says that the temp. did not reach 15° until nine o'clock at night. He gives :—

		4 p.m.		6 p.m.		9 p.m.
January 5th		11°0	.....	14°0	.....	15°0

Still further North the min. fell much later, viz., on the 6th; but we do not think that the air temperature fell to zero in any part of England.

ROYAL METEOROLOGICAL SOCIETY.

The monthly meeting of this society was held on Wednesday evening, the 26th ultimo, at the Institution of Civil Engineers, 25, Great George-street, Westminster, Dr. C. Theodore Williams, President, in the chair.

Mr. C. Harding, F.R.Met.Soc., gave an account of the "Great Storm of November 16th to 20th, 1893." This storm was the most violent of recent years, and, as far as anemometrical records are concerned, the wind attained a greater velocity than has previously been recorded in the British Islands. The velocity of the wind was 96 miles in the hour from 8.30 to 9.30 p.m. Nov. 16th in the Orkneys, where the hurricane burst with such suddenness, that it is described as like the shot of a gun, and the wind afterwards maintained the very high rate of 90 miles and upwards in the hour, for five consecutive

hours. At Holyhead the storm was terrific, the anemometer recorded a wind velocity of 89 miles in the hour, and it was 80 miles or above for 11 hours; while the force of a whole gale, 65 miles an hour and upwards, was maintained for 31 hours, and for $4\frac{1}{2}$ days the mean hourly velocity was 54 miles. Many of the gusts were at the rate of 115 miles in the hour, and at Fleetwood a squall occurred, with the wind at the rate of 120 miles an hour. The storm was felt over the entire area of the United Kingdom, and the wreck returns show that disasters occurred with almost equal frequency on all coasts. Four weeks after the storm the official records gave the total loss of life on our coasts as 335, while there were 140 vessels which had been abandoned, or had foundered, stranded, or met with other severe casualty, involving either loss of life, or saving of life by some extraneous assistance. There were 600 lives saved on our coasts by aid of the Life-boat Institution and other means. The author has tracked the storm from the neighbourhood of the Bahamas on Nov. 7th, across the Atlantic and over the British Islands to central Europe on Nov. 20th.

The other papers read were—"Rainfall and Evaporation Observations at the Bombay Water Works," by Mr. S. Tomlinson, M.Inst.C.E.; and "On Changes in the Character of certain Months," by Mr. A. E. Watson, B.A., F.R.Met.Soc.

SOCIEDAD METEOROLOGICA URUGUAYA.

To the Editor of the Meteorological Magazine.

SIR,—I have read with interest in the number 333 for October, 1893, page 136 of your valuable magazine, the remarks which the perusal of our *Revista* suggested, especially that referring to the delay in the publication of meteorological *datos* obtained at the various stations established since January, 1890.

I would observe, however, that these delays are not due entirely as the reviewer seems to imply—to climate conditions of these parts, but directly to the want of the pecuniary resources, necessary for the extensive and regular publication of these data. It is only to the patriotism of a few citizens (so few indeed, that I am often called upon to provide out of my own pocket the necessary sums to attend to the "service") that we are able to publish the *Revista* and provide for the maintenance of the stations. Therefore the delay will not be a matter of surprise, bearing in mind that the Uruguayan Meteorological Society is purely a private undertaking, without any help or aid whatever from the Government of the country.

In any case, the publication of the data would involve delay, owing to various causes, as it happens with other publications of greater importance than ours, possessing the necessary elements. For example:—*The Monthly Bulletin of the Central Magnetic and Meteorological Observatory of Mexico*, whose April number of 1890 was

published only recently in 1892; also the Bulletin of the Italian Meteorological Society, published in the September number of the year, the observations of July, 1892.

Thanking the reviewer for his good wishes for the prosperity of the institution, which I have the honour of directing, and reciprocating the same to yourself,

I am,

Yours very respectfully,

F. A. LANZA, Director.

*Sociedad Meteorologica Uruguaya, Calle Sarandi, 190,
Montevideo, Uruguay, November 25th, 1893.*

EXCEPTIONAL FROST FORMATION.

To the Editor of the Meteorological Magazine.

SIR,—In the sharp frost that occurred on 2nd and 3rd of this month, I noticed in a wood in Surrey, a very peculiar frost formation.

Patches of ground, about eighteen inches in diameter, were covered with little vertical columns of ice that had the appearance of having exuded from the ground, and in general form reminding one of the columnar basalt of Fingal's Cave in miniature. Some of the columns in the middle of the patch measured 2 inches high; they all came up to about the same level but decreased slightly in height to the edges of the patch. The soil is light, gravelly sandstone, and some of the soil, and small stones, measuring three-quarters of an inch, were supported here and there on the tops of the little columns.

The ice was clear but in structure was composed of bundles of fibres, like rock asbestos, the sides of each column being parallel, not tapering either at the top or the bottom. The diameter of the columns was about a quarter-of-an-inch, and the distance between them varied from 0 to half-an-inch, but in many cases they were closely related, forming rows about two or three inches long. Nearly all of them had a joint or interruption about two-thirds from the top, as if they had been caused by the action of two successive frosts. In some cases the lower portion was missing, the column being supported by those adjacent, and on the lower end where the joint would have been, was a bunch of rime spikes, like little rootlets, about three-quarters of an inch above the ground.

The few patches that I observed, were situated on the side of banks, where water could not have accumulated as a puddle.

Yours faithfully,

E. WHITE WALLIS.

49, Clifton Hill, N. W., 13th December, 1893.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 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	90·7	7	47·3	15b	74·5	55·2	53·0	0·100 70	100·3	43·0	2·46	17	6·0
Malta.....	96·1	14	65·7	20	87·0	70·8	66·8	70	146·9	60·8	·00	0	1·7
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	74·8	10	59·0	13	73·1	62·9	58·6	74	120·2	48·3	3·35	20	5·5
Calcutta	90·5	27	75·2	4, 5	87·0	78·5	79·0	88	154·6	74·9	10·97	16	8·5
Bombay.....	87·3	12	74·3	3	84·8	76·9	75·8	85	136·7	71·8	16·14	31	8·6
Ceylon, Colombo	86·9	15	73·4	3	84·1	77·2	70·9	77	156·0	70·0	2·20	11	7·7
<i>Melbourne</i>	60·0	23	31·0	28	54·8	41·8	43·3	83	111·5	24·9	2·32	17	5·9
<i>Adelaide</i>	63·6	23	35·7	3	58·2	44·2	43·9	76	129·0	26·1	2·00	15	...
<i>Sydney</i>	71·2	24	38·7	4	59·6	46·2	44·3	83	114·0	24·0	4·45	15	4·2
<i>Wellington</i>	60·0	14a	35·0	19	55·2	44·3	42·8	79	102·0	24·0	7·31	18	5·4
<i>Auckland</i>	64·0	6, 31	39·0	20	58·7	48·3	48·2	81	124·0	31·0	5·34	25	6·7
Jamaica, Kingston.....	92·9	4	69·8	10	87·8	72·2	71·3	74	...	...	5·94	14	6·5
Trinidad	93·0	12	65·0	17c	87·6	69·3	73·3	85	145·0	62·0	13·28	25	...
Toronto	93·3	25	45·0	24	79·1	57·5	58·5	72	...	41·0	2·27	14	4·0
New Brunswick, Fredericton.....	85·2	21	45·0	10	75·9	52·5	59·6	69	...	...	3·68	12	4·0
Manitoba, Winnipeg...	88·3	20	40·0	8	77·8	55·4	...	...	...	...	5·42	12	5·0
British Columbia, Esquimalt.....	71·4	30	45·2	19d	66·9	51·2	52·8	84	...	...	·95	11	5·0

a And 25, 31. b And 28. c And 18. d And 20.

REMARKS.

MALTA.—On 29th, at 10.30 a.m., a few heavy drops of rain fell, but not enough to measure. Mean temp. 77°·6; mean hourly velocity of wind 8·2 miles. J. SCOLES.

Mauritius.—Mean temp. of air 1°·1 below, dew point 0°·7 below, and rainfall ·96 in. above, their respective averages. Mean hourly velocity of wind 12·3 miles, or 0·4 mile above the average; extremes, 27·1 on 14th, and 2·1 on 19th; prevailing direction, E.S.E. C. MELDRUM, F.R.S.

Melbourne.—Fog on the 8th, 18th, 28th and 29th; frost on the 2nd, 8th, 28th and 29th; hail on the 1st and 25th; lightning on the 9th, 12th, 13th, 14th and 22nd. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·4 below the average of 36 years. Rainfall ·63 in. below the average. C. TODD, F.R.S.

Sydney.—Mean temp. 0°·3 above, humidity 7 above, and rainfall ·04 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Generally showery weather, with a few fine days; heavy rain in the early part and at the end of the month. Prevailing winds S.E. and N.W., frequently fresh, but very strong only on 14th and 30th, from N.W. Mean temp. 2°·1, and rainfall ·98 in., above their averages. R. B. GORE.

Auckland.—A stormy, wet and disagreeable month, rain falling on 25 days out of 31. Total rainfall nearly ·75 in. in excess. Barometrical pressure and mean temp. both considerably above the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Thunderstorms, with much rain and squalls. Rainfall nearly three times the average. Mean hourly velocity of wind 3·8 miles. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
DECEMBER, 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.	3·23	XI.	Builth, Abergwessin Vic.	9·44
„	Birchington, Thor	2·07	„	Rhayader, Nantgwilt..	8·37
„	Brighton, Prestonville Rd	...	„	Corwen, Rhug .....	...
„	Hailsham	3·12	„	Carnarvon, Cocksida ...	5·85
„	Ryde, Thornbrough	3·51	„	I. of Man, Douglas	5·50
„	Alton, Ashdell	3·85	XII.	Stoneykirk, Ardwell Ho.	3·41
III.	Oxford, Magdalen Col...	1·54	„	New Galloway, Glenlee	8·60
„	Banbury, Bloxham	2·60	„	Melrose, Abbey Gate...	3·51
„	Northampton, Sedgbrook	2·06	XIII.	N. Esk Res. [Penicuick]	4·40
„	Alconbury	1·24	„	Edinburgh, Blacket Pl..	2·50
„	Wisbech, Bank House..	1·36	XIV.	Glasgow, Queen's Park.	4·57
IV.	Southend	1·42	XV.	Islay, Gruinart School..	4·66
„	Harlow, Sheering	1·76	XVI.	Dollar	4·82
„	Colchester, Lexden	1·48	„	Balquhidder, Stronvar..	10·68
„	Rendlesham Hall	1·41	„	Coupar Angus Station..	2·55
„	Diss	1·72	„	Dunkeld, Inver Braan..	3·54
„	Swaffham	1·39	„	Dalnaspidal H.R.S. ...	10·06
V.	Salisbury, Alderbury...	3·79	XVII.	Keith H.R.S.	2·15
„	Bishop's Cannings	2·97	„	Forres H.R.S.	1·20
„	Blandford, Whatcombe.	3·97	XVIII.	Fearn, Lower Pitkerrie.	1·80
„	Ashburton, Holne Vic....	6·95	„	Loch Shiel, Glenaladale	22·20
„	Okehampton, Oaklands.	7·16	„	N. Uist. Loch Maddy ...	7·47
„	Hartland Abbey	5·11	„	Invergarry	14·80
„	Lynmouth, Glenthorne.	7·12	„	Aviemore H.R.S.	3·51
„	Probus, Lamellyn	5·23	„	Loch Ness, Drumnadrochit	5·84
„	Wincanton, Stowell Rec.	3·66	XIX.	Invershin	2·40
„	Weston-super-Mare .....	...	„	Scourie	7·12
VI.	Clifton, Pembroke Road	2·86	„	Watten H.R.S.	1·67
„	Ross, The Graig	3·45	XX.	Dunmanway, Coolkelure	9·23
„	Wem, Clive Vicarage ...	2·90	„	Fermoy, Gas Works ...	4·61
„	Cheadle, The Heath Ho.	3·10	„	Killarney, Woodlawn ...	7·80
„	Worcester, Diglis Lock	2·59	„	Tipperary, Henry Street	3·80
„	Coventry, Coundon	2·83	„	Limerick, Kilcornan ...	3·56
VII.	Ketton Hall [Stamford]	1·34	„	Ennis	5·33
„	Grantham, Stainby	1·82	„	Miltown Malbay	5·28
„	Horncastle, Bucknall ...	1·87	XXI.	Gorey, Courtown House	3·36
„	Worksop, Hodsck Priory	2·84	„	Mullingar, Belvedere...	3·11
VIII.	Neston, Hinderton	2·99	„	Athlone, Twyford	4·19
„	Knutstford, Heathside...	3·41	„	Longford, Currygrane...	3·74
„	Lancaster, Rose Bank...	3·36	XXII.	Galway, Queen's Coll...	5·03
„	Broughton-in-Furness..	6·62	„	Crossmolina, Enniscoe..	8·39
IX.	Ripon, Mickley	3·39	„	Collooney, Markree Obs.	4·78
„	Scarborough, South Cliff	2·08	„	Ballinamore, Lawderdale	3·88
„	East Layton [Darlington]	2·88	XXIII.	Lough Sheelin, Arley ..	3·29
„	Middleton, Mickleton..	2·96	„	Warrenpoint	4·01
X.	Haltwhistle, Unthank..	3·02	„	Seaforde	3·65
„	Bamburgh	1·15	„	Belfast, Springfield	4·44
„	Newton Reigny	4·61	„	Bushmills, Dundarave...	3·55
XI.	Llanfrechfa Grange	5·46	„	Stewartstown	3·21
„	Llandoverly	6·05	„	Buncrana	4·78
„	Castle Malgwyn	5·97	„	Lough Swilly, Carrablagh	5·52

DECEMBER, 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 .01 or more fell.	Max.		Min.		In Shade.	On Grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
		inches.	inches.	in.								
I.	London (Camden Square) ...	2.23	+ .16	.44	8	14	57.8	13	20.1	3	0	19
II.	Maidstone (Hunton Court)...	1.75	— .49	.43	12	13	...	...	...	...	...	...
III.	Strathfield Turgiss	3.80	+ 1.79	.67	12	22	54.2	13	16.5	3	13	27
IV.	Hitchin	1.90	— .13	.48	20	15	55.0	13	19.0	2	9	..
V.	Winslow (Addington)	1.44	— 1.01	.30	12	19	56.0	13	15.0	3	10	22
VI.	Bury St. Edmunds (Westley)	1.94	— .30	.29	12	14	54.0	13	18.0	30	...	...
VII.	Norwich (Cossey)	1.90	— .33	.54	20	12	...	...	...	...	...	...
VIII.	Weymouth (Langton Herring)	3.04	— .06	.57	19	14	54.0	13	22.0	3	5	...
IX.	Torquay (Cary Green)	4.97	...	1.23	12	16	55.5	13	24.8	3	4	10
X.	Bodmin (Fore Street) .....	...	...	...	...	...	...	...	...	...	...	...
XI.	Stroud (Upfield)	2.76	+ .31	.66	12	21	53.0	13	20.0	2	11	...
XII.	Churchstretton (Woolstaston)	4.52	+ 1.47	.91	12	23	52.0	13	20.0	2	10	17
XIII.	Tenbury (Orleton) .....	...	...	...	...	...	...	...	...	...	...	...
XIV.	Leicester (Barkby)	1.80	— .34	.41	20	19	55.0	13	13.0	1	15	26
XV.	Boston	1.36	— .49	.25	20	15	55.0	13	19.0	2	...	...
XVI.	Hesley Hall [Tickhill]	2.65	+ .67	.89	12	20	53.0	13 ^a	21.0	2	16	...
XVII.	Manchester (Plymouth Grove)	3.57	+ .13	.73	12	21	54.0	13	18.0	1	6	12
XVIII.	Wetherby (Ribston Hall) ...	2.59	+ .15	.79	13	11	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	6.94	+ .13	1.38	13	23	...	...	...	...	...	...
XX.	Hull (Pearson Park)	2.01	— .26	.77	20	15	55.0	13	22.0	2	11	17
XXI.	Newcastle (Town Moor)	1.36	— .94	.33	12	16	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	22.53	+ 7.72	3.71	24	27	...	...	...	...	...	...
XXIII.	Cardiff (Ely).....	4.88	+ .33	1.06	12	17	...	...	...	...	...	...
XXIV.	Haverfordwest	6.05	+ 1.06	.73	12	23	55.7	23	20.1	3	8	13
XXV.	Aberystwith, Gogerddan	4.61	— .27	.60	12	19	51.0	13	18.0	1, 2	...	...
XXVI.	Llandudno.....	3.57	+ .61	.60	12	19	55.0	24	32.4	2	0	...
XXVII.	Cargen [Dumfries]	6.72	+ 2.70	.96	13	22	53.0	16	17.8	2	...	...
XXVIII.	Jedburgh (Sunnyside).....	2.52	+ .32	.85	13	11	53.0	15	23.0	2	9	...
XXIX.	Old Cumnock	5.49	+ .42	.96	24	25	...	...	...	...	...	...
XXX.	Lochgilthead (Kilmory).....	7.96	+ .59	.73	2	29	...	...	19.0	1	8	...
XXXI.	Morvern (Drimnin)	10.34	...	1.00	2	30	...	...	...	...	...	...
XXXII.	Mull (Quinish)	8.55	+ .98	.75	6	30	...	...	...	...	...	...
XXXIII.	Loch Leven Sluices	3.80	+ .49	.70	25	15	...	...	...	...	...	...
XXXIV.	Dundee (Eastern Necropolis)	2.05	— .03	.70	24	19	53.0	16	24.1	1	7	...
XXXV.	Braemar	3.82	+ 1.35	.73	10	25	50.2	16	20.0	1	12	20
XXXVI.	Aberdeen (Cranford)	2.07	...	.50	24	22	52.0	6	22.0	1	10	...
XXXVII.	Strome Ferry.....	...	...	...	...	...	...	...	...	...	...	...
XXXVIII.	Cawdor [Nairn]	2.19	— .27	.30	6, 8	23	...	...	...	...	...	...
XXXIX.	Dunrobin	3.11	— .26	.54	2	17	56.0	6	22.5	1	12	...
XL.	S. Ronaldsay (Roeberry).....	3.31	— .35	.35	8	28	51.0	6, 15	31.0	10	3	...
XLI.	Darrynane Abbey.....	6.64	...	.83	27	23	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	4.33	+ .69	1.09	19	20	52.0	16	24.5	2	8	...
XLIII.	O'Briensbridge (Ross)	5.45	...	.58	12	23	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	3.55	+ .43	.56	24	24	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	2.48	+ .32	.50	24	19	56.7	15	28.3	2	3	16
XLVI.	Ballinasloe	4.23	+ .81	.61	12	23	51.0	28	29.0	31	8	...
XLVII.	Clifden (Kylemore)	11.48	...	1.53	18	24	...	...	...	...	...	...
XLVIII.	Waringstown	3.00	— .04	.40	24	20	55.0	27	23.0	1	14	18
XLIX.	Londonderry (Creggan Res.)..	3.95	— .26	.41	6	28	...	...	...	...	...	...
L.	Omagh (Edenfel)	4.85	+ 1.17	.66	27	26	53.0	24	22.0	1	14	19

a And 16.

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

METEOROLOGICAL NOTES ON DECEMBER, 1893.

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

ENGLAND.

STRATHFIELD TURGISS.—Taken altogether, December was a mild month, with a short snap of cold at the beginning and the end. The fluctuations of the bar. about the 17th were most remarkable. It fell from 30·469 in. to 28·464 in. in 48 hours. Heavy gale from N.W. on the 8th, and on the 12th a very severe gale, far exceeding any previous storm this winter; much damage was done to trees, and the celebrated oak over "Copenhagen's" grave in Strathfieldsaye Park was very seriously damaged. A large block of buildings was blown down at Aldershot. Gales again on the 19th and 20th. Grass min. on 3rd, 10°·5. Slight S on 1st.

HITCHIN.—The lowest barometer for many years occurred on the 20th, and the highest since February, 1887, on the 30th.

ADDINGTON.—Very sharp frosts occurred on the 2nd and 3rd, and again on the 30th and 31st, but there were no very low temperatures between those dates. R fell on many days, but in no great quantity, that registered on the 31st being partly fog, which was very dense all day, covering the trees with thick rime. Wind very strong at times. Much L at night on the 8th. Corrected bar. at 9 a.m. on 20th 28·902 in., and on the 29th 30·660 in.

BURY ST. EDMUNDS.—A mild month, with frequent R in small quantities, but no S. Violent oscillation of the bar. between 20th and 29th.

LANGTON HERRING.—The first and last weeks of the month were fine, and also from the 14th to the 18th, but the rest of the month was very unsettled, with great storms on the 12th and 20th. The storm on the 12th did considerable damage, blowing down tiles, slates, and coping stones in all directions, and uprooting many trees. The worst storm for many years. Mean temp. at 9 a.m. (42°·4), 3°·9 above the average, and 0°·8 above that of November. L on the 8th; H on the 9th; T on 11th and 12th. Solar halo on the 11th. Lunar halo on the 20th.

TORQUAY, CARY GREEN.—Heavy gale till 1.30 p.m. on 12th. R from 9 a.m. to 1 p.m., ·96 in.

STROUD, UPFIELD.—S.W. gales on 7th and 8th, with L on the latter day. S.E. gale on 10th, and S.W. gales on 11th and 13th. Violent storm of R and S at 4 p.m. on the 20th.

WOOLSTASTON.—A stormy month, with a succession of gales from the 8th to the 13th. S fell on the 19th and 20th.

LEICESTER, BARKBY.—A mild, open month; only a little S on the 1st and 20th. Water still very short. Mean temp. 38°·2.

MANCHESTER.—A very fine month; many days bright and sunny, more like spring. Mean temp. 40°·5. T and L on the 25th. Slight H showers on the 7th and 21st. Thick fog all day on 2nd. Thick fog and wet mist on the 29th, and 31st.

HULL, PEARSON PARK.—Squally, with showers of S on the 1st. Fog on the 5th, 28th, 29th, 30th, and 31st.

SEATHWAITE.—Falls of R exceeding an inch occurred on 8 days, exceeding 2·00 in. on 2 days, and exceeding 3·00 in. on one day. Hard frost on 1st and 2nd. H showers on the 7th and 21st.

WALES.

HAVERFORDWEST.—On the whole a mild December, although the first three days were very wintry, the Precelly range covered with S, and severe frost. Milder weather and fine, until the 8th, when a very stormy, wet, and at times very cold period set in, lasting seven days, the force of the wind being greater and the storm from the S.S.E. to E. greater than any gale since December, 1886. Stormy weather occurred several times afterwards, scarcely a day without R or S. About the 29th dense fog prevailed, the month ending with

hard frost. One of the wettest months of the whole year. Prevailing wind S.W., S.S.E., and N.E.

GOGERDDAN.—Very stormy and mild throughout and scarcely any sun.

SCOTLAND.

CARGEN.—Gales on the 8th and 10th; L on the 8th and 9th; S, sleet and R on the 12th and 13th; lunar halo on the 20th.

JEDBURGH.—The weather during the month was mild for the season. Snow-drops appeared above ground on 4th; primroses were in bloom after the 2nd. The S and frost never lasted beyond the day they occurred. Masons' work hardly got a check, and out-door work was never interrupted. S on the 7th, 8th and 13th. High wind on the 8th and 10th.

ROEBERRY.—A very unsettled month.

IRELAND.

DARRYNANE ABBEY.—The wettest month of the year, but mild.

WATERFORD, BROOK LODGE.—Fresh S on the Comeraghs on the 1st. Several heavy gales during the month. Mean temperature 42°·5.

O'BRIENSBRIDGE, ROSS.—This month exhibited the greatest rainfall of the year, with strong winds, mostly from S.E., especially on 17th. A marked rise of temp. occurred in the last week. Dense fog on 31st.

DUBLIN.—A generally open, rainy, squally month. Several serious gales were felt, but calms, with fog, prevailed during the closing days of the month, accompanied by an abrupt fall of temp. Mean temp. 43°·5, 2·2 above the average. Lunar halos appeared on the 14th and 18th. High winds were noted on 17 days, and attained the force of a gale on 5 occasions. The atmosphere was more or less foggy on 7 days. Neither S nor sleet fell in Dublin, although the mountains were covered with S on the 18th and 20th. H fell on the 13th; T and L occurred on the 8th.

BALLINASLOE.—Gales on 6th, 7th and 18th; high winds on the 8th, 9th, 10th and 15th; thick fog on 31st.

CLIFDEN, KYLEMORE.—Stormy and wet throughout.

WARINGSTOWN.—A very mild and open month, especially the latter half.

OMAGH, EDENFEL.—The month was ushered in with light S and sharp frost, which speedily gave way to mild and unsettled weather, with an extremely low and fluctuating bar., after the 27th, dry and cold with N.E. wind.

A COLD DAY IN DORSET.

To the Editor of the Meteorological Magazine.

SIR,—The temp. here to-day has been so exceptional that I send you a note of it for comparison with that of other places.

Last evening, at 9 o'clock, I set my thermometer, the temp. being then 20°; it fell to 15° by 9 a.m. and to 14° by 10 a.m.; it rose to 16° by noon and to 17° by 2 p.m. On only 12 days in the last 22 years, has the temperature fallen below 20°, and on only four days in that time has the temperature at 9 a.m. been below 20°, namely:—

	At 9 a.m.			Min.	Max.		At 9 a.m.			Min.	Max.
Jan. 22nd, 1881	...	14	13	26	|	Jan. 19th, 1891	...	19	17	31	
„ 25th, „	..	17	16	20		„ 5th, 1894	...	15	14	17	

by which it will be seen, that here, this day has been the coldest day in the last 22 years.

Yours truly,

CLEMENT H. GOSSET.

Langton Herring, Weymouth, January 5th, 1894.